COASTAL SUSTAINABILITY INDICATORS. A PROPOSAL IN TOURISM AND URBAN DEVELOPMENT WITHIN THE FRAMEWORK DPSIR (GRAN CANARIA, SPAIN).


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Introduction

The coastal zone is an extremely complex social-ecological system that changes in relation to its environmental, socio-economic, cultural and governance factors (Diedrich et al., 2010). Integrated coastal zone management (ICZM) is a process that seeks to develop an integrated model for sustainable development, that is based on finding points of convergence among these factors (IOC, 2006; cited Diedrich et al., 2010). Indicators are considered as efficient and acceptable instruments of anthropogenic and natural phenomena, which are optimal for ICZM (Diedrich et al., 2010). Indicators can be defined as quantitative or qualitative statements or measured/observed parameters that can be used to describe existing situations and make changes or trends over time (IOC, 2006), also in evaluating an isolated phenomenon (diagnosis) or in a monitoring system to evaluate processes and detect changes (Domeineh-Fuessada y Sanz-Larruga 2010). In ICZM, sustainability scenarios and indicators are no generic, rather they are specific to sites and restricted by political and local realities (Diedrich et al., 2010). In the context of these realities, the analytical framework used for an assessment helps to determine the variety of indicators that are chosen to communicate the outcomes of that assessment (Gabrielsen & Bosch, 2003). For its assessments of the relations between human activities and the environment, Environmental European Agency (EEA) uses the Driving forces-Pressures-State-Impact-Responses (DPSIR) framework (Figure 1; Gabrielsen & Bosch, 2003) and it has been used in this work.

The main goal of this work has been to show a proposal of sustainable indicators for the tourism and urban development (driving forces) in Gran Canaria. Since both are two important and influential forces the Canary Islands coastal (Geoplan, 2012) and therefore they should be taken into account in a local ICZM system.

Methods

First, a list of indicators was obtained according to the references, based on the established framework (DPSIR model) and the following four criteria: relevance, data availability, regular updating and ease of interpretation (criteria used by the public bank of environmental indicators of Ministry of Agriculture, Food and the Environment, MAGRAMA). Second, a DELPHI analysis was performed with four specialists in tourism and two in urban development, in order to decrease the number of preselected indicators. Third, the final weight of indicators was estimated by an Analytic Hierarchy Process (AHP; Saaty 1980). It was conducted in the two driving forces by the experts considered according to three criteria: relevance, data availability and ease of interpretation.

Results and discussion

The AHP set 32 (tourism) and 33 (urban development) indicators initially, divided into DPSIR categories. The experts observed the importance granted in parentheses (tourism // urban development) to the criteria of suitability (63% // 60%), data availability (26% // 25%) and ease of interpretation (11% // 20%). In driving force category of tourism, it was given a 40 % to "socioeconomic" and a 60 % to "ecosystem". Besides responses categories of tourism it was given a 40 % to "material and energy" and a 60 % to "habitats and biodiversity". In driving force category of urban development, it was given a 80 % to population and activities and a 20 % to natural resources. Besides, in response category of urban development, it was given a 52 % to "urban ordination", a 20 % to "energy efficiency", a 20 % to "transport system" and a 8 % to "governance".

There was not specific indicators to State category in urban development.

The information described above was combined with the comparative indicators that are part of the AHP, and the resulting normalized values (0 to 1) are observed in the Figures 2 (tourism) and 3 (urban development). The names of most relevant indicators and DPSIR categories appear in the Table 1 (tourism) and the Table 2 (urban development). This outcome has been delivered from the work agreed among the expert team of OMARCOST project (OMARCOST, 2014).

Notwithstanding DPSIR possess some drawbacks, the fact that the method is still in use more than three decades after its creation also attests to its robustness, and it has been concluded that the DPSIR framework is a useful tool that can still be refined (Gari et al., 2015). It links cause-effect relationships among the five categories of the framework (Figure 1) and has been used for analyzing and assessing the social and ecological problems of aquatic systems subject to anthropogenic influence, and it has been used to develop ICZM (Gari et al., 2015). We believe that DPSIR has successfully guided the selection of indicators for the drivers evaluated.

Figure 2. Normalized weights resulting from the Analytic Hierarchy Process (AHP) in tourism (these include a 42 % of the total weight of all DPSIR categories).

Figure 3. Normalized weights resulting from the Analytic Hierarchy Process (AHP) in urban development (these include a 52 % of the total weight of all DPSIR categories).

Table 1. Names of the 7 indicators as a result of the Analytic Hierarchy Process (AHP).

Table 2. Names of the 8 indicators as a result of the Analytic Hierarchy Process (AHP).

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References


