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ECOTOURISM, SUSTAINABLE TOURISM AND NATURE BASED TOURISM: AN ANALYSIS OF EMERGING FIELDS IN TOURISM SCIENTIFIC LITERATURE

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Abstract: The emergence and rapid growth of tourism paradigms such as ecotourism, sustainable tourism, and nature-based tourism signify a shift towards more environmentally and culturally conscious forms of tourism. We conduct a comparative analysis of these emerging fields with the aim of providing insights to the field and inform future research directions in this dynamic area of study. Our investigation spans diverse geographical regions over an extended period (1986-2022) to provide a comprehensive understanding of the global landscape of alternative tourism. The study utilizes descriptive bibliometrics and scientific mapping techniques using data derived from Scopus to depict changes and contributions over time and identify thematic structures and their evolution. Along with more established regional actors such as the US and European contributors, China and Latin America appear as emergent participants. The analyzed fields seem more prone to interdisciplinary approaches and more impactful than the average Tourism research. Also, international collaboration seems to have played a crucial role in advancing research in these topics. Overall, the study reveals a vibrant field with outstanding features in the context of general Tourism scientific area.

Keywords: Ecotourism, Sustainable Tourism, Nature Based Tourism, Bibliometric Analysis, Science Mapping

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INTRODUCTION

Tourism before the COVID-19 pandemic had sustained growth, according to the Barometer of the World Tourism Organization (UNWTO) in 2019, 1.5 billion international tourist arrivals were registered worldwide, maintaining for the tenth consecutive year growth in the world (UNWTO**,** 2021). Likewise, this organization defines tourism as a social, cultural, and economic phenomenon, which involves people who move to countries or places outside their usual environment for personal, professional, or business reasons (UNWTO, 2023).

Over the years, the tourism industry has undergone constant evolution, being today one of the most important economic activities worldwide and recognized as a factor of progress (Statista, 2020). Nevertheless, Tourism can pose a risk in some scenarios, creating economic vulnerability (Wang et al., 2022; Baloch et al., 2023), and thus, researchers and stakeholders have been compelled to look beyond GDP and develop a well-being lens (Dwyer, 2023). In the 21st century, alternative tourism appears as a response to mass tourism as part of the global trend to promote sustainability in all socioeconomic activities (Esparza et al., 2020).

The pandemic has increased interest in seeking new experiences in nature and outdoors. In this sense, interest is positioned for more authentic experiences that include greater interaction with local communities, their culture, and local production, with a more ecological approach, increasing opportunities for economic, social, and environmental development in rural territories (UNWTO, 2021). Likewise, travelers express greater interest in developing forms of responsible tourism, benefiting care for the environment (Skift, 2019). With this premise, various forms of tourism are developed that prioritize the conservation of tourist destinations, which are characterized by generating experiences based on promoting the sustainable use of the natural and cultural wealth of the communities, while contributing to the conservation of the biodiversity of the territory and the development of local populations (Stronza et al., 2019). This type of tourism has shown rapid growth, increasing the gross domestic product (GDP), generating tax revenue and

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foreign exchange, contributing to local populations, and raising funds for nature conservation (Bhammar et al., 2021). Within this type of tourism, ecotourism, sustainable tourism, and nature-based tourism emerge, related terms that focus on environmental conservation and the promotion of sustainable development in the tourism field, however, each one being similar typologies that has its own characteristics. Ecotourism has become one of the most important and fastest growing segments in the global alternative tourism industry (Stronza et al., 2019). Likewise, the concept of ecotourism emerges and gains popularity as a concept that provides economic development, decreasing the negative impact on biodiversity while fostering local identity and cultural values of local communities (Honey, 2008; Jaya, 2024; Kropinova, 2023). The Québec Declaration on ecotourism defines Sustainable Tourism as an "activity that motivates tourists in order to observe and appreciate nature, as well as traditional cultures, contributing to conservation and seeking optimization of resources" (UNWTO, 2002:3). Likewise, sustainable tourism is that type of tourism that seeks the integral satisfaction of local communities, tourists, the tourism industry and future generations.

Sustainable tourism becomes important because it is focused on the rational management of natural resources, biodiversity, landscape resources, biological diversity and all life support systems on our planet (Bello et al., 2016). Nature-based tourism was born as an alternative to cultural tourism; it has been related to the growing demand for various forms of recreation, relaxation and entertainment in natural environments such as national parks, nature reserves or protected areas (Olafsdottir, 2013). Bird watching, hiking, fishing, and walking on the beach are examples of nature-based tourism. The fields of sustainable tourism, nature-based tourism and ecotourism have seen a growing number of research studies applying bibliometric analysis methods to gain insights into various aspects of sustainability and tourism marketing. Prior reviews have examined the literature trends providing a comprehensive understanding of the field's evolution over time. These reviews have been organized around different dimensions, capturing the diversity of approaches (Yoopetch and Nimsai, 2019). Bibliometric analysis is a systematic quantitative method used to measure scientific progress by analyzing academic literature. It helps researchers identify emerging topic clusters, track the evolution of research in a field, and analyze the geographic dispersion of studies.

This type of analysis is particularly valuable in a dynamic field like sustainable tourism, where understanding the research output and its impact is relevant for further advancements. Bibliometric studies provide key indicators of research output and allow scholars to study the field of sustainable tourism as a knowledge creation system.

By analyzing the universe of literature, bibliometric studies in tourism offer valuable insights into the research landscape and identify areas of consistent interest, understanding the trends and patterns within this field and informing future research directions. The importance and proliferation of sustainable tourism research cannot be denied, yet there have been limited rigorous bibliometric analyses conducted in this area (Ruhanen et al., 2015). Moreover, in most of the cases approaches have been very narrow, which has impeded the possibility of considering the integration of similar but not identical research subjects, as we will try to make clear below.

There has been an evolution in sustainable tourism, ecotourism, and nature-based tourism research, both in the theoretical and methodological approaches, as well as in the themes favored by this sub-field. The research has moved away from definitional and conceptual reviews to a more empirical frame. Some themes have remained constant, while others have emerged or declined over time. Ecotourism and environmental aspects have remained a constant feature of the subfield (Ruhanen et al., 2015) while other new topics have arisen that will predictably remain a focus of interest in the future, such as climate change. Fang et al. (2018) revise precisely that topic and find that it has grown fast and drawn attention from an array of multidisciplinary scholars. Multidisciplinarity is precisely highlighted by Diéguez-Castrillón et al. (2022), which concluded that collaboration had sprawled from social sciences to involve environmental science and other technological areas, although their work was restricted to a narrow subset of the literature that studied sustainability indicators for tourism destinations. This aspect has been approached several times in the literature (Liu, 2020; Zhang et al., 2022; Mihalic et al., 2021), but never covering the whole range of publications in the sub-field.

The rapid growth of sustainable tourism and ecotourism literature is also a common finding in bibliometric studies (Niñerola et al., 2019; Garrigos-Simon et al., 2018). Liu and Li (2020) probably offer the clearest depiction of this phenomenon, although they analyze the literature published until 2016, and focus on the ecotourism perspective.

Traditional main scientific producers include Australia, USA, Canada, China and several European countries, although Hasana et al. (2022) already see the important ascend of South Africa, which was detected even before by Liu and Li (2020). This implies a certain change in terms of major scientific producers in the sub-field, an aspect that we think is worth analyzing. It's also important to note that specialized sector leaders can be found, such as Romanian sustainable mountain tourism (Zeng et al. 2022). Regarding nature-based tourism, to give a more general example, we can observe the increase in scientific production from Latin American countries (Rivero-Guerra, 2021).

Collaboration networks have been studied, which led to the identification of countries acting as main hubs, such as the US and Australia (Singh et al., 2021). Fang et al. (2018) also cite these countries as the most prominent members of the network and include a reference to a sub-network of dense collaboration among European countries, although their work is restricted to climate change and tourism. Bashir et al. (2022) detect a very high level of collaboration in tourism policy, and Dinç et al. (2023) include a third main hub of collaboration (China) in a wider set of literature that reflects research in Ecotourism.

