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Charting the Future Trajectory of Sustainable Tourism Research in Africa

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Abstract

This study offers a comprehensive bibliometric analysis of sustainable tourism research in Africa from 2003 to 2023, utilizing data from Scopus. It aims to identify leading journals, countries, institutions, and authors in the field, as well as to analyze research trends and themes. The methodology includes evaluating document count, citation score, and publication trends, supplemented by thematic analysis via VOSviewer. Key findings indicate that South Africa leads in research output with around 930 publications, followed by Egypt and Nigeria. The University of Johannesburg is highlighted as the foremost institution, marked by a high citation count (40,693). Prominent authors like C.M. Rogerson and C.M. Hall are noted for their contributions. The research predominantly encompasses Social Sciences, Business, and Management, with a notable fluctuation in publication numbers, including a decrease in 2018. The study uncovers five main clusters that define the focus of sustainable tourism research. This extensive 20-year analysis provides valuable insights into the geographic and institutional spread of research, thematic trends, and the evolution of research interests. The findings are pivotal for academics, policymakers, and practitioners in grasping the current landscape and future trajectory of sustainable tourism research in Africa, highlighting its multidisciplinary nature and global relevance.

Keywords: Tourism sustainability, Africa, bibliometric analysis, VOSviewer, eco-tourism

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Introduction

The imperative for sustainable economic development is increasingly evident as global economies expand and resource demands escalate to meet societal needs. Within the discourse of sustainability, a widely acknowledged definition, as posited by the World Commission on Environment and Development (Zia et al., 2021), underscores the importance of ensuring that present actions do not compromise the ability of future generations to meet their own needs. Central to this understanding is a conceptual framework often depicted through a Venn diagram (Dalampira & Nastis, 2020), comprising three essential dimensions: economic, social, and environmental (Gil-Gomez et al., 2020). Economic sustainability pursues resource efficiency for long-term profitability, while social sustainability encompasses principles of social justice, capital, and community development (Amorim-Maia et al., 2022). A socially sustainable environment fosters equitable, diverse, connected, and democratic communities that offer a high quality of life (Saunders et al., 2020). Meanwhile, environmental sustainability mandates the preservation of natural resources at a sustainable rate, recognizing their typically non-renewable nature (Guo et al., 2023). The interplay of these pillars is crucial; a weakness in any one dimension may render development viable, equitable, and tolerable in isolation (Haghshenas et al., 2023), but ultimately unsustainable when considered holistically (Rees, 2021) . The intersection of sustainability and tourism is particularly noteworthy given tourism's significant role in the global economy. In 2016, it directly contributed 3.1% (and indirectly 10%) to the global GDP, generating millions of jobs worldwide (Ram et al., 2022). Notably, tourism's capacity for job creation and wealth distribution, particularly in emerging economies, is highlighted in the literature (Loayza & Pennings, 2020). The World Tourism Organization contends that tourism achieves sustainability when it accounts for its current and future economic, social, and environmental impacts, meeting the needs of visitors, industry, environment, and host communities. Furthermore, sustainability is feasible across all forms of tourism, whether mass-scale or small-scale (Herbold et al., 2020) (Baloch et al., 2023).

Recently, tourism has been a vital component of many African economies, offering significant opportunities for economic growth, job creation, and cultural exchange. However, alongside its potential benefits, the industry also poses challenges related to environmental degradation, cultural disruption, and socio-economic inequality (Idahosa, 2019). In recent years, the concept of sustainability has emerged as a critical framework for addressing these challenges and ensuring that tourism development in Africa is both ecologically responsible and socially equitable (Nicolaides, 2020). After the 1992 Earth Summit, there was general agreement that sustainable development requires the adoption of a comprehensive and integrated approach to economic, social, and environmental processes. According to a recent economic report by the United Nations Economic Commission for Africa (2021), Africa's GDP growth rebounded by growing to 4.7 percent in 2021, from a contraction of 3 percent in 2020 due to the pandemic. International arrivals across Africa recovered 96% of pre-pandemic visitors at the sub-regional level, North Africa is performing particularly strongly. Here, arrivals were 8% higher than the pre-pandemic levels of 2019 in Jan-July 2023 (Nyasha et al., 2021) (Gowreesunkar, 2019). The recovery in growth was supported by pent-up demand following the relaxation of the COVID-19 restrictions, better global economic conditions, and the rebound in the tourism sector. There was a wide variation in the growth rates across the region (Fofack, 2021). Amid the economic growth, the New Partnership for Africa’s Development identified tourism as an important vehicle for addressing the development challenges facing Africa. In 2020, the United Nations World Tourism Organization (2021) approved its Tourism

