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Literature Review

Methodological trends in the sustainability assessment of ecotourism projects worldwide. A review

Tendencias metodológicas de evaluación de sustentabilidad de proyectos ecoturísticos a nivel mundial. Una revisión.

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ABSTRACT

This study conducts a literature review to identify and analyse the different methodological trends that exist in the scientific field related to the sustainability assessment of ecotourism worldwide during the period 2012-2022. The methodology of the study includes an active and systematic search for publications related to sustainability assessment methodologies with a net focus on the term "ecotourism". The literature review was conducted in four electronic databases: Springer Link, Science Direct, Scopus and Taylor & Francis. The results were classified into quartiles and the most relevant components of approach were identified in the methodological trends of sustainability assessment in the identified publications, which include the use of geographic information systems, indexes or indicators, assessments of sustainability perceptions of local communities, and quantitative or qualitative methods. The research concludes by showing the distribution of publications at a global level, the classification of evaluation methods and techniques, and the geographical and chronological distribution of the identified publications, which indicates that environmental, economic and social evaluations are the most relevant components in the methodological trends of sustainability evaluation in ecotourism.

Keywords: *Ecotourism, sustainability, evaluation methodology, methodological trends, bibliographic review*

RESUMEN

Este estudio realiza una revisión bibliográfica mediante la cual se identifican y analizan las diferentes tendencias metodológicas existentes en el campo científico relacionadas con la evaluación de la sustentabilidad del ecoturismo a nivel mundial durante el periodo comprendido entre los años 2012 y 2022. La metodología del estudio incluye una búsqueda activa y sistemática de publicaciones relacionadas con métodos de evaluación de sustentabilidad con un enfoque neto en el término "ecoturismo". La revisión bibliográfica se llevó a cabo en cuatro bases de datos electrónicas: Springer Link, Science Direct, Scopus y Taylor & Francis. Los resultados se clasificaron mediante cuartiles y se identificaron los componentes de enfoque más relevantes en las tendencias metodológicas de evaluación de sustentabilidad trabajadas en las publicaciones identificadas, las cuales incluyen el uso de sistemas de información geográfica, índices o indicadores, evaluaciones de percepción de sustentabilidad por parte de comunidades locales, y métodos cuantitativos o cualitativos. La investigación concluye indicando la distribución de publicaciones a nivel global, la clasificación de métodos y técnicas de evaluación, y la distribución geográfica y cronológica de las publicaciones identificadas, indicando que las evaluaciones ambientales, económicas y sociales son los componentes más relevantes en las tendencias metodológicas de evaluación de sustentabilidad ecoturística.

Palabras clave: Ecoturismo, sustentabilidad, metodología de evaluación, tendencias metodológicas, revisión bibliográfica

INTRODUCTION

The economic activity of ecotourism has its origins in the 1990s and has shown a steady growth since the first decade of the 21st century, with an increase of about 300% faster than the tourism sector in general (Ospina Díaz et al., 2013). As a result of people's constant search for experiences of direct contact with nature, as well as concern for the environment through its protection and conservation, ecotourism has become one of the fastest growing economic sectors worldwide in recent years (Batabyal, 2016).

This dynamic generates a number of positive impacts, including a balance between the demands of tourists, conservation and the needs of local communities, such as employment opportunities, new skills, income generation, among others (Amalu et al., 2017); and the generation of negative impacts, such as those described by Krüger (2005) in his review of 251 case studies, where ecotourism did not generate enough income to avoid the use of land for consumptive activities, such as the conversion of forests to agriculture or pastures, with a very low impact on conservation practices in general. Based on the above, there is a need for literature studies that describe exercises in the formulation and application of sustainability assessment methodologies, which usually do not have the same specificity and rigour applied to other types of economic activities (Oliveros Ocampo & Beltrán Vargas, 2018).

It is essential to highlight the need to carry out a research on the different methodologies that allow assessing the relevance of the sustainability character of ecotourism projects, based on the identification of descriptive methods, quantitative or qualitative in nature, within the framework of good ecotourism practices (Oliveros Ocampo & Beltrán Vargas, 2018). In this way, from the three dimensions of sustainable development: environmental, economic and social (Ministerio de Comercio, 2020), in the search for economic growth, improve the living conditions of the inhabitants of a given territory and promote the protection and conservation of the environment and, in particular, natural resources, minimising damage to ecosystems and addressing the potential and limitations of the environment and its physical natural, built and social components (Pérez Colmenares, 2018). To this end, we intend to carry out a bibliographic research based on the review of scientific publications in databases worldwide that describe an overview of methodological trends applied to the sustainability assessment of ecotourism projects over the last decade.

