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New possibilities of GIS for mapping a mature destination: a case in Benalmádena, Spain

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ABSTRACT

With the development of Geographic Informational System (GIS), contemporary art mapping is emerging as a powerful tool for analysing and understanding the complex and subjective nature of mature tourist destinations. This paper explores the potential of implementing GIS for mapping Benalmádena (Costa del Sol, Spain), by proposing two methods of analysis with two graphic examples: first, an ecstatic-objective mapping of the cartography of water, based on a new expressive approach arising from the comparison of coastlines and pools; second, a dynamic-subjective mapping defining the touristic emotion mapping, which maps the opinions from *TripAdvisor*'s website. The mappings demonstrate: the destination's transformation from sun-and-beach tourism to sun-and-water tourism, tourist clusters, and tourists' preferred public spaces.

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Geographic Information System; mapping; mature destinations; Costa del Sol; public participation; Internet users

Introduction

Recently, cartography has undergone a profound renewal from an artistic perspective, thanks to contemporary cartographic art works or mapping (Perales-Blanco, 2010). This new art tool enables the analysis of the intangible and subjective values given to places. Studies where mapping is applied to cities are well documented, but studies that specifically apply this concept to tourism (Reyes-Corredera, Nebot, & Sierra-Solis, 2012; Rosa-Jiménez, Nogueira-Bernárdez, & Camino-Martínez, 2012) are scarce. The purpose of this paper is to examine the possibilities of applying art mapping by using Geographic Informational System (GIS) and Web 2.0 combined as a new tool for analysing and understanding the complex reality of a mature tourist destination. This hypothesis is initially based on the fact that a tourist destination has traditionally been explained by mapping given its subjective nature. Moreover, a tourist destination has to be explained and represented in order to encourage future travellers' interest in the place, and to maintain the interest of current consumers.

The association between the subjective gaze and the artist was established in the early nineteenth century with the travel books of the romantic writers, who would intertwine their opinions and experiences with the description of monuments, places, views, and legends. Hence, this served as the platform for Murray, who started publishing in 1838, to integrate a subjective vision with a more scientific basis by including historical facts, maps, and prints of monuments or places to visit. In the

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twentieth century, apart from tourist guides, the flux in mass tourism called for a new way of offering quick information about places. Tourist maps were developed as highly simplified guides with distorted city maps whose phrasing was simple and clear. Alongside subjective maps, the rapid growth of associating photographs and postcards with tourist destinations is another direct link between tourism and the subjective vision of artists and photographers.

Cartographic representation is an important tool to understand both how space transforms into a touristic place, and the complexity of its territory. A mature tourist destination is different from an industrial city. In this sense, traditional maps of an industrial city or a territory are a symbolic, objective, and scientific description performed on a determined scale that expresses the reality of Euclidean space, where there is a direct relationship between time and space. However, in a tourist space, this relationship is transgressed due to tourists' multiple interpretations, because they have neither the time nor the information to design the same mental map as residents do. Their space is made up of snippets, partial spaces, schemes, and diverse scale charts, in other words, the landscape of the tourist is made of dreams, trips, visits, and places. Thus, a tourist map is a subjective range of a tourist's feelings, experiences, and the marketing of tourist products designed by administrations or tourist operators.

As a result, cartography has evolved to understand reality as a complex system; in this regard, Ian McHarg's Design with Nature (1969) opened up a new range of possibilities with the use of the layer-cake model and overlay mapping. This multidimensional process has deeply influenced the GIS, and currently, its possibilities are being extended due to the impact of Information and Communications Technologies (ICT). According to Castells (2001), the Internet is the most important invention after the printing press because it allows for a continuous relationship between people and information, in real time and without frontiers, and the Internet's numerous possibilities for tourism marketing and trading have already been highlighted by Rimmington and Kozak (1997).

ICT has started a new era and a revolution by eroding the long-established economic, political, and social limits, creating a multidimensional and hybrid society, termed by Ascher (2009) as hypermodernity, or liquid society by Bauman (2000); likewise, time mobility is dematerializing the space limit. In addition, the development of the Web 2.0 has also introduced a wide range and continuous interactive feedback of data, which is dematerializing the old tourist guides, maps, and postcards onto informational platforms. Travellers and tourists can express their opinions and share their own personal guide books; Open Access platforms such as *Google Earth* allow image uploading, while wikis provide a contact point for people to share their videos, photos, texts, and conversation.

