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Mapping Tourism and Global Change: A Bibliometric Analysis (2012-2022)

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Abstract

Tourism is an important sector of the industry with global influence on the economy and development while global change is nowadays a major challenge worldwide. This study aims to present a bibliometric analysis that evidences the trends of scientific production on "tourism" and "global change", supported by visualization techniques provided by VOSviewer software. A total of 3519 documents were retrieved from Scopus database and the analysis includes the identification of frequencies of papers published, most influential authors, countries with the highest contributions, co-occurrences term map, author co-citations analysis, and co-citation map by countries. Our findings evidence that there is an interrelation between the terms "tourism" and "global change" and that the literature on that topic has experienced sustained growth worldwide through collaboration networks including several prolific authors.

Keywords: *tourism; global change; bibliometric analysis; mapping; VOSviewer*

1. Introduction

Naturally, the global climate has evidenced changes and alterations. However, since the Industrial Revolution, the climate change process has been accelerated by the use of fossil energy and the emission of greenhouse gases causing local and global alterations that are more a consequence of anthropogenic activities than of a natural event. The IPCC's fifth report, where participated more than 830 scientists from 85 countries, concluded that "warming in the climate system is unequivocal and human influence is clear" (IPCC, 2014).

Climate change caused by human actions has affected the balance and functioning of the planet (IPCC, 2007), therefore, addressing, mitigation and adaptation represent now a major challenge worldwide. The climate change effects can affect the way of life of millions of people globally and are evidenced by the abnormal elevation of temperatures, severe floods and droughts, and the increase of extreme weather events. Climate change is considered a risk factor for the global economy and

development (Burke et al., 2018).

Tourism is a global economic sector that represents more than 10% of the national Gross Domestic Product (GDP) for more than 90 countries and thousands of communities (Scott et al., 2019; WTTC, 2016), contributing especially to the development of emerging economies (Berno & Bricker, 2001). Its capability to create employment and to distribute wealth has been highlighted (Higgins-Desbiolles, 2006) and has even been identified as an important contributor to Sustainable Development Goals (SDGs) (Hall et al., 2014; Scott et al., 2019; World Bank, 2017). However, touristic activities can cause negative impacts on the environment (as carbon emissions, pollution, biodiversity affectation, and ecologic degradation) (Ahmad et al., 2018; Gössling, 2002; Scott et al., 2012) and, on the destination communities (Caneday & Zeiger, 1991; Faulkner & Tideswell, 1997). Therefore, tourism should be studied and analyzed as an activity that can have both favorable and unfavorable consequences.

The interactions between tourism and global change have been widely addressed by several science disciplines evidencing a complex relationship where changes in the climate may affect touristic activities and vice versa. Hence, the nexus between tourism and global change has been proclaimed in global events such as the Djerba Declaration on Climate Change and Tourism (UNWTO, 2003) and, the Davos Declaration on Tourism and Climate Change (UNWTO, 2007). In 2018, the World Travel and Tourism Council in a joint declaration with the UNFCCC Climate Neutral Now initiative committed to becoming climate neutral by 2050 (World Travel and Tourism Council, 2018).

Traditionally, researchers have used literature reviews to increase the knowledge of a study field. Nowadays, it is possible to apply systematic reviews with specific algorithms to find and select literature through reliable procedures (Buchanan & Bryman, 2009) that allow the development of bibliometric studies that present the selected information in synthetic outputs that facilitate their analysis and interpretation (Keathley-Herring et al., 2016). Bibliometric studies include techniques used in the identification of patterns and current and future trends of the research fields through the analysis of citations, co-citations, co-occurrences, co-authorship, and bibliographic connection (Chang et al., 2015; Parish et al., 2018). A bibliometric analysis allows the visualization of the dynamics over time in a determined research field (Liu et al., 2013) and the structuration of compressive maps based on the evaluation and measurement of published papers that are compiled in a database (Zupic & Čater, 2015). Scopus is one of the main global databases identified as the largest abstract and citation database of peer-reviewed scientific journals, books, and conference proceedings. This database includes over 25,100 titles from more than 5,000 international publishers, covering a broad spectrum of the fields of science (Elsevier, 2020).