The aim of this review article is to identify and analyse the different methodological trends in the scientific field related to the evaluation of the sustainability of ecotourism projects or activities worldwide over the last ten years, based on a literature search in specialised databases. In addition, the distribution of publications at a global level will be analysed, based on the classification of available methods, indices or indicators, models or evaluation techniques. Finally, the geographical and chronological distribution of the previously identified publications will be studied in order to identify a trend with respect to the articles related to the initial review.

Conceptually relevant elements

The concept of ecotourism is generally associated with an activity in which public authorities, the tourism industry, tourists and local populations work together to allow tourists to visit genuine areas where nature is studied and enjoyed and where there is no exploitation of its resources, while at the same time contributing to sustainable development (Ospina Díaz et al., 2013). Ecotourism contributes to the conservation of the environment and its population, based on four relevant aspects: travelling to unspoiled natural environments, internalizing the experience gained in natural environments and in contact with local communities, stimulating the conservation of natural resources and educating about the environmental and cultural values of the places visited (Martínez Quintana, 2017).

On the other hand, the term 'sustainable' or 'sustainability' should not be considered as a static concept, as it depends on the dynamics of technology development and the characteristics of the resources and environment to which it refers (Salinas Chávez & La O Osorio, 2006). Much of the existing literature on sustainable ecotourism is based on case studies or empirical analysis. Similarly, there are no theoretical studies on the term ecotourism that highlight the dynamics that make its concept sustainable, which implies making decisions in time and reflects a high degree of uncertainty (Batabyal, 2016).

Existing methodologies

In different databases of scientific publications, it is possible to identify sustainability assessment methodologies of ecotourism projects or activities worldwide, based on

methods using GIS geographical information systems (Omarzadeh et al., 2022), using methodologies based on a set of indices or indicators (Leka et al., 2022), sustainability perception assessments by local communities (Lee & Jan, 2019), or simply by using quantitative (Fassoulas et al., 2012), or qualitative methods (Barbieri, 2013) that make comparisons between sub-classifications of ecotourism or similar activities. Some of the postulates focused at the Latin American level regarding the evaluation of the sustainability of ecotourism projects relate specifically to the formulation of evaluation indicators, such as the case of Camacho-Ruiz et al., (2016), who advocate the need to build a system of indicators with generalities and specificities for the sustainable management of ecotourism, or the case of Zarazúa et al., (2015), who propose a methodology for the evaluation of rural spaces related to ecotourism for a specific case in the city of Chiapas, Mexico. Similarly, there is evidence of scientific articles related to the evaluation of the sustainability not only of the ecotourism aspect itself, but in a more general way of the macro aspect of tourism as an important economic activity.

MATERIALS AND METHODS

Bibliographic search system.

To develop the literature review, an active and systematic search methodology was used for publications related to sustainability assessment methodologies, with a net focus on the term "ecotourism", considering the possibility of including case studies related to the term "tourism", since sometimes the research starts from the general concept to clarify in more specific considerations and directly related to the concept of ecotourism. The search for bibliographical information was limited to the period between 2012 and 2022, with no further restriction in terms of geographical scope or language of research. A total of four electronic databases were used, corresponding to (I) Springer Link, (II) Science Direct, (III) Scopus and (IV) Taylor & Francis, as they have a wide catalogue of multidisciplinary scientific journals. This bibliographic review was also carried out, including all search fields related to title, keywords, summary or abstract, document content, among others, as well as considering publications related to scientific articles, books or parts thereof, conference proceedings and research reports, mainly.

The bibliographical search began with a first phase, in which scientific publications related to the key words "ecotourism sustainability assessment" and directly related to the objective of this research were identified. It should be noted that the search was carried out in English in order to avoid limiting the information to purely Spanish-speaking authors. Taking into account the time limit of the search, a total of 2236 publications were identified in the Springer Link database, 2619 in Science Direct, 253 in Scopus and 2038 in the Taylor & Francis database (see Table 1).

Subsequently, a second phase of consultation was carried out, including, in addition to the initial search terms, the English keywords reported by the Science Direct database, which allowed the identification of the main components on which most ecotourism sustainability assessment methodologies are based, such as (I) environmental, (II) economic and (III) socio-cultural, according to Salinas Chávez & La O Osorio, (2006). The data on the publications found for each of the databases used can be seen in Table 1.

A third phase of the literature review was carried out, this time considering as the most relevant descriptive terms those presented in the type of methodology described in the documents consulted, including (I) method, (II) model, (III) technique and (IV) index. The aim of this phase was the identification of the most relevant aspects of the methodological trends of sustainability assessment in the publications in question.

