

THE CONTRIBUTION OF THE BIBLIOMETRIC ANALYSIS TO THE UNDERSTANDING OF TRENDS IN THE SUSTAINABLE DEVELOPMENT OF TOURISM

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Abstract

In the contemporary context of economic development and environmental conservation, sustainable tourism is an important field of research that significantly impacts local communities and natural resource management. The need to reconcile the growth of the tourism industry with the preservation of ecosystems and cultural heritage while producing long-term financial rewards makes this topic vital. Given the difficulties posed by climate change, the rise of mass tourism, and its effects on the environment and society, there is a growing interest in discovering efficient tourist management solutions. This desire led to the selection of this issue. Using a bibliometric method, the study sought to identify the most influential works, authors, journals, and international collaborations by analyzing the structure and development of the scientific literature on sustainable tourism. The bibliometric methodology was used in the study, and the associations between publications, authors, and nations were shown using the VOSviewer software and the Scopus database. Concept maps and collaborative networks were generated to demonstrate major trends in the field, and analysis focused on co-citation relationships, keyword co-occurrence, and bibliographic coupling. The results obtained indicated that sustainable tourism is an expanding field, with an exponential increase in publications over the last two decades. The most influential works are centered on destination management, environmental impact of tourism, sustainability strategies and tourist behaviour. In terms of the geographical distribution of research, a dominance of developed countries such as the United States, the United Kingdom, China, Australia and Spain has been observed, while emerging countries, although present, have a smaller impact. The analysis also highlighted a strong interconnection between sustainable tourism and other fields such as economics, ecology and development policies. However, the study highlighted several gaps in current research, including the lack of in-depth studies on the integration of new technologies in sustainable tourism, the long-term economic impact of tourism on local communities, regional disparities in the adoption of sustainability strategies, the influence of tourists' behavior on the implementation of responsible tourism and the need for standardized methods to evaluate the effectiveness of applied strategies. We believe that future research perspectives should focus on promoting interdisciplinary approaches and international collaborations for the development of sustainable models applicable on a global scale.

Key words: tourism, sustainable, responsible, management, bibliometric analysis

INTRODUCTION

Sustainable tourism has become a central topic in contemporary research, having the role of balancing economic development with environmental protection and ensuring the well-being of local communities. This idea developed out of the necessity to counteract the detrimental impacts of mass tourism and to guarantee the sustainability of travel destinations in the future [7, 8, 18].

Sustainable tourism, as defined by the World Tourism Organization, is a form of travel that takes into account both the immediate and long-term economic, social, and environmental ramifications in order to meet the needs of travelers, businesses, the environment, and host communities.

[22]. This definition emphasizes the need for a balance between the different components of tourism, which requires the adoption of clear management and regulatory strategies.

The main objectives of sustainable tourism include environmental protection, cultural heritage conservation, equitable economic development and the active involvement of local communities in the management of tourist destinations [22]. However, the achievement of these objectives is often hampered by the challenges of increasing tourist numbers, pressure on local resources and the lack of clear regulatory policies [10]. In many regions of the world, unsustainable tourism has led to overcrowding, which has damaged fragile ecosystems, increased pollution, and raised the cost of living for local residents [13]. Also, the effect of "showcase tourism" has been observed in many cultural destinations, where the authenticity of traditions has been affected by the need to meet the expectations of tourists [23]. Another challenge is excessive economic dependence on tourism, which can make local communities vulnerable, especially in crisis situations, such as the COVID-19 pandemic. Despite these challenges, sustainable tourism brings many benefits, such as stimulating the local economy, protecting biodiversity and increasing the quality of life for host communities [6, 22, 27.]. By taking steps like using renewable energy, cutting waste, and encouraging environmentally friendly transportation, sustainable strategies can help lessen their negative effects on the environment [16]. The creation of steady jobs, local entrepreneurship, artisanal industries, and traditional cuisine are all facilitated by sustainable tourism [23, 30]. Community tourism is a tangible illustration of the advantages of sustainable tourism, since it provides locals with the chance to actively engage in the tourism industry by providing lodging, guides, and traditional goods [25]. The preservation of cultural identity and equitable distribution of tourism revenue are two benefits of this kind of travel [22]. On the other hand, the sustainable management of a tourist destination requires the implementation of clear policies that prevent environmental degradation and optimize the tourist experience without negatively affecting the local community. Destination Management Organizations play

an essential role in this direction, being responsible for planning, regulating and promoting tourism in a responsible manner [30].

Among the most effective strategies adopted are: Establishing tourist load capacity, which mimics the number of visitors to prevent overcrowding and negative environmental impact [8]; Development of sustainable infrastructure that includes ecological transport, intelligent waste management and efficiency of energy resources [14, 20], Educating and raising awareness among tourists through information campaigns, being encouraged to adopt responsible behavior towards the environment and communities [20]; Intersectoral collaboration that involves the involvement of local authorities, NGOs and the private sector in defining coherent policies.

In order to better understand the evolution of research in this field, we considered that bibliometric analysis, which represents an important tool, which allows the identification of predominant themes in scientific literature, influential authors and international collaborations, offering a clear vision of trends and gaps in the field [23], represents a valuable methodological tool.

MATERIALS AND METHODS

Thus, in this study, a bibliometric approach was used to analyze the scientific literature related to the sustainable development of tourism, using the Scopus database as the main source of information and the VOSviewer software for data processing and visualization. The methodology was designed to highlight major trends in sustainable tourism research, identify networks of scientific collaboration, and examine the conceptual evolution of the field.

The scientific articles included in the analysis were extracted from the Scopus database, one of the most extensive and prestigious platforms for indexing scientific literature, frequently used in bibliometric analyzes to identify academic trends and the impact of research on a specific field [28]. Scopus provides an extensive coverage of academic

publications, including articles from renowned journals, international conferences and relevant books, making it an ideal source for analyzing scientific trends in sustainable tourism [5].

