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Case study

Carrying capacity in the tourism industry: a case study of Hengistbury Head ☆

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Abstract

This paper argues that it is necessary to define and implement the concept of carrying capacity as a critical aspect for facilitating planning in the tourism process. In order to achieve this aim, this article shows how the growth of Bournemouth may exceed the environmental and ecological carrying capacity of Hengistbury Head, using the case study approach. The paper, therefore, studies the concept of carrying capacity alternatives to this model and includes a set of proposed solutions for determining, managing, controlling and increasing the environmental carrying capacity of a tourist destination.

Keywords: Carrying capacity; Limits of acceptable change; Case study

1. Introduction

Tourism theory has recognised the key importance of environmental quality for ensuring the competitiveness of most types of tourist destinations (Inskeep, 1991, p. 347; Mihalic, 2000, p. 65). Thus, natural areas play an important role in promoting the tourist product (Riera Font, 2000, p. 114), and they can be added to other considerable efforts and funding to enhance the tourist image and attractiveness of certain destinations (Ritchie & Crouch, 2000, p. 1).

In this sense, most destinations recognise that competitiveness is illusory without sustainability (Ritchie & Crouch, 2000, p. 2). Nevertheless, the environmental debate in tourism has recognised that many conflicts with biological conservation arise as a result of the travel and tourism industry (Mihalic, 2000, p. 65). Ecologically, the expansion of recreational activities may threaten undisturbed landscape and wilderness areas for short-term economic benefits (Wanhill & Buhalis, 1999, p. 297; Hohl & Tisdell, 1995, p. 519). It changes the composition of the flora and fauna, creates pollution, erosion and visual impacts, and affects natural resources (Cooper, Fletcher, Gilbert, Shepherd, & Wanhill, 1998). Britain's coastal regions provide numerous instances of this kind of interaction (Edington & Edington, 1977, p. 25) and Hengistbury Head is one example of this situation.

Hengistbury Head is a 1.5-km-long peninsula jutting out into the sea from the east coast of Dorset, Great Britain (see Fig. 1). It is a promontory to the east with the remains of an iron age settlement, where trade flourished in the 1st century BC. On the north side of the Head, the rivers Stour and Avon flow into the harbour (Cunliffe, 1978). The peninsula is a wildlife reserve and Christchurch Harbour has been designated as a Site of Special Scientific Interest (SSSI) by the Nature Conservancy Council (NCC).

One of the main problems faced by the Head concerns erosion. This appears, essentially, along its southern side, which is constantly scoured by the wind and waves (see Fig. 2). A set of weak points can be identified at (see Fig. 3): (a) the eastern end of Hengistbury Head, on the South Beach, where a gabion revetment has been built to prevent it becoming an island; (b) the beach and dunes, where nesting birds are located and dune

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Fig. 1. Hengistbury Head.

Fig. 2. Impressive differential erosion of the various sands and clays.

grassland can prevent the loose sand being carried away by on-shore winds (Cunliffe, 1978); (c) the nature reserve; (d) the narrow superstructure and cliff area around Hengistbury Head, exposed to wind, rain and wave erosion; and (e) the Hengistbury beds, considered of priority geological importance by Bournemouth Borough Council.

However, the nature of the issue is the conflict between the conservation of the head and the development of Bournemouth, a large town next to Hengistbury Head. The growth of Bournemouth as an important tourist destination has disturbed and destroyed a landscape which has proved to be unusually rich in archaeological finds (Cunliffe, 1978, p. 15). Recreational activities disrupt the ecological system on the Head in a variety of ways. Most pressure is concentrated on the beach and first line of dunes (the most sensitive habitats). Nesting birds are easily disturbed by both people and dogs, while their eggs and young are liable to be trodden underfoot. On the dunes, trampling easily disrupts the first pioneer phase of plant colonisation. This can result in sand blowouts, which may in turn smother some of the established communities further inland. The fixed dunes and dune grassland can also be damaged by the regular passage of tourists (Edington & Edington, 1977).

