(04-032) - Sustainability of tourism activity around natural areas, the case of Costa Rica

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Costa Rica is a country renowned for its biological diversity, hosting about 6% of the world's biodiversity. These attributes has led to establish a robust system of protected areas that, today, contribute significantly to tourism activity. Its positioning as a benchmark for green tourism and its dissemination through social networks have contributed enormously to positioning it among the best eco-holiday destinations worldwide. This paper proposes a methodology to quantitatively show the tourism activity sustainability around the natural areas of Costa Rica, considering environmental, economic and social variables and taking into account different sustainability variables. We will rely on the use of Geographic Information Systems to combine the information. The results obtained allow us to improve the management of natural resources. The methodology will try to be extrapolated to any other protected area in the world.

Keywords: Tourism; protected areas; publicity; sustainability; social networks; G.I.S.

Sostenibilidad de la actividad turística entorno a espacios naturales, el caso de Costa Rica.

Costa Rica es un país reconocido por su diversidad biológica, albergando cerca del 6% de la biodiversidad mundial. Estos atributos le llevaron a establecer un sistema robusto de espacios protegidos que, hoy en día, contribuyen significativamente en la actividad turística. Su posicionamiento como referente de turismo verde y su difusión por las redes sociales han contribuido enormemente a posicionarlo entre los mejores destinos ecológico-vacacionales a nivel mundial. Esta comunicación propone una metodología para mostrar cuantitativamente la sostenibilidad de la actividad turística que se desarrolla entorno a los espacios naturales de Costa Rica, considerando variables ambientales, económicas y sociales y o teniendo distintos variables de sostenibilidad. Nos apoyaremos en el uso de los Sistemas de Información Geográfica para combinar la información. Los resultados obtenidos permiten mejorar la gestión de los recursos naturales. La metodología tratará de ser extrapolable a cualquier otro espacio protegido del mundo.

Palabras clave: Tourism; protected areas; publicity; sustainability; social networks; G.I.S.

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1. Introduction

The tourism in Costa Rica represents the main economic activity, well above the export of products that once based its economy such as coffee, bananas, pineapple or medicines, representing 8.2% of the GDP Tourism in Costa Rica represents the main economic activity, far surpassing the export of products that once based its economy, such as coffee, bananas, pineapples, or pharmaceuticals, accounting for 8.2% of the GDP (Costa Rican Tourism Institute, 2022). The country hosts significant biodiversity, with about 26% of its territory under some management category (Canet, 2021), which has favored the development of tourism largely in protected natural spaces. These areas are one of the main reasons for visiting the country; every year, Costa Rica has experienced a significant increase in visits to protected areas, which is considered positive from an economic point of view. However, the question arises: How sustainable can it be over time, considering the environmental aspect (possible impacts on biodiversity), economic, and social aspects.

Evaluating sustainability is not a straightforward process due to the diversity of variables that can be found, as well as the multiple elements that are interrelated (Aguado et al., 2017). Therefore, in the present study, a multi-criteria methodology has been implemented to facilitate handling a large amount of information from previously established indicators according to the study context, to favor the obtaining of results through value indices ranging from 0 to 1 (Pujadas et al., 2017), which will provide information on an ideal scenario of sustainability for tourism activity around a natural area. Additionally, Geographic Information Systems (GIS) have been incorporated to complement the results obtained, making it possible to obtain more precise and easily understandable results for decision-makers (Graymore et al., 2009).

For this purpose, multi-criteria methodologies and geographic information systems (GIS) have been combined, considering elements such as the use of biodiversity in a national park in southern Costa Rica (Corcovado National Park), taking into account environmental, economic and social variables, in order to demonstrate the functionality of the method so that it can be replicated in other scenarios and spaces.