Literature review

Contrasting the traditional physical representation of a territory created by cartographers, geographers, or architects, the contemporary activity of mapping allows the urban study of subjectivity, because mapping is both a scientific and an artistic representational tool of the experienced space (Cosgrove, 2008). With the development of the information age, mapping can "make the complex accessible, the hidden visible, and the unmappable, mappable" (Abrams & Hall, 2008, p. 12), thanks to a change of perspective and the shifting of information control from the hands of institutional power to the hands of the individual and their personal interests (Porter, 2004). This paper, in a twofold framework, presents the application of art mapping in a tourist mature destination in order to survey its complexity through two examples: water mapping, as an objective and static mapping, adjacent to the emotional map as a subjective and dynamic mapping.

In the "water mapping" only the water cartographic layer, as an objective pattern, was selected and analysed by GIS. A new and artistic expression of graphic output was applied to highlight the physical change experienced by mature tourist destinations due to the large development of second home pools. The "emotional map" shows the visitor's perception of places as a subjective pattern: it is a collaborative map consisting of the opinions of the people who interacted with the website *TripAdvisor*. According to Tuan (1977), places are "centres that leave some value", and in this sense, the emotional map is a personal and subjective description of a trip which determines the emotional charge that

certain urban elements and places can transmit to the tourist. Parts of a city without these qualities are usually in last place on the perceptual scale; whereas, the most pleasant emotions are related to spaces where residents enjoy leisure activities.

The emotional map presented in this paper is based on the artwork from the San Francisco Emotion Map by Nold (2007). This mapping is the result of a participatory art project developed by 98 participants who explored San Francisco's Mission District neighbourhood over five weeks with a bio mapping, a device which records a person's physiological response to a surrounding. The result of this process was a mapping composed of coloured dots, whose intensity expressed the level of physiological arousal, and the participants' personal annotations. Translating this methodology to GIS partially adds a subjective aspect in the handling of the information related to the immaterial values that the personal opinion of a person needs. On the other hand, it strengthens, throughout the planning phase, the connection of the community in the decision-making process.

Applying mapping to analyse new forms of graphic expression in mature tourist spaces requires GIS to be used beyond an orthodox approach as it interacts with tourist's inputs through the Web 2.0. Traditionally, GIS has been a geographical tourist analysis tool for geolocation data that has been used for various purposes. An example of its classic use can be found in Feng and Morrison (2002), who have explored the potential application of GIS in hospitality marketing by using supermarket clients' postal codes as a source. Recently, there has been a development in the use of GIS arising from the public's participation, through surveys, the use of open access platforms, and a whole new line of research has opened up with both private and business social networks.

Implementing "community participation" as a data source has expanded the possibilities of GIS as it includes subjective data and personal opinions in the planning or development processes. Several studies have focused specifically on the study of public participation (Tosun, 1999) and GIS in tourism development. In this sense, Participatory Approaches (PA) with GIS was surveyed by Hasse and Milne (2005), who defined PAGIS as a framework "designed to integrate complex forms of qualitative knowledge, such as values, emotions and perceptions, into a GIS" (p. 279). In the study, an aerial map and local residents' questionnaires were used to analyse the small island of Marahau (New Zealand), where the entire rural community of 165 residents was involved in the process.

On the other hand, the Public Participation (PP) and GIS or PPGIS is also useful for producing maps that characterize the local space (Elwood, 2006). For example, Bugs, Granell, Fonts, Huerta, and Painho (2010) reported the use of PPGIS with Web 2.0 technology in urban planning actions, and concluded that citizens' knowledge is an important source of "up-dated information that helps to improve the quality of the analysis, leading to different solutions" (p. 172). Using an Open Access platform like *Google Maps* was considered as a positive improvement by the volunteers who participated in the study. This graphic platform helped them identify places where they could post suggestions or complaints about a list of planning topics proposed by the researchers.

