Research Paper

The *ISOST* index: A tool for studying sustainable tourism

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ABSTRACT

This study tackles the primary problems facing sustainable tourism: the absence of any defined limits on sustainability in this sector and the difficulty of measuring sustainability. Based on a system of indicators calculated in municipalities that are representative of the different tourist areas and environments of Catalonia (Spain), the key variables in the study of sustainable local tourism are identified so that they can subsequently be normalised, weighted and aggregated in a single global score: the ISOST index. This index enables the definition of thresholds of sustainable tourism, thereby establishing a destination's level of sustainable tourism. It is a tool that can be applied to the definition of sustainable tourism strategies for the future.

1. Introduction

Indicators enable the description and measurement of the reality of a given context in terms of objective parameters, providing a simplified, comparable view of complex phenomena (Schernewski, Schönwald, & Katarzyte, 2014) and facilitating the understanding of the territory and of the elements and processes that occur there. Indicators can both characterise an existing situation and monitor its evolution: that is, they can identify the weaknesses and strengths of the prevailing model and define strategies to restructure and reorient that model for the future (Crabtree & Bayfield, 1998; Gahin, Veleva, & Hart, 2003; James, 2004).

In full awareness of the utility of this tool, and in seeking to move towards a new tourism model, many of the sector's stakeholders have proposed indicators of sustainable tourism. Here, a distinction can be drawn between two types of indicator: (a) simple indicators, and (b) composite indicators (Sánchez Rivero & Pulido Fernández, 2008). This distinction is based primarily on the degree of sophistication of the information that each indicator contains. Simple indicators present statistics obtained directly from reality or are based on a straightforward processing of these data, while indices are 'dimensionless' measures created by combining several simple indicators using a weighting system that ranks the components in terms of their relative significance. Lying between these two types there is a third: the indicator system, which comprises a structured set of simple indicators, the results of which are interpreted jointly (Torres-Delgado & Saarinen, 2013).

Recent years have seen an increasing number of proposals for indices that aim to offer a more comprehensive and integrated understanding of a phenomenon. As Schuschny and Soto (2009) claim, indices present a better contextual picture and are easier to interpret, given their ability to provide a composite image that reduces a list of indicators into a single comparable value for different geographical regions at different times.

The present study describes the methodology used to construct an index of tourism sustainability, known as the ISOST (based on its Catalan name, *Índex de Sostenibilitat Turística*), which was created via an empirical analysis of the present situation of Catalonia, Spain, and which may prove of value when applied to other contexts. Using a system of indicators calculated for 20 municipalities which represent a wide cross-section of the tourist amenities and services on offer in Catalonia, the key variables for the study of the sustainability of local tourism are identified and then normalised, weighted and aggregated in a single global score: the ISOST index. With the ISOST index it is possible to define thresholds and apply the methodology to other destinations in order to establish their level of sustainable tourism.

2. Objectives

In the context of the study of sustainability in the tourism sector, this research has the following objectives:

1. The construction of a composite index that can provide both a statistical summary and a single, simple result of the sustainability of tourism at the municipal level.
2. The study of the sustainable tourism of a sample of municipalities in Catalonia (Spain).

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3. The establishment of empirical limits for the classification of destinations on the basis of the degree of sustainability of their tourist practices.

3. Composite indicators or indices

3.1. Definition and characterisation

Composite indicators or indices emerged from the need to provide more comprehensive and integrated interpretations of phenomena, that is, from the aim to undertake a joint evaluation of their multidimensional characteristics. Thus, Mayer (2008, p.279) writes that an index is 'a quantitative aggregation of many indicators and can provide a simplified, coherent, multidimensional view of a system'. The present paper's interest in indices lies in their ability to summarise complex issues, provide the 'big picture', attract public interest and help in reducing prevailing lists of simple indicators (Saltelli, 2007). It is hardly surprising, then, that this tool is enjoying increasing recognition as it is adopted not only in the planning and public management of tourism (Mendola & Volo, 2017), but also in processes of communication and social awareness.

The main advantage of an index is that it presents information in a simplified form that can be readily interpreted, which means the general public finds it easier to understand composite indicators that highlight general trends by using simple indicators (Saltelli, 2007). However, such indices are not free of criticism, given that the simplification involved in the aggregation of indicators can conceal certain significant phenomena, while the weighting of components requires a high dose of subjectivity (Céron & Dubois, 2000; Mayer, 2008; Singh, Murty, Gupta, & Dikshit, 2009; Salvati & Carlucci, 2014). Hence, one of the maxims applied to the construction of indicators is the need for transparency in the procedures adopted to select and weight indicators that should involve participatory processes and/or the consultation of experts.

