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The Assessment of Beach Carrying Capacity: The Case of Dhermi Destination

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Abstract: Coastal areas in Albania are recognized as the country's great assets both from the development and environmental point of view. Their scenic beauty, favourable climate, diversity of ecosystems, rich cultural and historical heritage have attracted the major share of tourism investments, which due to the lack of the proper legislation and limited institutional capacity have exerted negative effects on their sustainable usage. Thus, the proper planning and implementation of a sound tourism policy together with beach carrying capacity assessment (CCA) take a paramount importance for sustainable development of the coastal areas. This research paper aims to define the carrying capacity thresholds for Dhërmi beach as a prerequisite for tourism planning and development. The methodology used to estimate CCA is based on physical conditions of the study area and its management and support infrastructure. The preliminary assessment of beach CCA for Dhërmi is estimated at 6,648 beach users/day and indicates that it is still in higher level as compared to current tourist activities of the last year. Nevertheless, taking into account the large number of tourists frequenting it, as well as current undergoing investments, TCC assessment should be used as a guide to prevent this coastal area from degradation and manage sound tourism investments in the future.

Keywords: sustainable tourism development, coastal areas; carrying capacity assessment, dhërmi beach, physical, real and effective carrying capacity.

1. Introduction

Traditionally, the resources of Albania's coast have been developed in a sectoral manner with little regard to the integrated nature of coastal and marine ecosystems. Coastal areas have been usually managed round political/administrative boundaries rather than environmental units. Such an approach has often resulted in overlapping jurisdictions and responsibilities (Coastal Zone Management Plan, The region of Durrësi Vlora, 1996). However, Albania's coast remains one of the country's most valuable assets both from the development and environmental point of view. Its excellent geographic position, rich ecosystems, favourable climate, great scenic beauty, rich historical and cultural heritage, makes it both an attractive area and an important resource for the development of economic sectors such as tourism. Recognizing the tremendous potentials for tourism development and the need to manage it in a sustainable manner, the Government of Albania has made considerable efforts during the last twenty years, to set up an effective legal and institutional framework for

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regulating sustainable development in the coastal areas. They included the gradual development of legislation on priority areas for tourism development, the national legislation on urban and physical planning, national legislation for nature and environment protection, the development of National Biodiversity Strategy and Action Plan, the implementation of various technical assistance and investment programs supported by international donors, etc. However, the present on-the-ground reality shows that the above mentioned efforts have not been sufficient enough to ensure a balanced, long-term sustainable development of coastal resources. During the past twenty years tourism investments along the Albanian coast have caused serious environment and scenic degradation, urban sanitation and congestion issues. Due to ad-hoc types of development, environmental limits of the coastal ecosystems are not taken into account, in most of the cases have been overexploited, thus creating constant and hazard conflict with coastal resources. As a result of negative consequences of uncontrolled pressure, the assessment of TCC has taken a paramount importance for sustainable development of the coastal areas. Such assessment is not considered yet as part of integrated management of the coastal developments in Albania, and part of drafting policies and development plans for coastal tourism. The incorporation of TCC assessment during the course of planning and management of tourism development projects should be considered as an important instrument which guides the development process through the participation of all the actors involved, like decision making authorities at the central and local levels, developers and investors, civil society and local communities in particular.

2. Literature Review

2.1 Carrying Capacity Concept

During the last 20–30 years there have been many attempts to define carrying capacity. At a theoretical level, carrying capacity has been defined by specialized researchers as the number of user unit use periods that a recreation/tourist area can provide each year without permanent natural/physical deterioration of the area's ability to support recreation and without appreciable impairment of the visitors' recreational experience (Coccossis & Parpairis, 1992) or as a measure of the tolerance a site or building are open to tourist activity and the limit beyond which an area may suffer from the adverse impacts of tourism (Middleton & Hawkins, 1998). Other definition describes carrying capacity as a certain threshold level of tourism activity beyond which it will cause damage to the environment, including natural habitats (Clark, 1997).