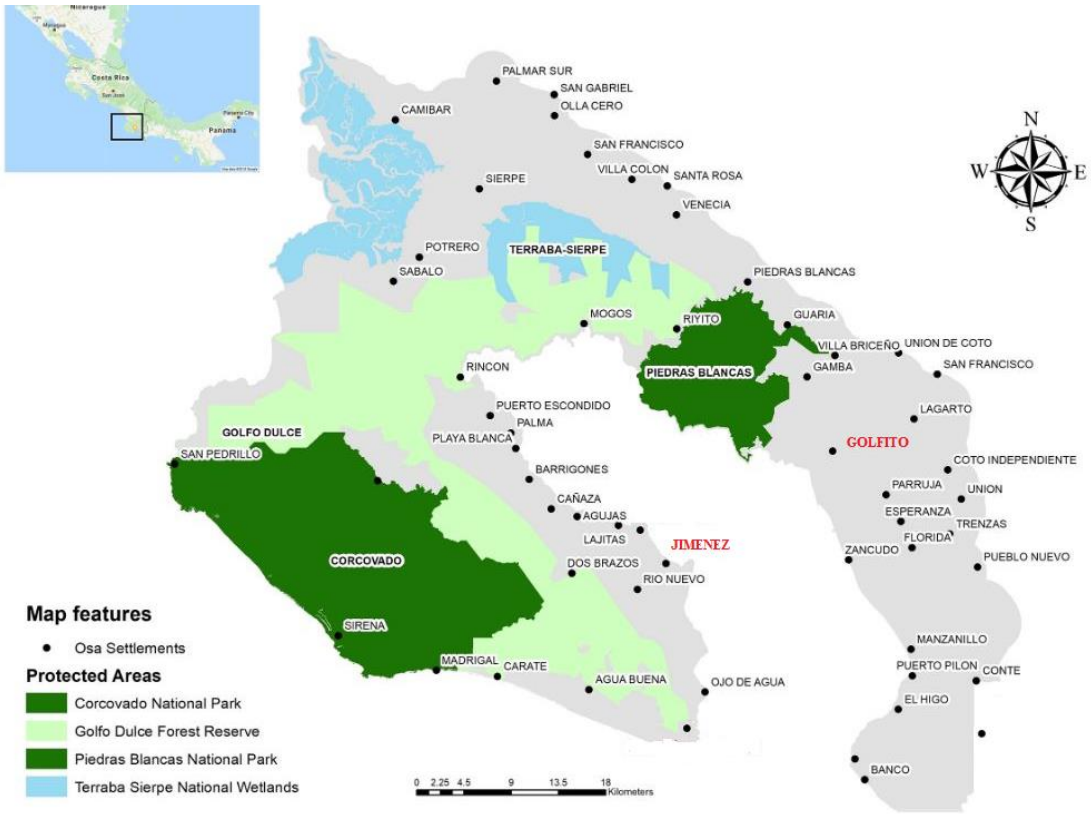
2. Methodology

2.1 Study area

The study was carried out in the Osa Peninsula (Fig. 1), located on the southern Pacific coast of Costa Rica, which covers a territory of 1093 km2 and contains important protected natural areas that conserve a high level of biodiversity (Brumberg et al., 2024). It is considered one of the most biodiverse places in relation to its size with 2.5% of the world's living species (Gutierrez et al., 2019), which has aroused the interest of naturalists and scientists to study the biodiversity present in the place that ultimately has served to give greater recognition and therefore turning the place as one of the favorite sites for the practice of ecotourism generating a significant increase in visitation mainly by foreign tourists.

For the study, the population centers of Carate-Matapalo, Jiménez, La Palma, Drake Bay and Sierpe were considered, all of which function together in the distribution of tourist activity around Corcovado National Park, Golfo Dulce Forest Reserve and the Térraba-Sierpe National Wetland.

Figure 1: Location of the study area



For the evaluation of the sustainability of tourism activity in the aforementioned sites, the tourism plant of each site has been divided according to the categorization detailed in Table 1.

Table 1: Categorization of the tourism companies evaluated

Category	Description
Hotel	Establishments that offer more than one service in addition to lodging, including food service, laundry, and others.
Hotel, Lodge concept	It is a concept associated with those establishments that are generally immersed within a natural or conservation area and that, in turn, focus on sustainability as their letter of introduction.
Cabins	Refers to a typical Costa Rican lodging service in which they are generally more accessible in terms of cost but only focus on a single service (lodging).
Hostal	Refers to lodging sites that are generally more affordable in terms of cost, usually shared rooms and bathrooms as well as common areas.