Action Plan. Most African governments have now included tourism in their national development strategies. Countries have also started to adopt policies that open opportunities for the poor within tourism (Dube & Nhamo, 2021) (Buzinde & Caterina-Knorr, 2023).

In recent years, scholarly and practical discourse has increasingly focused on the nexus between tourism and sustainability, recognizing both its significance and the challenges inherent in its enhancement (Mandić, 2020). Yet, it also underscores sustainable tourism as a crucial tool for competitiveness (Sulistyo et al., 2023) (Streimikiene et al., 2021). Addressing this relationship is paramount for academics and practitioners alike, prompting conceptual and empirical investigations. This study embarks on a comprehensive exploration of tourism sustainability in Africa, employing a bibliometric analysis spanning the period from 2003 to 2023. Through bibliometric analysis, this research aims to map the evolution of scholarly discourse, identify key themes, influential authors, and prolific journals, and assess the trajectory of research on tourism sustainability in the African context over the past two decades. By examining the scholarly literature, this research seeks to shed light on the current state of knowledge regarding tourism sustainability in Africa, highlight areas of consensus and contention, and pinpoint research gaps that warrant further investigation. Understanding the prevailing discourse and research trends is crucial for policymakers, practitioners, and scholars alike, as they attempt to shape policies and practices that promote sustainable tourism development on the African continent. Utilizing quantitative methods, bibliometric analysis classifies data and generates a representative summary, recognized as a useful approach for analysing the performance of journals, institutions, authors, and the characteristics of research topics (Rogerson & Rogerson, 2019). Despite the growing popularity of bibliometric analysis in tourism research, studies specifically focusing on sustainable tourism in Africa remain limited. In this study, various bibliometric indicators were analysed, including publication counts, total citations, citations per article, significant journals, most relevant universities, and influential countries, using VosViewer software (Ramukumba, 2023). This software was selected for its suitability in analysing data on the sustainability of tourism development, particularly in Africa. Data collection was conducted using the Scopus database, which encompasses a vast array of abstracts from peer-reviewed literature such as scientific journals, literature articles, books, and international conference proceedings (Okolo et al., 2023). Despite the database's extensive coverage, the researcher filtered the publications to focus solely on articles (Journal Articles, Conference Papers, Conference Reviews, and Review Articles) published and indexed in Scopus with the keyword "Sustainable Tourism" in the context of Africa from 2003-2023. Accordingly, this study tries to address the following Questions:

1. How has the scholarly discourse on sustainable tourism in Africa evolved from 2003 to 2023, and what are the most significant shifts or developments in the thematic focus of the literature?
2. Who are the most influential authors and which institutions have contributed significantly to the field of sustainable tourism in Africa, and how has their influence shaped current research and policy directions?
3. What is the impact of the research on sustainable tourism in Africa in terms of citations and recognition within the academic community, and how does this impact vary across different regions and sub-regions of Africa?
4. Which academic journals have been the most prolific publishers of research on sustainable tourism in Africa, and what are the characteristics of the most cited articles in this field?
5. Based on the bibliometric analysis, what are the gaps in the current research landscape regarding sustainable tourism in Africa, and how can future research inform policy and practical measures to address these gaps?