Much of the literature on sustainable tourism, ecotourism, and nature-based tourism examines relevant scientific literature using a fragmented approach. This fragmentation arises from the focus on specific publications, specific research topics or short time periods. Our hypothesis is that the three fundamental concepts within what we might broadly term "alternative tourism" should be studied together. In doing so, the resulting picture of scientific activity will not only be broader but also inherently different, and relevant insights on scientific production and its distinctive features will arise.

MATERIALS AND METHODS

Although nowadays several interesting options exist regarding bibliometric information, Scopus and Web of Science are still currently widely preferred for scientometric/bibliometric studies. We have chosen Scopus as the main source of information because we had the intuition that a significant share of the literature on the topic of ESN tourism would be produced and published in South America, and possibly in Spanish. Scopus is a well suited option when these aspects are a source of concern, as it has a better coverage of both social sciences, non-English literature and countries of the Global South, although we are aware that its coverage is still far from ideal (Tennant, 2020). To define the corpus of literature that would best represent the research on eco/sustainable/nature-based tourism (ESN tourism for short), we conducted several queries on the Scopus database. As there is not a single list of journals, terms or other filtering options that might enable us to delimit the scope of our analysis, we devised a feedback mechanism by which successive queries were submitted and then revised and enriched with new terms from the literature. The original query included only the term Ecotourism, but several others emerged during the relevance feedback cycle, which eventually resulted in the following query:

(TITLE-ABS-KEY("sustainable tourism") OR TITLE-ABS-KEY("eco-tourism*") OR TITLE-ABS-KEY(ecotourism) OR TITLE-ABS-KEY("nature-based tourism")) AND (EXCLUDE(PUBYEAR,2024) OR EXCLUDE (PUBYEAR,2023))

This election does leave aside terms that are clearly related to the topic, such as “Geotourism”, “Agrotourism” or “Community-based Tourism”, but they were not deemed as directly conveying the core meaning of the subject. They do portray relevant aspects that are to be found along the main literature that we were trying to delimit, and thus will emerge naturally in thematic analysis, as will be seen below. In short, we followed the advice to employ highly precise terms, even if it may result in the loss of some related works in the search results, to ensure a comprehensive description of what truly matters, the intellectual framework of the field and its evolution (Vargas-Quesada et al., 2017).

Scientific cartography was conceptualized through the lens of the overlay maps technique (Rafols et al., 2010). Initially, a foundational map is selected to encompass the entire literature to be analyzed. Subsequently, partial versions are generated and superimposed to examine salient aspects. VOSViewer has been utilized to generate the science maps, and full maps are available in the Zenodo repository, although for the sake of brevity, only snapshots are included in this manuscript. The terms that co-occur 10 or more times within the corpus are selectively identified, encompassing both authors' keywords and database keywords. This judicious selection serves to reduce the number of nodes from 39,158 to 1,963. After this initial selection, the first 1000 terms were normalized according with the following criteria: plurals and singulars where unified and the most commonly used form was chosen; forms with hyphens where also normalized using the same procedure; acronyms were spelled out in full but unnecessary explanations (e.g., Poland [Central Europe]) where removed, replacing the original label with a simplified one. The network was then reconstructed using co-occurrences of 10 or more keywords and clusters with at least 10 elements.

RESULTS AND DISCUSSION

Although there are several published bibliometric analysis on the matter, we have tried to produce a piece of work that simultaneously is wide in spectrum (encompassing the main thematic themes on ESN) and provides multiple perspectives on the literature with the aim of providing details to support our main hypothesis that ESN Tourism is a distinctive field of study with particular characteristics that set it apart from the rest of the Tourism literature. To achieve this, we have analyzed general features of the selected literature and put them in context. We have reviewed the evolution, formal characteristics, and thematic approaches, as well as a geographic, institutional and editorial perspective. We have detailed analysis on the three classical bibliometric approaches to literature analysis, which include production, collaboration, and impact in several of the mentioned dimensions.

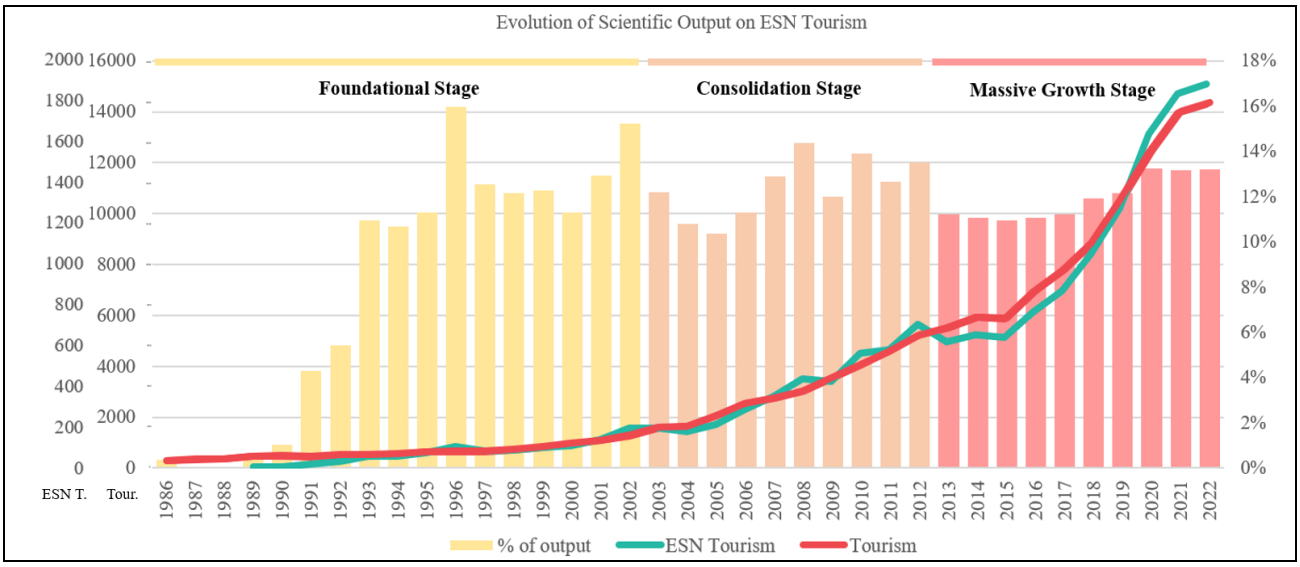

Figure 1. Evolution of Scientific output (as number of published documents) on Tourism and ESN Tourism, and relative importance of ESN Tourism scientific production (Source: Scopus)

Evolution of scientific production

ESN tourism has evolved pairwise to Tourism for a long time. Since the first papers on the subject during the 1980's a steady flow of literature on the topic has followed. If we look at the evolution of Tourism and ESN tourism (Figure 1) we can find three stages that would describe a foundational period, a consolidation one and a more mature phase that arrives to 2022.

Bars show the percentage of ESN tourism papers in comparison with Tourism as a full. The first years are clearly more unstable in terms of the share of papers that take an interest in the subject, but the other two stages seem to stabilize rates at roughly a 12% of the whole. The last two phases seem to fit nicely to an exponential growth pattern, with a R2 coefficient of 0.97 (2003 to 2012) and 0.96 (2013 to 2022). The first phase (1986-2002) does also show an exponential growth, although less decisively, with somewhat poorer fit (R^2 = 0.85). The three phases and the complete period as a whole (R^2 = 0.97) fit nicely into an exponential curve, or even better into a sigmoid curve with saturation phases, which is the expected behavior (Solla-Price, 1969). We have used the most evident saturation points to help defining the three phases.

Formal characteristics

There are visible differences regarding the formal aspects of both Tourism and ESN Tourism literature, although they are not very big. Overall, ESN Tourism seems more in line with mainstream trends in scientific publication, when one looks into formal features such as document types, open access print, the countries where they were edited or the language in which they were published (Figure 2).