Tour Operator	It is a travel agency but focuses on operating locally.
Restaurant	These are usually places that offer a wide range of eating and drinking options, are more spacious and may offer international cuisine.
Sodas	They are small establishments that offer a daily menu of meals, which can vary between 4 and 5 options to choose from, and the menu offered is local food.
Shelter	Similar to hostels, but can offer a variety of services, from lodging, tour-type activities and food services.

2.2 Methods

For the case study we have implemented the multi-criteria method MIVES (Value Integrated Model for Sustainability Evaluation) which is used in many studies related to the field of construction and civil engineering. (Pons & De La Fuente, 2013; Pons et al., 2016; Pujadas et al., 2017; Josa et al., 2020). However, given its versatility, it can be implemented in multiple fields of study, tourism being one of them. (Araya et al., 2023).

As a general rule, sustainability evaluations include a large number of variables that generate a great deal of information, for which the MIVES method facilitates the evaluation of each alternative or variable, identifying those considered to be the most sustainable (Alarcón et al., 2011) by obtaining a sustainability index. The MIVES contemplates the use of a decision tree incorporating the three pillars of sustainability (environmental, economic and social), as shown in Table 2. The decision tree defines the criteria on which the evaluation is based and the variables that will make it possible to obtain measurable values.

Table 2: Decision tree for sustainability assessment

Requirement	Criterion	Variable
Environmental	Operation management in the tourism activity	I_1Environmental Management Plan and Certifications
		I_2 Wastewater management
		I_3 Solid waste management
	Biodiversity and land use	I_4 Intensity of use/visitors per protected area
		I_5 Biodiversity Management in Tourism
Economic	Economic benefits and seasonality	I_6 Contribution of tourism to the local economy
		I_7 Tourist volume in high demand period
		I_8 Concentration of jobs according to the tourist season
Social	Social impact	I_9 Jobs generated
		I_{10}Local tourism companies
		I_{11} Cost/price ratio in tourist services

The incorporation of GIS made it possible to access information on the indicators evaluated in a more practical way. The application of the method followed the following steps:

- Literature review and consultation with a panel of experts to assign weights to the variables to be evaluated.

- GIS scoping of study sites.

- Implementation of GIS to access information on the indicators to be evaluated.

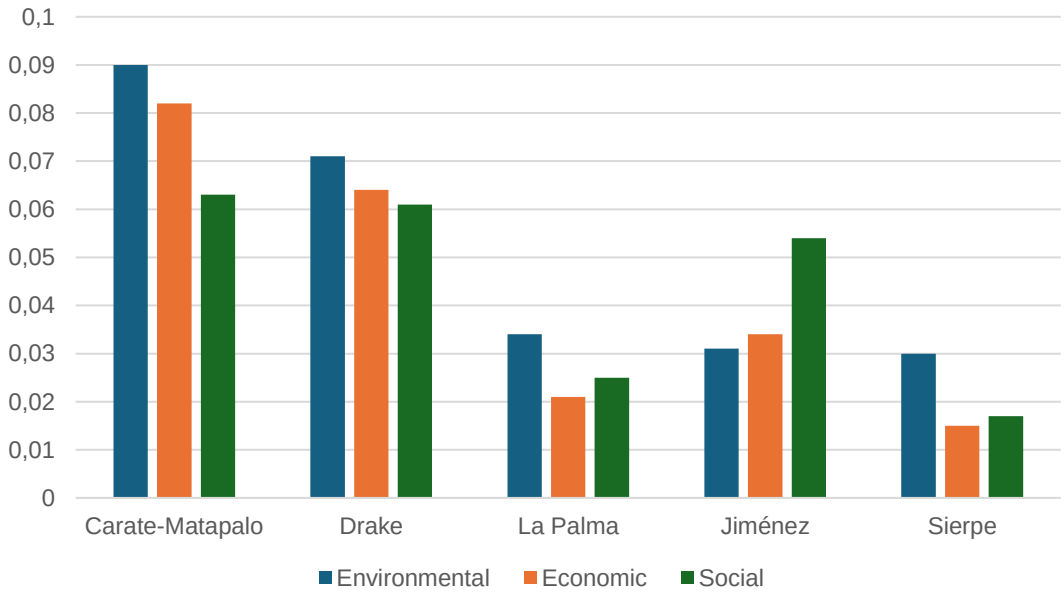
- Decision tree with requirements, criteria and indicators (See Table 1).

