

Adaptive environmental management of tourism in the Province of Siena, Italy using the ecological footprint

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Abstract

Adaptive management as applied to tourism policy treats management policies as experiments that probe the responses of the system as human behavior changes. We present a conceptual systems model that incorporates the gap between observed and desired levels of the ecological footprint with respect to biocapacity. Addressing this gap (or ‘overshoot’) can inform strategies to increase or decrease visitation or its associated consumption in the coming years. The feedback mechanism in this conceptual model incorporates a gap between observed and desired ecological footprint levels of tourists and residents. The work is based on longer-term and ongoing study of tourism impacts and ecological footprint assessments from the SPIN-Eco Project. We present historical tourism and environmental data from the province of Siena, Italy and discuss the use of discrete, static environmental indicators as part of an iterative feedback process to manage tourism within biophysical limits. We discuss a necessary shift of emphasis from certain and static numbers to a process-based management model that can reflect slow changes to biophysical resources. As underscored by ecological footprint analysis, the energy and material use associated with tourism and local activity can erode natural capital foundations if that use exceeds the area’s biological capacity to support it. The dynamic, and iterative process of using such indicators as management feedback allows us to view sustainability more accurately as a transition and journey, rather than a static destination to which management must arrive. Published by Elsevier Ltd.

Keywords: Adaptive management; Tourism; Ecological footprint

1. Introduction

Tourism is an important industry in almost every region of the planet. It touches the lives of most of the world’s population, employing one-twelfth of all workers and contributing 11 percent of the global GDP (WTO, 1999, 2003). Tourism has long been identified as a powerful tool for development, spurring economic growth, increasing foreign exchange, smallholder investment, and local employment (Brau et al., 2003; De Kadt, 1979; Woods et al., 1994). In some cases, tourism results in increased environmental protection and funds for conservation (Pearce, 1981; Woods et al., 1994; Pigram, 1980; Boo, 1990; Sonnino, 2003; Bramwell and Lane, 1994).

All major intra-governmental organizations which address tourism (e.g., World Tourism Organization, United Nations, World Wide Fund for Nature, World Bank, European Union) have established definitions of ‘sustainable tourism’ (IWGIST, 1993), yet exactly what this means in practice continues to be hotly debated (summarized by Sharpley, 2000; Clarke, 1997; Hunter, 1997). While “strong sustainability” is implied in much of the sustainable tourism literature (Collins, 1999), growing evidence indicates that most all tourism activity contributes to environmental pressure (Duffy, 2001). These impacts can be tracked in a variety of ways. One technique is direct observance and measurement of impacts. Tourism has been documented to lead to direct changes in land cover, land use, water and energy (Becken and Simmons, 2002; Carlsson-Kanyama and Linden, 1999), increases in biotic exchange (including disease), disturbance of wild species, and changes in environmental perceptions of the host

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community (Gössling, 2002a). Retrospective examination and restoration of tourism impacts on host communities and ecosystems are rarely successful. Moreover, given those degraded resource bases and civil infrastructure requirements, rejuvenation costs are generally quite high (Butler, 1980). Thus, even in conventional economic terms, there is significant and widespread interest in finding practical means of avoiding natural capital degradation which leads to a decline in visitation (BA, 1994; Garrigos Simon et al., 2003; Lindberg et al., 1997; Mowforth and Munt, 1998).

Tourism registers indirect yet profound and persistent changes on the natural capital of its destinations (Collins, 1999). However, the full extent of these impacts has been notoriously difficult to measure with direct and quantifiable indicators. Tourism impacts are often indistinguishable from those produced by local residents, and are therefore difficult to monitor and control. Often, the most challenging of tourism's impacts to assess are those which are the result of rapid economic growth which outpaces civil infrastructure and its ability to monitor changes to the environment. Even in the most wealthy and well-planned destinations, indirect impacts escape recognition because tourism's impacts can (for example in the case of airline emissions, or imported products) be caused half a planet away, or take years to manifest impacts (Gössling, 2002a; Patterson, 2005). While management concerns focus on the more visible, immediate, or offensive impacts of tourism, little to no attention has been focused on the slow but persistent erosion of natural capital which may be occurring if a given area is in ecological 'overshoot'. As a result, this feedback cannot be incorporated into tourism management and doubts in tourism's ability to deliver on promises of sustainable development have been expressed (Hunter, 1997; Schmidt di Friedberg, 1997; Collins, 1999).

Cost and other difficulties prevent the observation and documentation of the complete range of tourism impacts, effluents, and changes, at all relevant scales and through time. Thus, a second technique to assess tourism impacts is through tracking tourism impacts by accounting energy and resource use and waste emission per capita throughout the tourist's journey. This category of information is more difficult to incorporate into management considerations, because the source or sink of tourism impacts can be conceptually, spatially, or temporally far removed from the institutions and managers who would control them. One objective of this paper is to remove this conceptual distance by illustrating an example which incorporates this second form of impact assessment into an adaptive management structure. We use the ecological footprint and its corollary, biocapacity as an input to this process.

The biocapacity of any defined area represents the maximum amount of goods and environmental services that could be produced, in a sustainable way, according to the land use of that area (Wackernagel and Rees, 1996). As explained by Monfreda et al. (2004), when compared to the ecological footprint, biocapacity can be considered as a

measure of environmental carrying capacity. From a tourism management perspective this indication is of interest for a number of reasons. When an ecological footprint is calculated for an area's resident population, and is then compared to the area's biocapacity, it reveals the presence or absence of ecological 'surplus'. In theoretical terms this surplus is the result of natural capital producing ecological goods and services faster than they are being consumed. If an optimal outcome means maximizing the use of this surplus, in theory it can be reallocated to either support other populations, used as a 'buffer' against over-consumption, or it can support increasing consumption trends. Once biocapacity has been exceeded, this implies that environmental pressures are either occurring beyond the area of study, or within the study area but are unlikely to manifest themselves until some date in the future. As an input to a management plan for tourism impacts, this tracking approach may result in more detailed information with respect to the option of waiting for diffuse or delayed impacts to evidence themselves, and may prevent unintended consequences. The levels of visitation, and the visitor's consumption and waste are therefore of interest to provincial managers charged with maintaining natural capital in perpetuity, at local to global scales.

The systems model presented in this article cites recent work using an indicator of tourism's indirect and economic throughput impacts (the ecological footprint), and applies it to an adaptive management structure which can incorporate this information in an iterative process. Incorporation of new sources of information on tourism's direct and indirect environmental impacts can lead to more accurate and timely interventions.

The systems model presented takes its cue from the success of destination tools based on the concept of adaptive management. Adaptive management treats management policies as experiments that probe the responses of the system as human behavior changes; Limits of Acceptable Change (LAC) (Stankey et al., 1985) Visitor Impact Management (VIM) (Graefe et al., 1990) and Visitor Experience and Resource Protection (VERP) (National Park Service, 1995) are all examples (see review in Manning, 1999). However, as astutely noted by Lawson et al. (2003), adaptive management is *reactive* in nature, with little forward-looking policy, or ability to incorporate indirect or systemic impacts to the natural capital which supports tourism (as discussed above). As awareness for tourism's pervasive impacts has grown, developments in related fields suggest that tourism environmental management would be more comprehensive if both direct and indirect impacts could be incorporated into comprehensive, systemic, and adaptive paradigms (Hunter, 1997; Lawson et al., 2003).

2. Site description

The Province of Siena is a rural area located in Southern Tuscany in central Italy. Its economy is based on services,

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