Beyond community participation, many studies have also incorporated time as a variable in GIS use. This allows a dynamic visualization of tourist time–space behaviour patterns (Mckercher & Lau, 2008; van der Knaap, 1999) with a valuable application in understanding flows in public spaces associated with tourists. This has allowed state changes in two distinct time periods to be identified. So too have Brown and Weber (2012) used PPGIS and the web to measure changes in place values. Their method, in order to compare changes, spatially quantified place values as general public or stakeholder groups that were randomly selected at two different points in time (2004–2010). They provided a study website and a questionnaire that focused on assessing landscape values.

The difficulties of collecting data on the behaviour of the individual tourist (Ashworth & Page, 2011), have promoted the use of social media and the Internet as a wide sampling pool of possibilities. For instance, Paris (2013) has analysed the difficulties of using the social media *Facebook* for studies on backpackers. Moreover, several studies have focused specifically on the webpage of *TripAdvisor*, which has been used as a research source for surveying the ratings. In this regard, Bulchand-Gidumal, Melián-González, and González Lopez-Valcarcel (2013) analysed client's satisfaction through their ratings of hotels and its relationship with the destination. Other studies have surveyed the website's

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online reputation system (Lee, Law, & Murphy, 2011), and the way in which as an intermediary, *TripAdvisor*'s rankings build trust in the independent traveller (Jeacle & Carter, 2011). More recently, several studies have focused on the credibility of the travellers' perception of *TripAdvisor,* and how these perceptions influence attitudes and intentions during the travel planning process (Ayeh, Au, & Law, 2013; Verma, Stock, & McCarthy, 2012).

Methodology

Benalmádena, on the Costa del Sol (Málaga, Spain), is the research site of this study. This city is a coastal, mature tourist destination in the south of Andalusia; therefore, it fulfils the necessary objectives of our investigation. In 1970, this new sun-and-beach tourist development was officially declared a touristy city. Since the 1980s, a wide range of facilities, attractions, and activities for tourists have been developed, including an important marina, which has twice been the recipient of the best worldwide marina award (1995 & 1997). These facilities have helped diversify the initial touristic offer of sun-and-beach, and have introduced cultural, natural, and golf tourism. In addition, the city has consolidated a group of residential tourists, mostly comprising EU citizens, living in low-density condominiums and residential areas. Currently, around one-third of Benalmádena's population is foreign.

Methodology for water mapping

The process of producing the "water mapping" is based on GIS methodology: collecting information, attributing alphanumeric information, spatial analysis, and cartographic representation. For this map, obtaining and developing a database of pools, a standard procedure in any GIS work, was possible through three sources of information: official cartographic databases (i.e. National Geographic Institute or Institute of Statistics and Cartography of Andalusia), collaborative ones such as *OpenStreetMap* or websites like *Geofabrik*, where free spatial information developed by non-profit collaborators can be obtained, and aerial or georeferenced satellite photography. The latter was hardly used, due to a lack of information about pools, and most of them were digitalized using INSPIRE (Infrastructure for Spatial Information in the European Community) standards to ensure that the superposition of different elements was spatially adequate with a common reference system.

Attributing alphanumeric information consists of adding qualities or values such as the year of construction and the size of the surface pools. This information is displayed in the database, in which each record is associated with a feature. This phase can be as important as the spatial analysis because an item without alphanumeric attributes eradicates the possibility of applying a spatial analysis. On the other hand, the spatial analysis must show how important the data of swimming pools are, underlining the importance of graphical expression. For water analysis, the point-type geometry is adjusted in order to use spatial analysis algorithms such as the calculation of density (conditioned by the size of the surface), spatial extrapolations like Kriging, (following features tend to have similar values), or inverse distance weighting, in which increasing the cartographic distance reduces the influence of the value of a represented element (Moreno-Jiménez, Martínez-Suárez, & Prieto, 2006).

The water mapping is a specific handling of the information from an artistic perspective. Hence, chromatic characteristics according to their categories or gradations are highly relevant. However, the graphic design is conditioned by the nature of the objects to be represented: vector or raster. As vector elements are made up of the basic geometries of point, line, or polygon, a colour-coded chart based on their categories or features is more appropriate, as Nold (2007) applies to the San Francisco emotional map. However, the water mapping, as a raster element that represents the level of pool concentration, needs a chromatic gradation to express a quality or an idea rather than a quantity. In this sense, the selection of a blue colour gradation is essential to highlight the concept of a new sea inside the territory.