The consultation was carried out on February 16, 2025. The search was carried out using three main terms: "Sustainable tourism development", "Tourism management" and "Sustainable destination management", which reflect the most relevant aspects of sustainable tourism. Articles published in the period 1991-2025 were selected, in order to gain a perspective on the evolution of research in this field. Only articles published in recognized scientific journals were included, excluding conference papers, book chapters and articles that had not undergone the peer-review process. Also, only articles published in English were analyzed to ensure data comparability and international accessibility. Following the application of these filters, a total number of 2,028 articles were selected for bibliometric analysis. After the first term used "Sustainable tourism development" a number of 21,177 articles resulted, and after applying the second term "Tourism management" the number of articles was 7,683. For data processing and visualization, VOSviewer was used, a specialized software for the analysis of bibliometric networks that allows mapping the relationships between publications, authors and key concepts, facilitating the identification of thematic clusters, co-citations and international collaboration networks.

The bibliometric methodology was based on two main approaches:

Analysis of co-authorship networks that allowed the identification of collaborations between researchers and institutions, highlighting academic centers of excellence in the field of sustainable tourism [21]; Keyword co-occurrence analysis that was used to identify the most important research themes and see how they evolved over time [2].

Through this technique, the main research directions in sustainable tourism were highlighted, such as destination management, the economic and social impact of sustainable

tourism, and strategies to reduce negative environmental effects [19].

RESULTS AND DISCUSSIONS

Starting from the 2,028 articles published in the period 1991-2025, it can be seen that the subject of sustainable management of the tourist destination was addressed for the first time in 1991, subsequently gaining more and more importance. Thus, the number of articles reached almost 200 in 2021 and 2022 and 350 in 2024, which proves the importance of this subject for the scientific environment (Figure 1).

Regarding the number of published scientific articles/countries, we found that China is in first place, with 243 publications, followed by Spain with 191 scientific articles, the United Kingdom with 149 scientific articles and the United States with 140 scientific articles. Romania, with a number of 55 articles, ranks 13th among countries concerned with this subject (Figure 2). We found that countries with a developed tourism sector or with significant challenges in managing sustainability are the most active in research in the field, but there is an uneven distribution of scientific production, with a dominant influence of countries with strong academic infrastructures.

Although Romania's contribution to research in the field can be considered significant, we consider that there is a need to intensify international collaborations and funding for research projects focused on the sustainable management of tourist destinations, given that tourism has a strategic importance in the national economy, but also the existence of challenges related to the sustainability and international competitiveness of Romanian destinations. Additionally, Romania has a lot of potential for tourism, and in order to prevent the negative effects of mass tourism—like crowding, damage to natural resources and cultural heritage, increased strain on local infrastructure, and an adverse effect on host communities—sustainable management of tourist destinations is crucial. Scientific research is crucial in this regard for creating policies that strike a balance between the

requirement for long-term resource protection and economic growth.

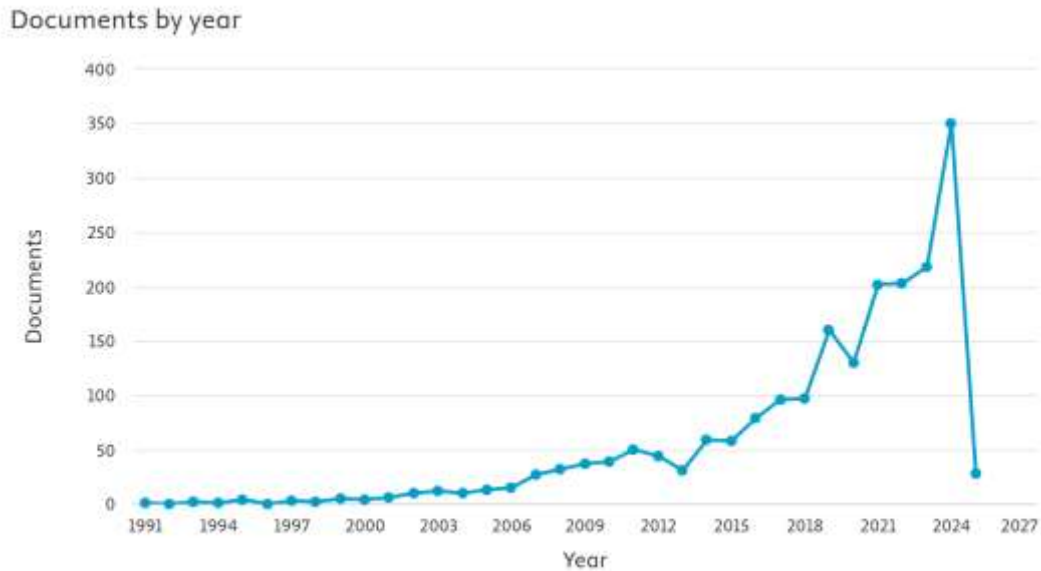


Fig. 1. The development of scholarly works about the sustainable administration of the tourism destination between 1991 and 2025

Source: own processing [24].

On the other hand, compliance with international standards for eco-friendly travel, especially the EU's goals for the travel industry's ecological expansion. The ability to conduct research and provide efficient

destination management models are key requirements for obtaining European funding for the development of green infrastructure, digitization of destinations, and ecotourism projects.

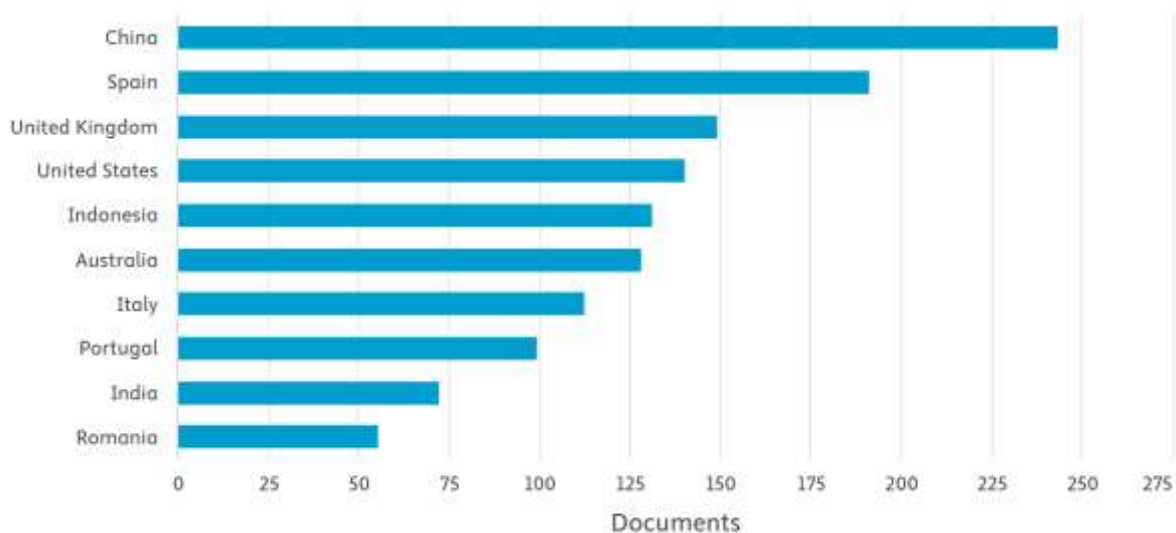


Fig. 2. Dissemination of scholarly works on the international level of sustainable tourism destination management
Source: own processing [24].