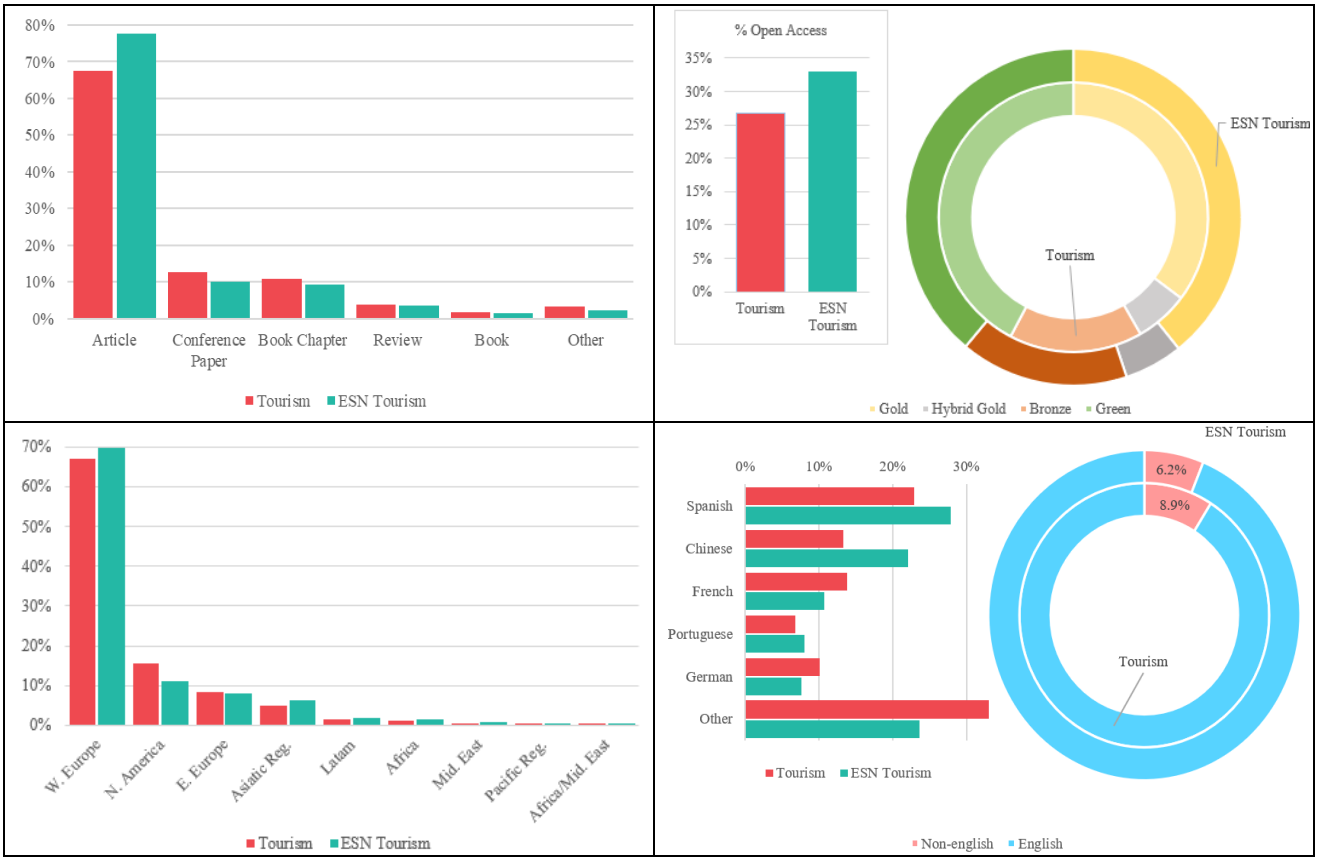

Figure 2. Formal aspects of scientific output: document types, open access, geographic origin of journals, and scientific output language based on the number of published documents (Source: Scopus, 1986-2022)

Literature on ESN tourism is slightly more prone to be published in articles than the Tourism literature (78% vs 67%), and also significantly more prone to be distributed on Open Access terms (33% vs 27%), with a modest difference in its preference for Gold OA over Green. As we have previously referred, we were expecting a greater amount of literature published in non english journals, with a greater emphasis on the participation of "global south" academics in publishing on ESN subjects. Journals that publish ESN Tourism literature are more likely to be geographically distributed over Latin America than Tourism literature (1.8% vs 1.6%), and the same goes to the Asiatic Region (6.3% vs 4.8%), the Middle East (0.8% vs 0.6%) or Africa (1.5% vs 1.2%), although the amount of literature published in those regions is very modest in relation to what is published in Europe and North America. Lastly ESN Tourism literature tends to be slightly more prone to be published in English than Tourism literature, although the difference is not great. Spanish and Chinese are the clear second language options for ESN papers, while French is somewhat more relevant in the case of Tourism than it is for the other case.

Subject areas, interdisciplinarity and publication venues

Scopus assigns papers the subject area or subject category of the journal, conference paper (or whatever publication venue) in which they are published. We can aggregate this information to describe thematic bearings of the literature, but is

also useful to associate it with other dimensions, such as impact or multidisciplinarity. It's important to bear in mind that the same journal can be assigned to more than one subject area, which implies that percentages refer to the number of documents which have been assigned to each area in relation to the total number of papers. In other words, percentages represent the spread of subject areas over the literature in the two scenarios that we are analyzing.

There are significant differences between the literature published in ESN Tourism and the Tourism literature in general when referring to the scientific areas in which they are classified. Although both contexts delve deeply into the Social Sciences (50% vs 47%) and Business, Management & Accounting (38% vs 41%), other main areas are quite different. ESN tourism is highly connected to Enviromental Science (41%) which is the second greatest subject area, while it's much more moderately present in Tourism literature (23%). The same goes for Agricultural and Biological Scieces (16% vs 7%) or Energy (9% vs 4%). The distribution of literature along scientific areas does also provide clues on other dimensions. A common way of measuring interdisciplinarity is accounting for the subject areas or subject categories assigned to the published literature. As mentioned before, specific papers get classified according to the sources/publication venues in which they have been published, and thus, examining the number of categories in which these journals, conference proceedings and specific papers have been assigned allows us to obtain a rough but telling estimate of the interdisciplinarity of both Tourism and ESN Tourism. In general, we can see that ESN Tourism literatu re gets classified simultaneously in more scientific areas than Tourism literature as a whole.

Table 1. Top subject areas where the literature on tourism and ESN tourism is classified (Source: Scopus, 1986-2022)

SUBJECT AREA	ESN T.	% Tour.	% ESN T.	Cites/doc 3y	FWCI (2022)
Social Sciences	8060	47%	50%	2.43	1.41
Environmental Science	6637	23%	41%	4.77	1.15
Business, Management and Accounting	6160	41%	38%	4.7	1.5
Agricultural and Biological Sciences	2588	7%	16%	3.49	1.17
Earth and Planetary Sciences	2096	12%	13%	2.88	0.89
Economics, Econometrics and Finance	1581	11%	10%	3.13	1.3
Energy	1411	4%	9%	5.65	1.13
Engineering	1304	10%	8%	4	0.95
Computer Science	947	10%	6%	3.68	0.91
Arts and Humanities	531	7%	3%	1.24	1.52

Adding the percentages of Table 1 would yield a significant difference between the two, although the information provided by the table is only representative of 90% of the papers (Tourism) and 90% of the papers (ESN Tourism). Adding the total number of area assignments and dividing it by the number of published documents yields a 1.89 assignments per paper for Tourism literature and a 2.02 for ESN literature, which is not great, but is significant, nevertheless.

ESN tourism literature gets more cited on average than tourism literature as a whole (19.4 cites per doc vs 16.7 cites per doc) in our literature set. This might be connected to the citation rates of the main areas in which works get published. As shown on Table 1, literature on Environmental Science and Energy gets significantly more cited (on average) than other areas, and ESN tourism is more tightly concentrated around it than the general Tourism literature is. The same goes for Agricultural and Biological Sciences, although the effect would necessarily be more modest.