- Value functions to convert the physical units of each indicator into normalized values from 0 to 1.

3. Results

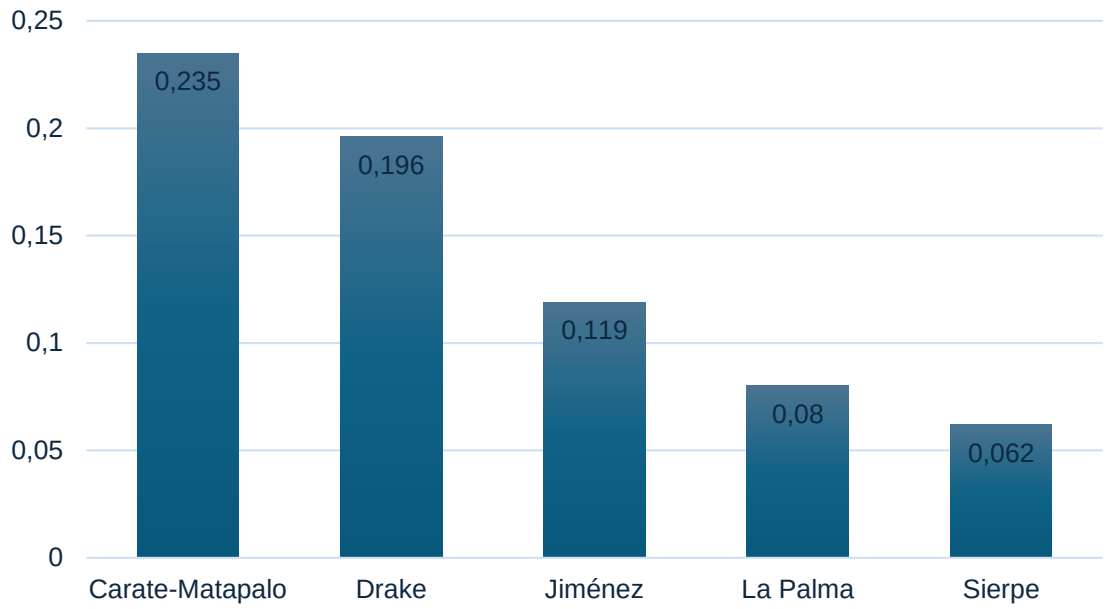
The results obtained once the MIVES method has been implemented are shown in Figure 2. It should be understood that a requirement will be more sustainable the closer it is to the unit (1); on the contrary, the farther away it is, the less sustainable it is. Each requirement is evaluated according to the variables established for its measurement and each variable has been weighted by a panel of experts who, according to their knowledge, have given a greater or lesser weight at the time of the evaluation according to their criteria.