The results of the examination of the conceptual maps produced by VOSviewer indicate that there are three main areas of study in the field of sustainable tourism:

responsible tourism implementation strategies, the effects of sustainable tourism on the economy and society, and sustainable destination management. Eight idea maps

were developed for the study, each of which concentrated on a distinct aspect of sustainable tourism, such as co-authorship

networks, keyword co-occurrence analysis, and the historical evolution of the sector.

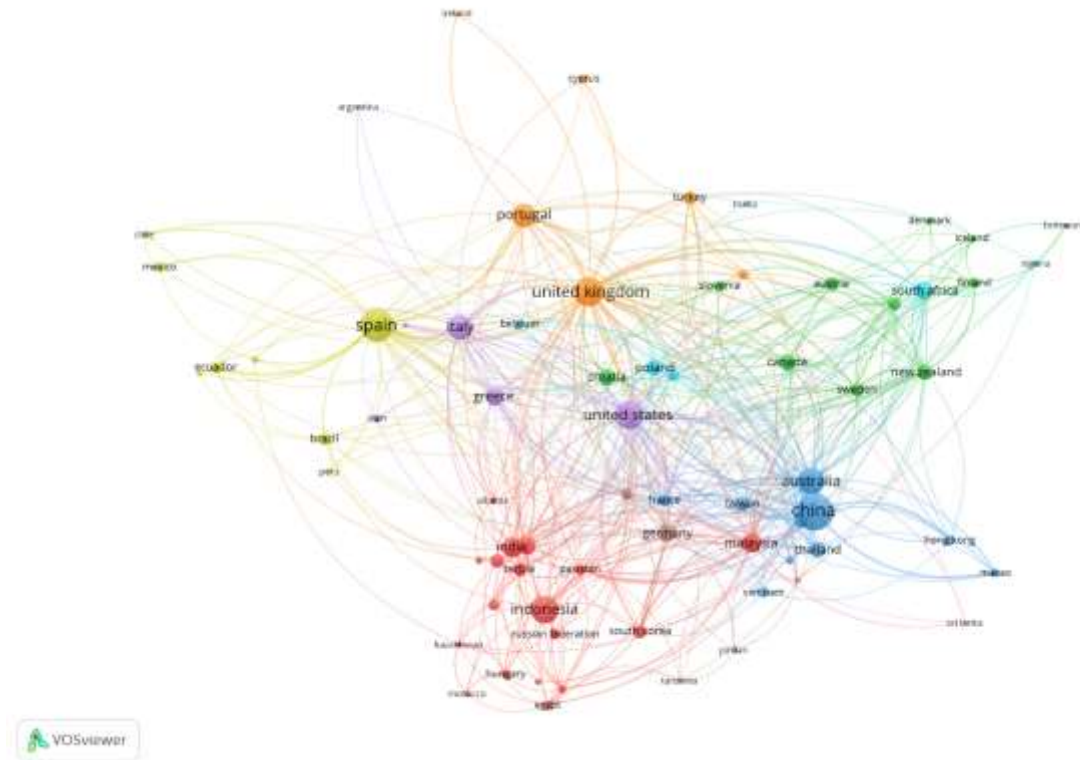


Fig. 3. International collaboration networks in sustainable tourism research
Source: own processing [29].

Based on the data analysis presented in Figure 3, the main hubs of the network are the United States, China, and the United Kingdom, with the strongest connections to other countries. This implies that they are at the forefront of sustainable tourism research and collaborate closely with international partners. The UK has a central position, with close links to Spain, Portugal and Italy, reflecting strong cooperation between the European institutions. A balanced distribution of research between North America and other developed regions is evident. China and Australia form a distinct cluster, having significant interactions with Southeast Asian countries such as Malaysia, Thailand and Indonesia, which reflects the interest of these states in sustainable tourism, which is due to the economic and environmental importance of this sector. At the bottom of the network, a cluster consisting of India, Indonesia and the

countries of South Asia and North Africa is noted, highlighting the collaboration of these countries that have limited access to the global scientific networks dominated by Europe and North America. Similarly, Northern European countries such as Sweden, Finland and Denmark are closely linked and collaborate on specific sustainability issues, given the region's high interest in advanced environmental policies. Another important aspect is the presence of Latin American countries such as Brazil, Mexico and Ecuador, which connect mostly with Spain and Portugal, which reflects the linguistic and historical links between these regions. However, Latin America and Africa are relatively under-represented in global collaborative networks as a result of their limited access to funding and academic resources.