The early concept of carrying capacity was initially introduced in biological science to indicate the limit, or the level a species population size attains given the environmental resistance indigenous to its location (Lein, 1993). Although the first analysis of the ability of parks and protected areas to absorb tourist and to study their impact was made in USA at the beginning of 1930s, the TCC concept emerged as an important discipline during 70s' and 80s'. Since that time, many international organizations dealing with tourism development, have elaborated their own definitions of TCC. Thus, the WTO has proposed the definition of TCC as "the maximum number of people that may visit a tourist destination at the same time, without causing destruction of the physical, economic and socio-cultural environment and an unacceptable decrease in the quality of visitors "satisfaction" (UNWTO, 1993).

2.2 Three Dimensions of CCA

Many researchers agree that during the course of carrying out TCC, multidisciplinary elements should be considered including environmental assets, cultural heritage, residents' aspirations and the quality of visitor's

experience. Following these considerations the carrying capacity concept has four major facets: physical, social, economic and psychological carrying capacity. Initially, TCC was concerned with environmental considerations, but later on with evolution of theory and practices on sustainable tourism and with the need for a multidimensional approach combining simultaneously social, economic and environmental dimensions was taken much emphasis. Consequently, the existence of three different types of carrying capacity was developed by Pearce as following:

- *physical carrying capacity*: "the maximum number of people who can use a site without an unacceptable alteration in the physical environment and without an unacceptable decline in the quality of experience gained by visitors" (Mathieson & Wall, 1982);
- *social carrying capacity:* the level of tolerance of the host population for the presence and behavior of tourists in the destination area;
- *economic carrying capacity:* the ability to absorb tourist functions without squeezing out desirable local activities and avoiding the decline of the tourist destination caused by the disruption of the local attractions (Pierce, 1989).

On the basis of the main dimensions of the development, the impacts of tourism in a given area can be analyzed in terms of three major axes: physical environment (natural and man-made including infrastructure), social (population and social structure and dynamics) and economic (including institutional and organizational). These three basic axes compose physical-ecological, socio-demographic and political-economic dimensions of TCC (UNEP/MAP/PAP, 1997).

The interaction between the above dimensions varies in accordance to the characteristics of a tourist destination including local resources, the sensitivity of natural ecosystems, size and compositions the population, economic structure, local cultural heritage, types of tourist visiting the area and the model of tourism development. Therefore TCCA should be applied individually for each specific tourist destination by using an individual approach that takes into consideration the specific features of the destination (UNEP/MAP/PAP, 1997).

In addition, during the past decades, the concept of carrying capacity has re-emerged by facing a new direction according to which the focus has shifted from determining the maximum numbers of users towards the achievement of desirable conditions, identification of limits of acceptable changes. The prevailing concern for a scientific approach to tourism carrying has been gradually broadened towards a management approach. This implies moving from explicit and numerical values to toward more indicative systems, which should involve not only the key stakeholders, but also the tourists themselves (Cocossis, 2004).

3. Objectives and Methodology

The main goal of this study is the formulation and adoption of a methodological framework, highlighting the concept of CCA in coastal areas and its practical implementation for Dhërmi beach.

Specific objectives included:

1) Defining the tourism carrying capacity for the study area as a useful plannign and management tool for touruism develipomn in sumpathy with thye environment;
2) Preparation of a pilot assessment of carrying capacity for the area, thus contributing to creation of approporiate condition o for sustainable toirism develoment in th future;
3) Sensitising local government authorities, tourism planners and other relevant stkeholders with the

methodology and guidelined for CCA that gurantee integrated coastal managment and their sustainable development in the future.