3.2. The construction of indices

The construction of an index is necessarily based on an initial selection of simple indicators that when organised constitute a system of relevant indicators of the phenomenon. These simple indicators then have to be normalised to obtain a 'dimensionless' measure that can be weighted and aggregated to generate a single index value.

OECD (2008) identifies ten steps to be followed in the construction of a composite indicator, the careful monitoring of which should avoid any data handling errors and misinterpretations, thus guaranteeing the transparency of the methodological procedure: 1. Theoretical framework; 2. Data selection; 3. Imputation of missing data; 4. Multivariate analysis; 5. Normalisation; 6. Weighting and aggregation; 7. Uncertainty and sensitivity analyses; 8. Back to the data; 9. Links to other indicators; 10. Visualisation of the results. Most sustainability indices built to date adhere to this general methodological procedure. Moreover, many of these indices incorporate the same underlying data in their calculations, due to the small number of available sustainability datasets (Mayer, 2008).

The theoretical framework defines the most basic variables on which the index is subsequently based, which, in turn, determines the system of indicators generated. The latter is structured according to its underlying rationale and so it may vary greatly depending on the model of organisation chosen (sectors, environments, themes and sub-themes, causal model, etc). Moreover, the mathematical processes involved in creating the index, i.e. the normalisation, weighting and aggregation of indicators, also introduce a wide range of variations.

4. The use of indices for measuring the sustainable development of tourism

Most international indices used in measuring sustainability do not take an integrated approach to the study of the phenomenon; that is, they do not carry out joint analyses of the social, economic and environmental dimensions, but tend to focus on just one of these (Kumar Singh, Murty, Gupta, & Dikshit, 2009). This has much to do with the ambiguity in current definitions of sustainable development, which leads to different, often incomplete, interpretations and to considerable practical difficulties (Tanguay, Rajaonson, & Therrien, 2013; Torres-Delgado & López Palomeque, 2012). This ambiguity, combined with the shortage of data on which to base indicators and the lack of political monitoring, is one of the reasons why the indices have failed to achieve real sustainability (Wilson, Tyedmers, & Pelot, 2007). Yet, Miller (2001) claims that the development of indicators is nevertheless useful to parameterise a concept, and indeed the desire to progress in this direction has generated much information that has helped improve interpretations (Torres-Delgado & Saarinen, 2013).

A number of proposals have been made for the application of sustainable development indices to the tourism sector, including those of 'carrying capacity' (Canestrelli & Costa, 1991; Garrigós Simón, Narangajavana, & Palacios Marqués, 2004; Navarro et al., 2012) and 'ecological footprint' (Huiqin & Linchun, 2011; Hunter & Shaw, 2007; Li & Yang, 2007). Likewise, sector-specific indices unrelated to sustainable tourism can be found, including for example the Travel and Tourism Competitiveness Index developed by the World Economic Forum (WEF, 2015), which measures the factors and policies that allow the development of the sector; or the Brand Image Index proposed by Varela Mallou et al. (2006), which based on surveys of Spanish tourists proposes a methodology for quantifying the value of the brand image of tourist destinations.

Indices dedicated specifically to sustainable tourism are rare and those that do exist are difficult to apply and face significant problems of data availability. One of the first attempts resulted in the development of the Tourism Penetration Index, proposed by McElroy and Albuquerque (1998). The authors had detected that expanding mass tourism was threatening the sustainability of small Caribbean islands and, on the basis of this case study, they built an index to measure the degree of economic, social and environmental penetration of tourism. Despite their conceptual efforts, the need to simplify the calculation and the lack of available data in the destinations studied served to condition the development of the index, which was eventually reduced to a combination of just three indicators: daily tourist densities, tourist spending and number of hotel rooms. Later, Sánchez Rivero and Pulido Fernández (2008) presented the Sustainable Tourism Index, which calculates sustainable tourism based on the weighted sum of composite indices generated by each component of the DPSIR (Driving Forces-Pressure-State-Impact-Response) causal framework for 14 indicators in the Spanish System of Environmental Indicators of Tourism (MMA, 2003). Similarly, Castellani and Sala (2010) proposed a Sustainable Performance Index, which includes 20 indicators concerned with demographic dynamics, the economic and social conditions of local communities, environmental factors, and the tourism characteristics of the regions under investigation. The sustainability indicators selected were the outcome of a prior process of analysis and consultation with local stakeholders, as well as of an analysis of the local situation and its tourism planning, subsequently aggregated to provide decision-makers with local policy guidelines. Along similar lines, Blancas, Gonzalez, Lozano-Oyola, and Perez (2010) developed a multi-dimensional index of 32 simple indicators that they applied to Spanish coastal destinations so that their results might serve as a guide for tourism policy development.

The various proposals have all had to face the uncertainties that