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A LITERATURE REVIEW OF ECOTOURISM CARRYING CAPACITY MEASUREMENTS: INITIAL FINDINGS

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## ABSTRACT

The most challenging aspect of carrying capacity is measuring it in terms of realistic indicators that will capture the complexity of any given system, yet without embroiling the procedure in meaningless and costly specifics. This paper looks into the various attempts to develop measurements of carrying capacity in the context of the ecotourism sector.

Preliminary findings show that in lieu of measures that entail pegging numerical upper limits to visitors at tourism destinations as earlier defined, new methodologies have evolved that allow for defining thresholds to carrying capacity in each relevant state or category (e.g., land use) of a defined system. These evolved frameworks allow for multiple data sourcing and methodologies as well as participatory planning mechanisms to arrive at results that allow for evaluation and mitigation responses among various stakeholders. The practicality and flexibility of the approaches are invaluable to sustainable ecotourism planning and development. However, it is clear that some data for certain states or categories may not be available and substituting these with approximate values may entail some subjectivity. Proxy indicators may have to be developed. In the interest of operational significance, the substitution of proxy indicators must be validated carefully and periodically assessed in terms of comparability and replicability.

Finally, the carrying capacity approaches and indicators reviewed were applicable to all recreational areas and protected areas, but not specifically to island coastal areas that are prone to overcrowding as a result of mass tourism. This is a specific area of investigation that is unique to a tourism destination type. The development of a composite outcome-based approach and a corresponding set of indicators will be useful in facilitating the effective management of specific resource-based recreation types.

## 1. Introduction

The concept of ecotourism became known in the 1980s, and it has been defined in many ways. The elements that are commonly referred to are the (a) need for sustainable use of the physical environment; (b) economic opportunities provided for the local communities; (c) minimizing unwanted socio-cultural impacts created by visitor presence on host communities; (d) creating an educational experience for visitors, or (e) a combination of these elements (Boo, 1990; Nelson, 1994; Wood, 2002 in Clifton and Benson, 2006).

The sustainable development aspect of ecotourism is highlighted because it is generally accepted that it refers to nature-based destinations. For this reason, the advocacy for responsible use of ecotourism sites has mounted. Sustainability principles are largely anchored on ecotourism's environmental, economic and socio-cultural aspects, calling for a suitable balance among these three dimensions (UNEP, 2002).

Among the key features of sustainable ecotourism planning and management is the application of operational measures that are meant to manage visitor access and behavior. This is where the highly subjective concept of carrying capacity and its approaches becomes most relevant.

The paper intends to undertake a literature review of approaches to measuring carrying capacity in pursuit of sustainable development in ecotourism destinations.

## 2. Literature Review

### 2.1 Carrying Capacity

The negative externalities of uncontrolled tourism range from environmental, social, economic and cultural. The net result is degraded site attributes, which eventually end up as economic losses for the multisectoral industry and its beneficiaries (Ward and Beanland 1995). Hence, the aim of sustainable tourism development plans is to ensure that the natural environment is not compromised in the pursuit of economic goals. In this context, several studies have pointed to carrying capacity as a most useful concept in defining issues, strategies and plans.

Wagar (1964) was the first to explore the concept of carrying capacity vis-à-vis recreation, when he posited that the former was contingent on the values and needs of the people in relation to some management objectives. He also suggested that the magnitude of use can be reduced by using familiar management tools such as zoning, engineering and education (Brown 2009).

In the thick of skepticism surrounding the usefulness of carrying capacity as a concept in managing resource-based ecosystems, the idea of tourism carrying capacity was defined by

Mathieson and Wall (1982) as “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.”

This definition was adopted by the World Trade Organization in 1999 when it related the concept of carrying capacity to the tourism industry as “the maximum number of persons which could visit a location within a given period, such that local environmental, physical, economic and socio-cultural characteristics are not compromised, and without reducing tourist satisfaction.” O’Reilly (1986) sought to reinforce the initial carrying capacity concept from the twin perspective of supply and demand. From the supply side, he defined the concept as “the capacity of the destination area to absorb tourism before the negative impacts of tourism are felt.” From the demand side, carrying capacity was “the levels beyond which flows will decline because tourists believe there are too many tourists.”

## 2.2 Approaches adopted in measuring carrying capacity

The most challenging part of working with carrying capacity in the context of sustainable development of ecotourism destinations is that the concept requires operational handles and quantitative parameters so that it can be applied in a practical way. Some authors signaled the need for an accurate evaluation of the sector’s sustainable development and carrying capacity through new methodologies and instruments in a comprehensive manner (Elkington 1997).

McCool & Lime (2001) raised some issues related to the application of numerical carrying capacity in the real world. He cited the complexity of tourism destinations, that Bimonte & Punzo (1995) identified as made up of objective (e.g., resource availability) and subjective variables (e.g., perceptions among tourists and local residents).