Finally, a fourth stage is established, which highlights the types of sustainability assessment methodologies used in the identified publications, based on the three theoretical-methodological proposals used worldwide, which emerged from the Earth Summit held in 1992 (Saldívar et al., 2002), which are based on (I) the Sustainable Development Index (SDI), (II) the Barometer of Sustainability (BS) and (III) the Environmental Sustainability Index (ESI), terms that were used in combination with the keywords initially used, resulting in much lower values than those found in the previous phases two and three.

Bibliographic analysis system

For the analysis of the information identified, a quartile classification method was used (Zafra Mejía et al., 2017), based on the definition of an index related to the data obtained in phases 1, 2, 3 and 4 of the literature review

methodology implemented, mainly those related to the frequency and relevance of the citations made for each publication, which in turn is reflected in the importance of these publications at the scientific level. The index used showed a general variation between 0 and 1, with quartiles defined as follows Q1 between 0.75 and 1.0, Q2 between 0.5 and 0.74, Q3 between 0.25 and 0.49 and Q4 between 0 and 0.24. The identified publications cited more frequently, on average for Phase 2, the terms "environmental assessment" (Q1=0.96) for the environmental component, "services" (Q1=0.79) for the economic component and "communities" (Q1=0.87) for the social component, as indicators of the focus of the scientific publications for each component.

With regard to phase 3, it can be seen that the term "method" (Q1=0.81) is the most frequently used term in the scientific publications consulted, but the term "model"

Table 1: Phases of literature review methodology

Phase	Key Word		Springer Link			Science Direct			Scopus			Taylor & Francis			Total DD	Average I	Average Q
			DD	I	Q	DD	I	Q	DD	I	Q	DD	I	Q			
1	Ecotourism sustainability assessment		2236	1	Q1	2619	1	Q1	253	1	Q1	2038	1	Q1	7146	1	Q1
2	Environmental	Environmental management	1109	0,50	Q2	2397	0,92	Q1	126	0,50	Q2	1956	0,96	Q1	5588	0,72	Q2
		Environmental assessment	2203	0,99	Q1	2478	0,95	Q1	234	0,92	Q1	2021	0,99	Q1	6936	0,96	Q1
		Ecology	1449	0,65	Q2	1113	0,42	Q3	134	0,53	Q2	1460	0,72	Q2	4156	0,58	Q2
		Ecosystems	1856	0,83	Q1	2127	0,81	Q1	124	0,49	Q3	1171	0,57	Q2	5278	0,68	Q2
		Biodiversity	1691	0,76	Q1	1858	0,71	Q2	94	0,37	Q3	1083	0,53	Q2	4726	0,59	Q2
	Economics	Tourism management	1707	0,76	Q1	1842	0,70	Q2	192	0,76	Q1	1671	0,82	Q1	5412	0,76	Q1
		Carrying capacity	1352	0,60	Q2	1312	0,50	Q3	48	0,19	Q4	790	0,39	Q3	3502	0,42	Q3
		Services	2041	0,91	Q1	2272	0,87	Q1	143	0,57	Q2	1696	0,83	Q1	6152	0,79	Q1
	Social/Cultural	Stakeholders	1576	0,70	Q2	1564	0,60	Q2	108	0,43	Q3	1190	0,58	Q2	4438	0,58	Q2
		Perception	1186	0,53	Q2	1215	0,46	Q3	140	0,55	Q2	1482	0,73	Q2	4023	0,57	Q2
		Communities	2065	0,92	Q1	2284	0,87	Q1	191	0,75	Q1	1855	0,91	Q1	6395	0,87	Q1
		Traditions	884	0,40	Q3	526	0,20	Q4	17	0,07	Q4	1399	0,69	Q2	2826	0,34	Q3
3	Method		1835	0,82	Q1	2325	0,89	Q1	179	0,71	Q3	1710	0,84	Q1	6049	0,81	Q1
	Model		1875	0,84	Q1	2105	0,80	Q1	174	0,69	Q3	1526	0,75	Q1	5680	0,77	Q1
	Technique		1277	0,57	Q2	1801	0,69	Q2	52	0,21	Q4	1290	0,63	Q2	4420	0,52	Q2
	Index		1113	0,50	Q2	1008	0,38	Q3	173	0,68	Q2	585	0,29	Q3	2879	0,46	Q3
4	Sustainable Development Index (SDI)		35	0,02	Q4	9	0,00	Q4	166	0,66	Q2	7	0,00	Q4	217	0,17	Q4
	Barometer of Sustainability (BS)		111	0,05	Q4	13	0,00	Q4	7	0,03	Q4	19	0,01	Q4	150	0,02	Q4
	Environmental Sustainability Index (ESI)		48	0,02	Q4	30	0,01	Q4	168	0,66	Q2	7	0,00	Q4	253	0,18	Q4