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Methodology for emotional mapping

The increasing number of websites being created, especially the ones by service operators or hotels (offering customers the opportunity to rank their level of satisfaction), permit tourists to know the opinions about every destination or facility. For this study, *TripAdvisor* (http://www.tripadvisor.es) was selected due to its worldwide coverage. The website allows tourists to interact in a wide range of subjects, but only the "attractions" items in "Things to Do in Benalmádena" were reported, in order to know tourist's feelings and preferences. From the information available, the following features were selected: (1) number of attractions registered; (2) number of reviews for each attraction and the date they were created; (3) the overall rating of the attraction: the website uses a five-degree scale, from least to greatest, terrible, poor, average, very good, excellent; (4) number of photos added by the user, and (5) number of nationalities that reviewed the attraction.

Two filters were applied to check the data. The first reviewed the information to detect errors. Previously, items with only one opinion were not considered due to their low impact level. In this case, two criteria were considered: If travellers had created two or more articles for the same attraction, the data of the best rated was added, and travellers who added the wrong attraction photos had no effect. The second filter corroborates the information by checking it with the official Benalmádena City Hall website (http://www.benalmadena.com), which has the correct description, location, and images of the resources. The evaluation of the emotional charge of an attraction corresponds to the rating appraised by the website. *TripAdvisor* orders and rates the items according to their own formula, something which is not analysed in this paper. The process ends by georeferencing each tourist resort with a circle whose diameter is inversely proportional to the ranking achieved.

Results

The water mapping demonstrates both the physical and environmental changes experienced in Benalmádena as a result of the intense development of housing with pools, which has been gradually increasing away from the coastline. Furthermore, the sum of the areas delimiting the surface of the water layer in pools is extremely elevated: there are more linear metres of private beach in pools than in natural coastline. The public and natural coastline is contrasted with the new and artificial private coast formed by the sum of all the pools throughout the residential developments on the Costa del Sol (Figure 1). The water mapping expresses a fragmented lake made up of hotels, condominiums, and house pools as well as aquariums and spas, revealing an intense process of coastal sprawl over the interior territory as a response to the desire and demand to expand and replicate the benefits of coastal space.

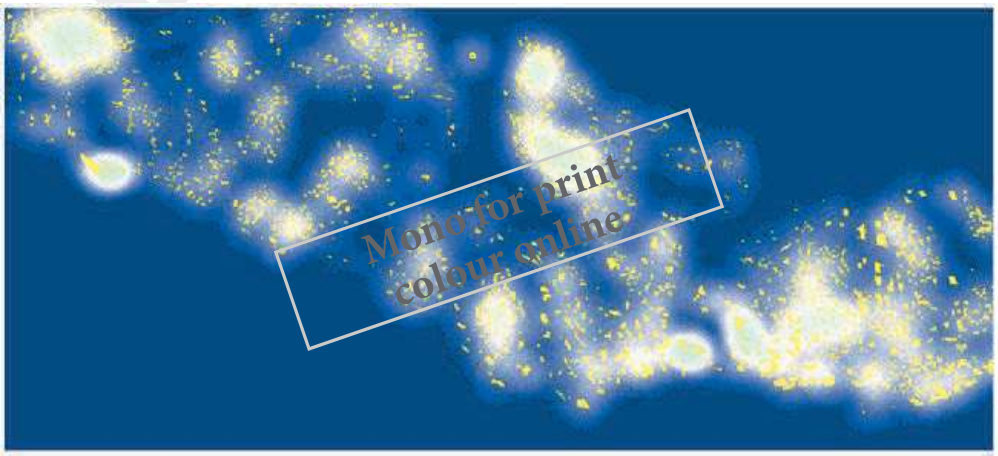

Figure 1. The water mapping of Benalmádena.
Source: Own elaboration.

Now, Benalmádena is a residential archipelago, and water has colonized the territory with two coasts: the public and natural coast, where the traditional activity of sun-and-sand tourism takes place and the private and artificial coast associated with second homes. The mapping concludes that the continuous growth of second homes has transformed the initial concept of sun-and-beach tourism into sun-and-water tourism. This change in perception and in the use of space is similar to the results obtained by Wallace (2009) in his study of the cartography of fear generated by crime-mapping software provided by police departments in US cities. While this study analyses a social sphere alien to tourism, in both cases, it is shown that the representation of reality through a single variable is able to highlight changes and mutations in nature which may go unnoticed in a more complete and comprehensive cartography.