Several technological tools to build and visualize bibliometric networks have been developed and VOSviewer has generated extensive attention in bibliometric research due to its capability to generate and visualize a wide variety of bibliometric networks (Herrera-Franco et al., 2020). VOSviewer is a specialized software (N. Van Eck & Waltman, 2010) that bases its analysis on bibliometric parameters such as journals, authors, keywords, references, and other identifying elements (Montalván-Burbano et al., 2020; N. Van Eck & Waltman, 2010) which could be related with the study field and trends.

This study attempts to answer the following question: What are the basic trends, interrelations, and patterns of research on “tourism” and “global change” fields during the period 2012-2022?

2. Methods

Bibliometric studies develop systematic reviews focused on the analysis of bibliographic data extracted from scientific publications compiled in one or several databases (Zupic & Čater, 2015). The methods are based on explicit algorithms that allow the identification of scientific production through a transparent, rigorous and, reproducible procedure (Tranfield et al., 2003) to guarantee the quality of the information used (Keathley-Herring et al., 2016).

This bibliometric study considered Scopus as a source database because of the reliability and high quality of its bibliographic process of extraction, ease of downloading data (Harzing & Alakangas, 2016), and the broad coverage in the collection of information (Elsevier, 2020).

The search was carried out in December 2022 and was directed to collect information published in English on "tourism" and "climate change", during the period 2012 to 2022 based on descriptors contained in titles, abstracts, and keywords. The following research string using Boolean logical operators was applied:

TITLE-ABS-KEY ((tourism OR touristic) AND ("climate change" OR "global change" OR "global warming" OR "climate adaptation" OR "climate mitigation")) AND PUBYEAR > 2011 AND PUBYEAR < 2023 AND (LIMIT-TO (LANGUAGE , "English"))

A total of 3519 documents were retrieved and we used VOSviewer (Visualization of Similarities) software (N. Van Eck & Waltman, 2010) to generate the co-occurrence and co-citation maps, where the larger the number of publications in which two terms co-occur, the stronger the terms are considered to be related to each other.

The analysis includes the identification of: a) frequencies of papers published, b) most influential authors, c) countries with the highest contributions, d) co-occurrences term map, e) author co-citations analysis, and, f) co-citation map by countries.

3. Results and Discussion

3.1 Frequencies of papers published

The frequencies of papers published from 2012 to 2022 are represented in figure 1. During the first six years of the period (2012-2017), the average of annual publications was 229; while during the last years (2018-2022), the annual average increased to 429, evidencing a notable increase since 2018.

The number of publications yearly published is an important indicator of the progress of a specific field of study (Rana, 2020). Our results show that the publication number has increased gradually and constantly with exceptions in 2015 (-16%), 2017 (-12%), and 2022 (-7%), however, the search was carried out in December 2022 and, publications of that year could be not completely added in the Scopus database, leading to a possible underestimation. Similar findings have been reported in bibliometric analysis (Pathmanandakumar et al., 2021) including tourism and global change even when another database (WoS) was used.

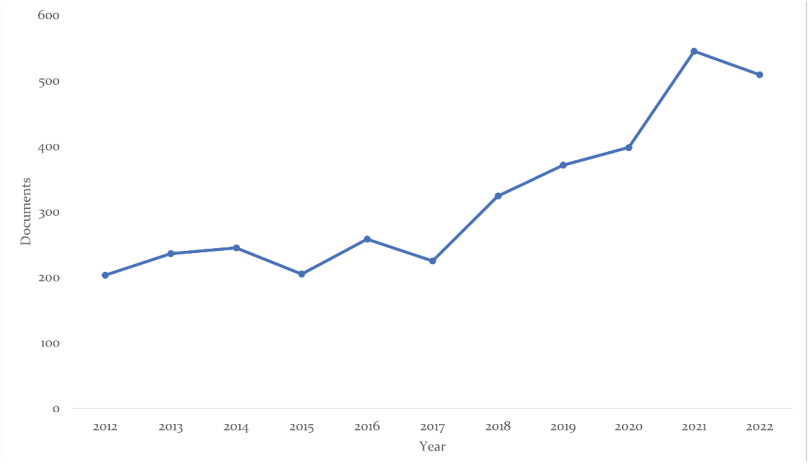

Figure 1: Frequencies of papers published (period 2012-2022).