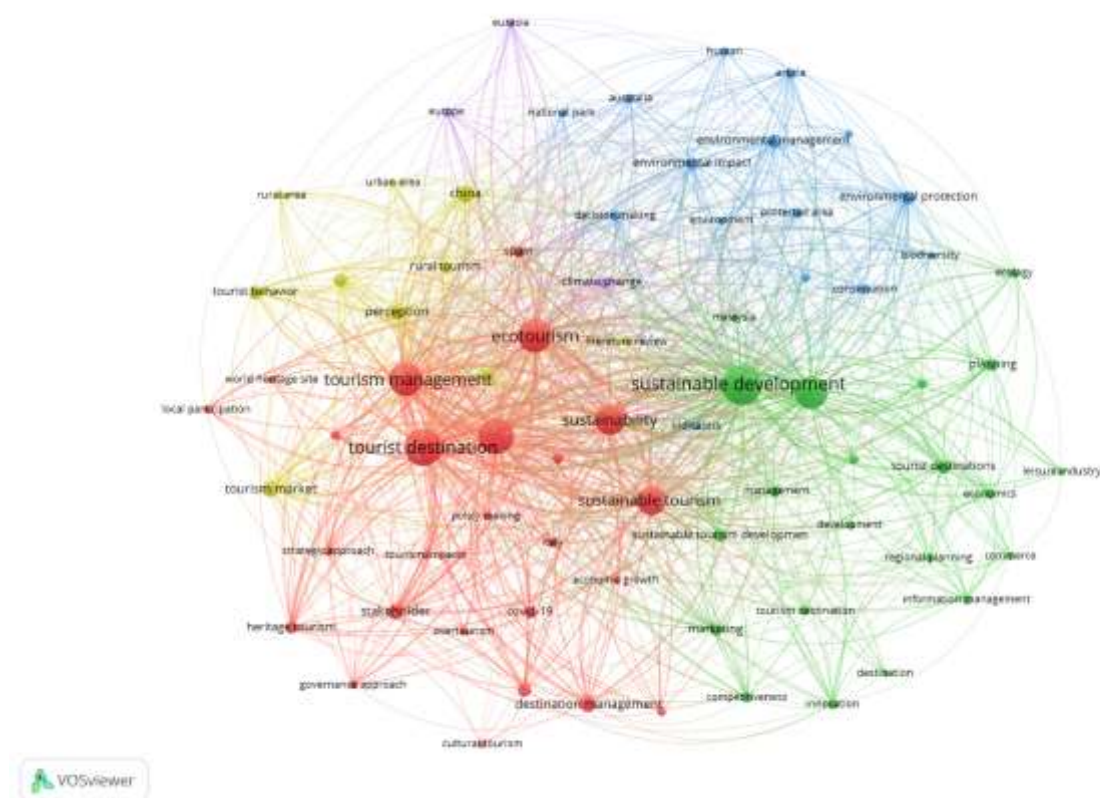


Fig. 4. Conceptual networks in sustainable tourism management research

Source: own processing [29].

Figure 4 highlights four major research directions. The first is sustainable development and tourism economics, where terms such as "sustainable development", "sustainable tourism", "destination management", "economics" and "marketing" emphasize the importance of economic and competitiveness strategies in the sustainable management of tourist destinations. This research direction reflects the concern for optimizing the economic impact of tourism on the host regions and the implementation of innovative solutions for resource management. The second major direction is tourism destination management and tourist behaviour, where terms such as 'tourism management', 'tourist destination', 'stakeholder', 'over-tourism' and 'policy making' indicate the challenges of destination management and regulation of mass tourism. This cluster shows that research addresses both the social and economic impact of tourism and the strategies needed for effective public policy planning. The links with the terms "heritage tourism" and "cultural

tourism" demonstrate an important concern for the protection of heritage sites and the integration of cultural tourism in sustainable planning. A third research direction identified is ecological impact and environmental management, where terms such as "environmental protection", "climate change", "biodiversity", "conservation" and "environmental management" highlight the growing concern for the relationship between tourism and environmental protection. This cluster highlights how crucial it is to analyze how tourism affects biodiversity and protected areas and incorporate ecological regulations into tourist initiatives. The close links between the terms "decision making", "environmental impact" and "policy making" show that more research is being done on the creation of regulations to lessen the adverse environmental consequences of tourism. The last direction highlighted by the conceptual map is ecotourism and rural tourism, where terms such as "ecotourism", "rural tourism", "local participation" and "tourist behavior" indicate a significant interest in the integration

of local communities in the development of tourism and the promotion of ecotourism as an environmental conservation strategy. The connection with the terms "perception" and "tourist behavior" shows that researchers analyze how tourists perceive sustainability and how this aspect influences their travel behavior and choices. Therefore, sustainable tourism management is a multidisciplinary field, combining tourism

economics, destination management, environmental protection and the involvement of local communities. The four major clusters reflect the main research directions, and the interconnection of terms shows that sustainable tourism development cannot be approached separately from economic and ecological aspects.

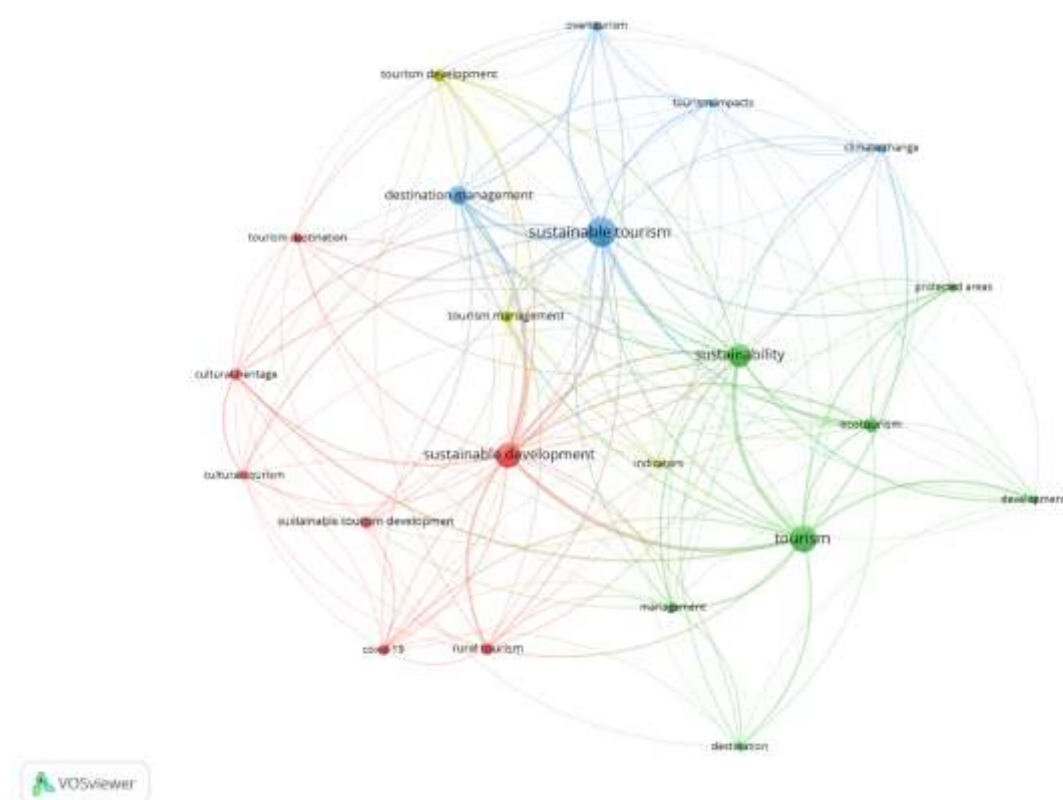


Fig. 5. Conceptual network of term co-occurrence in sustainable tourism research
Source: own processing [29].