The emotional tourist map of Benalmádena (Figure 2) reflects the evaluation of the tourist destination for the 20 July 2013. On this date, 34 items were registered, of which two were discarded for being duplicates, and four for having only one evaluation. The comparative study of the ranking of touristic resources determined by *TripAdvisor*, against all the other factors listed on the web – interviews, photos, or nationalities – leads us to conclude that the main indicator to consider is the number of reviews. These translate into the interest any given touristic resource arouses within the website community, regardless of the satisfaction level of the tourist. Furthermore, the number of photos is not directly related to the number of reviews, nor do the best-rated reviews have a greater number of images. Similarly, the 11 nationalities (Spanish, English, French, Dutch, Danish, Italian, German, Portuguese, Russian, Norwegian, Polish, Swedish, and Japanese) do not provide any meaningful differentiating factor as they are a qualitative factor on the impact of the resources. AQ3

For the emotional weight analysis, in this study, the first four ranked items in *TripAdvisor* have been named as the Best-Rated Places (BRPs). If we analyse the BRPs, the first in the ranking is a public park used by tourists and residents alike. The second is the historical centre of the city; the third is the marina, whose unique architecture and commercial area play a fundamental role. Finally, the fourth is a natural recreational centre, accessible via a cable car. All of these are public spaces that either have

