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Developing a non-compensatory approach to identify suitable zones for intensive tourism in an environmentally sensitive landscape

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ABSTRACT

This study aims to evaluate the suitability of Torghabeh Shandiz in Khorasan Razavi Province, Iran, for intensive tourism development. Due to having a sensitive and fragile ecosystem, consisting of mainly erodible soils and vulnerable vegetation, a non-compensatory framework was developed and applied. To do so, a complete list of 60 evaluation criteria were screened by the Simple Additive Weighting (SAW) method, resulting in 25 criteria divided into four categories including environmental, economic, socio-cultural, and managerial. The Fuzzy AHP procedure presented by Mikhailov (2003) was then utilized to weight the screened set of criteria. Weighted Linear Combination (WLC) was separately employed to evaluate the suitability of land in terms of economic, socio-cultural and managerial criteria. Simultaneously, the environmental suitability of the land was assessed through modifying an ecological model developed by Makhdoum (2001). Finally, by using AND logic, suitable areas chosen on the basis of economic, socio-cultural and managerial land evaluation were eliminated in regions environmentally unsuitable. The results showed that limitations in some criteria such as soil erosion and soil fertility resulted in no highly suitable regions for intensive tourism development, such that about 85% of the region was not suitable for intensive tourism development. However, this kind of tourism is more than extensive tourism development in the study area, thereby highlighting the importance of adopting land-use planning strategies aiming at sustainable development.

1. Introduction

Tourism is known as one of the three first-ranked profitable industries in the world (Deng et al., 2002), providing numerous opportunities for economic development (Engelhardt et al., 2004). The foundation of World Trade Organization (WTO), which originated in United Nations, and the International Union of Official Tourist Publicity Organizations (IUOTPO) in the first half of the 20th century have led to a systemic perspective in this industry, focusing more on economic development, especially in the developing countries (Jafari, 1975). However, too much preoccupation with economic efficiency, although profitable, has caused substantial adverse environmental, cultural and social impacts (Engelhardt et al., 2004), thereby reflecting the multidisciplinary structure of tourism (Coles et al., 2006). In such a structure, economic and environmental factors are constantly interacting through a complex feedback loop, and the primary objective is to set a balance point in which economic profit and environmental conservation can be sustainably optimized (Neto, 2003). In doing so, the first step in sustainable tourism development is to identify the inherent capabilities, along with cultural and biophysical carrying capacity of a given region (Bertzky and Stoll-Kleemann, 2009). To put it simply, natural resources are fundamentally finite, and human consumption of these resources is rapidly growing. Hence it is incumbent upon land use managers and decision makers to evaluate the impacts of intensive tourism plans and the corresponding pressure on the environment based on local biophysical and socio-cultural characteristics of a given region (Makhdoum, 2001).

Investigating the capabilities of tourism development in Iran shows that considering the high potential for attracting tourists, proper management has not been carried out in many tourist destinations, which should be regarded as an important factor in environmental degradation in these areas. Torghabeh Shandiz Township, as one of the tourism hubs of Iran, faces a large number of tourists due to its pristine historical and natural attractions in most months of the year; this is associated with the development of centralized tourism infrastructures and facilities; however, it has also caused serious damage to the environment and the natural state of the area. However, considering the economic and social needs of local and regional communities and the increase in income and employment as a result of the development of tourism activities in the region, if this development can be realized

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along with the observance of environmental principles and in accordance with the capacity of the region, it not only causes no conflict with the environmental protection, but also improves the quality of the environment and its stability.

Finding the right places to create activities in a certain geographical area is an important step in the tourism planning. Accordingly, the final tourist sites should provide, as much as possible, all the necessary conditions and constraints; therefore, the absence of zoning of the area in terms of desirability and non-consideration of the capacity of the region before the intensive tourism planning will bring a lot of adverse outcomes. Therefore, it is necessary to determine the desirable zones for the development of intensive tourism in the study area so that a large part of the planning and also, tourism management plans can be centered in areas with a higher potential.

Successful combination of Multi-Criteria Decision Making (MCDM) and GIS (known as spatial MCDM) can be regarded as a milestone in solving the problems associated with land use management and land resource allocation, especially for tourism development planning (Ritchie et al., 2005). Generally, spatial MCDM entails a combination of several structural processes including identification of factors affecting the purpose (evaluation criteria maps), their integration and finally, contribution to land use managers and planners by providing them with proper response/decision making variables (Malczewski, 2006). In doing so, the best results can be achieved whenever special attention is paid to every part of this process. Identification and selection of effective evaluation criteria can be taken as the first step and backbone of land evaluation for tourism development. Despite the mentioned importance, there has not been any coherent framework to identify and select the effective evaluation criteria. According to biophysical and socio-economic characteristics of a given region, different types of evaluation criteria should be selected and specifically analyzed (Castellani and Sala, 2010; Logar, 2010; Barzekar et al., 2011; Lozano-Oyola et al., 2012; Liu et al., 2012; Kim et al., 2013; Cottrell et al., 2013; Xin and Chan, 2014). However, screening a broad set of evaluation criteria derived from literature review (Salehi and Izadikhah, 2014; Pourahmad et al., 2015) or modifying a pre-existing set of evaluation criteria developed for similar regions (Makhdoum, 2001) are the main procedures employed in constructing the first component of a spatial MCDM, especially for intensive tourism development, which is a type of tourism that needs to develop tourism infrastructures and facilities; it is the most common type of tourism in developing countries such as Iran.