The aim of leisure management is to make positive provision for recreation, while protecting and enhancing the resource (Glyptis, 1991). According to this author, the basic aims of planning and management of tourist and recreational natural areas should be: (i) to obtain and maintain public access; (ii) to improve tourists' perception obtained through a visit; (iii) to protect the site; and (iv) to make recreation compatible with other interests. However, at a theoretical level, there are many difficulties in defining and measuring the carrying capacity of a site.

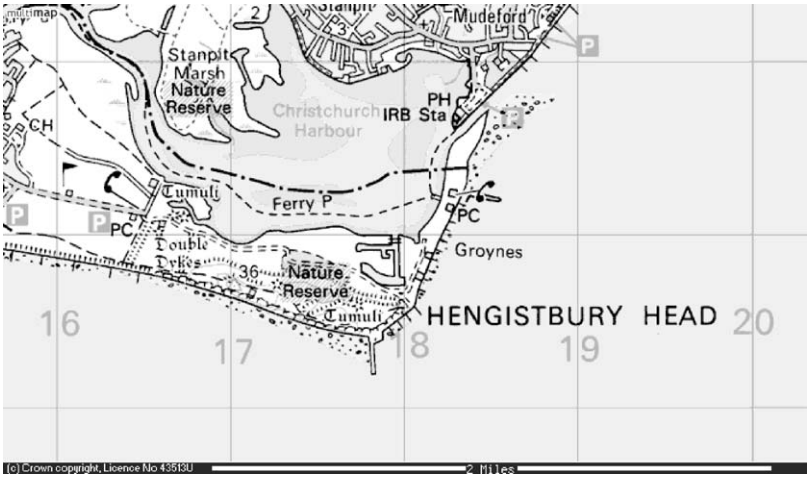

Fig. 3. Map of Hengistbury Head.

Taken into account the nature of the problem, the purpose of this research is to study the carrying capacity problems in Hengistbury Head, bearing in mind two specific criteria: environmental impacts and physical constraints. In addition, the article also seeks to analyse and propose some mechanisms for determining, managing, increasing and controlling the environmental carrying capacity of Hengistbury Head.

2. Carrying capacity and environmental carrying capacity

It is important to conceptualise carrying capacity, because the ability to express this in terms of an unambiguous standard measure is essential in order to facilitate tourism planning (Saveriades, 2000, p. 155). The World Tourism Organisation defines it as "the level of visitors use an area can accommodate…" (Buckley, 1999, p. 706). However, there is a plethora of conceptual bases for carrying capacity: social, economic and ecological. Almost all definitions incorporate two central aspects: the behavioural component, reflecting the quality of the recreational experience, and the biophysical component (Saveriades, 2000, p. 148). In this sense, this research uses the Mathienson and Wall (1982, p. 184) definition, considering carrying capacity as the maximum number of people who can use a place without an unacceptable alteration in the physical environment and an unacceptable decline in the quality of the recreational experience.

Despite these considerations, some authors agree that carrying capacity is mainly an ecological concept, which expresses the relationship between a population and the natural environment (Abernethy, 2001, p. 9). In this sense, Buckley (1999, p. 706) defines it as the number of visitors that produces no detectable, or at least no irreversible, ecological change to the ecosystems in an area; or the maximum level of recreational use in terms of numbers and activities that can be accommodated by an area or an ecosystem before an unacceptable or irreversible decline in ecological values occurs (Papageorgiou & Brotherton, 1999, p. 271).

3. Problems in measuring carrying capacity

It is broadly recognised that some form of intervention is necessary to protect the environmental assets on which tourism is based (Inskeep, 1991). Nevertheless, protection of the environment can only be achieved if the impact of development programmes is predicted before approval for them is given (Park, 1986).

In this situation, the determination of carrying capacity at any point in time will be the type of impact with the greatest change relative to the impact threshold (Cooper et al., 1998, p. 198). However, in order to be useful, carrying capacity must be measured. The question and challenge is whether this is possible (Buckley, 1999, p. 706).

