

## A Historical Review of Recreational Carrying Capacity Model (RCC) in Island Tourism

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**Abstract:** The degree to which a protected island can sustain a viable tourism and recreation presence is dependent on the physical environment, the behaviour of visitors, and most importantly is the management and resourcing. Without appropriate management, regardless of how beautiful an island is, eventually it will lose its nimbus. This paper presents a historical review of recreational carrying capacity in island. It also provides the modeling approaches for visitor impacts to protected islands, and followed by the dimensions of recreational carrying capacity model, and the limitations, as well as how the model has been applied to island tourism.

**Key words:** Ecosystem management, island tourism, recreational carrying capacity, sustainability, tourism management strategies, visitor impact management.

**Suggested Citation:** Badaruddin Mohamed & Tay, Kai Xin. (2016). A historical review of recreational carrying capacity model (RCC) in island tourism. *TEAM Journal of Hospitality and Tourism*, 13(1), 27 – 39.

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### Introduction

Carrying capacity has proved to be a useful concept in wildlife and range management, where it refers to the number of animals of any species that can survive in a given habitat (Manning, 1999). The definition of carrying capacity was first refined as “the maximum extent of the highest type of recreational use which a wilderness can receive, consistent with its long-term preservation” (Sumner, 1942). Carrying capacity was raised from a question ‘*How large a crowd can be turned loose in a wilderness without destroying its essential qualities?*’ (Stankey, 1981, p. 44) as early as 1936s. This question then led to a solution to keep the wilderness use within the carrying recreational saturation point. The point was considered as the maximum permissible use or short of impairment in 1942 (Stankey, 1981). However, two questions; ‘*How much use?*’ and ‘*Can a given area stand without physical deterioration of the site or impairment of aesthetic and spiritual values?*’ were raised in 1957 (Stankey, 1981). Both of these early appraisals of the carrying capacity problem conceived of it as substantially one determined by physical-biological parameters (Stankey, 1981). Implicitly, it defined this capacity as an inherent feature of a system which was subject to direct and relatively unequivocal measurement.

In 1950s and 1960s, massive crowds in protected areas stimulated concern over the appropriate level of visitor use (Anderson, Lime & Wang, 1998; Manning, 1999). The concept of

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carrying capacity attracted a plethora of definitions within the context of outdoor recreation (Saveriades, 2000). The concept of carrying capacity was applied to recreation, particularly wilderness management, to describe how wilderness conditions deteriorate in the face of rapidly escalating levels of use (Anderson *et al.*, 1998; Lucas, 1964; G. Stankey, 1981; Wagar, 1964). Except for some suggestions and publications, formal development of the Recreational Carrying Capacity (RCC) began in earnest with a conceptual monograph on the idea by Wagar (1964) and an empirical study by Lucas (1964).

Wagar's research hypothesised a relationship between crowding and recreational satisfaction that would vary in terms of the specific activities in which an individual participates and the kinds of needs or desires that the activity is to fulfil (Stankey & McCool, 1984). Thus, the fundamental premise, that the relationship between use density and recreational quality depended upon the motives underlying participation was clearly affirmed. This was similar to Lucas's (1964) study, which reported that the type of use encountered was a critical factor in any decision regarding the area's capacity rather than the number or amount per se (Stankey & McCool, 1984). Both of the prior studies criticised that RCC was not an absolute value inherent solely in the ecology and original characteristics of each land area, i.e. the critical issue was exclusive of psychological nature, with the quality of experience or satisfaction independent of resource conditions (Lucas, 1964; Wagar, 1964). Due to Wagar and Lucas's study (1964), the notion of an 'inherent' capacity – determined by biological parameters, was dispelled.

The perception of social carrying capacity was further demonstrated in 1973 in a study of wilderness carrying capacity by Stankey (1973) who stated that the type of 'group encountered' had a significant influence on expressed preferences for encounters independent of the number involved. For example, visitors preferred contact with hikers over those with horseback groups in the three Western wildernesses (Stankey & McCool, 1984). Social carrying capacity was reviewed by Graefe *et al.* (1987) and integrated existing researches into a conceptual framework that reflects the range of considerations inherent to the concept.