3.2 *Most influential authors*

The most influential authors identified in the search (Figure 2) are presented by the number of documents (Figure 2a) and by the number of citations (Figure 2b). According to the number of documents, Dube and Scott lead the production with 8 documents, followed by Buckley, Gössling, Hall, Kaján, O'Rourke, and Pandy with 3 documents published. While in the analysis by citations Gössling leads the group (2082 citations) followed by Scott (715 citations) and Buckley (569 citations). The most cited documents in the study period are shown in Table 1, where "Karst Hydrogeology and Geomorphology", "Pandemics, tourism and global change: a rapid assessment of COVID-19" and "The Millennium Drought in southeast Australia (2001–2009): Natural and human causes and implications for water resources, ecosystems, economy, and society" appear as the most cited with 2232, 1818 and 834 cites respectively.

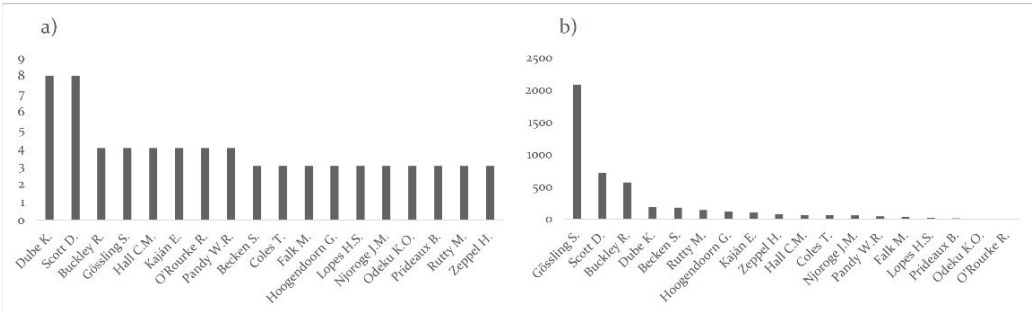

Figure 2: Influential authors in the field of the research (period 2012-2022). a) By the number of documents. b) By the number of citations.

Table 1: Most cited documents (period 2012-2022)

Title	Authors	Citations
Karst Hydrogeology and Geomorphology	Ford D.; Williams P. (2013)	2232
Pandemics, tourism and global change: a rapid assessment of COVID-19	Gössling S.; Scott D.; Hall C.M. (2020)	1818
The Millennium Drought in southeast Australia (2001–2009): Natural and human causes and implications for water resources, ecosystems, economy, and society	Van Dijk A.I.J.M.; Beck H.E.; Crosbie R.S.; De Jeu R.A.M.; Liu Y.Y.; Podger G.M.; Timbal B.; Viney N.R. (2013)	834
Progress in Understanding Harmful Algal Blooms: Paradigm Shifts and New Technologies for Research, Monitoring, and Management	Anderson D.M.; Cembella A.D.; Hallegraeff G.M. (2012)	663
Sustainable tourism: Research and reality	Buckley R. (2012)	566
Natural Area Tourism: Ecology, Impacts and Management	Newsome D.; Moore S.A. (2012)	563
Widespread global increase in intense lake phytoplankton blooms since the 1980s	Ho J.C.; Michalak A.M.; Pahlevan N. (2019)	436
Consumer behaviour and demand response of tourists to climate change	Gössling S.; Scott D.; Hall C.M.; Ceron J.-P.; Dubois G. (2012)	411
Massive yet grossly underestimated global costs of invasive insects	Bradshaw C.J.A.; Leroy B.; Bellard C.; Roiz D.; Albert C.; Fournier A.; Barbet-Massin M.; Salles J.-M.; Simard F.; Courchamp F. (2016)	394
Tourism and water use: Supply, demand, and security. An international review	Gössling S.; Peeters P.; Hall C.M.; Ceron J.-P.; Dubois G.; Lehmann L.V.; Scott D. (2012)	380

3.3 *Countries with the highest contributions*

The top 15 countries that most contributed in the period (2012-2022) were identified in Figure 3, through two approaches a) by the number of documents published and b) by the number of citations according to the country. United States (498), United Kingdom (378), Australia (366), and China (286) lead the list with the higher number of publications; while, according to the number of cites, Australia (11655), United Kingdom (11397), United States (11108) and, Canada (10906) are situated on the top.