Table 2. Best quartiles of journals that publish literature on ESNT and Tourism
(Data published by Scimago Journal & Country Rank, 2022 version)

SJR Best Quartile	Tourism	ESNT	Tourism	ESN Tourism
Q1	49482	6926	51.2%	54.6%
Q2	17391	1866	18.0%	14.7%
Q3	15487	1962	16.0%	15.5%
Q4	10559	1325	10.9%	10.4%
-	3781	614	3.9%	4.8%

Table 2 shows another angle of analysis, as journals in which the literature gets published do not only get classified in different areas with different citation averages, but also get ranked in different positions according to relevant impact metrics, in this case, SJR. This analysis does only cover the literature that gets published in journals (roughly 70% and 80% respectively), though. Given the fact that quartiles do not depend on the categories we could add another factor to explain why the literature on ESN Tourism gets cited more often than general Tourism literature. We can see a slight advantage in terms of Q1 publishing for ESN Tourism literature. That is, its published in journals that overall get more citations within their subject, having more relative scientific relevance as measured by their relative SJR score. Nevertheless, both tables 1 and 2 are based on the latest information available and do not strictly reflect the state of fields and journals over the whole period. This data is used to elaborate on the idea that the higher impact of ESN tourism is a multi-cause phenomenon, but a finer-grained and thorough analysis should be made to obtain conclusive evidence in this regard.

Top producing publication venues for ESN Tourism show a mix of low impact per document and high (or very high) cites per document journals. Table 3 shows only venues that have published 100 or more papers on the topic, and includes a mixture of conferences and regular journals, in which the later clearly tend to produce more impact per document.

Table 3. top journals in the ESN T sub-field according to their output in the subject.
Only journals with more than 100 documents are included (Source: Scopus, 1986-2022)

Main publishing sources	Citations	Output	Cites/Doc
Journal of Sustainable Tourism	58439	1045	55.92
Sustainability (Switzerland)	12833	834	15.39
IOP C:S.: Earth and Environmental Science	595	411	1.45
Journal of Ecotourism	7718	341	22.63
Tourism Management	26416	285	92.69
Current Issues in Tourism	7143	189	37.79
WIT Transactions on Ecology and the Environment	369	182	2.03
Annals of Tourism Research	13784	160	86.15
Geojournal of Tourism and Geosites	822	143	5.75
African Journal of Hospitality, Tourism and Leisure	476	132	3.61
Tourism Recreation Research	1914	126	15.19
Tourism Geographies	5901	114	51.76
Worldwide Hospitality and Tourism Themes	664	113	5.88
Asia Pacific Journal of Tourism Research	2478	111	22.32
E3S Web of Conferences	195	106	1.84
Journal of Environmental Management and Tourism	283	101	2.80

Table 4. highest raw-impact journals with significant ESN Tourism publishing
Only venues with more than 2000 cites are included (Source: Scopus, 1986-2022)

Main sources of impact	Citations	Output	Cites/Doc
Journal of Sustainable Tourism	58439	1045	55.92
Tourism Management	26416	285	92.69
Annals of Tourism Research	13784	160	86.15
Sustainability (Switzerland)	12833	834	15.39
Journal of Ecotourism	7718	341	22.63
Current Issues in Tourism	7143	189	37.79
Journal of Travel Research	5999	87	68.95
Tourism Geographies	5901	114	51.76
Biological Conservation *	5310	80	66.38
Journal of Cleaner Production *	3732	71	52.56
Tourism Management Perspectives	3601	91	39.57
Ecological Economics *	3505	47	74.57
Journal of Environmental Management *	3309	68	48.66
Environmental Conservation *	2881	44	65.48
Conservation Biology *	2619	38	68.92
Ocean and Coastal Management *	2525	95	26.58
Asia Pacific Journal of Tourism Research	2478	111	22.32
Environmental Management *	2447	56	43.70
Biodiversity and Conservation *	2258	46	49.09

Table 4 offers a different view of the issue in which the journals that are generating a greater raw impact are shown. In this case, each of the top impact generating venues are journals, although some have not produced a great amount of literature and could be (in that regard) considered to be out of the core of the subject. They boast very high citations per document, which implies a well-developed efficiency in disseminating knowledge on ESN tourism. Thus, they are not core journals, but they are extremely influential from a scientific perspective. There is also an important feature of the list of the journals in Table 4, as it includes 9 journals (out of 19) that are classified outside the Social Science or Business, Management and Accounting areas that can be considered the core of the literature and are associated with Environmental Science and to a lesser extent, Energy and Agricultural and Biological Sciences. In this sense, journals from other disciplines are providing a sizeable share of the impact of the whole domain.

Key players and scientific collaboration

The top 25 countries contribute to roughly the 78% of the whole literature on ESN tourism, which is a very similar ratio to the production of the top 25 countries for Tourism (77% for the same period). There is though, a relevant difference when examining the list of top producers, as positions in the rank vary significantly, and four of the top producers in Tourism (Russian Federation, Hong Kong, South Korea and Greece) are out of the top 25 for ESN Tourism, as shown in Table 5.

As stated before, traditional main scientific producers in the various research areas around ESN Tourism included the US, UK, China, Canada or Australia. Over the last years some new regional actors have appeared, and some regions have grown substantially, which induces us to think that they will be playing an important role in the future. In the Asiatic region, both Malaysia and specially Indonesia have produced a very significant output. Both countries are also relevant producers of tourism literature in the world scenario (8^{th} and 12^{th} main producers), but share a more acute interest in ESN literature, as suggested by the fact that they rank significantly higher when considering this type of production (5^{th} and 9^{th}).

African countries have also made relevant progress in terms of ESN literature, but only South Africa (a well-studied case) has made it to the top positions, both in terms of the general subject (16th) and specially in terms of both Ecotourism and Sustainable Tourism, and to a lesser extent, nature-based tourism. As this has already been described in the literature and also marks starkly the local development of this specialized production, we have moved our attention to the case of the Latin American region. Both México and Brazil have developed relevant outputs in the last years, but in the whole region a specific interest in this kind of studies seems to have emerged, although it's still incipient. Of the ten regional producers that generate a significant output in both Tourism and ESN Tourism (100/10 papers), only Argentina and Jamaica rank lower in ESN Tourism than they do on Tourism as a whole. African countries also seem prone to ESN Tourism, but with countries outranking their global positions in Tourism being proportionally lower (8/14 for the countries with comparable outputs).

Table 5. Top producers of ESN Tourism literature (Source: Scopus, 1986-2022)

Country	Region	Tourism	ESN Tourism	Diff (rank)	
United States	Northern America	18399	2288	0	
China	Asiatic Region	14169	1483	0	
Australia	Pacific Region	9712	1467	1	
United Kingdom	Western Europe	12913	1378	-1	
Indonesia	Asiatic Region	4223	914	3	
Spain	Western Europe	8367	832	-1	
Canada	Northern America	4435	689	0	
South Africa	Africa	3097	672	8	
Malaysia	Asiatic Region	3398	647	3	
Italy	Western Europe	5206	630	-4	
India	Asiatic Region	3669	487	-2	
New Zealand	Pacific Region	3166	406	1	
Portugal	Western Europe	3514	358	-3	
Germany	Western Europe	3480	354	-3	
Brazil	Latin America	1954	323	10	
Taiwan	Asiatic Region	2789	317	1	
Turkey	Middle East	3152	298	-3	
Sweden	Western Europe	1694	283	9	
Poland	Eastern Europe	2504	263	0	
France	Western Europe	3118	262	-5	
Netherlands	Western Europe	2173	262	2	
Mexico	Latin America	1285	262	14	
Norway	Western Europe	1433	260	7	
Japan	Asiatic Region	2336	257	-4	
Thailand	Asiatic Region	1828	253	1	

Main hubs of scientific collaboration have also been studied, although a comprehensive picture of the global framework has not been created yet (to the best of our knowledge). In order to do so we have used Social Network Analysis techniques and software such as VOSViewer (Van Eck and Waltman, 2010) and Gephi (Bastian et al., 2009). Visualization software and techniques are extremely useful to create representations that can help us identify main actors, collaborations and sub-structures in the literature. Scientific collaboration seems to be increasingly beneficial when the participants part away from local or national cooperation and delve into international collaboration (Guerrero-Bote et al., 2013). This is why we have focused our analysis on the international collaboration and have not dealt with interinstitutional or interpersonal collaboration, which would also require a much more fine-grained approach, on the other hand. Also, we think that it would be interesting to bear in mind that international collaboration appears to bring even more benefits to developing countries (Onyancha and Maluleka**,** 2011), and that developing countries are precisely very well represented in Table 5. To consider but a list of what could be considered "developing countries", we could use Australia's Foreign Affairs Minister list (2023). According to this inventory, 10 of the 25 biggest scientific producers on ESN Tourism literature can be classified as developing countries.