Source: Own elaboration of the authors of this work, 2024
Notes: DD: Detected documents; I: Index; Q: Quartile; Q1: 0,75 to 1,0; Q2: 0,5 to 0,74; Q3: 0,25 to 0,49; Q4: 0 to 0,24

(Q1=0.77) is one of the terms with the highest number of citations, almost as high as the term initially indicated. On the other hand, phase 4 shows very low citation values in comparison with phase 1 "Ecotourism Sustainability Assessment", since the three terms consulted are in the last quartile (Q4), the concepts "Environmental Sustainability Index (ESI)" (Q4=0.18) and "Sustainable Development Index (SDI)" (Q4=0.17) standing out (Saldívar et al., 2002).

Statistical analysis

The Shapiro-Wilk test (p-value < 0.001) was used to analysis of the normality of the data set, finding that the data examined on the sustainability components reported in the studies analysed did not follow a normal distribution (Razali y Wah, 2011), so non-parametric tests were chosen for further statistical analyses. Specifically, the Mann-Whitney U-test (Fay y Proschan, 2010) was used instead of the t-student test to assess differences between environmental, economic and socio-cultural components. At a 95% confidence level, statistically significant differences were found between the three components, with the environmental component being the most frequently addressed in the studies reviewed (Gössling et al., 2012), while socio-cultural aspects have received less

attention (Choi y Sirakaya, 2006). These findings highlight the need for a more holistic approach to assessing the sustainability of ecotourism that appropriately balances its environmental, economic and socio-cultural dimensions.

RESULTS AND DISCUSION

Methodologies for sustainability assessment: component analysis

The selection of the 2470 documents in the database used was based on the filtering of information related to the search terms of the first phase of Table 1 and their possible correlation with the terms broken down in the second phase of the same table, which consists of the environmental, economic and socio-cultural components. From this it was possible to establish the citation index (Q) and the order of importance of the main components after applying the proposed methodology, which were identified as follows: (I) environmental (Q3=0.46); (II) economic (Q4=0.2) and (III) socio-cultural (Q4=0.29), as shown in Table 2.

Table 2: Phase 2 results of literature review

Component	Subcomponent	DD	I	DD Total	I Total	C
Environmental	Environmental management	126	0,08	712	0,46	Q3
	Environmental assessment	234	0,15			
	Ecology	134	0,09			
	Ecosystems	124	0,08			
	Biodiversity	94	0,06			
Economics	Tourism management	192	0,12	383	0,2	Q4
	Carrying capacity	48	0,03			
	Services	143	0,09			
Socio-cultural	Stakeholders	108	0,07	456	0,29	Q4
	Perception	140	0,09			
	Communities	191	0,12			
	Traditions	17	0,01			
	Totals	155	1	1551	1	

Source: Own elaboration of the authors of this work, 2024.
Notes: DD: Detected documents; I: Index; Q: Quartile; Q1: 0,75 to 1,0; Q2: 0,5 to 0,74; Q3: 0,25 to 0,49; Q4: 0 to 0,24

By analysing the information contained in selected documents, it was possible to identify and classify each of them in a previously defined subcategory within each of the environmental, economic and socio-cultural components, according to the priority of citation. As noted by Ashok et al., (2017) through the proposal for the sustainability assessment of ecotourism at the operational level using a Principles-Criteria-Indicators-Verifiers scheme, commonly used in the assessment of forest and tourism sustainability, several of the selected articles reflect the use of methodologies that address the three components already mentioned, making it essential to identify each of the subcomponents specifically highlighted.

Environmental component

Within the documentary research carried out, it was possible to identify a series of subcomponents, framed within the environmental component, which follow the different approaches to the subject of sustainability assessment of ecotourism, according to the type of study carried out and based on the territory evaluated. Thus, the selected literature was classified by identifying the environmental management approach, among which the sustainability assessment model of ecological-urban systems based on emergence analysis by Pan et al., (2021), which establishes indicators based on emergence conditions considering ecosystem services to assess the sustainability performance of urban systems through a case study of Simao, China, stands out. As for the environmental assessment approach, where recent trends in the achievement of sustainability goals are assessed in a socio-ecological context, they lead to the definition of ecotourism as an opportunity to stimulate multifunctional and sustainable landscape management in relation to the non-productive benefits of the agricultural landscape, such as recreation and biodiversity (Bezáková & Bezák, 2022). The Ecology approach, which highlights the importance of considering the calculation of the Ecological Footprint in ecotourism processes, an environmental pillar of sustainability that informs stakeholders and citizens about the overall pressure of a territory on the biosphere (Galli et al., 2020). The ecosystem approach considers relevant aspects such as ecosystem-based disaster risk reduction (Eco-DRR) measures, which are gaining attention as creative solutions to reduce the vulnerability of communities to risks while providing multiple co-benefits (Chabba et al., 2022);; finally, a biodiversity-based approach such as sustainable production systems related to seaweed cultivation and its relationship with ecotourism and food for human consumption, as proposed by Pereira et al., (2021).