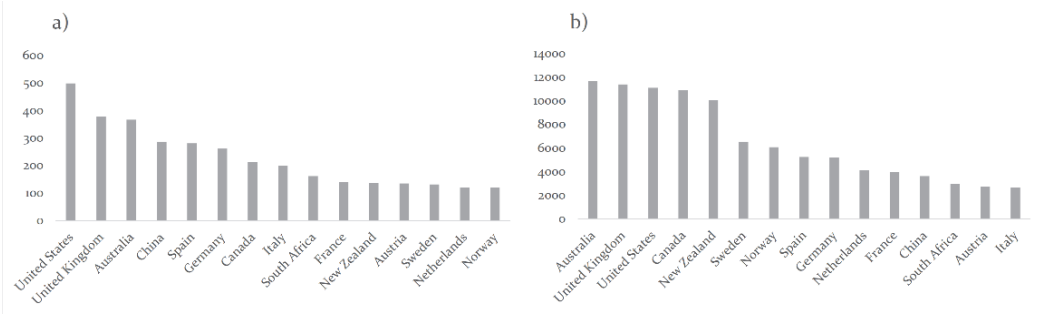

Figure 3: Top 15 countries with the most contributions (period 2012-2022). a) By the number of publications. b) By the number of citations.

3.4 *Co-occurrences term map*

The co-occurrences term map on "tourism and global change" research was based on a LinLog/modularity normalization method and is displayed in Figure 4, evidencing three clusters represented by blue, green, and red colors. Each cluster represents a research theme including one or more topics.

The blue cluster has as core the term "climate change" and groups terms as "adaptation", "temperature", "global warming" and "sea-level rise" revealing the use of those terms in studies that focus on the assessment and adaptation to global changes. Other bibliometric studies dealing with the term "climate change" have reported similar findings (Di Matteo et al., 2018; Haunschild et al., 2016).

The green cluster showed terms related to tourism modalities such as "sustainable tourism", "sustainable development", "tourism industry", and "natural-based tourism" presenting as a core term "tourism". This cluster shared terms with the blue cluster ("adaptation", "global warming", "weather", and "water").

The red cluster was represented by the term "sustainability" as a core and included terms such as "conservation", "ecosystem services", "environment", and "biodiversity"; share also terms with the blue and red clusters as "resilience", "vulnerability"," ecotourism", and "climate change adaptation".

In a term map when the number of publications in which two terms co-occur is greater, the relationship between them is considered stronger. Therefore, terms that often co-occur in the same publications are located close to each other, and terms with low co-occurrence are located further from each other (Di Matteo et al., 2018; Nardi et al., 2016). Graphically, each term is represented by a circle which size is related to the number of publications including the corresponding term in their title or abstract.

VOSviewer identifies clusters of related terms and produces a co-occurrence term map using the VOS clustering technique (a weighted and parameterized variant of modularity-based clustering) (Waltman et al., 2010; Waltman & Van Eck, 2013). Therefore, in our results, the colors (blue, green, and red) represent a specific research area.