3.1 The Study Area

This research was conducted at Dhërmi area, a summer tourism destination extended along the Southern Riviera through the settlements of Himara Municipality. The area is distinguished for its reach natural and cultural heritage which is concentrated along the villages of Palasa-Vuno section where one can find diversified combination of coastal, terrestrial and mountainous ecosystems, encompassing small habitats that continue to live in sympathy with local architectural and cultural traditions. The Ceraunian Mountains separates the coast from the hinterland. The climate is characterized by a mild winter and hot and dry summer, with 330 sunny days per year. The yearly average temperature is 17°C, in January it varies between 9°C and 100°C and during July and August 25–260°C. The water temperature varies between 17–22°C and sea bathing usually starts at the first week of June till the first half of October, thus enabling a rather long tourist season varying from 120 till 150 days per year. The area is also famous for its outstanding beaches among which the biggest and finest ones are those of Palasë, Dremades and Dhërmi, extended into 3 km long and 20–50 m wide. Being divided by stunning rocks, they attract thousands of tourists who used to come to enjoy the intact nature, pristine beaches, crystal clear waters and delicious food. Dhërmi gains international attention after the reconstruction of the coastal panoramic road and has been host to youth hubs and beach summer holidays.

3.2 The Assessment of Beach Carrying Capacity

The assessment of TCC for the three beaches of the study area (Palasa, Dremades and Dhërmi) was done by analyzing the quality of beaches and their management, the quality of tourist facilities, infrastructure and other relevant supporting services, as well as the tourist activities during the last years. In general, the calculation of beach carrying capacities should employ a broad range of indicators, including the state of the natural environment, energy, infrastructure, accommodation and tourist facilities, and complimentary tourist products. However, for this study, beach CCA was made taking into account the topography of the study area (sea, hills and adjacent mountains), environmental data (climate, temperature and sunshine), as well as beach management factors (parking facilities, littering, safeguards).

In order to assess the beach usage (seasonality and sunbathing), beach quality perception and beach facilities at three above mentioned beaches, during the last two weeks of June 2017, a survey was conducted with participation of 124 beach users. To facilitate the survey a questionnaire was designed to understand how the beach was perceived by the users by highlighting their positive and negative experience. The data collected were tabulated and grouped by interest analysis to address concerns and purposes of the research.

The assessment of TCC was based on Cifuentes's methodology applied in calculating TCC in several beach areas and followed by Ceballos Lascurain (1996) and Sayan and Atik (2011) for the assessment of CC in some protected areas. The approach developed was to define the destination's capacity for a maximum number of visitors, based on physical biological and beach management conditions through Physical Carrying Capacity (PCC), Real Carrying Capacities (RCC) and Effective or Permissible Carrying Capacity (ECC). The calculation of these parameters has taken into account physical, ecological and maritime conditions of the study area. Thus, the PCC represents the maximum number of tourist s that can physically fit into a specific area, over a particular time. The formula used for such calculation is:

$$PCC = A/Ab \times Rf,$$

where: A is the size of the study area

Ab area required per bather in order to enjoy a comfortably sunbathing

Rf, rotation factor (the number of beach bathers per day)

Taking into account World Tourism Organization guidelines and the objectives of local authorities for the development of medium class tourism, the optimum area required per bather (Ab) is 10 m^2.

Rf = daily open hours /average hours of beach visit

Rf = 12/8 = 1.5

The three beaches (Palasa, Dremades and Dhërmi) of Dhërmi area were taken for calculation of TCC by determining their natural boundaries including the hilly range, river stream in case of Palasa beach, and the total available area where visitors/bathers can use for sunbathing.

In order to study the physical beach carrying, it is crucial to accurately measure the available area for recreation purposes on each beach (da Silva, 2002). Their surfaces were computed based on the aerial photography of State Authority of Geospatial Information (ASIG), taken in the year 2015, with a spatial resolution of 20 cm (1 pixel equal to 20 cm). On screen digitalization of three beaches was made using GIS system techniques by interpreting the scale 1:500 with a digitalization error 0.2 × 500= +/- 100 cm. The exposure of the study area during high and low tides was negligible; therefore this factor was not taken into account. Based on the results of the digitalization the surface of the three beaches was calculated in Table 1.

Table 1 The Beaches of Dhërmi Area with Their Respective Surfaces

No.	Beaches	Beach area in m^2
1.	Palasa	96,938.2
2.	Dremades	106,679.4
3.	Dhërmi	76,174.6
4.	Total	279,792.2

Thus in total, the physical carrying capacities for the three beaches is:

PCC = 279,791 / 10 * 1.5 = 41,969 visitors/day

Real carrying capacity (RCC)

The real carrying capacity (RCC) is the maximum permissible number of tourists to a specific site once the correction factors (Cf) derived from the particular characteristics of the site have been applied to RCC.