In this sense, studying patterns of collaboration and regional structures might provide an interesting insight into the inner mechanisms of the sub-field. In order to try to unveil this we have produced a network based on co-authorship of authors affiliated with institutions based in a number of countries (109) that had produced a minimum of 10 papers on the subject over the years using VOSViewer. We have then organized it using a ForceAtlas 2 layout algorithm, which as a Force-directed layout "produces visual densities that denote structural densities" (Jacomy et al., 2014).

The nodes repulse each other, and the edges attract the connected nodes proportionally to their weight, so that heavily collaborating countries are displayed together, and unconnected countries are set apart. In this representation, betweenness centrality (Freeman, 1979) is associated with both the size and tone of the nodes, so actors that play a pivotal role as hubs in the global structure can be clearly identified (Abbasi et al., 2011).

As we can see in Figure 3, there are two very distinctive hubs in terms of scientific collaboration, United States and the United Kingdom. These are on the other hand well known and have been reported in the literature, along with several European countries. Our representation shows they are much more prominent than stated before (Fang et al., 2018) and new regional leaders have ascended to the position of world collaboration hubs when looking at the whole picture.

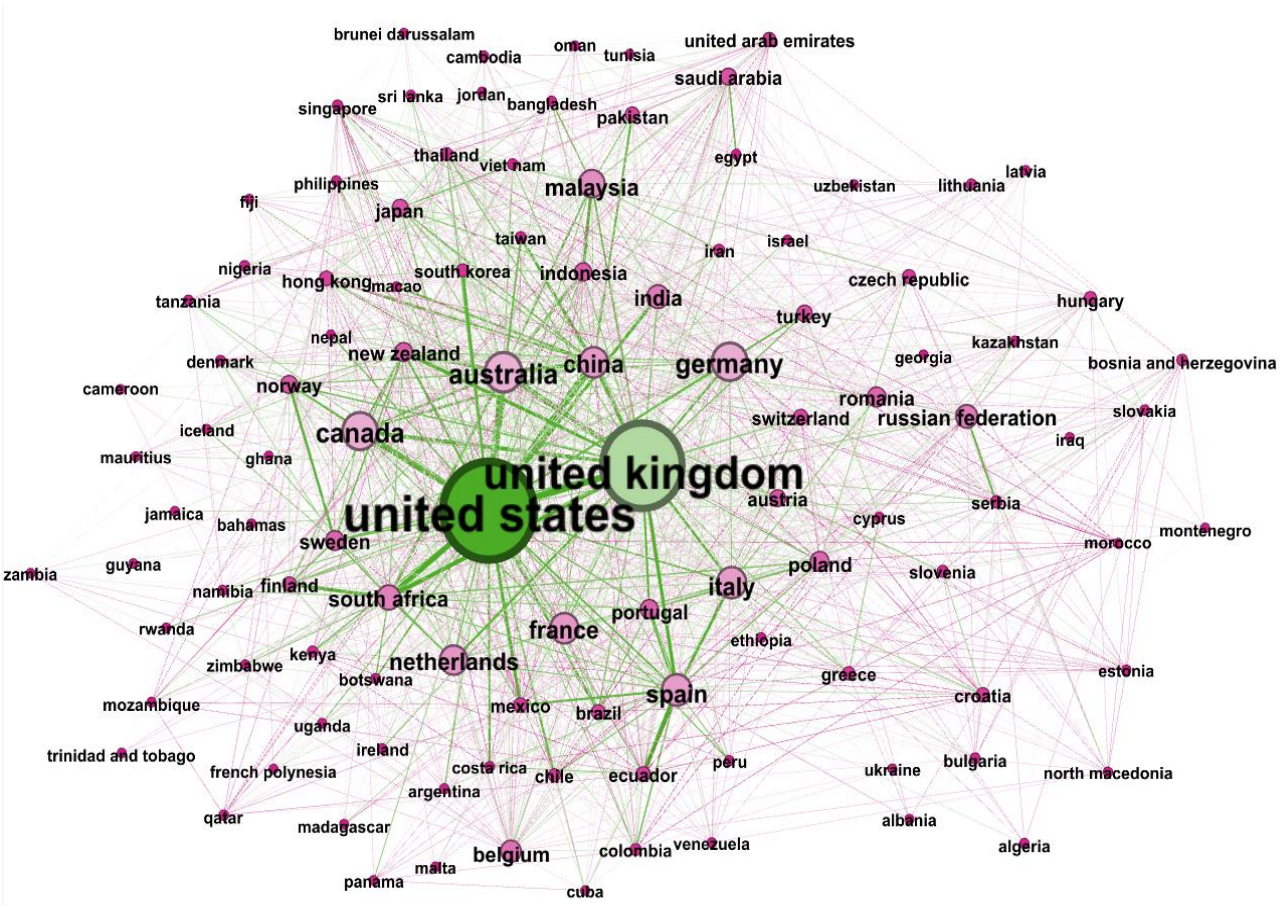

Figure 3. International collaboration network in ESN Tourism literature (Created with Gephi using Scopus data: 1986-2022)

Countries with very prominent BC scores (green, but also light pink) include South Africa (104), Malaysia (125), China (145) and Spain (153), seem to be brokering local substructures, respectively connecting African, Asian and Latin American research to the world network in a great deal. Netherlands, France, Italy, Germany and Australia are also integrated into other sub-networks (and have very prominent BC) but seem to have a less clear role in connecting them to the rest of the countries that produce science on ESN Tourism. Many of the countries in the center of Figure 3 form part of the core radial structure that is typical of scientific collaboration (Gazni et al., 2012; Guerrero-Bote et al., 2013) and represent a great deal of the total interaction between countries, but a relevant part of the outer radial structure is connected via local hubs in both Africa, Asia and Latin America.

Science maps

Scientific cartography or "scientography" has been used for years as a tool to discover and display structural features regarding the thematic distribution of scientific literature, or more simply put, its intellectual structure. This type of procedure has been used very widely because of its inherent value, as it "facilitates the analysis of domains by showing the structure and relations of the inherent elements represented" (Moya-Anegón et al., 2007).

The maps that we have created intend to reflect the intellectual structure of the literature on Ecotourism, Sustainable Tourism and Nature Based Tourism based on co-word analysis. In order to do so, we adopt the overlay map technique (Rafols et al., 2010) that has been very successful in mapping scientific outputs.

