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Mapping recreation and ecotourism as a cultural ecosystem service: An application at the local level in Southern Chile

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A B S T R A C T

The question of how ecosystem services can be spatially defined and visualized continues to be challenging, particularly for cultural services such as recreation and ecotourism. This study proposes a methodological framework that combines Geographic Information System and participatory methods (Delphi method and Analytic Hierarchy Process) to map recreation and ecotourism at the municipality level. Attributes selected were singular natural resources, scenic beauty, accessibility, tourism attraction capacity, and tourism use aptitude, which were represented by specific spatial criteria validated and weighted by experts. Two types of indicators were obtained and mapped: i) Recreation and ecotourism potential (REPf) which, based on the selected attributes, measured recreation potential in a 0–100 point scale; and ii) Recreation and ecotourism opportunities (REOi), which adjusting REPf by carrying capacity, measured the visitors per hectare that could sustainably recreate in the study area. The resulting maps were highly consistent with the distribution of areas recognized by the tourism authorities as of interest for recreation development (i.e. areas with emblematic flora and fauna and the presence of public and private protected areas). Overall, the methodology demonstrates an important potential for identifying recreation areas to inform local decision making regarding land use planning.

Introduction

Recreation and ecotourism, or also called opportunities for recreation and tourism, is an ecosystem service defined as the "recreational pleasure people derived from natural or cultivated ecosystems" (MEA, 2005; TEEB, 2010) and has been pointed to as an important type of cultural ecosystem service (CES) (Maes et al., 2011; MEA, 2005; TEEB, 2010).

Public acknowledgment of the role of recreation and ecotourism in regional development and their implications for land use planning has led to the development of a range of approaches for its spatial assessment, from different disciplines, using a range of techniques. Examples of these approaches can be found in Albritton and Stein (2011), Brown (2006), Eadens et al. (2009), Kienast, Degenhardt, Weilenmann, Wäger, and Buchecker (2012), Kliskey, Lofroth, Thompson, Brown, and Schreier (1999), and Kliskey (2000) among others.

Within the ecosystem service (ES) literature, the spatial assessment of recreation and ecotourism has followed four general approaches: i) Mapping of visitor expenditures per unit of space, which are ascribed to specific protected areas, excluding from the maps zones of potential benefits for which indicators cannot be obtained (e.g. Anderson et al., 2009; Eigenbrod et al., 2010); these types of maps show neither the benefits in an economic sense, nor the ecosystem service as components of nature, directly enjoyed, consumed, or used to yield human wellbeing; ii) Mapping potential recreation areas as a function of the amount of natural and semi-natural habitat, and the accessibility of the area, as measured by its proximity to population centers and major roads, as well as by the right to access, as indicated by management designations; examples of this approach can be found in Arriaza, Cañas-Ortega, Cañas-Madueño, and Ruiz-Aviles (2004), Bailey, Lee, and Thompson (2006), Chan, Shaw, Cameron, Underwood, and Daily (2006), Gimona and van der Horst (2007), and Lautenbach, Kugel, Lausch, and Seppelt (2011); iii) Mapping benefits from tourism, based on the transfer of monetary figures from one location to the evaluated site (e.g. Plummer, 2009; Rosenberger & Loomis, 2001; Shrestha & Loomis, 2003), method that has been demonstrated to

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generate a large bias, particularly when applied at the local scale (Eigenbrod et al., 2010); and more recently iv) Mapping recreation and landscape values through stakeholders' engagement (e.g. Brown, Montag, & Lyon, 2012; Fagerholm, Käyhkö, Ndumbaro, & Khamis, 2012; Kienast et al., 2012; Raymond et al., 2009; van Riper, Kyle, Sutton, Barnes, & Sherrouse, 2012; Sherrouse, Clement, & Semmens, 2011).

Despite these relevant contributions, the question of how CES can be spatially defined and visualized continues to be a challenge in the ES literature (de Groot, Alkemade, Braat, Hein, & Willemen, 2010; Maes et al., 2011), due to the fact that their assessment is rather subjective and value-laden, as each individual or each group of individuals has different value systems and demands (MEA, 2005). As a result, all CES are related more to the observer than to ecosystem conditions (Hansen-Möller, 2009; Kumar & Kumar, 2008). Nonetheless, it has been argued that a clear distinction between ecosystem conditions (functions), their direct and indirect contribution to human welfare (services), and the welfare gains they generate (benefits) is fundamental for an adequate ES assessment (Haines-Young & Potschin, 2010; TEEB, 2010). Specifically for the case at hand, it is important to differentiate between the "final" ecosystem service (Boyd & Banzhaf, 2007) being assessed and its benefits, where the term "final" is used to emphasize the ultimate biophysical natural element used by individuals to acquire a benefit (Nahlik, Kentula, Siobhan Fennessy, & Landers, 2012).