Economic component

In the economic component, approaches to tourism management were evaluated, highlighting documents related to the exploration of the first stages of large rural tourism development projects oriented towards sustainability, in countries without a great background in ecotourism, but with a good supply of resources and innovation capacity, such as Norway (Mwesiumo et al., 2022). In parallel, there is evidence of documents focused on highlighting the carrying capacity of ecotourism activities as a means to evaluate and constantly monitor the trajectory of tourism development in the coastal zones of Mediterranean islands, as proposed by Leka et al., (2022). Finally, the valuation of ecosystem services through the application of alternative approaches such as Bayesian networks to ecosystem service valuation, identifying key drivers of change and trade-offs between the potential of ecosystem services in different scenarios (Pham et al., 2021).

Socio-cultural component

Another component to be considered in sustainability assessment methodologies for ecotourism activities is the social and cultural aspects of the population living in or around the areas where these activities take place. Through the stakeholder approach, the results of a sustainability assessment are understood to reveal the views of stakeholders on sustainability issues related to a given project, as in the case of the Icelandic population on geothermal energy projects (Shortall et al., 2015). On the other hand, the importance of the perceptions of the inhabitants and visitors of areas with ecotourism activities, some papers assess the opinions of the general public on the importance of the fact that forests contribute to different ecosystem services, determine the public's need for information on the impact of ecotourism activities on ecosystems, and assess how responsibly the public believes these ecotourism projects act in relation to their impact on ecosystems (Ranacher et al., 2017). In turn, through the study of the community(s) and their traditions, it is possible to deduce the need for changes in the community's socio-ecological system itself through ecotourism activities in order to achieve sustainable management, such as the building of a strong sense of community identity, the evolution of community uses, customs, quality and lifestyles, and their collaboration with the scientific community (Pérez-Serrano et al., 2021).

Methodological approaches

Through the bibliographic consultation previously defined by the components of sustainable development, it was possible to identify, in parallel, the existence of different methodological approaches in relation to the type of methodology used by researchers to address the aspect of sustainability assessment of ecotourism from different aspects. In the case of publications with a "methodological" approach, an analysis of the attitudinal-behavioural gap in sustainable tourism stands out, linking holiday behaviour to environmental consequences (Juvan & Dolnicar, 2014). Using the concept of Resource Use Intensity (RUI), Gössling & Peeters (2015) assess the total global resource use of tourism, including fossil fuels, associated CO2 emissions, freshwater, land and food use as essential factors in assessing the impact of global ecotourism between 1900 and 2050. Asmelash & Kumar (2019) propose the use of the Delphi method based on 6 key performance criteria for progress towards sustainable ecotourism. Similarly, García-Melón et al. (2012) use a combined ANP-Delphi approach to evaluate sustainable tourism. In another case study of the Xinjiang Kanas tourism area, Xu et al., (2022) assess the sustainability of a tourism system based on emergent accounting and emergent ternary diagrams. Antić et al., (2022) evaluate five caves in the karst landscape of south-eastern Serbia using the M-GAM method, based on a type of geotourism evaluation where caves, paleoclimate and archaeology, among others, are considered as pillars of ecotourism activity. Finally, Kuščer & Mihalič (2019) propose to assess residents' attitudes towards overtourism using statistical tools based on social science.

Regarding the use of the term 'model', it was found that Trave et al. (2017) propose a marine wildlife valuation model (MWT) where they propose management measures in combination with appropriate ecotourism policies. Villanueva-Álvaro et al. (2017) propose a partial least squares (PLS) model in which they analyse the environmental impact of ecotourism in Spain. Winter tourism in the Dolomites in Italy is also approached from the perspective of management methods and tools to involve local stakeholders, foster creativity and adapt to climate change, among others (Bonzanigo et al., 2016). In Spain, Leco et al. (2013) study the attitudes and motivations of tourists towards the practice of agrotourism activities.

In terms of the use of 'techniques' to assess the sustainabi-

lity of ecotourism, D'Antonio et al. (2013) use visual surveys, among others, to assess visitor impacts in protected areas; Huang & Coelho (2017) propose a sustainability performance assessment focused on the protection of coral reefs by the tourism industry in the Coral Triangle region. In Brazil, a study is found directly on mangroves, where a socio-ecological assessment is conducted for environmental planning in coastal fishing areas (Santos et al., 2017). Finally, Roe et al. (2014) present a three-stage model that applies risk assessment principles to environmental sustainability assessment in the tourism and recreation sector.