From 1970s to 1980s, many published articles discussed both physical and social carrying capacity issues, for instance, recreation impacts and management techniques for managing the physical resources and visitors (Lime & Stankey, 1971); empirical study using a wilderness purism scale to emulate visitors' satisfaction with differing value systems (Stankey, 1972); and review of carrying capacity evolution from the traditional concept to a multi-dimensional model of capacities (acceptable changes) (Frissell & Stankey, 1972). Others like Brown (1977), Heberlein (1977), Lime (1976) and McCool (1977) have advanced the carrying capacity concept into a more conceptually sophisticated one. However, most of the previous studies merely focused on either site application or the critical review of its definition and conceptual framework. There was a limited study on historical review of recreational carrying capacity; despite the fact that this model had enjoyed a long history since 1940s. Moreover, this paper focuses on the RCC application in island tourism which was neglected or missed in past studies.

## **The Definition of Recreational Carrying Capacity**

The definitions of carrying capacity incorporated a growing range of physical, social and organisational settings, as Schneider, Godschalk and Axler (1978, p.1) defined carrying capacity analysis as a planning tool that studies the effects of growth (i.e. amount, type, location and quality) on the natural and man-made environment in order to identify critical thresholds beyond which public health, safety or welfare will be threatened by serious environmental

problems unless changes are made in public investment, governmental regulations, or human behaviour. Sociologically, RCC incorporates a relationship between the amount of use and user's satisfaction (Stankey, 1982). In physical planning, the concept of carrying capacity has to do with determining the spatial ability of an area (i.e. size, number of places suitable to the activity) to accommodate visitors.

The concept of RCC has often been used to identify the 'limit' of a system to assimilate changes. The term 'use level' had caught the attention of academics and industrial practitioners. Most scholars and managers agreed that RCC is not an inherent value and must reflect value judgements (Cole, 2001; Stankey & McCool, 1984; Wagar, 1974). Shelby and Heberlein (1984) proposed a generic definition of carrying capacity as the level of use beyond which impacts exceed acceptable levels specified by evaluative standards. Carrying capacity identifies a number for one management parameter: use level.

### **The Purpose of Recreational Carrying Capacity**

In the 1980s, the concern of the biophysical and social impacts widened as large-scale tourism development evolved which is ultimately articulated in the discourse about sustainable tourism or ecotourism (McCool & Lime, 2001). The principles of sustainable tourism development started to compound into the concept of RCC (refer to next section – dimensions and indicators). According to Castellani and Sala (2012), to reach the goal and to set targets for improvement, the basic requirement is to first investigate and manage the physical limits of the system. Yet, carrying capacity evaluation seems to be a useful concept to support the circumscription of local management strategies and plans for sustainable tourism.

However, the voice urging a reconsideration of carrying capacity studies began emerging since 1970s stating that the carrying capacity concept was a bad choice and should be dropped (Lindberg, McCool & Stankey, 1997; Wagar, 1974). These and other scholars summarised a number of difficulties in establishing numerical carrying capacities (Stankey & McCool, 1984; Washburne, 1982). Stankey and McCool (1984) argued that the primary question underlying carrying capacity was not 'how many is too many?' but rather determining how much change from natural conditions are acceptable given the goals and objectives for a protected area. Washburne (1982) debated that setting standards and monitoring specific conditions would be more effective than calculating use capacities.