Based on the information in figure 5, three major clusters can be distinguished that structure the field of sustainable tourism. The green cluster is centered around the concept of "sustainability", being associated with terms such as "tourism", "ecotourism", "protected areas" and "development". This group highlights the researchers' concern for the sustainable management of tourist destinations, with a particular focus on environmental conservation, protecting natural areas and integrating ecotourism practices. The strong connections between the terms "indicators" and "management"

demonstrate a high interest in the development of sustainability measurement systems in tourism, which indicates a trend towards the development of evidence-based strategies to optimize tourism impact. The red cluster revolves around the term "sustainable development", highlighting the relationships between sustainable development, cultural tourism, rural tourism and the impact of COVID-19 on the tourism sector. This group of concepts reflects a concern for the impact of tourism on local communities, the economics of rural tourism and global crisis management. The term "cultural tourism" is

strongly connected with "cultural heritage", it shows that sustainable tourism is often approached through the lens of preserving cultural heritage, which underlines the need for effective policies to protect and promote local identities. The blue cluster focuses on the sustainable management of tourist destinations, with the central terms "sustainable tourism", "destination management", "tourism impacts" and "overtourism". This grouping suggests that the field's study focuses on ways to manage tourist flows, lessen the negative effects of excessive tourism, and develop rules to maintain the balance between economic growth and environmental preservation. The link between "tourism impacts" and "climate

change" suggests that concerns about how climate change is influencing travel are becoming more prevalent, a topic that has recently attracted attention from academics.

As a result, we discover a multifaceted framework for sustainable tourism research, wherein destination management, environmental preservation, and economic development are all interrelated. According to the connections between the terms, current research trends are focused on integrating sustainable strategies into tourist development, optimizing destination management, and assessing the impact of tourism on the environment and local populations.

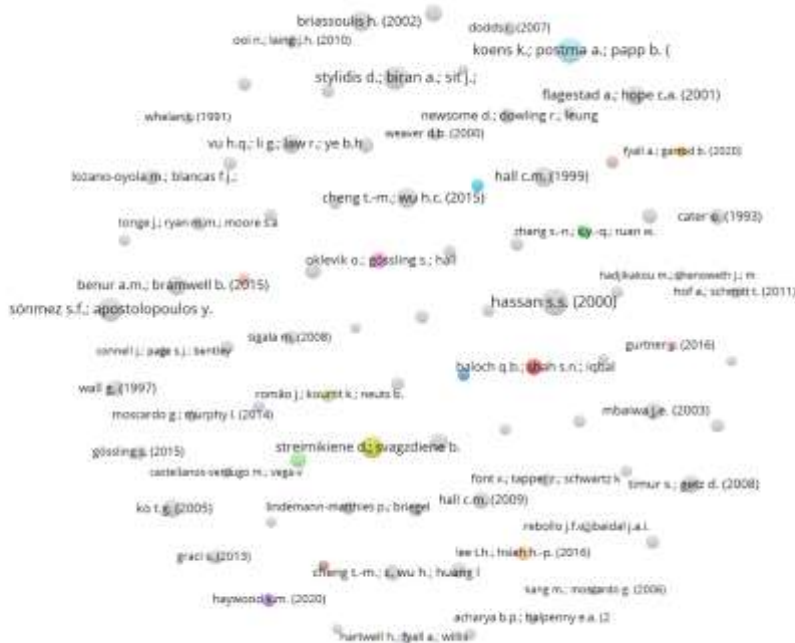


Fig. 6. Citation network in sustainable tourism research
Source: own processing [29].

A selection criterion of 100 citations per article is used, and Figure 6 shows the correlation between the quantity of citations obtained and scientific papers. Based on the sub-themes of sustainable tourism, a number of groups of significant studies are discernible. The works that have had the biggest influence on this field of study, including Hall C.M. (1999, 2009) [9, 10],

Gössling S. (2015), [11, 12], are the most cited. These authors have addressed issues like the environmental impact of tourism, sustainable destination management, and sustainability legislation, all of which have significantly advanced the idea of sustainable tourism. Publications that study the relationship between tourism, the economy, and local development, such as Bramwell B.

(2015) [1], Sönmez S.F., and Apostolopoulos Y. [26], represent another important category: studies on how tourism affects local communities and the economics of sustainable tourism. These studies are essential for developing balanced models of economic growth in the tourism sector and for comprehending how sustainable policies can help host communities. Important studies in the fields of ecotourism and environmental protection are highlighted at the top of the graph. For example, Weaver D.B. (2001), Lindemann-Matthies P., Briegel B., and Castellanos-Verdugo M. [17, 31] are examining the connections between tourism,

biodiversity, and natural resource preservation. These studies highlight the significance of ecotourism as an environmental effect and sustainable development approach. A small number of reference works dominate the field of sustainable tourism, according to the citation network analysis, which had a big impact on the future course of the study. The connections between the articles prove that the major topics of sustainable tourism are interconnected, including sustainability policies, environmental impact, economic development and destination management.