Methodology

Figure 1 shows that this study employs a mixed-methods approach to analyse the impact of sustainability on tourism research in Africa from 2003 to 2023. It commences with a bibliometric analysis of articles focusing on sustainability in African tourism (Sharifi, 2021). This analysis aims to gauge the scope and depth of existing research, pinpointing knowledge gaps and future research opportunities as per (Niñerola et al., 2019). This methodology is chosen for its effectiveness in offering a structured overview of the field, especially in evaluating the contributions of journals, institutions, authors, and overall research trends in sustainability and tourism, as highlighted by (Ertz & Leblanc-Proulx, 2018).The research primarily considers English-language articles that correspond with the Sustainable Tourism Development Goals, which are directed at enhancing life quality for the current generation while ensuring a thriving environment for future generations (Jiménez-García et al., 2020). The study's core is a comprehensive examination of the role of tourism in community development in Africa, utilizing bibliometric data from 1,849 scientific papers (referenced in Figure 1). This approach aims to provide a thorough understanding of the evolution and current trends in sustainable tourism research on the continent.

Data extraction

The data extraction process in this study involved a meticulous approach to gathering relevant information on the topic of sustainability in tourism research in Africa. Utilizing the Scopus database, one of the most comprehensive multidisciplinary databases, the research team performed a targeted search to collect pertinent data. This search, conducted on February 3, 2024, focused on English-language articles featuring keywords like 'Tourism', 'Sustainability', 'Tourism Development', 'Ecotourism', 'Sustainable Tourism', 'Eco-tourism', 'Ecological Tourism', 'Green Economy', 'Green Tourism', 'Blue Economy', 'Blue Tourism', 'Circular Economy', 'Circular Tourism', 'Bio-economy', and 'Eco-friendly Tourism', specifically in the context of Africa (Garrigos-Simon et al., 2018).The initial search in Scopus yielded a vast collection of 32,500 documents. To manage this data, each search result was systematically organized into labelled lists within Scopus and then exported in CSV format. For a more

detailed analysis and visualization of the information networks, the study utilized VosViewer software, a tool effective in identifying relationships and patterns within large datasets, as noted by (Oyewola & Dada, 2022) To refine the scope and ensure the relevance of the data, publications from the incomplete year of 2024 were excluded (Işik et al., 2017). The refined screening focused on selecting publications relevant to tourism development in Africa between 2003 and 2023. This screening process led to the selection of various international journal publications, resulting in a final corpus of 1,849 documents. This corpus comprised 1,707 articles, 85 reviews, and 57 conference papers, which collectively formed the empirical foundation for the study's examination of sustainable tourism research trends and developments in Africa.

Data analysis

The data analysis section of this study on tourism sustainability research in Africa describes a comprehensive approach using VosViewer for bibliometric analysis. This tool is adept at handling large datasets and excels in creating scientific maps and intuitive visualizations of complex data, making it ideal for examining relationships and patterns in fields like tourism management (Niñerola et al., 2019). The analysis involves categorizing published articles according to various metrics such as citation counts, influential publications and journals, types of publications, geographical distribution, research fields, and trends specific to tourism sustainability in Africa (Xu et al., 2023). The study employs two network visualization analyses to deepen the understanding of the field. These visualizations organize topics into color-coded clusters, representing different thematic areas within tourism sustainability research (Saheb & Saheb, 2019). This approach not only highlights the evolution of research themes but also indicates the direction of future research in Africa. The network visualizations also reveal collaborative networks between authors from various countries, showcasing the most prolific nations and central collaborations in the field (Gui et al., 2019). This aspect of the analysis provides insights into the structural dynamics of co-authorship and the main contributors to the field. Additionally, the visualizations are color-graded to represent varying levels of activity and interaction within the research network, which helps identify areas of high scholarly engagement.