These authors in effect questioned the assumptions behind numerical values placed on carrying capacity, given the complexity of the subject environments and unwieldy operational implications. They recommended transforming the question from “*how many* can an area sustain?” to “what are the conditions that are desired or appropriate?” The latter question was seen to represent the crux of tourism impact concerns and addressing it will produce more realistic mitigation measures.

Earlier approaches to carrying capacity operationalization were in the form of management tools. The Limits of Acceptable Change (LAC) was first published in 1985 and then applied in 1987 to a Forest Plan for the Bob Marshall Wilderness Complex, USA (Cole and Stankey 1997). It was the culminating result of an effort to effectively manage a wilderness destination frequented for recreation. LAC identified specific and achievable objectives that described desired ends or conditions, rather than means or management actions. The overriding concern was to exact accountability through “trackable and traceable”

wilderness plans. “Explicit and visible objectives” were identified, with objective-driven results evaluated against objective monitoring data.

Other processes that aimed to operationalize carrying capacity concerns are the Recreation Opportunity Spectrum (ROS), Process for Visitor Impact Management (VIM), Visitor Experience and Resource Protection (VERP), and Management Process for Visitor Activities (VAMP) in the United States. Nilsen & Tayler (1997) concluded that the use of resource indicators and standards similar to LAC made VERP and VIM most appealing to recreation planners and managers from a scientific natural resource management viewpoint. The approach was also attractive to those who were keen on ecosystem-based management and monitoring. Among all the approaches, only VIM emphasized an understanding of the possible causes of visitor impacts, making it more valuable in terms of defining management strategies and alternatives. In the end, all approaches were assessed to have recognized that “effective management involves both scientific and judgmental considerations...and [effective management] is more than carrying capacity and use limits” (Graefe 1990 in Nilsen and Tyler 1997).

A recent LAC-consistent is the Tourism Optimization Management Model (TOMM), developed and implemented in some tourism destinations in Australia (Manidis Roberts Consultants 1997). Compared to the other models, TOMM recognizes the role of industry viability and offers a framework that addresses the vested interests of key stakeholders, namely: (a) ecological health of the visitor reserve; (b) perceived quality of visitor experience; (c) economic sustainability of visitor experience, and (d) continued endorsement of the host community.

More recently, Castellani and Sala (2012) attempted to quantify each condition of tourism management categories in a framework that proposed the measurement of thresholds over which alterations due to tourism activities become unacceptable, as opposed to absolute figures. They used the DPSIR model (Drivers, Pressures, State, Impacts, Responses), an evaluative procedure that defines which data set are most useful to describe current and future areas in Oltrepo Mantovano and Alpi Lepontine, northern Italy. The aim was to address future policies for sustainable tourism in the area using quantitative scenario setting.

### 3. Initial Analysis

From this limited body of work, it is suggested that the concept of carrying capacity has evolved from a purely qualitative and normative concept to a more quantitative interpretation that involved a finite number of visitors. Over time a range of management tools have supplanted the numbers game in carrying capacity, duly involving planning considerations in terms of strategies, indicators and targets.

The supply and demand management of nature-based destinations needs reconsidering. Increased urbanization, decreasing living and work spaces, and rising incomes will continue to push demand for outdoor recreation worldwide. Meanwhile, the supply of nature-based tourism sites will remain constant, and yet their attraction to visitors can be expected to rise given foreseeable increases in population and stress levels. Clearly, demand management is imperative given nature's limited supply.

In this context, a management framework that accounts for flexible data sources and practical methodologies will serve demand management purposes. As raised in the DPSIR application, the challenge is in using local values that are both relevant and important to setting acceptable conditions and outcomes for every state of the resource system. These local values may take the form of expert opinions and subjective perceptions that may define proxy indicators.

Finally, the management frameworks need to evolve into outcome-based and resource-specific formats that account for relevant indicators. Desired outcomes must be captured in the planning stages. These must be developed from the perspective of multiple stakeholders (i.e. TOMM approach) to ensure tourism viability. At the same time, the outcomes and parameters must be resource-specific as some indicators may be more relevant than others (e.g., mobility in mountain resorts may be more important to hikers than land use). It is also possible to impose higher entry and user fees to discourage crowding or offer incentives for dispersing resource use among investors and tourists.

In the end, the tangible and intangible benefits derived from any management tool must exceed its actual costs. Determining these values will necessarily use practical and relevant indicators for specific nature-based tourism destinations.

#### 4. Areas for Further Investigation

The need to apply the concept of carrying capacity in specific ecotourism contexts will require concrete definitions and practical measurements. A key imperative is to develop context-specific variables and indicators for varying ecotourism sites, such as island coastal areas that are prone to heavy tourism traffic.

Another relevant area for investigation is how to modify monitoring and evaluation frameworks to adequately reflect supply and demand indicators that are outcome-based and resource-specific. In this connection, designing appropriate stakeholder engagement frameworks is in order, so that a symbiotic exchange of interests may be facilitated in the interest of sustainable ecotourism management.

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