Finally, the implementation of "index" within this literature review is found to be one of the most practical and cited tools worldwide, such as the case of Tanguay et al. (2013), who propose the use of sustainable tourism indicators (STI) for policy implementation and scientific recognition; the use of a composite indicator for the evaluation of tourism destinations in Cuba (Pérez et al., 2013); another type of composite indicator, by static and dynamic components, leading to a comprehensive assessment of sustainable tourism is one of the proposals of Blancas et al. (2016). The distribution of scientific publications by conceptual components related to this section is described in Table 3.

Table 3: Phase 3 results of literature review

Components	DD	I	I Total	Q
Method	179	0,115	0,31	Q3
Model	174	0,112	0,30	Q3
Technique	52	0,034	0,09	Q4
Index	173	0,112	0,30	Q3
Totals	*578*	*0,373*	*1*	

Source: Own elaboration of the authors of this work, 2024.
Notes: DD: Detected documents; I: Index; Q: Quartile; Q1: 0,75 to 1,0; Q2: 0,5 to 0,74; Q3: 0,25 to 0,49; Q4: 0 to 0,24

Theoretical and methodological proposals

Taking into account the proposals made at the Earth Summit, which define the Sustainable Development Index, the Sustainability Barometer and the Environmental Sustainability Index (Saldívar et al., 2002), there is evidence of publications that partially include some of the three approaches, since the proposals are mostly limited to the use of methods, indicators or models for assessing sustainability based on these concepts, but not specifically on the three theoretical aspects raised in this section. Therefore, the vast majority of the publications consulted include some of the concepts mentioned in Stage 3, but not directly any of the three theoretical-methodological approaches mentioned (see Table 4).

Table 4: Phase 4 results of literature review

Component	DD	I	I Total	Q
SDI	166	0,107	0,49	Q3
BS	7	0,005	0,02	Q4
ESI	168	0,108	0,49	Q3
Totals	*341*	*0,965*	*1*	

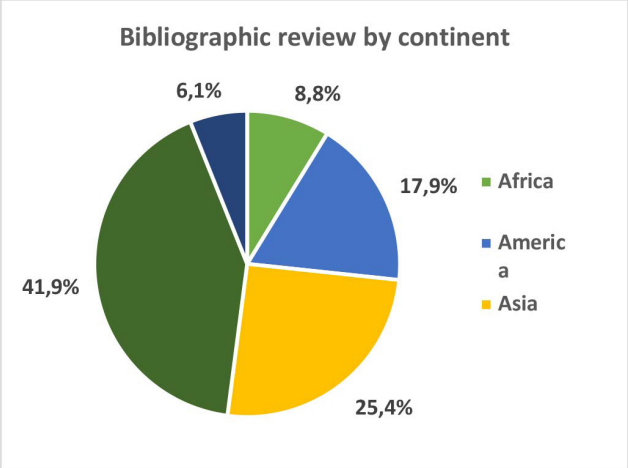
Source: Own elaboration of the authors of this work, 2024.
Notes: DD: Detected documents; I: Index; Q: Quartile; Q1: 0,75 to 1,0; Q2: 0,5 to 0,74; Q3: 0,25 to 0,49; Q4: 0 to 0,24

Geographical distribution analysis

Of the total number of documents analysed for each of the components between phases 2 and 4 of the bibliographic consultation (2470), it was determined that they have a geographical distribution mainly located in the countries of the old European continent, with 1034 documents (41.9%), 627 documents located in Asian countries (25.4%), 442 documents belonging to countries on the American continent (17.9%), 217 documents belonging to African countries (8.8%) and 150 documents published within the limits of the continent of Oceania (6.1%) (see figure 1). Of the total number of documents classified within the American continent, 186 (7.5%) correspond to documents from Latin American countries and, of these, 14 (0.6%) belong to documents reported at the Colombian level (see figure 2).