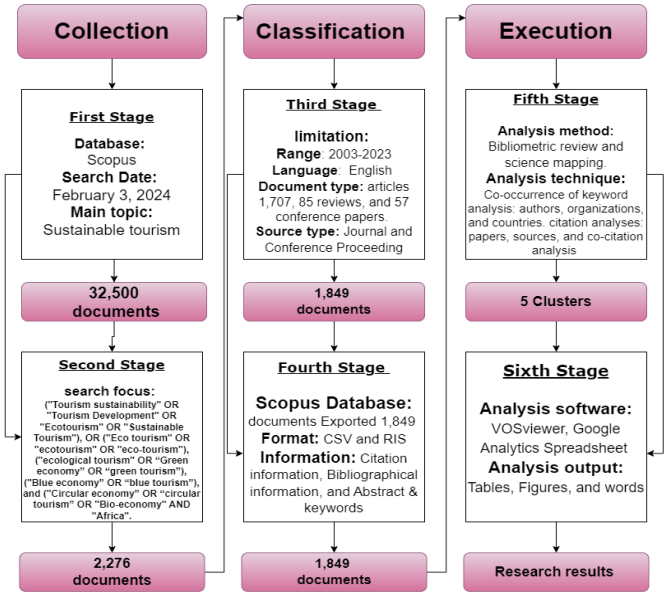

Figure 1 **The research framework of this study**

Results and discussion

As exemplified in Figure 1 the results provide a comprehensive bibliometric analysis of sustainable tourism in Africa from 2003 to 2023, focusing on key journals, productive countries, institutions, and authors (León-Gómez et al., 2021). It lists the top journals by various metrics such as document count, total publications, citation score, and most cited documents. Additionally, it details the most productive countries and academic institutions in sustainable tourism research, highlighting leading universities and their contributions (Moyle et al., 2020). Key authors in the field are identified, showcasing their document count, country, affiliation, total citations, and publication count. analysing citations, authorships, geographical distribution, thematic cluster, and keywords frequency. The results also feature the top 5 articles on the Scopus database by citation score, emphasizing their impact on the field. Figure 2 illustrates the number of publications related to sustainable tourism research from ten African countries over a period from 2003 to 2023. South Africa stands out as the most prolific country, with approximately 930 publications, Egypt follows with about 144 publications, and Nigeria is next, with approximately 122 publications. The other countries, in descending order of publication count, are Ethiopia (~101), Botswana (~92), Ghana (~82), Kenya (~77), Mauritius (~72), Tanzania (~67), and Morocco (~62). The trend line shows a negative slope, indicating that, except South Africa, there is a general decrease in the number of publications as we move from the most to the least productive countries. The steep initial decline from South Africa to Egypt and a more gradual decline among the following countries suggest a significant disparity in research output, potentially reflective of differing levels of investment in research,

available expertise, or academic focus areas within the realm of sustainable tourism. South Africa's dominant position could be attributed to its well-established research institutions and a historical focus on tourism as a key economic sector.

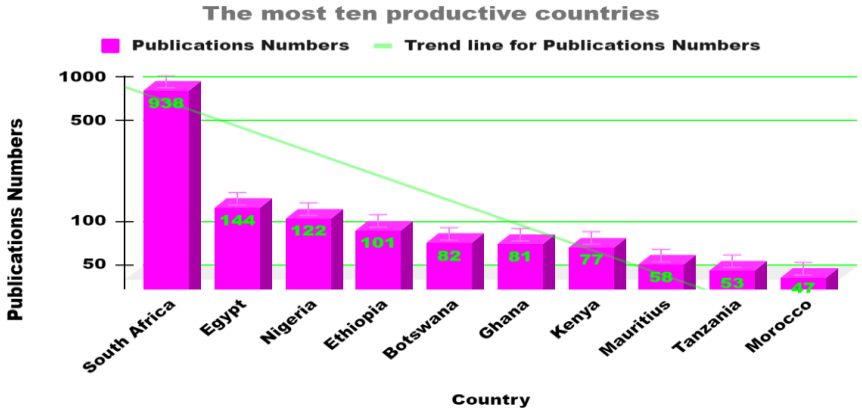

Figure 2. The most ten productive countries

Other countries may have emerged or developing research capacities in this field. The publication numbers may also reflect the economic importance of tourism to these countries and the degree to which sustainable practices are prioritized by policymakers and academic institutions (Rasoolimanesh et al., 2023). The disparities in publication numbers could also be indicative of the levels of international collaboration. South Africa's significant output might result from more extensive networks and partnerships, which can enhance research quality and visibility.