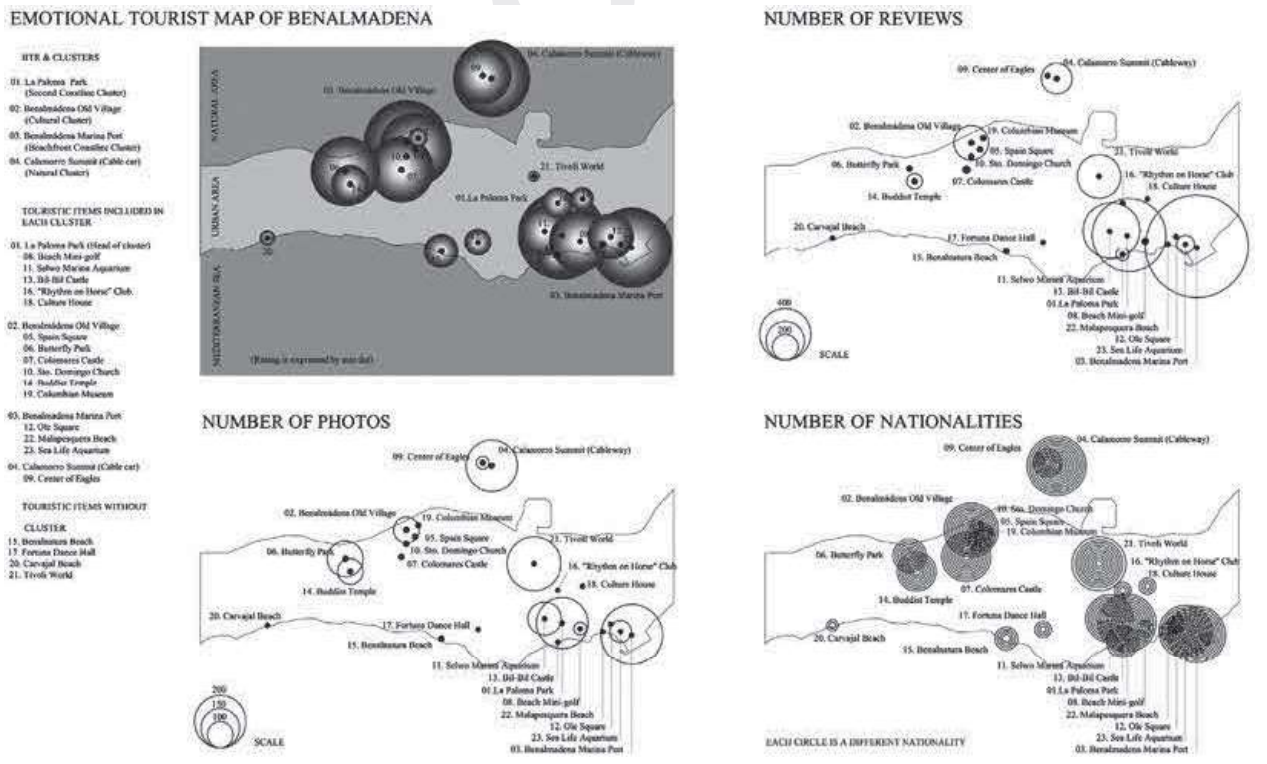

Figure 2. The emotional map of Benalmádena via tourists' opinion on the *TripAdvisor* website (above left). Alongside: another analysed website's items: reviews, photos, and nationalities.
Source: Own elaboration.

a great or a distinctly cared for and designed landscape. Therefore, it can be deduced that the places ranked by tourists as the best are public spaces that have a great design quality to them. These spaces are also usually appreciated by local residents; thus, as highlighted by Garrod (2008), residents and tourists do not hold significantly different perceptions of a place.

Furthermore, touristic resources of some consequence are generally organized into touristic clusters as they always include one or two of the BRPs, highlighting the added value of grouping these resources together. Thus, each cluster coincides with a distinct geographical area and segment of the touristic offers provided by the municipal: cultural (old village), natural (rekking trails and recreational activities) and coastline (beachfront and second row). This result is similar to the conclusions reached by Lazzeretti and Capone (2008) in their study of the local tourism systems in Italy in which they distinguish tourist districts or special areas (seaside, mountain, or lake) with data obtained from local labour systems. Contrarily, BRPs results showed a certain invisibility of the traditional resources such as the beach, the amusement parks, and the golf courses, possibly indicating a wearing out of the products.

Conclusion and implications

Mapping developed by GIS and Web 2.0 has expanded the understanding of a mature tourist destination's reality more than if a traditional mapping or GIS approach had been used. One of the main advantages of mapping is that it helps to visualize not only the intangible and subjective aspects of a destination, but also tourists' personal opinions and evaluations of these spaces and touristic resources. This is an advantage over other information sources, as it enables the most attractive tourist areas in the destination to be easily identified, and establishes topological and distribution relationships. The majority of webs only identify individual tourism resources and gather opinions and photos from tourists but do not use this information to analyse the reasons why some areas of activity are successful and the possible consequences of failure.

Another contribution of this study is the procedural description used for working with *TripAdvisor*'s data, which required the opinions for only one of the items to undergo a checking and verifying process. A follow-up study should aim to analyse all the items (activities, night-time, shopping, hotels, and restaurants) to provide not only an emotional map, but also a wider and more complete spectrum of the tourist destination, in order to know the areas with higher tourist activities. Future studies should also consider a similar analysis but with other web platforms such as *Booking, Travelocity, Lonelyplanet, Wikitravel, Virtualtourist,* and *Mytravelguide* permitting the ratings given (for the same tourist destination) on different websites to be contrasted and comparatively studied.

In the case of dynamic mapping, an important limitation of the study lies in the fact that only the information for the determined date was sampled. This leaves room for future studies to develop a comparative study on the date the dynamic mapping was created, similar to the work of Brown and Weber (2012), and to be able to assess, according to the entries, the trend changes in the opinions of the users regarding a tourist destination. As for the practical implications, the emotional map can be included in a wider technological platform. The use of mapping with the help of web and mobile applications allows one to explore the relationship between emotions and places through the Internet, which gives one the opportunity to share eclectic materials, create virtual journeys and stories, or see exhibitions on the web either on a computer or mobile device at a location (Sinker, Giannachi, & Carletti, 2013).

With respect to the concept of the intelligent tourist destination, a new generation of tourist websites that use multi-range communication technologies can promote not only tourist and local participation in decision-making but also some managerial implications for the fields of marketing, landscape design, and urban development. The emotional tourist map shows those resources that have a greater effect on the opinion of tourists as well as the ones that have a lower rating. The use of such maps can help in the decision-making process in management and marketing policies. For instance, it could help diminish the invisibility of the worst-rated resources, especially those tourism resources that do not rely on ticket sales, thereby making it difficult to quantify the number of visitors they attract.

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Disclosure statement

No potential conflict of interest was reported by the authors. AQ6

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