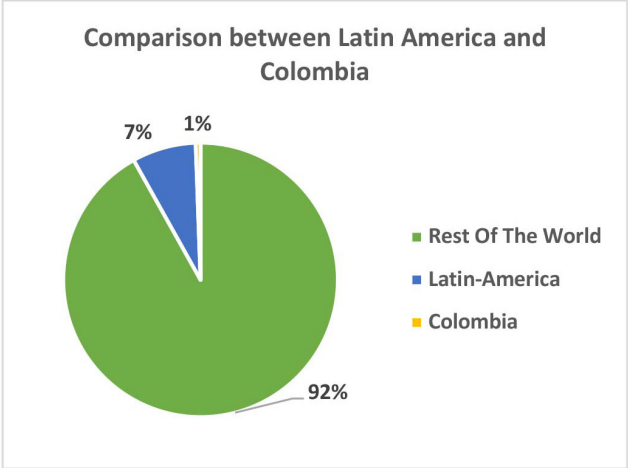
Thus, when assessing the sustainability of ecotourism, countries such as Spain and Italy lead the research carried out on the European continent, followed by China on the Asian continent and those carried out by American authors on the American continent. The contribution of Latin American countries to these research topics is relatively low compared to countries in the East or the African continent itself.

Figure 1. Continental distribution of publications



Source: *Own elaboration of the authors of this work, 2024.*

Figure 2. Latin-American distribution of publications

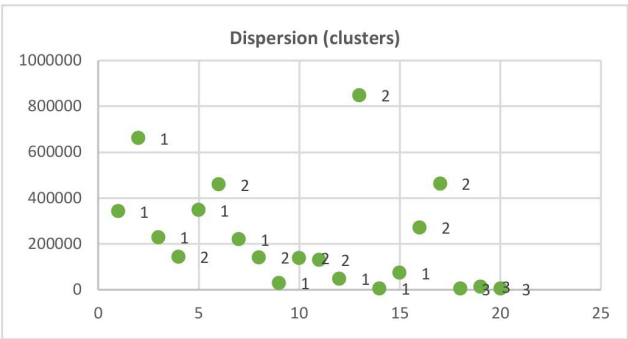


Source: *Own elaboration of the authors of this work, 2024.*

Multivariate statistical analysis

Multivariate statistical analysis allowed us to explore the relationships between the different components and criteria for assessing the sustainability of ecotourism identified in the literature review. Using techniques such as cluster analysis and hierarchical grouping, we sought to identify patterns, similarities and differences between the different aspects that make up a comprehensive sustainability assessment. The results of this analysis provide relevant information for the formulation of a robust and balanced assessment model that adequately incorporates the environmental, economic and socio-cultural components of ecotourism in the study area. The data set presented in Table 1 of this document was then used, where individual data were classified into homogeneous groups prior to a data normalisation process. In this case, cluster number 3, which corresponds to the values obtained for phase 4 of this research, represents the homogeneity of the data, considering that they belong to the same methodological theoretical approach based on Saldívar V. et al. (2002). For the other values distributed in clusters 1 and 2, homogeneity was not evident, which indicates a great variability in the data of publications by components, as evidenced in the different databases consulted in this research (see Figure 3).

Figure 3. Scatter plot



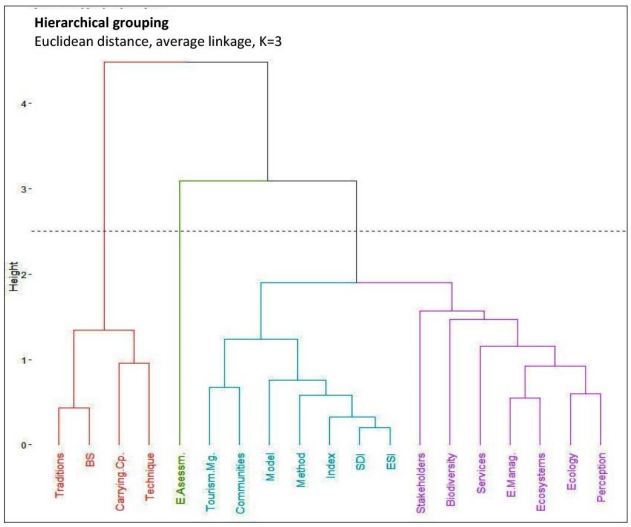
Source: *Own elaboration of the authors of this work, 2024.*

Considering the number of publications related to the evaluation of the sustainability of ecotourism in the Scopus database, the analysis of the components studied was carried out by geographical distribution, showing significant groupings between terms, since the publications deal with topics that can be well established within the different components described. For these data, the method of linkage averages allows a slightly better representation of the similarity between observations (see Figure 4).

As a result, 3 hierarchical clusters of similarity or distance emerged for the data evaluated, with those related to the aspects of techniques, carrying capacity, sustainability barometer and traditions standing out. This cluster brings together terms related to the socio-cultural component of sustainability, since it includes theoretical and methodological measurements together with cultural specificities and the carrying capacity of territories, i.e. the social component and the impact of human activity are directly involved in the various publications. Another cluster includes components related to tourism management, com-

munities and different methodological approaches to evaluation, such as models, indices and methods. In this case, the relationship between the components is discussed with a rather theoretical approach, as it is based on methodological approaches rather than on the characteristics of the components embedded in the sustainability assessment itself.