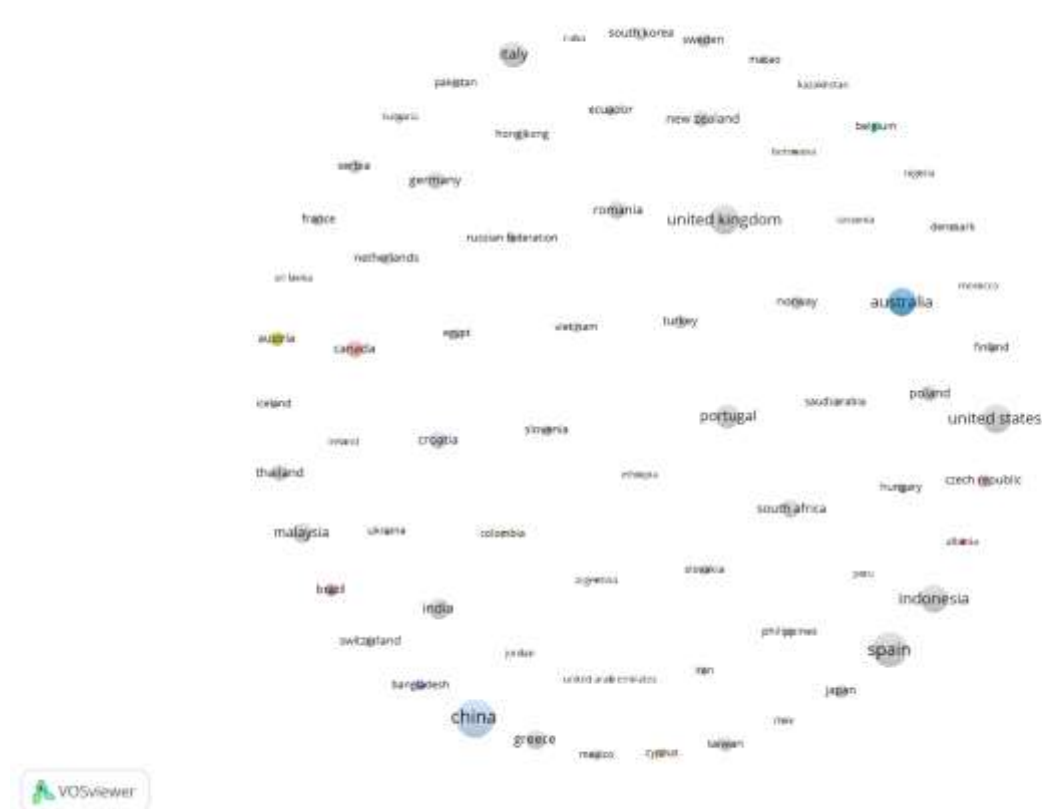


Fig. 7. Cross-country citation network in sustainable tourism research
Source: own processing [29].

Figure 7 shows the distribution of citations among countries contributing to sustainable tourism research, providing insight into each nation's academic influence.

It is observed that China, the United Kingdom, the United States, Spain and Australia are the dominant centers in the citation network, indicating that these countries have a significant impact on the

scientific literature in the field of sustainable tourism. China is the largest node in the diagram, which demonstrates that papers published by Chinese researchers have been extensively cited internationally, reflecting the country's growing influence in sustainable development studies. The United Kingdom and the United States are also well represented, confirming their role as leaders in

scientific production and generating theoretical frameworks relevant to sustainable tourism. Spain and Australia appear as important points of reference, due to their high interest in managing tourist destinations and implementing sustainability strategies in their tourist regions. However, while being part of the network, Central and Eastern European nations like Romania, Poland, and the Czech Republic have smaller nodes, which suggests that their academic influence is lesser based on the quantity of citations. However, the presence of these states demonstrates a growing contribution to the

specialized literature. Southeast Asian countries such as Indonesia and Malaysia are found in the network, indicating a development of research in this area. The data reveals the disparity in the distribution of scholarly influence on sustainable tourism, with citations predominating in nations with a strong academic infrastructure and research traditions. At the same time, emerging countries are joining international academic networks more frequently, which suggests that research on sustainable tourism is becoming more globally integrated.

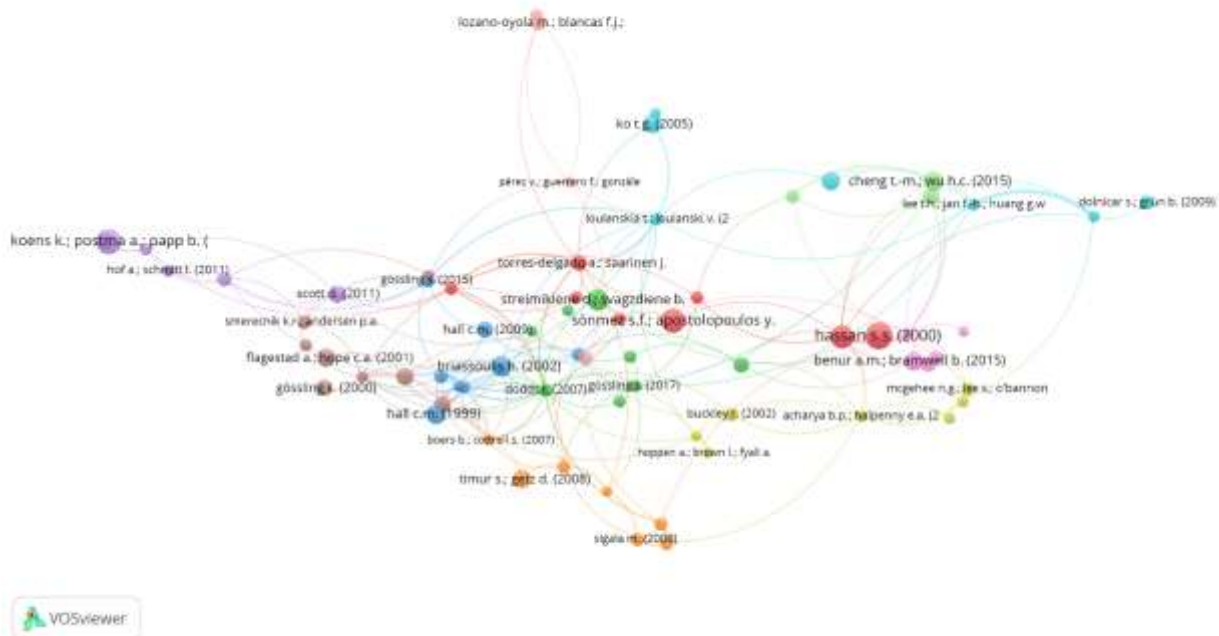


Fig. 8. Network of papers with bibliographic links in research on sustainable tourism
Source: own processing [29].

Figure 8 shows the bibliographic coupling network, which reflects the relationships between scientific articles that share common bibliographic sources, providing insight into the conceptual coherence of the field and the knowledge structures that have influenced the development of sustainable tourism research. Several major groups of works can be distinguished. A central cluster, consisting of works signed by authors such as Hall C.M. (1999, 2009), Gössling S. (2000, 2015) and Hassan S.S. (2000) [9, 10, 11, 12], show that these studies represent the theoretical

foundation of sustainable tourism. These papers address essential topics such as the impact of tourism on the environment, sustainability policies and the development of destination management.