The RCC was determined using the formula: *RCC = PCC x (Cf1 x Cf2 x Cf3)*

Where RCC = real carrying capacity; PCC = physical carrying capacity;

Cf1…Cfn = correction factors.

The correction factors were determined based on the equation:

Cfx = 1 Lmx/Tmx

where Cfx = correction factor of the variable x, Lmx = limiting magnitude of variable x, and Tmx = total magnitude of the variable x.

The correction factors were determined on the bases of biophysical, environmental, ecological, social management variables parameters (Zacarias, Williams & Newton, 2011). As correction factors for the study were considered the sunburn, seasonality and the quality of beach management which can affect the tourist satisfaction at a given time.

The calculation of correction factors, known also as limiting factors, is done as follows:

3.2.1 Tourist Seasonality (Cf1)

Though the theoretical summer season could be extended up to 160 days, in reality it includes the period from beginning of June till end of September.

The limiting magnitude of this parameter is calculated as: 30 days/June + 31 days/July + 30 days/August + 31 days/September = 122 days of tourist season per year. The total magnitude is defined as the total days of the year, i.e 365 days.

Thus, the correction factors for tourist seasonality are determined as:

$Cf1 = 1 - LMx/Tmx$ = 1 – 122 / 365 hours =1 – 0.3342 = 0,665

3.2.2 Excessive Sunshine (Cf2)

Excessive sunshine is considered an import limitation for outdoor recreation and beach tourism. With the current tourist facilities the summer season in Dhërmi is extended between June and September and is characterized by a hot and dry summer. The highest temperatures during the summer season are recorded during the hours interval 13:00-15:00 PM. The high sunshine during this time span may cause dangerous UV radiation, therefore tourist and bathers presence during this interval was almost inexistent. The limiting magnitude of this parameter was calculated as 122 days (June to October) × 3 hours =366 hours of excessive sunshine per year. The total magnitude is defined as the days of the year, i.e., 365 days × 12 hours/day = 4380 hours.

Thus, the correction factors for the excessive sunshine are determined as:

Cf2 = 1 – LMx / Tmx = 1 – 366 hours / 4380 hours = 1 – 0.08335 = 0.917

3.2.3 Beach Quality (Cf3)

Beach quality is another important parameter which attracts more and more tourists to Dhërmi area and may negatively influence their satisfaction. In order to assess beach quality the proposed model by Nghi was taken as a reference with a slight adjustment (Nghi, Lan, Thai, Mai & Thanh, 2011). For beach quality assessment the following geographical and environmental criteria were taken into account: Beach type, beach length, seawater quality, littering.

The results of beach quality assessment and relevant correction factors were determined separately for the three beaches of the study area. The results of Cf4 correction factor are given in Table 2.

Table 2 Quality Assessment Matrix for Dhërmi Beaches

Beach	Beach type	Beach Quality					Total	Estimated
		Material	Slope	Length	Sea water quality	Littering		
Palasa	Pebble beach	-	+	+	+	+	1/5	0,20
Dremades	Pebble beach with gravel	+	+	+	+	-	1/5	0,20
Dhërmi	Pebble beach with gravel	+	+	+	+	-	1/5	0,20

"+" means good quality; "-"means not good quality

Cf4 = 1-Lmx / Tmx =1 - 1/5 parameters=1 – 0.20 = 0.80

Thus in total, the real carrying capacity for the three beaches is:

RCC = PCC × (Cf1 × Cf2 × Cf3) = 41.969 × (0.665 × 0.917 × 0.80) = 20.474 visitors / day

For the three separate beaches the specific physical and ecological carrying capacities are showed in Table 3:

Table 3 Calculation of PCC and RCC for the beaches of Dhërmi Area

No.	Beach Name	Beach area in m^2	PCC (visitors/day)	RCC(visitors/day)
1.	Palasa	96,938.2	14,541	7,093
2.	Dremades	106,679.4	16,001	7,808
3.	Dhërmi	76,174.6	11,426	5,575
4.	Total	279,792.2	41,698	20,476

3.3 Effective Carrying Capacity (ECC)

ECC represents the maximum number of tourists that a site can sustain, given the management capacity (Mc) available. The Mc indicates the present conditions of tourism of tourism management in certain beaches and is estimated based on available infrastructure, beach facilities and amenities (R. Srithar, E. Yuvaraj, V. Sachithanandam, TMageswaran, R. Purvaja & R. Ramesh, 2016). Zaharias stated that ECC is a result of the combination of RCC with Mc of the area. Consequently, the following equation can be used:

$ECC = RCC \times Mc$, where:

ECC = effective carrying capacity; RCC = real carrying capacity; Mc = management capacity.

Mc was determined using beach infrastructure and tourist activities available, which were assessed through individual perceptions of tourist that were interviewed by the researcher. Results of the interviews were tabulated in an assessment matrix developed for the three beaches of project area shown in Table 4.

Table 4 Assessment Matrix of Beach Management Capacity in Dhërmi Area

Beaches	Beach Management Activities							
	Beach access	Parking facilities	Beach security	Beach facilities	Beach cleanness	Waste collection	Credits	Mc
Palasë	+++	-	-	-	+	+	5	0.28
Drimadhes	+++	-	-	+	++	+	7	0.39
Dhërmi	+	-	-	++	++	-	5	0.28

"+++" = Very good, "++" = Good; "+" = Somehow; "-" = Dysfunctional

1) For Palasa Beach:
   ECC = RCC x Mc
   ECC = 7,808 x 0.39
   ECC = 3045 bathers/day
2) For Dremades Beach:
   ECC = RCC x Mc
   ECC = 7,093 x 0.28
   ECC = 1986 bathers/day
3) For Dhërmi Beach:
   ECC = RCC x Mc
   ECC = 5,775 x 0.28
   ECC = 1, 617 bathers/day
4) For Entire study area:
   ECC = 6,648 bathers/day.

This calculated number that takes incorporates the influence of beach quality and management factors represents on optimal number of beach visitors. Taking into account ECC and the normal extension of tourist

season (122 days) the optimal number of tourists Dhërmi area can withstand without having negative impacts on ecology of the coastal area is estimated at 811,056 tourists/visitors. In fact, the number of tourists having spent overnight stays in Dhërmi area during the summer of 2017 is estimated at 430,539. Therefore, the current tourist activity which is estimated in the highest level compared to the previous last 5 years is still in a lower level compared to its carrying capacity. So it is the number of accommodation establishments which according to reporting statistics of business establishments.

4. Conclusions and Recommendations

The effective management of coastal resources represents a great challenge for local authorities, tourism planners and managers and the assessment of optimum usage of coastal resources is not an easy task. Nevertheless, the beach CCA is considered an important parameter of any tourism development planning process that should guide the tourism development and also planning of other activities, traffic routes and other type of infrastructure intervention.

This research is important for Dhërmi destination, as currently no such analytical highlight is in place at a time when the region has gained full exposure to foreign and local tourist markets that are likely to bring in the short run much more tourist than the area can withstand.

The results of beach CCA for Dhërmi area revealed that the Real Carrying Capacity for the coastal area of Dhërmi is estimated at 6,648 bathers per day. Such a number is exceeding almost twice the current number of tourists visiting the area. However, taking into account tremendous potentials of Dhërmi and the objectives of central and local government to develop it as an upmarket destination, beach carrying capacity concept should be carefully considered in order to avoid reaching its saturation point rather soon.

For Dhërmi area it is required a more specific approach being adapted to the principal characteristics of the environment and types of tourism that could develop successfully. The main reasons of such differentiation are the characteristics sensitive-ecosystems, specific environmental climate, determination, and seasonality with greatest intensity in the summer, great wealth of cultural heritage sites, specific tradition and behaviour of the local population, etc.

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