Table 1: top 10 journals in sustainable tourism in Africa 2003-2023

Journal	DN	TP-2023	TC-2023	CS (2023)	Most cited document	Time Cited	Publisher
African Journal of Hospitality Tourism and Leisure	195	570	1,542	2.7	Rogerson, C.M., et al.2020	84	Africa Journals
Journal Of Sustainable Tourism	90	511	11,603	22.7	Gössling, S. et al.2020	2,654	Taylor & Francis
Geojournal Of Tourism and Geosites	74	720	2,748	3.8	Rogerson, C.M., et al.2020	93	Editura Universitatii din Oradea
Sustainability Switzerland	62	54,742	370,077	6.8	Aristovnik, A.et al. 2020	967	(MDPI)
Development Southern Africa	46	258	1,044	4.0	Hamann, R. 2003	166	Taylor & Francis
Current Issues in Tourism	45	795	12,124	15.3	Guttentag, D. et al.2015	1,186	Taylor & Francis
Journal Of Ecotourism	40	80	491	6.1	Lindsey, P.A. A.et al. 2007	190	Taylor & Francis
South African Geographical Journal	27	109	356	3.3	Mbaiwa, J.E.2018	85	Taylor & Francis
Geojournal	25	1,018	4.912	4.8	Goodchild, M.F. 2007	3,263	Springer Nature
Koedoe	25	68	223	3.3	Roux, D.J., et al. 2011	84	OpenJournals Publishing AOSIS (Pty) Ltd

DN= Documents Number, TP= Total publications, TC=Total score, CS=Citation score

Table 1 above provides a bibliometric analysis of the top 10 journals focusing on sustainable tourism in Africa from 2003-2023. It includes data on the number of documents published, total publications, total citations, and citation scores for each journal. Notably, the 'African Journal of Hospitality Tourism and Leisure' has the highest number of documents (195), but 'Journal of Sustainable Tourism' leads in citation score (22.7) and total citations (11603). The 'Sustainability Switzerland' journal, although with fewer documents (62), has a vast number of total publications (54742) and the highest total citations (370077), indicating significant influence. The data reflect the journals' impact and contribution to the field of sustainable tourism research in Africa. Publishers include Africa Journals, Taylor & Francis, MDPI, and others, reflecting a diverse academic dissemination of research findings in sustainable tourism (Niñerola et al., 2019).

Figure 3 displays the number of publications per year from 2003 to 2023 related to sustainable tourism. There's a noticeable fluctuation in publication numbers over the years, with peaks around 2023 (210), 2022 (208), and 2021 (185). A sharp decline is observed from 2018 onwards. The trend line shows an overall decrease in publication numbers over time, suggesting a possible shift in research focus or changes in publication practices. This could indicate evolving priorities in sustainable tourism research or broader academic and socio-economic trends influencing the volume of research output (Merigó et al., 2019).

Figure 3. The number of publications per year

Table 2 details the output of the most productive academic institutions in sustainable tourism research. South African universities, particularly the University of Johannesburg with 344 publications and the highest number of citations for a single document (40,693), dominate the list, highlighting the country's focus on sustainable tourism. The University of Cape Town's substantial total publication count (83,875) suggests a broad research influence. The presence of Oulun Yliopisto (Finland) with a significant citation count (11,714) indicates international collaboration and global relevance of the research conducted in African institutions. This data underscores the importance of these institutions in advancing sustainable tourism knowledge.