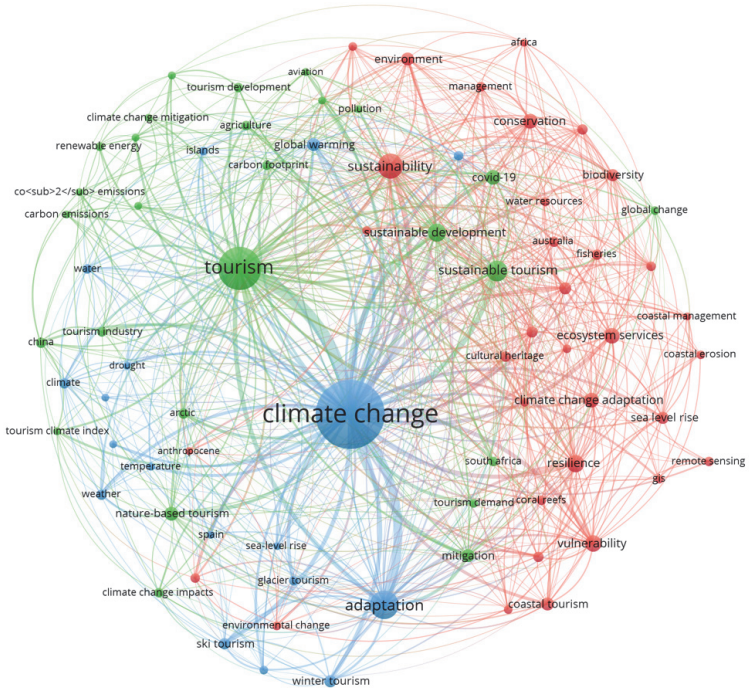

Figure 4: Trends of papers addressing tourism and global change as a research field (period 2012-2022).

3.5 Author co-citations analysis

The top 15 most co-cited authors are shown in Table 2, where is expressed the number of co-citations and the total link strength which indicates the number of links of an item with other items and the total strength of the links of an item with another item (N. J. Van Eck & Waltman, 2017). Also, an author co-citations analysis was developed (Figure 5) to identify patterns in the number of publications written jointly by the authors on the theme. The map displayed co-citation nodes connected in six clusters. The proximity between each node exposes the relationship of each author and the number of citations represented by circles that vary in size (Herrera-Franco et al., 2020).

Table 2: Most co-cited authors (period 2012-2022)

Author	Co-citations	Total link strength
Scott, D.	1023	835.73
Gossling, S.	671	575.53
Hall, C.M.	553	422.63
Becken, S.	311	268.79
Steiger, R.	252	222.51
Amelung, B.	154	143.95
Peeters, P.	149	140.36
Dawson, J.	155	133.89
Abegg, B.	138	127.55
Rutty, M.	129	122.34
Dubois, G.	119	116.99

Author	Co-citations	Total link strength
Mcboyle, G.	121	115.86
Saarinen, J.	127	106.68
Zhang, Y.	122	101.91
Qin, D.	98	87.14

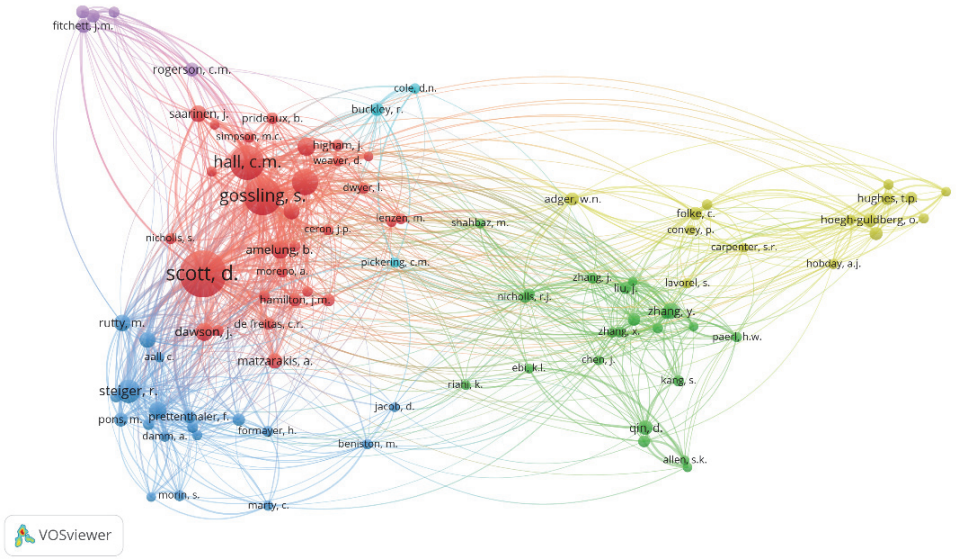

Figure 5: Autor co-citation map (period 2012-2022)

The authors leading the top 15 list of co-citations are represented in the red cluster by Scott (1023 co-citations), Gossling (671 co-citations), Hall (553 co-citations), Becken (311 co-citations, Steiger (252 co-citations), Amelung (154 co-citations), Peeters (149 co-citations), Dawson (155 co-citations), Dubois (119 co-citations) and, Saarinen (127 co-citations). In the blue cluster by Abbeg (138 co-citations), Rutty (129 co-citations), and Mcboyle (121 co-citations). And in the green cluster by Zhang (122 co-citations) and, Quin (98 co-citations).