Another important cluster consists of the works of Sönmez S.F. and Apostolopoulos Y. [26], which focuses on the interaction between tourism, the economy and local communities. This group indicates that researchers have actively explored how sustainability strategies can influence the

economic development and social protection of tourism regions.

The research group represented by the studies of Ko T.G. (2005) [15], Cheng T.M. and Wu H.C. (2015) [3] have a strong connection with the analysis of tourists' behavior and the perception of sustainability. These papers highlight how tourists' perceptions influence the adoption of sustainable practices in tourism, highlighting the need for visitor education to reduce negative impacts on destinations. The cluster formed around the authors Dolnicar S., Grün B. (2009)[4] demonstrates the concern for the segmentation of the tourist market and the development of sustainable marketing strategies. This body of

work explores how sustainable tourism can be adapted to different consumer profiles and what measures can be implemented to promote responsible tourism.

We thus find that sustainable tourism research is structured along several major directions, including sustainability policies, economic impact, tourist behavior and destination management strategies. The bibliographic coupling network shows that these fields are not isolated but deeply interconnected, emphasizing the need for a multidisciplinary approach to effectively understand and implement the principles of sustainability in tourism.

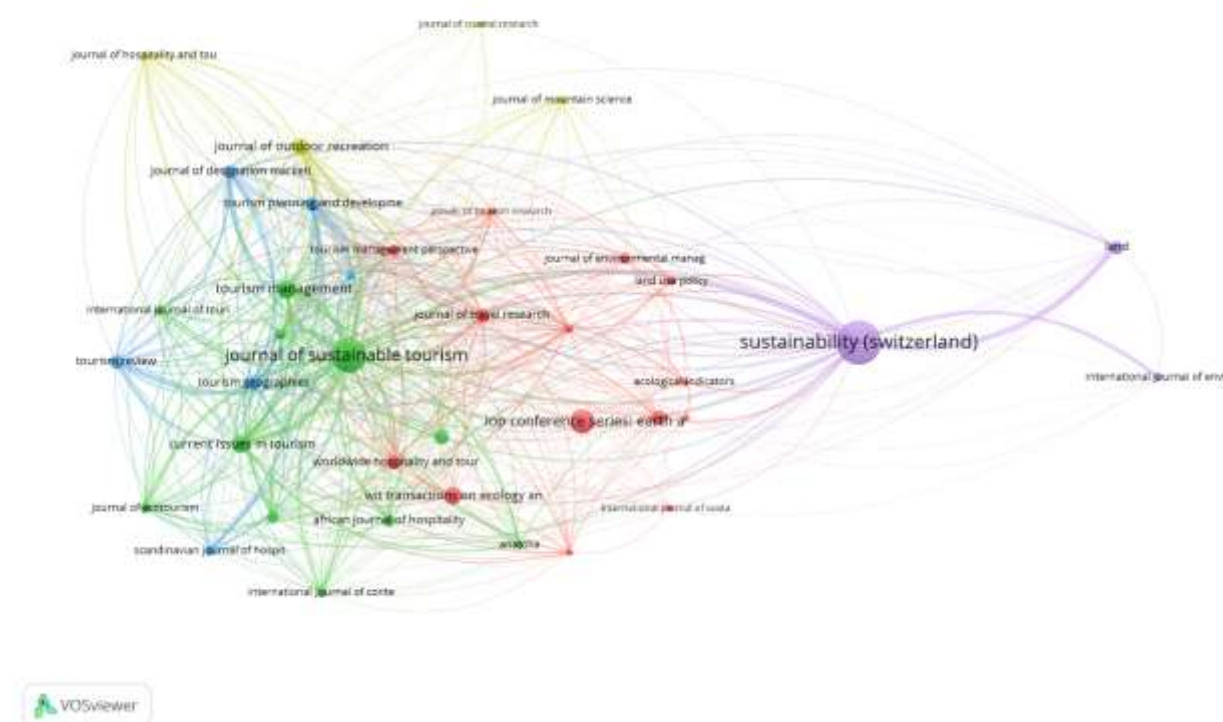


Fig. 9. A network of sources with bibliographic links for research on sustainable tourism
Source: own processing [29].

A key resource for sustainable tourism research, the "Journal of Sustainable Tourism" is the network's most important and core node. Figure 9 uses bibliographic coupling to illustrate the relationship between the scientific sources used in studies on sustainable tourism. Its close ties to other tourism journals, including "Tourism

Management," "Tourism Geographies," "Journal of Travel Research," and "Annals of Tourism Research," demonstrate that sustainable tourism is a prominent subject in the literature and is approached from a number of perspectives, including destination management, the effects of tourism on the environment, and sustainable planning of the

tourism industry. Another major cluster is that represented by 'Sustainability (Switzerland)', which is an important reference point with strong connections to environmental and sustainability policy journals such as "Land", "Journal of Environmental Management" and "Ecological Indicators", highlighting a close link between sustainable tourism research and the general sustainability literature, indicating that tourism studies are based on environmental science theories and methodologies. The cluster of journals such as "IOP Conference Series: Earth and

Environmental Science" and "WIT Transactions on Ecology and the Environment", which focus on ecology, environmental policies and the impact of economic development on natural resources, demonstrate that sustainable tourism researchers are collaborating and borrowing concepts from the environmental sciences to study the impact of tourism on ecosystems.

Journal clustering shows that, although sustainable tourism is a well-defined field, it is strongly influenced by general trends in sustainability and environmental protection.