However, the term carrying capacity continued to be used in legislative and policy mandates by park managers (Cole, 2001; Manning, 1999; Simón, Narangajavana & Marqués, 2004). Brown (2009) revealed the uncomfortable truth concerning carrying capacity in that the numbers do matter and need to be addressed in some way in any plan of management. In particular, the allocation of commercial permits, the development of infrastructure and accommodation, transport and access provision, aesthetic impact, regional tourism planning, and physical and social impacts (Brown, 2009). Thus, it is still reasonable to apply RCC, especially if park managers consider it as a multi-variable concept including visitor numbers, behaviour, experiences, conflict, facilities, information and above all the criteria to manage people as part of the ecosystem where tourism activities take place (Brown, 2009).

In the 1990s, RCC was defined as the ability of the physical-biological environment to withstand recreational use and as a means of expressing the amount of use that is consistent with some measure of quality in the recreational experience (Hall & McArthur, 1996). This definition is expanded from the intent of the original definition put forward by Wagar (1974),

that focus on the levels of recreational use an area can withstand while providing a sustained quality of recreation. Theoretically, tourism carrying capacity could also be defined as the point where the minimum infrastructure or superstructure requirements as well as the natural resource assets (e.g. beaches, mountains) become insufficient to meet the needs of both the local residents and the visitors, whereby the threat of environmental hazards occurs (Coccosis & Parpairis, 2000).

Saveriades (2000) outlined that the RCC of a destination is determined by its ability to absorb tourist development before negative affect access the acceptable changes. It is also determined by the level of tourist development beyond which tourist flows will decline because the destination area will cease to satisfy and attract them. Moreover, Navarro Jurado, Damian, and Fernández-Morales (2013) emphasised that carrying capacity is an operational tool to achieve sustainability. The general concept of RCC benefits the protected area. However, carrying capacity can only be examined in a case by case basis 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 others (Simón *et al.*, 2004). The more recent researchers moved their attention from review and criticism of RCC to practical application in various protected area. For example, Saveriades (2000) assessed the carrying capacity of a region in terms of sociological capacity thresholds for the case of the Republic of Cyprus, while Simón *et al.* (2004) studied the carrying capacity problems in Hengistbury Head. The summary of RCC is presented in Table 1.

(Insert Table 1 here)

## Dimensions

The RCC is the character of use that can be supported over a specified time by an area developed at a certain level without causing excessive damage to the physical environment and the experience for the visitors (Lime & Stankey, 1971). Therefore, capacity is a multi-dimensional and dynamic concept that is capable of manipulation by the manager – consistent with administrative, budgetary and resource constraints (Lime & Stankey, 1971; Stankey, 1981). Lime and Stankey (1971) outlined three crucial components of carrying capacity, namely, (a) management objectives; (b) visitor attitudes; and (c) recreational impacts on physical resources.

Firstly, capacity or limit could be determined only in light of particular management objectives for a protected area. The objective must explain what type of recreational opportunity or opportunities the area is going to offer (Lime & Stankey, 1971). It will be futile if the managers try to manage any destination for its carrying capacity without being guided by definite objectives. Secondly, visitor attitude is one of the critical constructs in establishing the carrying capacity. This is because not all visitors perceive the environment in a similar way. For example, on one hand, what is quality recreational experience to one may be entirely undesirable to another (Lime & Stankey, 1971; Wagar, 1964). On the other hand, what a visitor perceives as acceptable or desirable may be totally different from what the managers perceive it to be (Lime & Stankey, 1971; Lucas, 1964; Wagar, 1964).

Therefore, Wagar (1964) and Lucas (1964) elucidated that carrying capacity setting requires the consideration of values and yet the values are subjective. Lime and Stankey (1971) asked several questions regarding whose values are to be counted the most? Destination management team or the public? If public values are to be relied upon, which 'public' (it's a large population)? Lastly, any use of an ecosystem causes some changes and these changes can be