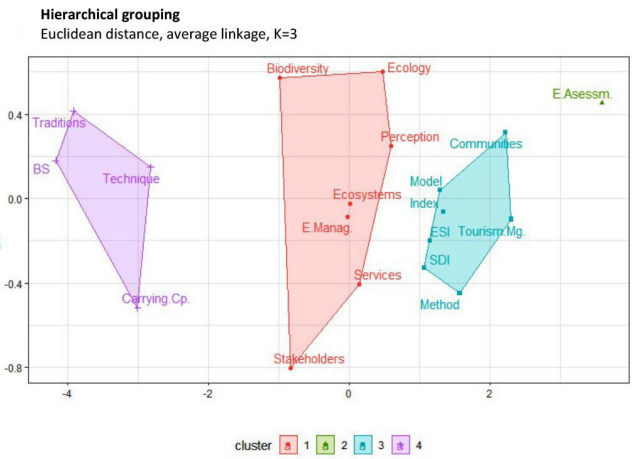
Figure 4. Cluster chart



Source: *Own elaboration of the authors of this work, 2024.*

A third cluster links a wide range of components, from biodiversity to the provision of services and the role of stakeholder perceptions, tending to move this cluster towards a more economic-environmental consideration than the others.

Figure 4. Cluster chart



Source: *Own elaboration of the authors of this work, 2024.*

The identification of an aspect outside the clusters, related to environmental assessment, stands out as an outlier in the statistical analysis, as it is present in most of the specific themes of the total number of publications consulted. In this way, it is possible to identify 3 clusters of average distribution, as well as an additional non-clustered cluster belonging to a single component (see Figure 5).

CONCLUSIONS

Through the identification of the different methodological trends in the evaluation of the sustainability of ecotourism projects or activities, it was possible to identify a number of key factors in the formulation of evaluation schemes or dynamics, which vary according to the component within which the document to be analysed is located, be it environmental, economic, socio-cultural or a mixture of several or all of them in concatenation. Sub-components have also been identified as important for the approach to sustainability assessment, which are directly related to the environmental component, from its management to the assessment itself, to aspects directly related to ecology, biodiversity and ecosystems. With regard to the economic component, aspects such as the carrying capacity of the areas, the services offered by ecotourism activities and the qualitative and quantitative value of tourists and residents of the areas under study were highlighted. With regard to the socio-cultural component, the role of the communities in the different stages of the approach to ecotourism projects or activities was highlighted, as well as their perception and receptivity to the traditions of the place and the interest of those involved in the different value scales.

The literature review then suggests that the methodological trends identified in phase 2 of the research are, in order, as follows: Environmental assessment (Q1=0.96), Communities (Q1=0.87), Services (Q1=0.79) and Tourism management (Q1=0.76), all of which fall within quartile 1, reflecting a higher number of citations or thematic approaches in the identified publications. As for phase 3, it was found that the terms Method (Q1=0.81) and Model (Q1=0.77) are the most used when proposing a methodological approach to assess the sustainability of ecotourism. In the case of the theoretical-methodological approaches proposed at the Earth Summit, it is evident that they are used very little in the related publications, especially the one related to the Barometer of Sustainability (BS), which was placed in quartile 4 (Q4=0.02).

The identification of variables for the analysis and evaluation of ecotourism activities in a given area depends on the type of activity to be evaluated and the geographical location of the area itself. The bibliographical review found articles from areas of recognised ecotourism, especially from tropical countries in the Americas, such as some African or Asian countries, as well as from countries with geographical and climatological conditions different from those of tropical countries, such as northern European countries like Norway and Iceland, among others. The results showed the following global distribution by continent Africa 9.6%, the Americas 19.6%, Asia 27.9%, Europe 45.8% and Oceania 6.7%. The countries where most research or scientific articles have been published on the evaluation of the sustainability of ecotourism are Spain, the United States and China.

The determination of the mechanism for approaching sustainability assessment, which can move between methodological approaches, the use of assessment indicators or indices, data and information management techniques, or the formulation of models that configure the above aspects or that result from the cohesion of several factors, will reflect the assessment trend that is relevant to each particular investigation. The agglomeration clusters reflect particular relationships between the components, but they do not show a representative homogeneity of the data, which indicates that each of the components evaluated has a specific niche of publications that are not usually directly related to other publications on similar topics. This means that the approaches to the central theme of sustainability assessment of ecotourism are very diverse and have many edges from which to approach their study, since no particular methodological trend stands out.

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