The base map (Figure 4) represents the literature for the whole period (1986/2022) as a co-word network. Co-word analysis is a well-known technique (Callon et al., 1983) and has been widely used in scientometric studies (Callon et al., 1991; Cobo et al., 2011; Peters and van Raan, 1993; Tseng et al., 2007) for studying the thematic distribution, structure, and evolution of scientific fields. Words cooccurring in 10 or more documents were selected for both the layout of the networks and the detection of clusters of keywords in the literature. Fractional counting was used to build up the networks, as opposed to whole counting approach, as it was reported to provide better results in the literature (Perianes-Rodriguez et al., 2016; Vargas-Quesada et al., 2017). Only the top 1000 terms were selected in order to produce a more manageable network, although we think that the level of detail is quite high. The six clusters are identified by using the modularity-based clustering algorithm implemented in VOSViewer (Waltman et al., 2010). Standard settings were applied, although small clusters were dissuaded by setting the minimum size to 50. A total of 6 clusters resulted from the clustering procedure, ranging from 285 members (cluster 1, red) to 69 members (cluster 6, light blue), which discards smaller and more cohesive clusters but results in more balanced clusters in terms of their relative importance. Figure 4 shows the base map that was used as the background layer for the rest of the maps, that are subsequently overlayed on top to appreciate the differences and contributions of the different chronological or geographic slices of the literature.

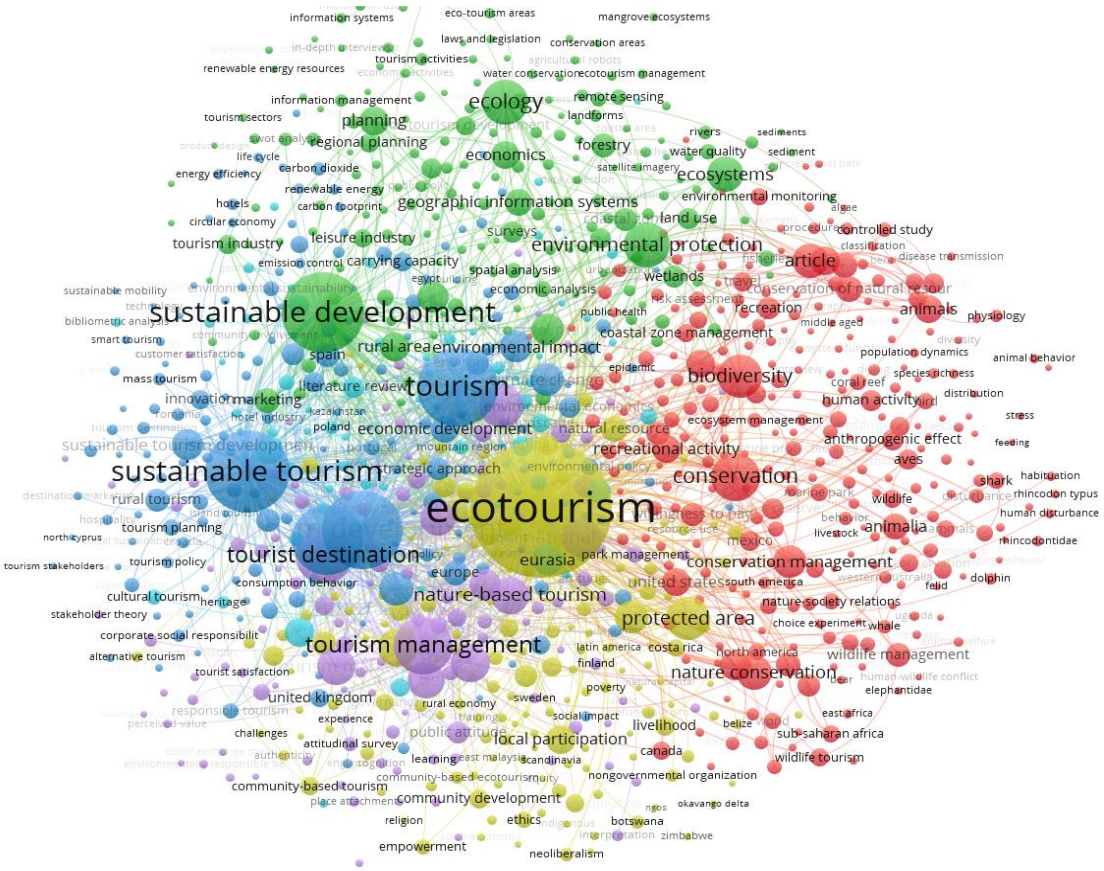

Figure 4. Base outline of the co-word analysis network. Full network available online at Zenodo: https://zenodo.org/doi/10.5281/zenodo.11401067 (Created with VOSviewer using Scopus data 1986-2022)

The resulting six clusters depict a landscape in which the original concepts of the query combine and unfold to offer a complex and highly interrelated intellectual structure. By utilizing the information from Table 6 regarding the foundational co-occurrence structure of words, we can delineate the different clusters based on their core semantic fields.

Table 6. Intellectual structure of ESN Tourism research, worldwide, whole period (Source: Scopus, 1986-2022)

Cluster 1 Red (285)	**Cluster 2 Green (183)**	**Cluster 3 Blue (179)**	**Cluster 4 Yellow (159)**	**Cluster 5 Purple (125)**	**Cluster 6 Light blue (69)**
Label (freq.)	**Label (freq.)**	**Label (freq.)**	**Label (freq.)**	**Label (freq.)**	**Label (freq.)**
conservation (911)	sustainable development (2573)	sustainable tourism (2710)	ecotourism (7554)	tourism management (1306)	eurasia (394)
biodiversity (751)	ecology (830)	tourism (2461)	protected area (764)	tourist destination (1260)	heritage tourism (337)
article (486)	environmental protection (801)	tourism development (2444)	stakeholder (581)	china (737)	cultural heritage (318)
nature conservation (477)	ecosystems (498)	Sustainability (1972)	protected areas (435)	national park (624)	asia (232)
conservation management (421)	environmental management (414)	tourism economics (449)	local participation (344)	perception (596)	literature review (181)
australia (371)	decision making (373)	climate change (426)	natural resource (266)	nature-based tourism (576)	education (174)
human (346)	rural area (341)	environmental impact (416)	indonesia (224)	tourism market (554)	geotourism (167)
animals (318)	planning (332)	sust.tourism development (374)	development (214)	tourist behavior (529)	landscape (144)
ecosystem service (316)	economics (325)	economic develop. (286)	malaysia (201)	tourist attraction (491)	world heritage site (138)
recreational activity (312)	geographic information systems (304)	europe (264)	local community (200)	questionnaire survey (372)	far east (109)
united states (309)	marketing (261)	Spain (244)	governance approach (192)	public attitude (192)	comparative study (107)
animalia (279)	forestry (243)	Environment (225)	developing countries (177)	environmental education (180)	heritage conservation (101)
conservation nat. resources (271)	coastal zone (212)	covid-19 (209)	rural development (169)	spatiotemporal analysis (154)	assessment method (98)

The first cluster (red) brings together keywords related to nature conservation and natural resources in their various facets, encompassing concerns for biodiversity, management activities, and, to a much lesser extent, the provision of these resources for recreational activities. This is the biggest cluster in terms of the number of keywords (285) but is also the most prominent in terms of the aggregated frequency of those keywords (21,244 occurrences in the corpus). The second cluster (green) is smaller (183 keywords) but also substantially less conspicuous than the first, as its keywords are mentioned a bit over 15,000 times. It has a very prominent keyword, "sustainable development", followed by keywords that could be grouped around ecology and ecosystems, and their management.

The third cluster (blue) is actually almost as relevant as the first one in terms of occurrences (21,219), which are concentrated around a small set of keywords related to sustainable tourism, sustainability and development. In general, tourism, the economic aspects and environmental concerns dominate this cluster. The fourth cluster (yellow) has a similar density of concepts than the third one, although in this case, the core of the semantic space is clearly defined by the keyword "ecotourism", which accounts for 40% of the total occurrences. Several significantly less important themes are connected to this central idea and can be grouped around concepts such as protected areas, local development, and stakeholders. The fifth cluster (purple) has much more homogeneous keywords, although tourism management and destinations seem to point to a direction in which common research topics are pinpointed (tourist perceptions, attraction, behavior). A sub-topic regarding nature-based tourism, natural parks and environmental culture can also be detected.