Figure 2: Sustainability value by requirement and study site



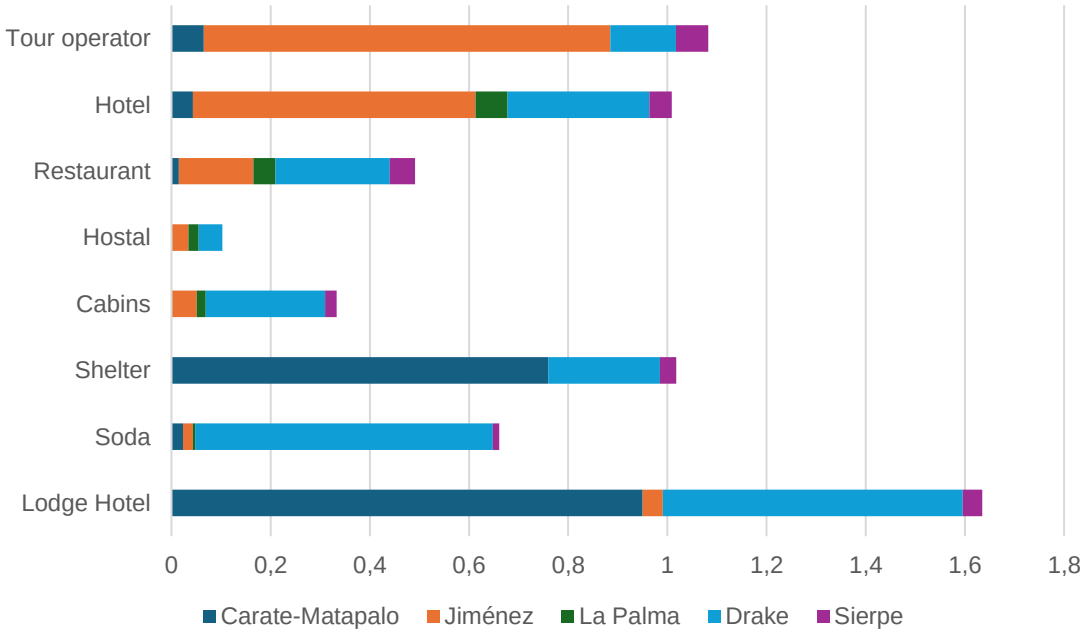
As shown in Figure 2, at the requirements level, the Carate-Matapalo site is the best valued, with the environmental requirement obtaining the best sustainability values, followed by the economic requirement (0.09 and 0.082, respectively). The second best valued site is Drake, where the environmental requirement stands out with values of 0.071 and the economic with 0.064 and social with 0.061. For the other sites, there is greater variability in the results between each of the requirements, with the Jimenez site showing the best values for the social and economic requirements with values of 0.054 and 0.034. In the case of the La Palma and Sierpe sites, the environmental requirement was the best evaluated, and the economic requirement was the worst.

Figure 3: Global sustainability index



At an overall level, low sustainability values are evident for all the study sites evaluated, with the Carate-Matapalo site being the best. Each site presents particular characteristics that make them more or less sustainable, for example, the composition of the tourism infrastructure, access to environmental management services, the capacity in terms of economic resources available to operate in tourism, and influential factors regarding the reception and distribution of tourists visiting the area. In Figure 4, the overall sustainability values obtained for each category as described in Table 1, considering all the study sites, are shown:

Figure 4: Sustainability values by category



As shown in Figure 4, the Hotel Lodge category is the one with the best sustainability values, with the Carate-Matapalo site obtaining the best values with 0.95, followed by the Drake site with a sustainability value of 0.60. On the other hand, the sites with the lowest sustainability values in the Hotel Lodge category are Jimenez, Palma and Sierpe, with values that are not very representative and far from unity.

The Tour Operator category is the second best positioned with respect to the others, with the Jimenez site being the best rated with 0.82, followed by the Drake site. With respect to the other categories, the most representative values are Hotel and Hostel, with the Carate-Matapalo and Jimenez sites being the best evaluated with 0.76 and 0.57.

As can be seen, the Hostal category is the worst evaluated, with values of 0.034 for Jimenez, 0.021 for La Palma and 0.0475 for Drake. Although these values can be considered very poor, it is clear that the result may be influenced by the number of establishments under this type of category and also that they are not found in the five study sites, so their representativeness may be affected in the overall analysis.

4. Discussion

At a general level, the results obtained in the evaluation of sustainability show variable values according to the type of category and the site where they are located. At the level of requirements (environmental, economic and social), the environmental requirement is the best evaluated, with the exception of the Jiménez site, with the Carate-Matapalo and Drake sites showing the best values. This particularity may be due to the composition of the tourism infrastructure of each site, where it is possible to find tourism establishments with high quality standards where the environmental component plays an important role, hence the emphasis that these companies give to the protection and conservation of the environment.

As a common practice, these types of establishments have a sustainability department and management, and may also have environmental certifications, such as tourism sustainability certification, blue flag, carbon neutral, among others. An important element to mention is that both the Carate-Matapalo and Drake sites are the closest to Corcovado NP, surrounded by important private reserves and conservation projects; therefore, their tourism operation cannot be alien to sustainability.