The main problems faced in measuring carrying capacity are:

A. Carrying capacity means different things to different people; there is no universal definition, and "is centred around tolerance-levels" (Cooper et al., 1998, p. 192).
B. There are a variety of standards to measure. As Miller (2001, p. 351) states, the list of acronymic organisations involved in the development of indicators for sustainable development is long and impressive. In addition, for the concept of carrying capacity, different things, such as environmental capacity and tourist capacity, must be measured.
C. Carrying capacity is a dynamic and fluid concept. It is neither fixed nor static, and can depend on the speed of change.
D. The concept is virtually unquantifiable (Abernethy, 2001, p. 9). Therefore, there is a lack of quantifiable measurements and problems with qualitative measurements (Miller, 2001, p. 352).
E. There are difficulties in predicting impacts. Besides, an impact is only known if it is detectable, but detection thresholds can be highly variable (Buckley, 1999, p. 707).
F. Management can alter effects or processes and, therefore, impact assessment must be made before, during and after any development.
G. Solutions proposed by different experts do not often achieve general agreement. In particular, the "do nothing" option often results in environmental losses just as a "do something" option would. For example, Fig. 4 shows the ranking given to six options by different experts concerned with ecological, archaeological, geological, and geomorphological landscape features of Hengistbury Head. The experts do not agree as to whether or not it is desirable to allow erosion to continue at the Head.
H. Finally, some authors even criticise the concept. "The concept is deficient in theory, unrealistic in implementation and impossible to measure" (Papageorgiou & Brotherton, 1999, p. 271). Buckley (1999) also states that carrying capacity is not a concept that can be applied to a rigorous analysis or in practical management.

The dynamic nature of carrying capacity, together with the lack of a universally acceptable definition, has resulted in some bodies adopting the alternative terminology of LAC (Cooper et al., 1998, p. 189). The main objective derived from the LAC model is the confluence between recreational and ecological aims

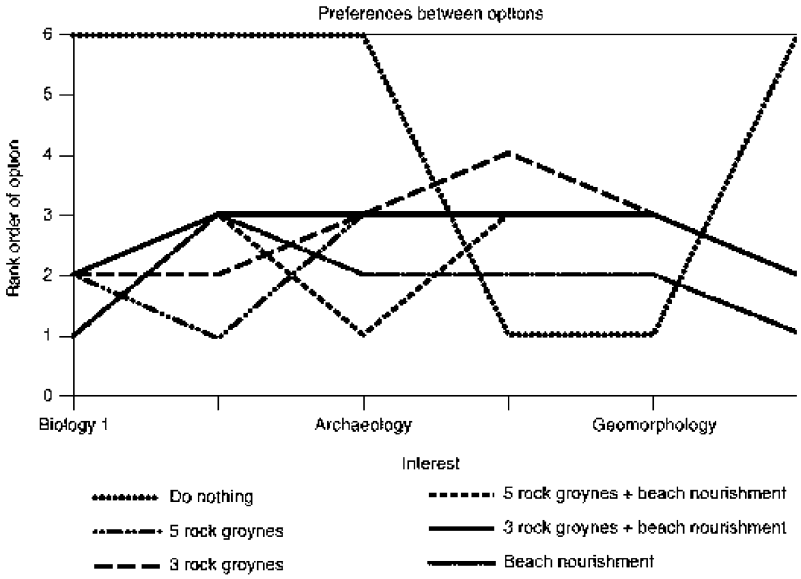

Fig. 4. Hengistbury Head: options ranked by different interests.

(McCool, 1996). The advantage of the new terminology is that it can be converted from conceptual to operational form more easily than carrying capacity. The LAC shifts in focus from "How much use is too much?" to "How much change is acceptable?" and places the issue of carrying capacity in a prescriptive as opposed to a technical context (Stankey, McCool, & Stokes, 1984), representing a framework within which decisions can be made about the kinds of conditions that will be allowed to occur in an area, integrating recreational impacts with political environmental decisions. In addition, LAC reaches beyond the traditional carrying capacity model to evaluate the costs and benefits from alternative management actions for producing specific desired resource and experience conditions on the site.