This brings up the possibility of suggesting a hypothesis (that unfortunately we cannot test) by linking methodological and research-intensive literature to the nature-based tourism topic. Lastly, the sixth cluster (light blue) is substantially smaller than the rest, and more homogeneous in the occurrences of the diverse keywords. It's clearly netted around the ideas of cultural heritage and tourism expressed in several different but similar keywords.

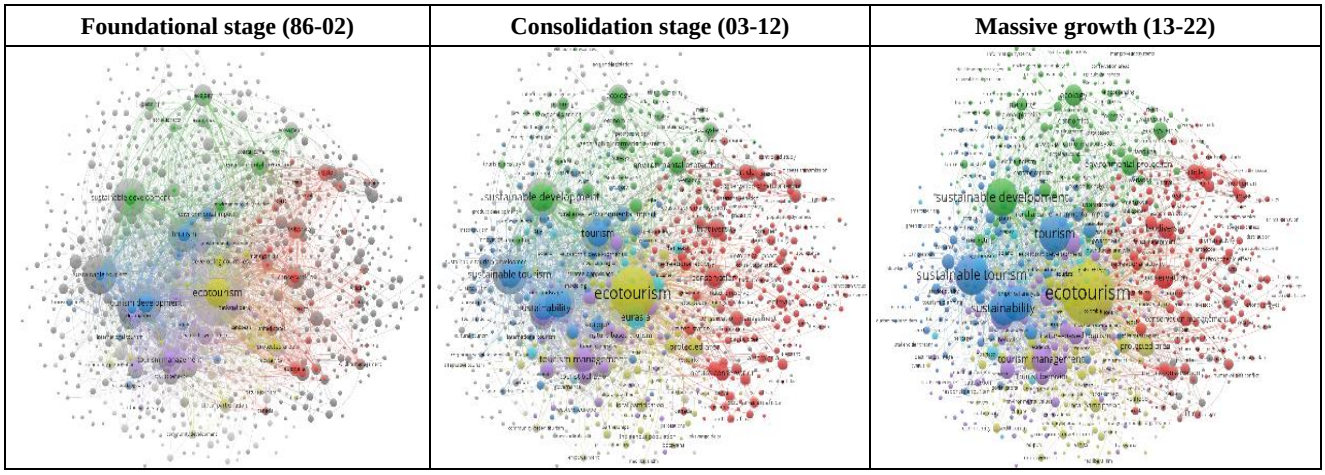

Figure 5. Overlay maps depicting the evolution of areas of interest over time. Overlays available online at Zenodo: https://zenodo.org/doi/10.5281/zenodo.11401198 (Created with VOSviewer using Scopus data 1986-2022)

The first and most evident difference between the overlays in figure 5 is their size, as they represent periods with important production differences. Apart from this, more nuanced differences emerge, as will be shown below.

In the first stage, the foundational stage that runs from 1986 to 2002, only 90 of the 1000 keywords occurred enough (10 or more times) to be displayed in the corresponding scientogram. That's not surprising, as the literature on ESN Tourism has had an accelerated growth. Of the 6 clusters identified in the base map, one of them, the sixth, did not even exist during the first years. The rest of the clusters contained between 8% and 12% of their keywords during the first analyzed period and represented from 2.2% to 4.8% of the total occurrences. This can be clearly appreciated graphically in figure 5a, as many of the background nodes are basically empty.

The second period, which we have characterized as a consolidation phase, spans from 2003 to 2012. It's much shorter than the first one, and obviously more similar to the base map. There are some singularities to highlight, though, as clusters behave differently during the period. The first cluster (red), which contained keywords on nature conservation, natural resources and management (see above for a more refined description) was already mature during the period, and contained around 72% of the keywords present in the base map.

For comparison, the rest of the clusters span from 42% to 50% of the total keywords. Also, it represents 33% of the occurrences, while rest of the clusters do only account for a range between 20% and 24%. Cluster 6 is of course an exception, as it was created during the second period. These details can be found in Table 7.

During the last period, cluster 1 does not incorporate many more keywords (some 7% difference with the consolidation stage) while the rest of the clusters show differences from 32% to 50%. They evolve very significantly both in terms of the number of different keywords and the total number of occurrences of those keywords. Cluster 5 (pruple, on tourism management, and nature-based tourism) seems the one that has evolved more significantly during the last period. The % of keywords that can be found during this the previous period rises from 50% to 97%, and the occurrences compared to the base map rise from 21.6% to a 72%. Also, VOSviewer provides an average of the years of the occurrence of the terms, and cluster 5 shows a significant difference with regards to the rest of the clusters.

Table 7. basic statistics for the temporal layouts. Number of keywords (KW), Occurrences (Occ.), Average Occurrences (Av. Oc.), % Key words (%KW) and % Occurrences (%Occ.) (Source: Scopus, 1986-2022)

	Cluster 1 – avg. year 2013.6				**Cluster 2 – avg. year 2015.6**				**Cluster 3 – avg. year 2015.9**			
	Base	86-02	03-12	13-22	Base	86-02	03-12	13-22	Base	86-02	03-12	13-22
KW	285	32	205	226	183	14	77	169	179	14	84	169
Occ.	21,144	671	7,142	11,674	15,724	516	3,149	11,059	21,219	703	4,503	15,259
Av. Oc.	74.2	21	35	52	85.9	37	41	65	118.5	50	54	90
Var. C.	1.3	0.7	1.1	1.3	2.5	0.9	1.9	2.4	3.0	1.1	2.1	2.9
% KW		11%	72%	79%		8%	42%	92%		8%	47%	94%
% Occ.		3.2%	33.8%	55.2%		3.3%	20.0%	70.3%		3.3%	21.2%	71.9%
	Cluster 4 – avg. year 2014.5				**Cluster 5 – avg. year 2016.1**				**Cluster 6 – avg. year2015.6**			
	Base	86-02	03-12	13-22	Base	86-02	03-12	13-22	Base	86-02	03-12	13-22
KW	159	19	90	141	125	11	62	121	69		32	61
Occ.	18,605	899	4,567	12,243	13,354	288	2,878	9,682	4,605		1,398	2,842
Av. Oc.	117.0	47	51	87	106.8	26	46	80	66.7		44	47
Var. C.	5.1	2.2	4.2	4.8	1.9	1.3	1.5	1.7	1.1		1.6	1.0
% KW		12%	57%	89%		9%	50%	97%		0%	46%	88%
% Occ.		4.8%	24.5%	65.8%		2.2%	21.6%	72.5%		0.0%	30.4%	61.7%
				41%				51%				31%

Another perspective of the base map can be scanned if we study the distribution of co-word clusters over relevant world regions (Figure 6). This has been attempted for a limited number of regions and countries that we believe are most interesting for understanding the inner characteristics of the sub-field, but we acknowledge that this could also have been applied to other environments. Europe and United States are clearly the two most prominent scenarios that we would be looking at, but there are also others that we thought worth analyzing.