**Table 1.** The summary of recreational carrying capacity

Concepts/ Models	Elements																		
Recreational Carrying Capacity (RCC)	<p>The level of recreational use an area can withstand while providing a sustained quality of recreation (Wagar, 1974). The ability of the physical-biological environment to withstand recreation use and as a means of expressing the amount of use that is consistent with some measure of quality in the recreational experience (Hall &amp; McArthur, 1996).</p> <p>Process</p> <ol style="list-style-type: none"> <li>1. Specify management objectives and standards.</li> <li>2. Identify current levels of use for a defined period.</li> <li>3. Identify indicators for the capacity dimensions to be considered.</li> <li>4. Measure the current state of each indicator.</li> <li>5. Identify the apparent relationship between the state of indicators and the level of use.</li> <li>6. Make value judgments about the acceptability of the various impacts</li> <li>7. Determine a Recreational Carrying Capacity that is more, the same or less than current visitation.</li> <li>8. Implement management strategies to ensure recreational carrying capacity is not breached.</li> </ol> <p>Indicators</p> <table> <tr> <td>The elements of RCC in 1970s:</td> <td>The elements of RCC in 1980s:</td> </tr> <tr> <td>Biophysical</td> <td>Physical</td> </tr> <tr> <td>Social-cultural</td> <td>Economic</td> </tr> <tr> <td>Psychological</td> <td>Ecological</td> </tr> <tr> <td>Managerial</td> <td>Social</td> </tr> </table> <p>Application</p> <table> <tr> <td>Planning</td> <td>To evaluate the size and character of alternative sites &amp; predetermine optimum level of use.</td> </tr> <tr> <td>Site design</td> <td>Assign activities dependent on natural limits &amp; identify suitable position for activities.</td> </tr> <tr> <td>Administration</td> <td>Use of marketing to attract visitors to alternative destinations.</td> </tr> <tr> <td>Example</td> <td>Angkor World Heritage Site in Cambodia – A capacity of 300 to 500 visitors at any one time (annual capacity set at 500,000) Green Island in far North Queensland – 1,900 visitors per day / no more than 800 at any one time.</td> </tr> </table> <p>Strength</p> <p>Simplicity- Use as a best guess as to when some basic management decisions must be made without the benefit of a complete impact analysis;</p> <p>Weaknesses</p> <p>It is often determined before the strategic objectives for planning are considered.</p>	The elements of RCC in 1970s:	The elements of RCC in 1980s:	Biophysical	Physical	Social-cultural	Economic	Psychological	Ecological	Managerial	Social	Planning	To evaluate the size and character of alternative sites & predetermine optimum level of use.	Site design	Assign activities dependent on natural limits & identify suitable position for activities.	Administration	Use of marketing to attract visitors to alternative destinations.	Example	Angkor World Heritage Site in Cambodia – A capacity of 300 to 500 visitors at any one time (annual capacity set at 500,000) Green Island in far North Queensland – 1,900 visitors per day / no more than 800 at any one time.
The elements of RCC in 1970s:	The elements of RCC in 1980s:																		
Biophysical	Physical																		
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Table 1. From Previous Page

Use as a yardstick for regulations based on resource use controls and performance standards;	It assumes that the community values and preferences have been predetermined, they may be unlikely to change.
Help managers to think in a structured way about heritage use problems.	It is more related to personal value judgement.
Use as community awareness and education device.	Stakeholders may have conflict with management when imposing use limits.
	One dimension may not coincide with another (social higher than ecological).
	May over-emphasise on constraints to use.
	It is applicable to an area at a time rather than a region or system.

called impacts, both positive and negative. However, the visitor impacts always seem to introduce negative impacts to the physical resources (Castellani & Sala, 2012; Lime & Stankey, 1971; Manning, 1999; Stylidis, Terzidou & Terzidou, 2007; Wagar, 1974).

There are four major dimensions of RCC – bio-physical, socio-cultural, psychological and managerial as suggested by Lime and Manning (1977) and cited in McArthur's (2000) thesis. The first two dimensions are the level of human use that can be sustained without long term effects on the resource base (biophysical) and host population (sociocultural). The third dimension is defined as the level of use that is made to enhance visitor experience (psychological). The last dimension is the level of use which reflects the ideal and sustainable type and degree of management (managerial).