In the co-citation term map, the color of a research term represents the average citation impact score of the papers in which the term occurs. The colors reflect the average citation impact score for the term rather than by cluster. A co-citation analysis can be used to identify the most active research areas and also emerging trends (Hou et al., 2018).

3.6 Co-citation map by countries

A co-citation map displayed by countries (Figure 6) evidenced three clusters. The red cluster includes the United States, Australia, the United Kingdom, Australia, and China as predominant countries. The green cluster where are present most of European countries (e.g. Germany, Spain, Italy, France, Greece, and Portugal). And the blue cluster includes countries such as Canada, Norway, New Zealand, and South Africa. The top countries that contributed the most during the period 2012-2022 agree with the findings presented in previous studies (Demiroglu & Hall, 2020; Di Matteo et al., 2018; Haunschild et al., 2016; Pathmanandakumar et al., 2021)

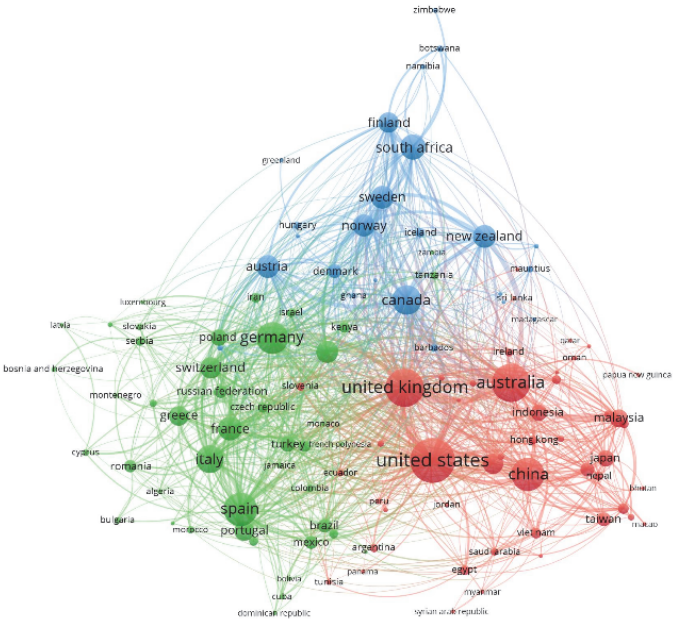

Figure 6: Co-citation map displayed by countries (period 2012-2022).

4. Conclusions

This study covers the research publications on tourism and global change over the last 10 ten years and was developed under a structured methodology. However, our research presents the following limitations: only considered Scopus as the source of data without considering the information available in other databases frequently used in the academic ambit as Web of Science, and only considered publications written in English even when there are several and important documents available in other languages.

This work aims to contribute to the study of tourism and global change with a bibliometric analysis that presents the trends of scientific production on these topics, supported by visualization techniques provided by VOSviwer software. Bibliometric visual maps have proved to be a very useful tool for the analysis of a large amount of data.

The article includes the co-occurrence, co-citation, and co-author analysis which indicated that the study of "tourism" and "global change" has experienced sustained growth worldwide. This is evidenced by the number of documents, authors, journals, and countries identified during the search.

The co-occurrence analysis revealed as central themes "climate change", "tourism" and, "sustainability", evidencing the interrelation between the terms. These support the statement that tourism could contribute to sustainable development (Pavione et al., 2017; Quevedo et al., 2022; UNEP & WTO, 2005).

The co-citation analysis identifies as the most referenced researchers to Scott, Gossling, and Hall, whose publications have contributed to the themes, revealing that tourism and global change are active areas of research. The co-author analysis identified also their patterns of collaboration visualized through clusters represented by colors. Finally, the co-citation map displayed by countries evidenced that the United States, Australia, the United Kingdom, Australia, and China were the predominant countries.

The literature regarding "tourism" and "global change" presents a relevant opportunity for researchers interested in exploring that field. Therefore, these findings could contribute as an initial guideline for future contributions.

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