Table 2. The most 11 productive academic institutions

Institutions	Country	PN	TP by institution	Most Cited Document	Time Cited
University of Johannesburg	South Africa	344	40,693	Aad, G., Abajyan, et al 2012.	7883
North-West University	South Africa	107	26,287	Abbafati, C.,et al 2020	6731
University of Botswana	Botswana	67	8,658	Abbafati, C.,et al 2020	6731
University of South Africa	South Africa	62	22,385	Lozano, R.,et al 2012	10602
University of KwaZulu-Natal	South Africa	60	59,007	James, S.L.,et al 2018	7983
College of Business and Economics	South Africa	57	981	Ramkissoon, H. et al 2020	144
University of Pretoria	South Africa	54	58,324	Abe, O., et al 2005	6670
Oulun Yliopisto	Finland		58,585	Ojala, T. et al 2008	11714
Durban University of Technology	South Africa	51	5,898	James, S.L., et al 2018	7983
University of Cape Town	South Africa	50	83,875	Lozano, R. et al 2012	10602
University of Mauritius	Mauritius	45	4,296	Gurib-Fakim, A.2006	1396

PN= publications Number, TP= Total publications,

Figure 4 illustrates the distribution of research themes, trends, and topics within a dataset. Social Sciences dominate with 34.7%, followed by Business, Management, and Accounting at 24.4%. Environmental Science represents 15.0%, and Agricultural and Biological Sciences account for 7.7%. Smaller segments include Earth and Planetary Sciences, Economics, Econometrics and Finance, Energy, Arts and Humanities, Computer Science, and Engineering. This distribution suggests a multidisciplinary approach to sustainable tourism, with a strong emphasis on social and business aspects, reflecting the complex nature of sustainability issues that intersect with human behaviour, economic systems, and environmental concerns (Phung & Nguyen, 2023).

Figure 4. The research themes, trends and topics

Table 3 lists the top 10 authors contributing to sustainable tourism, dominated by South African researchers. C.M. Rogerson from the University of Johannesburg has the highest number of documents (48) and substantial total citations (8,736), indicating a strong influence in the field. The presence of authors from Mauritius, the United States, and New Zealand, particularly C.M.

Hall with an h-index of 84, suggests a global reach and international collaboration in sustainable tourism research. The h-index values indicate the authors' significant and sustained contributions to academia. Overall, the data reflects a concentration of research within certain regions and institutions, highlighting key individuals driving the academic discourse in sustainable tourism.

Table 3. The most 10 contributed authors

Author Name	DN	Country	H-Index	Affiliation	TC	TP
Rogerson, C.M.	48	South Africa	47	University of Johannesburg	8,736	471
Giampiccoli, A.	37	South Africa	16	Durban University of Technology	856	73
Saarinen, J.	35	South Africa	35	University of Johannesburg	4,463	164
Saayman, M.	35	South Africa	31	North-West University	3,517	188
Tichaawa, T.M.	25	South Africa	17	University of Johannesburg	713	70
Nunkoo, R.	23	Mauritius	43	University of Mauritius	7,177	119
Woosnam, K.M.	23	United states	44	University of Georgia	5,600	166
Hall, C.M.	20	New Zealand	84	University of Canterbury	30,398	723
Mbaiwa, J.E.	20	South Africa	22	University of Johannesburg	1,246	68
Mtapuri, O.	18	South Africa	13	University of KwaZulu-Natal	513	90

DN= Documents Number, TC=Total score, TP= Total publications,

Table 4 lists the top five articles on sustainable tourism from the Scopus database, ordered by citation score. The most cited is "Is overtourism overused? Understanding the impact of tourism in a city context" by Koens et al., published in 2018 with 447 citations, reflecting significant influence in the field. Close behind is Khadaroo et al.'s article on transport infrastructure and tourism with 445 citations. These works, along with the others listed, are pivotal in understanding diverse aspects of sustainable tourism, from economic impact to the response to global crises like COVID-19, emphasizing the interdisciplinary nature of the field (Persson-Fischer & Liu, 2021).