Pigram (1983) suggested four key dimensions to the RCC, i.e. physical, economic, ecological and social. These four dimensions are also included in the principles of sustainable tourism. Physical carrying capacity is related to the maximum number of use units (e.g. people, boats, vehicles) that can be accommodated in an area (McArthur, 2000; Pigram, 1983; Sowman, 1987). The space or surface available for recreational activities is often fairly easy to associate with the amount of use (Washburne, 1982). This dimension always serves as a starting point from which the assessment of RCC can proceed (Sowman, 1987). It is therefore essential that projections of recreational demand together with a proposed development be undertaken at the initial stages of a project in order to calculate whether the scale of the project and anticipated recreational pressure is realistic in the protected area (Sowman, 1987; Washburne, 1982).

Economic carrying capacity is concerned with the resources concurrently used for outdoor recreation and economic activities, like a domestic water-supply reservoir (Sowman, 1987) or forestry. This dimension also establishes recreational use levels that do not unduly interfere with the non-recreational activity so as to reduce the economic viability of the resource (McArthur, 2000; Pigram, 1983; Sowman, 1987). The information is from an ecological

study used to determine the economic tolerance level of the system to different levels of recreational use. However, according to Sowman (1987), coastal resources utilised for economic activities are rarely available for recreational use.

Ecological carrying capacity is defined as 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 happens (McArthur, 2000). This term is sometimes confused with the physical, biophysical or environmental capacity (Pigram, 1983; Sowman, 1987). Sowman (1987) outlined several problems associated with monitoring environmental changes or impacts caused by recreational activities. Due to the complex interaction of components in an ecosystem, it is difficult to separate them. As a result, controlling the variables under investigation becomes a crucial challenge.

The other challenge is the dynamic, fluctuating nature of ecosystem processes which makes it difficult to define a baseline or initial data against which man-induced change can be measured. Recreational activity or recreationist's use level is also divergent, since levels and intensity of recreational use and people's actions are not uniform (Sowman, 1987). Furthermore, Goldsmith and Munton (1971) described that most recreational sites have different spatial boundaries from those of existing ecosystems and this adds to the difficulty of analysing an integrated data from ecological research. Also, some ecosystems may react tardily to recreational pressure, and environmental changes may appear in the later stages (Sowman, 1987). Therefore, it is arduous to find direct cause-effect relationships between recreational activities and ecological impacts. However, ecological research is still needed (Lime & Stankey, 1971) because the study should be able to explain the potential effects of the recreational activity on the resource-base, identify areas where uncertainty exists, and indicate when and where conservative recreational use level should be adopted (Sowman, 1987).

Social carrying capacity refers to the perceptual, psychological, or behavioural capacity (Sowman, 1987). This dimension concerns the recreationist's perception upon encounter with others in an area, satisfaction of visitors and the sense of crowding (Stankey & McCool, 1984). It is the maximum level of recreational use, in terms of numbers and activities, above which there is a decline in the quality of the recreational experience from the point of view of the recreation participants (McArthur, 2000; Pigram, 1983; Sowman, 1987). These are the least tangible capacity concepts since the level of crowding tolerated would not merely vary between individuals, but can also change for the same person in different places (Sowman, 1987).

Establishing a carrying capacity involves both descriptive and evaluative (prescriptive) components (Shelby & Heberlein, 1984). For descriptive component, carrying capacity focuses on facts or numbers, whereas the evaluative component concerns seemingly more subjective issues or value judgements about levels of impact in resource conditions and the quality of the visitor experience that is acceptable (Manning, 2002; Shelby & Heberlein, 1984). Graefe, Vaske and Kuss (1984) and Shelby and Heberlein (1984) referred to the descriptive elements of RCC as the use level, for example 192 hikers per day climbing Mount Kinabalu, Sabah, Malaysia. The descriptive component involves management parameters (i.e. any factor which can be directly manipulated by managers), impact parameters (i.e. what happens to visitors or the environment as a result of use level or other management parameters), and the relationship between the two (Shelby & Heberlein, 1984).