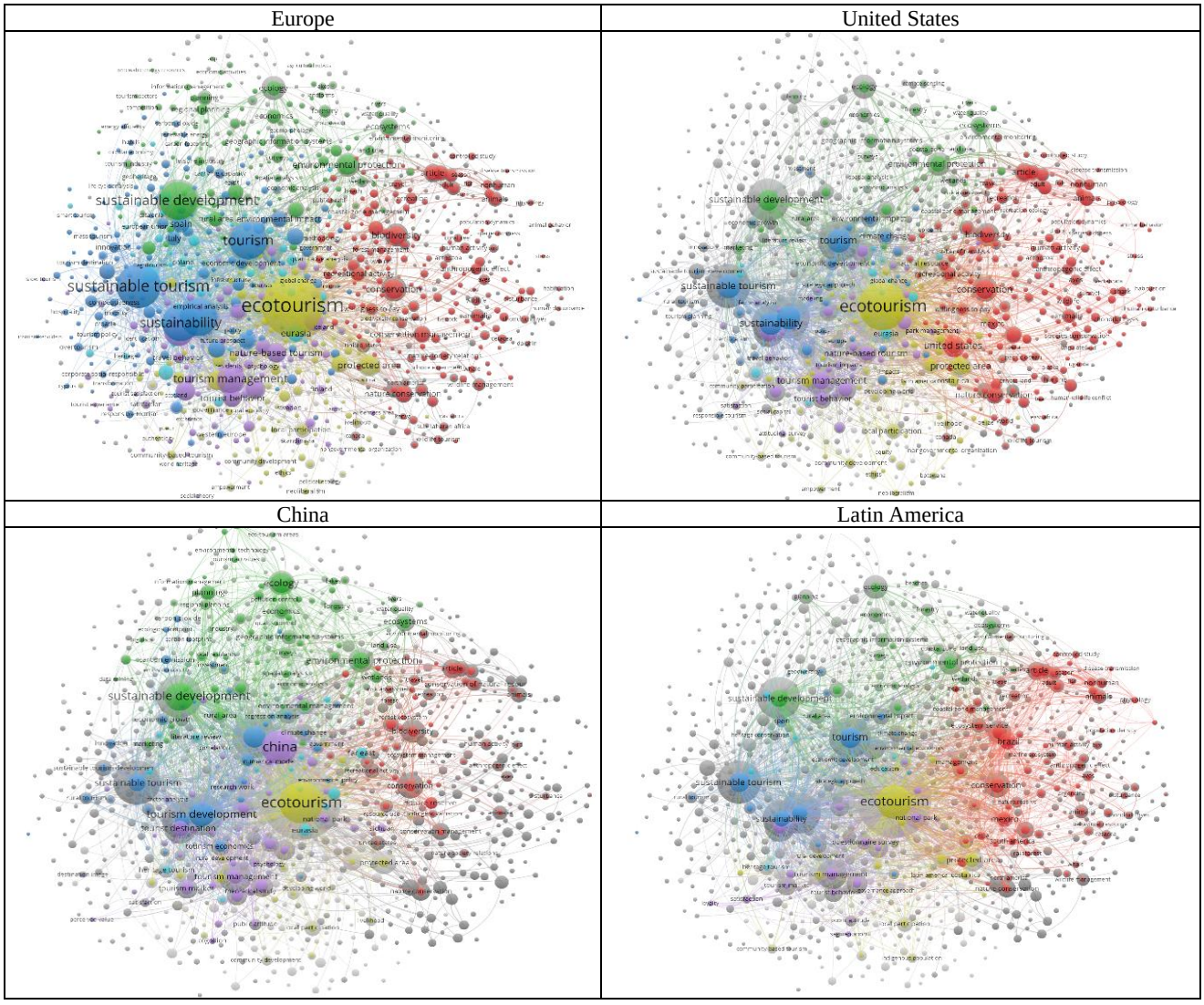

Figure 6. Overlay maps comparing the focus of output from Europe (28), United States, China and Latin America. Overlays available online at Zenodo: https://doi.org/10.5281/zenodo.11401126 (Created with VOSviewer using Scopus data 1986-2022)

China is a prominent local hub as well as a very relevant global actor that has not received as much attention as it would seem to deserve, and we have already described what we think is a promising actor for the ESN Tourism literature, the Latin American region. These four geographical entities have been analyzed separately in order to show their differences. A specific scientogram has been created for each of them and it has been overlayed on top of the base map in Figure 6.

The distribution of clusters, and thus thematic emphasis on research over the four regions is quite different. The European region is by far the biggest producer of ESN Tourism literature, and is quite prominent in the first cluster (red), being very much the world leader around the nature conservation/natural resources group of topics. Surprisingly, its contribution to the third cluster (blue - sustainable tourism, economic aspects and environmental concerns) it's even bigger, being 5, 6 and 12 times bigger (in terms of word occurrences) than the US, China or Latam region.

It' also very prominently the most clearly represented region in the sixth cluster (light blue –cultural heritage), although the reader is advised to use the full size image that can be found online to appreciate this particular aspect of the scientogram. The US in turn has a global sum of word occurrences of over 4,500 in the second cluster (sustainable development, ecology and ecosystems), significantly lower than the European space, but representing a greater proportion of the topics that characterize American research.

The Latam space, which is well connected to the US, is also most prevalent in this cluster, having disproportional presence in the area when compared to other very significant regions, such as China, which has almost double the global occurrences in the network, but roughly a 40% less number of occurrences in this cluster. China in exchange seems to have developed a specialization in the fifth cluster (purple - tourism management, destinations, nature-based tourism).

CONCLUSIONS

Although many approaches can be taken to study a developing field of study, bibliometrics offers some key advantages that can contribute significantly to understanding the dynamics and features of emerging scientific research fields. Ecotourism, Sustainable Tourism, and Nature-Based Tourism (ESN) has undergone significant evolution over the years, paralleling the development of the broader tourism field. Three distinct stages—foundational, consolidation, and maturity—have been identified, indicating a consistent growth pattern over time. The exponential growth observed in ESN tourism literature, particularly during the consolidation and mature phases, suggests increasing interest and engagement with the topic within the academic community.

While there are some differences in formal characteristics between ESN tourism and general tourism literature, such as document types and open access publishing, overall, ESN tourism aligns with mainstream trends in scientific publication. ESN tourism literature tends to be slightly more prone to be published in English, with notable contributions from Spanish and Chinese publications, indicating a global interest and participation in the dissemination of ESN-related research.

ESN tourism literature exhibits significant differences in subject areas compared to general tourism literature, with a stronger emphasis on environmental science, agriculture, and biological sciences. The interdisciplinary nature of ESN tourism is evident, with papers being classified in a greater number of scientific areas compared to general tourism literature. This is probably a relevant factor in explaining why ESN tourism literature tends to receive more citations on average, also suggesting its perceived importance within the academic community.

The distribution of scientific production in ESN tourism is globally dispersed, with significant contributions from both traditional and emerging research hubs. International collaboration plays a crucial role in advancing ESN tourism research, with notable contributions from developing countries, indicating a growing interest and participation from diverse regions. The case of Malaysia, Indonesia and the Latin American region is showcasing this trend.

The scientific maps presented in this study offer a comprehensive depiction of the intellectual landscape within the ESN literature domain. Utilizing co-word analysis and overlay mapping techniques, the study delineates six distinct thematic clusters, each representing a unique area of research focus within the ESN tourism domain. These clusters encompass diverse topics such as nature conservation, sustainable development, ecotourism, tourism management or cultural heritage. By identifying clusters based on core semantic fields and analyzing their co-occurrence structures, the study provides insights into the complex interrelationships and thematic evolution within the ESN tourism literature. Temporal analysis reveals significant shifts in thematic emphasis and research focus over different time periods. The study identifies a foundational stage (1986-2002) characterized by rapid growth in ESN tourism literature, followed by a consolidation phase (2003-2012) where certain clusters matured while others emerged. Notably, a distinctive structure depicting cultural heritage and tourism literature only emerged during the consolidation phase, indicating dynamic changes in research priorities and thematic composition over time. Furthermore, the study observes substantial evolution in thematic clusters during the last period, indicating ongoing development and diversification within the ESN tourism literature domain.

Geographical analysis highlights regional variations in thematic emphasis and research contributions. Europe emerges as a prominent producer of ESN tourism literature, particularly in topics related to nature conservation and sustainable tourism. The United States exhibits a strong focus on sustainable development and ecology-related topics, while China demonstrates specialization in tourism management and nature-based tourism. Latin America, closely connected to the US, shows significant presence in sustainable development topics. These regional differences underscore the global diversity and interconnectedness of research efforts within the ESN tourism domain, offering valuable insights for future collaboration and interdisciplinary research endeavors.

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I.B. and R.S.J.; writing - original draft preparation, I.B. and R.S.J.; writing - review and editing, I.B. and R.S.J. and K.V.C. and R.M.E.H.; visualization, R.S.J.; supervision, K.V.C. and R.M.E.H.; project administration, K.V.C. and I.B. All authors have read and agreed to the published version of the manuscript.

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