The economic requirement is the second best evaluated, Carate-Matapalo, Drake and Jimenez are the best positioned, this result indicates that tourism can make an important contribution to the local economy, giving rise to a circular economy where all actors are benefited directly and indirectly, also explained by the fact that these three sites concentrate the largest tourism offer in terms of attractions and tourism plant, which contributes to the local economy through the purchase of products and services and employment generation.

The sites of La Palma and Sierpe can be seen that in general terms at the level of requirements their values are the most unfavorable compared to the others, this may be because the composition of the tourist structure for both sites is smaller in scale and even of lower quality than that offered in the other sites, hence the operation of the companies is based more on being a site of short stays and distribution to the sites of greatest tourist interest, For this reason, it could be understood that the economic and social requirements are relatively lower with respect to the others, for example, at the level of employability, most of the establishments are cabins or small hotels, which work with few personnel or are self-service sites that do not require direct intervention in the attention of visitors.

The social requirement shows positive values for the sites of Carate-Matapalo, Drake and Jimenez; considering the variables used to measure this requirement, there is evidence of greater benefits in terms of employment generation and concentration of jobs, with respect to Sierpe and La Palma, the variability of employment is not strongly marked by the tourist season, and these are sites where they are much more consolidated companies with an established position in the market, which makes it easier to maintain their staff regardless of the season and to concentrate the largest number of jobs.

La Palma and Sierpe are smaller population centers, their tourism offer is reduced both in terms of attractions and services, and they have little positioning in the tourism market compared to the other sites, directly and indirectly affecting their operation in the activity, being more sensitive to the seasonal nature of tourism.

At the category level, it can be observed that lodge-type hotels and tour operators are the ones that present the best sustainability values. This can be explained by the fact that they are establishments with a vocation to offer activities in which sustainability and being “green” are considered as a way to make their product more attractive, which helps them to position themselves in the tourism activity by using sustainability as a form of promotion with the objective of attracting more visitors.

In general terms, the sustainability values obtained can be considered low, with important differences between each site. It is possible to see how those companies with greater purchasing power and a larger tourist plant obtain higher sustainability values, compared to those companies that are smaller in their operation and therefore, the focus on environmental management or contributions to the economy may be much lower.

5. Conclusions

According to the results presented, the application of the method allowed the identification of gaps in the sustainability of tourism activities developed around the natural areas of the Osa Peninsula.

Through the analysis, considering the variables applied for the study, it can be seen that there is an oversaturation of one protected natural area more than others, namely Corcovado NP, where 95% of the tourism offer revolves around the national park.

It is also evident that sustainability can be deeply rooted in image and marketing issues, given that the best sustainability values are found in those establishments that promote themselves as such and that generally have greater economic capacity to implement sustainable actions.

Another relevant aspect is that 75% of the jobs generated in tourism in these natural protected areas are stable, with no distinction between high and low season. In addition, 88% correspond to local employees, residents of each site.

Of that 88% of the labor force is concentrated mainly in the Carate-Matapalo, Drake and Jimenez sites, which is understandable given that these sites are where the largest number of tourist establishments on the Osa Peninsula are located compared to the La Palma and Sierpe sites.

Likewise, it is important to recognize that the sites where the tourist structure and plant is more reduced, their capacity to obtain better results in environmental, economic and social terms is much lower than that of those sites where there is a greater offer, in addition to the fact that it is deeply rooted in the positioning of each place.

Local entrepreneurship, in the Osa Peninsula 72% of the companies are in the hands of nationals and 70% correspond to locals. The above are not minor data, although it is true that

there are important gaps to have better levels of sustainability, in general terms the results are encouraging and can be used to make decisions that contribute to greater sustainability.

While there is a high degree of local entrepreneurship, it should be noted that most small businesses are owned by nationals, on the contrary, large hotels with a lodge-type concept are in the hands of foreigners. At the site level, Carate-Matapalo and Drake are dominated by large businesses in foreign hands, while small businesses are concentrated in Jiménez, Palma and Sierpe, these being the majority with respect to the other sites.

Finally, the use of multi-criteria methods and GIS contribute to a simpler definition of the different variables to be evaluated and, therefore, a more practical way to make decisions, through the application of the method, it is expected that it can be replicated in other areas given its versatility and flexibility.

6. Communication aligned with Sustainable Development Goals

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