Stankey (1978) reviewed the literature and pointed out that use level is not always intently related to impacts, somehow use level cannot be controlled, but other management parameters can sometimes be manipulated to mitigate impacts. This means that managers can reduce

**Table 2.** Summary of recreational carrying capacity components and dimensions

Researchers/ Authors	Components/ Dimensions of Recreational Carrying Capacity
(Lime & Stankey, 1971)	Three components of Recreational Carrying Capacity 1. Management objectives 2. Visitor attitudes 3. Recreational impacts on physical resources
Lime and Manning, (1977) cited in (McArthur, 2000)	Four dimensions of Recreational Carrying Capacity 1. Biophysical 2. Sociocultural 3. Psychological 4. Managerial
(Pigram, 1983)	Four dimensions of Recreational Carrying Capacity 1. Physical 2. Economic 3. Ecological 4. Social
(Shelby & Heberlein, 1984)	Two components of Recreational Carrying Capacity 1. Descriptive 2. Evaluative or prescriptive  Four types of carrying capacity 1. Ecological 2. Physical 3. Facility 4. Social

the impacts without limiting use, or even allow increased use without altering the impacts. Management parameters involve changing the kind of recreational activities provided and the amount of use in an attempt to affect impact parameters (Lime & Stankey, 1971; Shelby & Heberlein, 1984; Stankey, 1978). Many researchers agreed that establishing a relationship between management parameters and impact parameters is the necessary step in setting carrying capacity (Graefe *et al.*, 1984; Manning, 1999, 2002; Shelby & Heberlein, 1984).

Apart from descriptive and prescriptive, Shelby and Heberlein (1984) also pointed out four elements of RCC: ecological capacity, physical capacity, social capacity, and facility capacity. The first three types of capacities are similar to Pigram's (1983) described above, except the economic dimension. Perhaps the economic dimension is less relevant to recreational capacity compared to the facility dimension. This view is shared by Sowman (1987). Facility capacity involves man-made improvements intended to handle visitor needs (e.g. parking lots, campsite and rest rooms) (Shelby & Heberlein, 1984). The summary of RCC components and dimensions is presented in Table 2.

## Limitations

In 1968, Wagar highlighted four common misconceptions that cloud the real carrying capacity adoption issue. The first misapprehension was that the resources were the responsibility of the

management rather than the provision of long term benefits to society. Secondly, each acre of recreational land had an inherent level of productivity that determined carrying capacity. The third error was that quality recreation was considered equivalent to natural conditions, and the fourth misconception was in assuming that management of recreational areas would be easier if managers knew the 'numerics' of carrying capacities (Stankey, 1981).

Sowman (1987) raised two central aspects of the RCC which constituted the real issues. On one hand, maintaining the integrity of the resource-based implies some threshold or tolerance level after which further exploitation of the ecosystem's natural homeostatic gets controlled. Setting this tolerance level requires making a value-judgement. On the other hand, providing a recreational experience of high quality to the user is equally subjective. An individual's perception of a good-quality leisure experience depends on numerous factors and varies from person to person. Moreover, a destination manager may view the quality of a recreational experience from a completely different perspective than a visitor (Sowman, 1987).

### **Application of Recreational Carrying Capacity Framework**

The Urban Research and Development Corporation (1977) reviewed the potential of the RCC and prepared guidelines for understanding and determining the optimum capacity used. The guidelines were developed to help recreation planners and destination managers in determining whether to develop a RCC model and if so, how to apply it in the selected site. Three key propositions were revealed by the study:

1. Park planners interested in protecting the natural resources or simply meeting recreational demand rather than providing a high quality experience;
2. Park planners were significantly different from park visitors;
3. Several managers had established capacity limits based on the availability of support facilities rather than the optimum RCC.