Integration of the selected evaluation criteria maps produces response variables. To date, a variety of integration techniques have been developed to tackle the objectives of the spatial MCDM. These techniques lie along a spectrum between two extremes representing compensatory and non-compensatory techniques (Malczewski, 1999). Compensatory techniques, which have been more common than other techniques (Machiwal et al., 2011; Sánchez-Lozano et al., 2013; Pourahmad et al., 2015), provide a tradeoff between evaluation criteria in which the inadequate suitability of an evaluation criterion could be compensated by the high suitability of other evaluation criteria. However, in non-compensatory ways such as the AND operator in Boolean logic, tradeoff between indicators is not allowed, and the weakness of an indicator is not compensated by the advantage of the other indicators. Therefore, in these methods, each indicator is considered alone and the comparisons are made on indicator-to indicator basis (Asgharpour, 1998). Further, in intensive tourism development, the disadvantage of an evaluation criterion could not be compensated by other evaluation criteria, thereby mitigating the overall suitability of land substantially due to a specific evaluation criterion (Makhdoum, 2001). This issue should be further taken into consideration in sensitive ecosystems with highly erodible soils and vulnerable vegetation types, such as the study area addressed in this research, because insufficient attention to the identification of evaluation criteria and also selection of ineffective integration techniques could not lead to realistic and applicable decision solutions.

In Iran, economic development needs to pay more attention to tourism development (Zamani-Farahani and Musa, 2008; Ghaderi and Henderson, 2012); however, due to having sensitive and fragile ecosystems, a systematic understanding is required to point out the potential obstacles which could limit tourism development in a given landscape. In this case, an attempt was first made by Makhdoum (2001) to address this issue through developing an ecological evaluation model; up to now, this model has been broadly employed to conduct several land resource evaluation analyses in Iran. Despite indicating the non-compensatory nature of evaluation criteria (especially water resources as a limiting factor in Iran) and taking advantage of an integrated structure, his model suffers from some shortcomings, particularly in the identification of socio-economic and managerial criteria, as well as utilizing simple and primitive methods to integrate the evaluation criteria. Hence, the main focus of this study was enhancing the performance of tourism development models through emphasizing the non-compensatory nature of evaluation criteria and employing an effective evaluation procedure to integrate the selected evaluation criteria.

In the present study, the authors have proposed a methodological procedure for evaluating the intensive tourism suitability based on the assumption of 'non-substitutability' of the environmental indicators. These indicators all have the same importance, and achieving compensation among them is not allowed (Munda and Nardo, 2005). To this end, to adhere to the principle of non-compensability of environmental criteria, in this research, by using two different techniques and combining the special model and multi-criteria decision-making methods, the final zoning of intensive tourism was done in terms of four categories of economic, socio-cultural, managerial and environmental, with a special look at the environmental parameters. To do so, by taking Torghabeh Shandiz Township as a typical case study area in the north of Iran, this study follows the following objectives:

1. Identifying the most important evaluation criteria which could effectively describe the suitable regions for intensive tourism development in north eastern regions of Iran, especially environmental, economic, socio-cultural and managerial (planning) criteria.
2. Testing the feasibility of integrating the ecological evaluation model developed by Makhdoum (2001) and the Fuzzy Analytical Hierarchy Process (FAHP) in tourism development.
3. Land suitability zonation and identification of the preferred zones for intensive tourism development.

2. Materials and methods

2.1. Study area

Torghabeh Shandiz (Binaloud) Township in Khorasan province, in the north east of Iran (59° 10′ 22" to 59° 15′ 22" longitude and 36° 25′ 21" to 46° 21′ 11" latitude), with the area of about 120,000 ha and the population of 50,665, was selected as the study area in this research (Fig. 1). This township is located in the northern parts of Binaloud Mountain Chain, with elevation rising to 1300 m a.s.l. This area consists of 7 permanent rivers, 12 deep and semi-deep wells, and 225 seasonal and permanent springs. Based on historical meteorological data, the mean annual minimum and maximum temperatures are −4° and 25 °C, respectively (Consulting Engineers of Khorasan Razavi, 2002). From a geological point of view, the study area consists of limestone, conglomerate, sandstone, shale and phyllite. A considerable part of the study area is occupied by shale and phyllite, which are highly sensitive to soil erosion. Such a condition, along with the erosion-resistant protrusions of limestone and quartzite in valleys, can describe the main geological characteristics of the study area. Moreover, steep slopes, shallow soil depth, and low-density vegetation suffering from low rainfall have exacerbated soil erosion in this region; however, valleys of