4. Methodology

In this research, the case study method has been used to achieve the objectives. According to McNeill (1990) and Jankowicz (1995), this methodology is a focusing approach that allows the discovery of a variety of interactive processes and the factors involved in an in-depth study of a destination. It is a flexible process, taking into account unexpected issues that may arise or which a participant deems important.

The case study as a research method can include various techniques. Among primary research, the most frequently used methods are observation and interviews (Bell, 1996). The researcher has been to Hengistbury Head and Bournemouth. In addition, opinions have been collected from professors and other people in the area. The data were collected during the period between December 1999 and June 2001. The chosen sample included key people: experts in tourism from Bournemouth University; government bodies, in particular members of Bournemouth Borough Council; private companies and associations. Content analysis was used to analyse the data. In addition, secondary data were used throughout the whole study. The data were collected at Bournemouth University and other universities from Spain and Thailand.

5. Proposed solutions

Planning is complex, extremely ambiguous and difficult to define (Tosun & Jenkins, 1998, p. 101). However, the more successful the planning and management, the fewer the impacts and the greater the carrying capacity (Cooper et al., 1998, p. 194). Prevention is better than cure (Weldford & Gouldson, 1993, p. 31), sustainability of tourism depends on the ability to anticipate the needs of the future traveller (Coathup, 1999, p. 70), and planning new tourism must be proactive (Ryan, 2002, p. 23).

Referring to the Dorset coast, natural attractions are those which attract the majority of visitors. In Bournemouth and Christchurch, the natural attractions are the beaches, although Poole Harbour is an attractive centre for yatchting, watersports and boat trips. Furthermore, the country has over 120 built visitor attractions covering a range of interest including historical properties, wildlife attractions, museums and exhibitions, gardens and country parks. Attractions also include local amenities such as retail centres, leisure complexes

such as Tower Park and local sports facilities. The resorts towns of Bournemouth and Christchurch could also be considered as build attractions in themselves.

In Dorset there is a Structure Plan, which is a tool for achieving the strategic planning authorities' vision for the coast. More specifically for Hengistbury Head, there is a management plan that seeks to conserve and enhance the natural environment, which should in turn contribute to increased biological diversity. The main aspects of the plan include: (a) the introduction of cattle in Barn field, which is beneficial for ground nesting birds; (b) the repair and extension of the low fence to include the north end of the pond; (c) the creation of a small paddock for the horses and a larger one for the cattle; (d) replenishing the beach and building an artificial reef off the head; (e) moving the facilities and sunken car park from their current location near the Double Dykes to a position further west. Other initiatives on the coast are the "Dorset Area Tourism Group", which comprises the Tourism Industry Consultative Forum, and the Joint Tourism Marketing Executive Panel, consisting of industry representatives and local government officers, respectively.

However, the plans have some deficiencies, which will be explained below as we point out some solutions. However , in order to search for solutions, there are aspects which must be considered first (Briassoulis, 1999, p. 892):

(a) There is no perfect solution and previous evaluation is needed. Integrated planning for a specific project requires inputs from different sectors, agencies or disciplines (Tosun & Jenkins, 1998, p. 105)
(b) Issues such as accessibility or physical space must be taken into account together with changes in natural processes, viability and risk of damage. Biodiversity depends on the viability of ecosystems across a whole area of countryside and not only in designated reserves (Selman & Wragg, 1999, p. 695).
(c) The need for flexibility is another fundamental element (Tosun & Jenkins, 1998, p. 106). In the past, planning was often too rigid to cope with rapidly changing socio-cultural, economic, technological and other conditions, and such plans were therefore impossible to implement (Inskeep, 1991).
(d) Technological developments covering the carrying capacity must be considered (Meyer & Ausubel, 1999, p. 209). Past discoveries and technological breakthroughs have increased carrying capacity many times and some western disciplines encourage the belief that the potential of technology is unlimited (Abernethy, 2001, p. 9).
(e) Environmental decision making covers a hierarchy of levels from the individual project, through the more general program, to the overall policy (Park, 1986, p. 27). In addition, according to Trousdale (1999, p. 840), local, regional and national roles must be specified and community inputs incorporated.
(f) Stakeholders' opinions and the power of the media are other key matters. It is of paramount importance to emphasise the need for collaboration between all the stakeholders towards sustainable development (Park, 1986, p. 28; Wanhill & Buhalis, 1999, p. 297).