Table 4. The top 5 articles on Scopus database by citation score

Document title	Authors	Source	affiliation	Source	Citations
Is overtourism overused? Understanding the impact of tourism in a city context	Koens, K., Postma, A., Papp, B.	Sustainability (Switzerland)	University of Johannesburg	2018	447
The role of transport infrastructure in international tourism development: A gravity model approach	Khadaroo, J., Seetanah, B.	Tourism Management,	University of Technology, Mauritius	2008	445
Tourism and economic growth: The case of Mauritius	Durbarry, R.	Tourism Economics	University of Technology Mauritius	2004	381
Reset redux: possible evolutionary pathways towards the transformation of tourism in a COVID-19 world	Brouder, P.	Tourism Geographies	University of Johannesburg	2020	339
The importance of dry woodlands and forests in rural livelihoods and poverty alleviation in South Africa	Shackleton, C.M., Shackleton, S.E., Buiten, E., Bird, N.	Forest Policy and Economics	Rhodes University, South Africa	2007	339

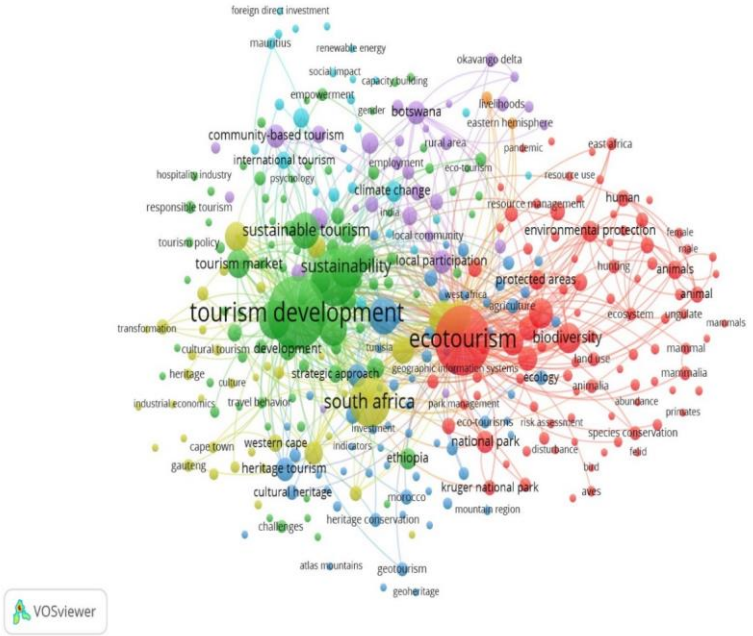

Figure 5. The research trends regarding tourism sustainability in Africa

Figure 5 shows the bibliometric analysis conducted using VOSviewer illustrates the interconnectedness of various topics within the domain of tourism sustainability in Africa over a 20-year period. The resulting visualization categorizes related topics into

distinct clusters, identifiable by color, which represent different thematic concentrations in the literature. The visualization underscores the multidimensional nature of tourism sustainability research in Africa, highlighting a comprehensive approach that encompasses ecological, economic, social, and cultural dimensions. The prominence of 'Ecotourism' and 'Sustainable Tourism' as central nodes reflects a global shift towards environmentally responsible travel, aligning with the United Nations Sustainable Development Goals (SDGs). Figure 5 shows the Current and Future Research Directions of the research in African context (Baker et al., 2020).

Table 6 Illustrates the over the two-decade span, research on tourism sustainability in Africa outcomes has been segmented into five main clusters, each denoting a specific thematic concentration and interconnectedness between various topics within the field. The table shows a comprehensive range of research themes within the realm of tourism, conservation, and possibly geographical studies, each with a distinct focus. The "Occurrence" metric likely indicates how often these topics appear in the literature, while the "Strength of keyword linkages" could measure how interconnected these topics are within the literature, possibly indicating the depth or impact of research in each area. This kind of table would be useful for academics and practitioners in the field to identify trends, focus areas, and the relative importance or maturity of different research topics.