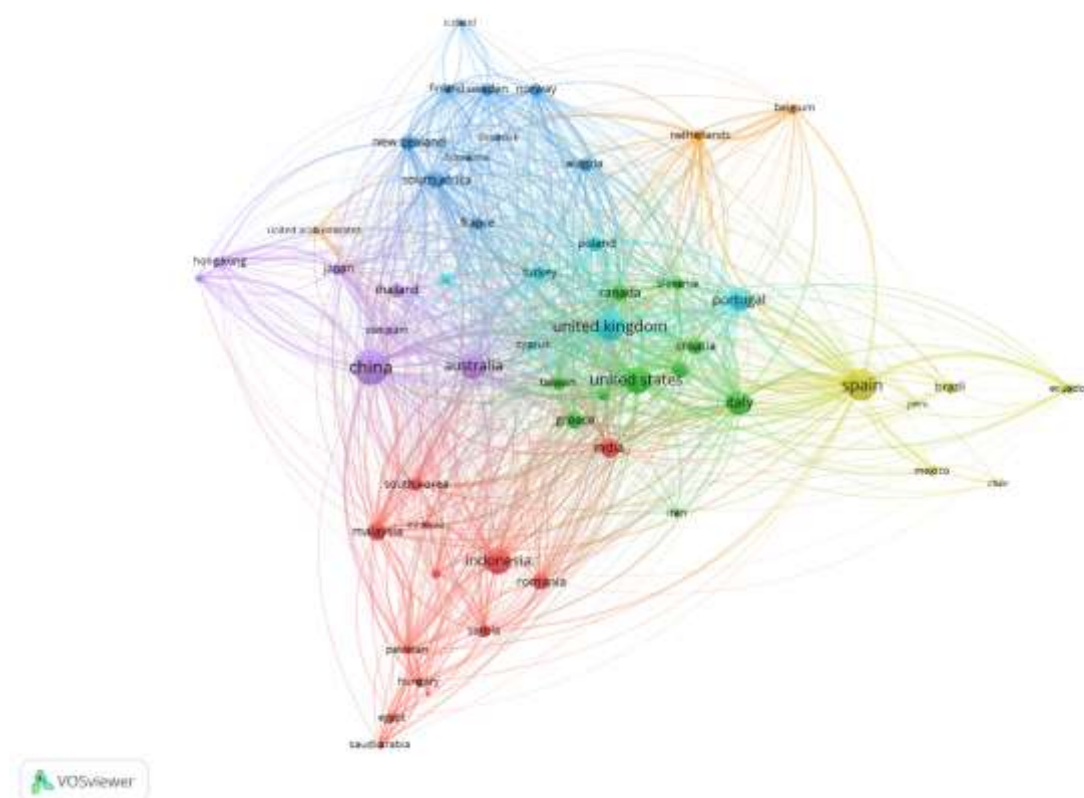


Fig. 10. Cross-country bibliographic linkage network in sustainable tourism research
Source: own processing [29].

Figure 10 demonstrates the bibliographic coupling relationship between countries that contribute to sustainable tourism research, based on a minimum threshold of 100 citations per country.

The network highlights several geographic and thematic clusters, which suggest dominant research centers and international academic partnerships. The three primary academic hubs—the United States, the United Kingdom, and China—are at the core of the

network and have the most links, suggesting that they have a big impact on the body of research on sustainable tourism worldwide. The blue cluster comprises Northern and Central European countries such as the United Kingdom, Germany, France, Sweden, Norway and Finland, which collaborate strongly with each other, reflecting a common interest in sustainability policies and strategic tourism planning. The green cluster, dominated by the United States, Italy, Portugal and Canada,

highlights the interplay between research focused on tourism management and the economic impact of sustainability. The red cluster is dominated by China, Indonesia, Malaysia and India, reflecting a large volume of research on the environmental impact of tourism in Asian regions and strategies for ecotourism. The yellow cluster, led by Spain, Brazil, Mexico and Ecuador, identifies a strong link between Latin American and Southern European research focused on the sustainable development of tourism in cultural and natural destinations. Another interesting aspect is the position of some emerging countries, such as Romania, Serbia and Pakistan, which, although they have a lower number of publications and citations, are connected to larger research centers, suggesting a progressive integration into international collaborative networks.

Relations between countries show that sustainable tourism is a multidisciplinary and global field, where academic collaboration plays an essential role in developing effective strategies for environmental protection and responsible tourism management.

CONCLUSIONS

This study provides a clear and structured perspective on the evolution of research in sustainable tourism, identifying the most influential papers, journals and international collaborations. By using the bibliometric analysis, the research highlighted the main scientific trends, identified the research gaps in order to propose future directions for the development of the field.

Thus, one of the gaps identified in the literature is the integration of new technologies in sustainable tourism, finding the existence of a small number of studies that analyze the use of artificial intelligence, big data and blockchain in the management of tourist destinations and the reduction of ecological impact. There is also a dearth of research on the long-term economic repercussions of sustainable tourism; most studies concentrate on the short-term advantages rather than closely examining how it affects the socioeconomic structure and

quality of life of the host communities. Regional variations in the adoption of sustainable tourism are also poorly understood because the majority of study focuses on developed countries, ignoring the opportunities and problems in developing regions like Eastern Europe, Africa, or Latin America. Furthermore, a deeper understanding of how visitor behavior contributes to the shift to responsible tourism is desperately needed, especially with regard to the psychological and motivational elements that influence travelers' decisions to adopt sustainable travel practice.

We think there is still room for improvement in the evaluation of sustainable tourism policies' effectiveness through the use of standardized indicators and clear evaluations of their impacts on the environment, locals, and the economy. The lack of research on the effects of climate change on tourism and the capacity of sensitive places to adapt to extreme weather events makes it difficult to develop effective resolution strategies.

Even while sustainable tourism is frequently marketed as a means of fostering economic growth, little is known about how it relates to social justice and economic equity. More thorough research is necessary to fully understand the fundamental socioeconomic injustices caused by tourism, income distribution, and vulnerable groups' access to tourism resources. We believe that covering these gaps could considerably improve the efficiency of sustainable tourism strategies, allowing the development of innovative and equitable models. Future research should integrate interdisciplinary approaches and promote international collaborations to gain a broader perspective on tourism sustainability globally.

From a practical perspective, we consider that this study can provide information to public authorities, decision makers in the tourism industry and researchers interested in the implementation of effective sustainability policies. For political decision-makers, the obtained results can contribute to guiding tourism development strategies by highlighting the most effective models of destination management, adopted in countries

with advanced research in this field. For tourism operators, the study provides information on international trends, highlighting key aspects that should be integrated into the development and promotion of tourist destinations. For the academic community, the study is essential because it identifies the most cited papers and journals, facilitating access to the most relevant sources of information and encouraging international collaborations. The study also highlighted disparities in research between different regions, which could motivate research investments and international collaborations to integrate emerging countries into the global debate on tourism sustainability.

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