Once all these aspects have been taken into account, there are four key components to an environmental management system: (i) the environmental review, (ii) the environmental policy, (iii) the design and implementation of the system, and (iv) the environmental audit (Weldford & Gouldson, 1993, p. 92). According to them, and with the problems of carrying capacity mentioned above, the follow steps could be designed: (a) determine the maximum and minimum likelihood of particular events happening (environmental and tourism); (b) identify concerns and issues in the area, desired future resources and social conditions, and determine maximum and minimum thresholds tolerable in each area of impact, for which it is essential to select indicators of resource and social conditions, make an inventory of them, and specify standards for both; (c) identify alternative opportunities and management actions for each alternative and determine priorities; (d) evaluate and select alternatives, by maximizing them subject to these constraints, and observing the Pareto law; and (e) implement actions and monitor conditions. In practice, the most effective approach is to establish monitoring programs and adopt a set of management tools that can be applied or modified on the basis of monitoring data (Buckley, 1999, p. 708).

Certain specific solutions can be proposed:

(a) Creating a positive social and political environment, inside and outside Hengistbury Head, which goes beyond the excessively reductionist ecological or physical issues included in the plans for Hengistbury Head. More specifically:

(1) Educating Hengistbury Head tourists, residents and workers (Geller, Winnet, Everet, 1982). Environmental education of visitors can increase effective carrying capacity and contribute to the quality of the visitor experience (Papageorgiou & Brotherton, 1999). For instance, at Hengistbury Head, sailors and windsurfers can help by not disturbing or feeding birds and walkers by not picking flowers or allowing their dogs to disturb the birds.
(2) Creating a financial environment that encourages best practices. Implementing an entry fee scheme, or other measures if this is not possible, could improve the finances of Hengistbury Head, which, in turn, could help improve protection of the resource base.

Although the ecosystem of the Head is quite complex and it may be difficult to reach accurate economic estimates for financial valuation, an attempt could be made to find a technique to measure the conservation value of Hengistbury Head, such as that developed by Parker and Thomson (1987).

(3) Encouraging social support. When the environmental movement and the tourism industry support the development, there will be a much higher managerial capability for achieving both environmental protection and future tourism goals (Van Sickle & Eagels, 1998, p. 234). In addition, sustainability as a long-term objective can only be relevant if it can win the support of present day beneficiaries (Tosun & Jenkins, 1998, p. 112).

(4) Encouraging government support. It is essential that government and the public sector become partners in the entire process of tourism development (Van Sickle & Eagels, 1998, p. 225; Coathup, 1999, p. 71). It must be realised that promoting economically viable and ecologically sustainable tourism can be time consuming, complex and expensive, usually requiring strong political support and enabling legislation, highly skilled management, sensitivity to local decision-making processes and a flexible design which can adapt to the lessons of implementation (Wells & Sharma, 1998, p. 240).

(b) Controlling and limiting the volume and the flow of tourists, spread them over space and time (Hohl & Tisdell, 1995, p. 522), and look for the "best tourist". Hengistbury Head attracts in the region around 780,000 people annually. An increase in visitors can lead to pressure for new developments to serve and capitalise on their needs (e.g. caravan parks, visitor centres, cafes, signs, car parks and additional accommodation). Factors such as the average length of stay, the characteristics of the tourist and host, the geographical concentration of tourism, the degree of seasonality, the types of tourism activity, the accessibility of specific sites, the level of infrastructure use and possible spare capacity must be taken into account (Cooper et al., 1998, p. 186). According to Mihalic (2000, p. 68), and Ryan (2002, p. 21), it is often presupposed that an environmentally aware tourist acts in an environmentally responsible way because he is concerned with the environment or wishes to ensure a beneficial impact upon the place visited. Sophisticated measures include using booking systems, controlling numbers by charging high entrance or permit fees, dividing areas into zones, and allowing only one group per zone at any time… (Buckley, 1999, p. 706). For instance, here, different kinds of recreational capacities have to be considered. In addition, although it is also important to consider aspects such as distribution of use, environmental setting, type of use, and timing of use, it must be remembered that recreation impacts vary with mitigating actions taken by managers and with people's expectations and norms. Some restrictions can be introduced:

(1) Limiting overall accessibility. By making access difficult (Anderson, Kneese, Reed, Taylor, & Stevenson, 1977), or by managing the capacity of supporting facilities, any future unwelcome expansion of visitors can be constrained (Papageorgiou & Brotherton, 1999). For instance, tourist places can be rationed by reservation, lotteries, queuing, price, or merit.

(2) Restricting accessibility to sensitive sites (allowing recovery times for fragile areas, or considering physical and ecological capacities), zoning, or creating and channelling tourists on to paths (Edington & Edington, 1977, pp. 29–32). It is useful to employ a zoning concept that is defined ecologically, geographically, temporally, politically, or socially.

(3) Limiting accessibility by restricting activities or facilities. Imposing legislation on tourism growth, or charges (uniform or variable). However, practical proposals for environmental charges require much applied economic and technical research to make them workable in specific contexts and to minimise undesirable secondary consequences (Anderson et al., 1977, p. 149, 191).

(4) Targeting environmentally aware tourists (Cooper et al., 1998, p. 198). Designing and offering acceptable conditions for activities undertaken by significant numbers of a specific visitor group or in areas used by sports enthusiasts, in the light of different sites and demands by visitor groups in the same resource area, with techniques aiming for a more even distribution of visitors. These measures encourage more visitors in order to satisfy the economic dimension of management and this has been shown to be possible without exceeding either perceptual or ecological capacities (Papageorgiou & Brotherton, 1999). In addition, it is important to control social capacities, such as tourist behaviour, crowding and meeting at the recreation site.

(5) Virtual reality and other techniques can induce people not to spend much time on the Head, thus increasing carrying capacity.

(c) Preventing indirect effects of developments in the area, such as the increase of certain tourism facilities or effects such as pollution coming from Bournemouth or on the Head (Anderson et al., 1977). Under this heading, the plans should be more interrelated, requiring regional and destination-specific plans (Tosun & Jenkins, 1996, p. 530), integrated in the local

management policy (Dredge, 1999, p. 773). However, what is preferred by local people can conflict with national or even global preferences as is the case with the preservation of certain species, when locals might prefer hunting to conservation (Hohl & Tisdell, 1995, p. 520).

(d) Investment in regeneration, research and other human activities. According to Abernethy (2001), technology can provide clean air and water, or adopt various strategies to minimise pollution and other environmental disturbances. Nevertheless, there is often no clearly superior environmental option. In this sense, Hengistbury Head has some problems:

(1) Sand blowouts are not easy to anticipate, but once they have occurred, various rehabilitation techniques can be used. At Hengistbury Head, it is important to combat the erosion of vegetation. Where no biological conservation issue is involved, it is appropriate to combat it by whatever means are both practical and aesthetically acceptable. Where the vegetation at risk is of conservation significance, the options become more restricted and the strategy of diverting the public is usually the only one available (Edington & Edington, 1977, p. 181).
(2) Wave erosion continues to be a danger. One idea that appears to have been completely ignored in the management plan is to partially line the base of the cliff with boulders, replacing those lost in the 1850s. While this idea may seem simplistic, it can be seen on the beach at Hengistbury Head that, where ironstone boulders remain, the cliff has regressed less.
(3) Protection of shore-nesting birds is difficult to carry out. It usually has to involve a combination of fencing, explanatory notices and active wardening (Edington & Edington, 1977)
(4) Basic facilities can be provided, such as litterbins, improved management, greater presence of wardens and appropriate application of education and incentives to improve visitor behaviour in the area. Problems such as litter and vandalism could be significantly reduced, thereby enhancing the users' recreational experience (Papageorgiou & Brotherton, 1999, p. 282).