In the early stage, the RCC concept was initiated in United States. The number of canoes and boats likely to affect perceptions of wilderness were estimated for a wilderness area (Lucas, 1964) and the research for determining use capacities of the boundary waters canoe area (Lime, 1970). Both of these studies were not fully implemented in the protected site. According to McArthur (2000), two of the case studies that have actually been fully implemented were the Angkor World Heritage Site in Cambodia (Wagar, 1995) and Green Island in far north Queensland (Environmental Protection Agency, 2003; Queensland Department of Environment and Heritage & Great Barrier Reef Marine Park Authority, 1993). The first application set a capacity of 300 to 500 visitors at any one time with an annual capacity of 500,000. The second application was for Green Island where the capacity was set at 1,900 visitors per day or no more than 800 at any one time. This carrying capacity is also applied in Malaysia, for example, visitors to Kinabalu Park are only allowed to explore 10% of the park's land and Mount Kinabalu has limited the number of climbers (197 climbers per day) (Chan & Tay, 2015).

In recent studies, the carrying capacity concept was widened, applied and suggested. For example, carrying capacity studies were conducted in respect of underwater trails in Isabel Island National Park, Mexico (Ríos-Jara, Galván-Villa, Rodríguez-Zaragoza, López-Uriarte & Muñoz-Fernández, 2013) we propose two ecotourism management strategies: (1; beach management at Praia de Faro, Portugal (Zacarias, Williams & Newton, 2011); in three Amazon macrotidal beaches during the peak vacation season (Sousa et al., 2011); and the social carrying

capacity model in island Costa del Sol, Spain (Navarro Jurado *et al.*, 2013). The Ríos-Jara *et al.* we propose two ecotourism management strategies: (1) (2013) study proposed some preventive management for tourism carrying capacity in underwater trails, such as a periodic closure and rotation of trails to protect the corals, short briefings and/or interpretative material that would explain how to use the equipment safely.

The results of Zacarias *et al.* (2011) research found that the physic-ecological carrying capacity suggested 1491-2982 visits per day for two different scenarios at the beach of Praia de Faro. Alternatively, the socio-cultural carrying capacity estimated 305 and 608 beach users. Obviously, there was a significant difference between the numbers of physic-ecological and socio-cultural carrying capacity, thus the researchers suggested that the physic-ecological carrying capacity may be applied for ecosystem management, whilst the socio-cultural part may be addressed when management objectives concern the target market of tourists and beach users. This implies that it is imperative to set the management objectives before setting the limits acceptable for a protected area.

The coastal zone of the Brazilian Amazon was studied by de Sousa *et al.* (2011) to understand the RCC of three beaches (namely Ajuruteua, Princesa and Atalaia) during the peak visitation. The outcomes showed that the RCC of these three beaches was influenced by factors such as the day of the week, insolation, accessibility and tide levels. At last, they suggested five methods: (1) prohibition of vehicular access; (2) provision of parking areas; (3) regulation of land use in the dune zone; (4) construction of an adequate public sanitation system; and (5) establishment of a permanent water quality monitoring programme. Overall, many preventive methods were introduced to the carrying capacity of a beach or an island. However, there is either lack of implementation or implementation without documentation.

## Conclusion

The paper presents a historical review of the RCC model. This paper also provides in-depth insights on RCC, which directly contributes to better understanding of visitor impact management application in island tourism. This paper suggests that island creates a platform for tourism experiences, and that conversely the experiences clarify and consolidate the way people value island and support its conservation. Herein lies an interdependent relationship between the condition of the island environment and the quality of visitor experiences. A powerful way to understand and manage this relationship is the use of RCC models. Therefore, it is essential to understand the model from its application before being adopted to any island destination.

## Acknowledgements

The authors would like to extend their appreciation to the Universiti Sains Malaysia for the Research University Grant entitled 'Tourism Capacity and Impact Studies' [Grant No. 1001/PTS/8660011] that makes this study and paper possible.

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