In this context, the goal of this study was to develop a framework that, combining Geographic Information System and participatory methods (Delphi and Analytic Hierarchy Process), was capable to map recreation and ecotourism as a final ecosystem service (Boyd & Banzhaf, 2007). The framework is applied at the local institutional scale in Ancud municipality, in Chiloé Island, Southern Chile.

Mapping recreation and ecotourism can serve multiple purposes from designing nearby recreation hotspots to allocating resources to new ecotourism initiatives on areas where recreation potential is known to be high. This is particularly important in a study area such as the one selected in Chiloé Island, that has been designated a Global Importance Agricultural Heritage Systems (GIAHS) pilot site (FAO, 2008) because of its "remarkable land use system and landscape, rich in globally significant biological diversity and which evolves from the co-adaptation of a community with its environment and its needs and aspirations for sustainable development" (FAO, 2003). Finally, ES assessment is an emergent but relevant line of work in developing countries where there are very few studies accounting for the magnitude and spatial distribution of cultural services.

Materials and methods

Area of study: Ancud municipality, in Chiloé Island, Southern Chile

The municipality of Ancud (73° 15′ and 74° 15′W and 41° 50′ and 42° 15′S) is located in the northern portion of Chiloé Island (Fig. 1) in the Chiloé Archipelago in Southern Chile and is part of the Valdivian Temperate Rainforest Ecoregion (35°S–48°S) (Di Castri & Hajek, 1976, p. 127). It covers a territory of 172,400 ha of which less than 1% is classified as urban. During the last decades Ancud has experienced rapid population expansion, particularly during the 1980's, when annual growth reached 2.4% between 1982 and 1992. In turn, the rural population decreased continuously from 41.9% (12,325 people) in 1982 to 31.7% (12,654 people) in 2002 (INE, 1982, 1992, 2002). According to the last population census, of the total population (39,946 people) 31.7% is rural (INE, 2002).

The natural heritage of Ancud is valued and admired by tourists from around the world, who travel exclusively to experience Ancud's numerous and diverse attractions. Among them are the Islets of Puñihuil and the northern part of the Chepu river, old growth temperate rain forests characterized by their high degree of endemism (Armesto, León-Lobos, & Kalin, 1996; Villagrán & Hinojosa, 1997) most of which are protected under Chiloé National Park (Fig. 1), and other salient features such as whale feeding and breeding areas.

According to the latest statistical record made by the National Tourism Service (SERNATUR), 72,189 visitors traveled to Chiloé in the summer of 2011. Market studies conducted by SERNATUR in Chiloé establish that the most common activities practiced by tourists in Chiloé are wildlife observation (87%) and hiking (26.4%). According to other market surveys for nature tourism in Chiloé (2008), 36.37% of visitors engage in nature-based activities such as hiking or agro-tourism and cultural activities. Given these data, it is estimated that the current market for nature-based tourism is of 30,258 visitors during the peak season (January–March) (Lozada & Oyarzún, 2009).

Methodological framework for mapping recreation and ecotourism

The methodological framework comprised five steps (Fig. 2) which are explained in detail in the following sub-sections.

Selection of the attributes and spatial criteria that determine recreation and ecotourism (step 1)

Attributes at the ecological (ecosystem and landscape) and institutional dimensions (territory) define the magnitude and spatial distribution of recreation and ecotourism. The ecosystem dimension comprises the physical, biological and chemical components that by interacting allow the ecosystem to perform certain functions. Ecosystem functions, in turn determine the capacity of the system to provide services and benefits to human users (Haines-Young & Potschin, 2010). In turn, the landscape dimension is understood as a human construction and exists to the extent that someone interprets it to develop a purpose (e.g. economic, aesthetic, or recreational). Finally, the territorial dimension represents the efforts embodied by the institutions so as to value natural attractions that give more facilities to recreationists to enjoy places.

Bibliographic sources (Clay & Daniel, 2000; Daniel & Vining, 1983; Universidad Católica de Temuco, 2002; Zube, Sell, & Taylor, 1982) were used to select five attributes that were deemed to determine recreation and ecotourism. These attributes were the presence/absence of singular natural resources (ecosystem dimension), scenic beauty (landscape dimension), accessibility (territorial dimension), tourism use aptitude (TUA) (landscape dimension), and tourism attraction capacity (TAC) (territorial dimension).

These attributes were spatialized through specific criteria created from available spatial data (Section 2.2.3). The originally selected attributes, their spatial criteria, scales of measurement, and assumed direction of impact on recreation and ecotourism are shown in Table 1. A multisource database was assembled in GIS, with data preparation involving projection to the same datum and coordinate system and homologation of scales and resolution. Based on these primary spatial data, other data sets were derived including view sheds, road concentration and variety of natural attractions.

Validation of attributes and spatial criteria by means of participatory techniques (step 2)

The originally selected attributes and their spatial criteria (Table 1) were validated by two groups of experts: 14 professionals