However, to implement an effective plan, and before applying steps (b)–(d) it is also important to take account of the LAC perspective, using some indicators to discover problems. Thus, the following set of items, grouped into environmental and recreational indicators, has been suggested to managers of the tourism destination for quantifying variations in these intangible constructs.

(a) *Environmental indicators*: Amount of bare ground or widths of paths in the dunes and in the upper beds; amount/weight of litter in the nature reserve; noise level for the shore-nesting birds; number of breeding pairs of birds or their species composition; water quality of the river and beach; deposits of materials on both the southeasterly beach and the northerly harbour shore line; number of visitors in different zones or passing a particular point at set times; total number of visitors to the site/property; number of people carrying out a particular activity; number of visitors coming by different means of transport (this is useful to find out the typology of tourists).

(b) *Recreational indicators*: Income generated from car parks, coastal businesses, etc.; employment recruited on the Head or in the area because of the destination; donations received; satisfaction levels of the visiting public; percentage of people feeling overcrowded at particular times; number of complaints; number of prosecutions.

6. Conclusions

Carrying capacity has no universal definition. It remains an elusive concept and a fixed deterministic approach is inappropriate for management. Apart from the environmental aspect of carrying capacity considered in this paper, a large range of factors, including socio-cultural, economic, psychological and perceptual factors, must also be considered, depending on the particular concern.

The concept has other problems. Apart from including quantitative and qualitative measures, there are aspects of tolerance and dynamic nature. For instance, feedback over time between carrying capacity and local and external factors can be responsible for increasing/decreasing the magnitude of acceptable tourism presence. Because of this, it is difficult to define and measure. The introduction of LAC concept and some of the environmental and recreational indicators tries to solve these problems. However, a reliable and well-designed environmental monitoring program continues to be necessary (Buckley, 1999, p. 707).

With those problems, carrying capacity can only be examined in a case-by-case situation because it is sensitive to aspects such as location, the type of tourist activity, the speed of tourism growth, the temporal dimension of technical developments, and so on.

At Hengistbury Head, major difficulties in measuring carrying capacity include the lack of considered knowledge of impact of visitors on the biological system, population numbers of target mammal species and bird fauna, the level of concern visitors have for various aspects of the resource, and the prediction of sand blow outs and wear on vegetation.

The solutions to Hengistbury Head's problems are very difficult to find. Apart from an effective analysis of

the problem and the determination of the carrying capacity, various solutions could be: (i) moral persuasion and environmental education, to ensure environmental impacts are taken into account in private decisions; (ii) direct (legal) regulation at the site or the integration of tourism into local or regional site management policy (Tosun & Jenkins, 1996; Dredge, 1999) involving the use of mechanisms (law, licenses, permits, registration, limits on accessibility, directives, presence of wardens) to discourage damage beyond a pre-defined acceptable level; (iii) economic incentives, to correct specific deficiencies (subsidies, taxes, charges), or to improve visitor behaviour in the area (Papageorgiou & Brotherton, 1999); (iv) management of the "tourist presence", seeking the best tourists (Cooper et al., 1998; Mihalic, 2000; Ryan, 2002) and designing mechanisms to increase carrying capacity, such as diverting the public (Edington & Edington, 1977) or controlling social capacities of tourists on the site; and (v) research, investment in environmental protection and restoration (Cunliffe, 1978, p. 11) in the area, and other managerial and man-made actions, for instance using new technologies (Abernethy, 2001) to avoid and try to solve environmental problems.

It is important to consider the limitations of this study. First of all, this paper is limited by our narrow perspective. A wider study is, therefore, required that would consider other multidisciplinary visions and solutions for this area. In addition, the article has only dealt with the environmental element of carrying capacity within the area of Hengistbury Head, without taking into account the other important elements mentioned above. Finally, additional research into the concept and advanced measurements of carrying capacity are essential for a better planning process.

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