Table 6. Comprehensive range of research themes and clusters

No	Cluster Name	Main Topics	Occurrence	Strength of keyword linkages
1	Red Cluster	Biodiversity	111	1312
		Protected Area	89	944
		Ecotourism	585	4680
		Environmental protection	53	799
		Ecosystem	22	287
2	Green Cluster	Tourism Development	634	4404
		Tourism Market	103	732
		Responsible Tourism	20	129
		Sustainable Tourism	153	864
		Ethiopia	53	284
3	Blue Cluster	Geoheritage	9	65
		Geotourism	25	179
		Climate Change	31	187
		Morocco	12	45
		Heritage Conservation	102	673
4	Yellow Cluster	South Africa	312	2481
		Industrial Economic	9	114
		Transformation	10	61
		Foreign Direct Investment	9	39
		Innovation	10	76
5	Purple Cluster	Community based tourism	65	308
		Local Participation	68	619
		Botswana	68	569
		Rural area development	27	218
		Employment	25	203

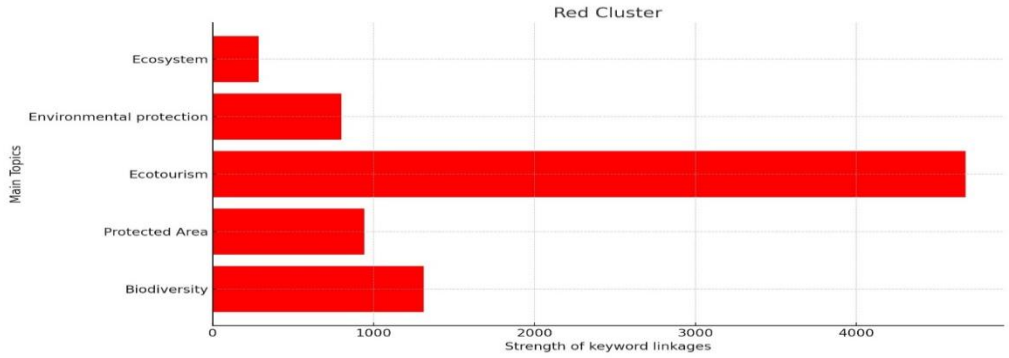

Figure 6 The red cluster

Figure 6 shows the red Cluster encompasses a range of main topics that are integral to the study of sustainable tourism and environmental conservation. The chart quantitatively represents the interconnectedness of specific keywords within this research domain, presumably measured by the frequency and context of their co-occurrence in academic literature. Biodiversity is shown as a foundational topic within this cluster, with a substantial strength of keyword linkages, indicating its critical importance and frequent discussion in relevant research. Protected Area follows, with a lower but still significant level of keyword linkage strength, suggesting its role as a key subject within the conservation discourse. Ecotourism has the highest strength of keyword linkages by a considerable margin, emphasizing it as a central theme within the Red Cluster. This indicates that ecotourism is a highly interconnected topic, likely discussed in various contexts, from economic impact to sustainable practices and conservation strategies. Environmental protection, while having fewer keyword linkages than Ecotourism, still holds a considerable measure of importance, reflecting its relevance in sustainability and conservation research. Ecosystem has

the lowest strength of keyword linkages among the listed topics. However, its presence signifies its role as an underlying concept that is essential to the understanding of the other topics within the Red Cluster. Red Cluster is characterized by a strong focus on biodiversity and ecotourism, signifying an intense academic interest in the natural aspects of sustainable tourism. The occurrence of topics such as 'Protected Area' and 'Environmental protection' indicates a considerable amount of research dedicated to the preservation of natural resources within the tourism sector. The strength of keyword linkages suggests a high level of integration between these topics, highlighting the importance of ecological considerations in African tourism (Bielański et al., 2022). Figure 7 revealed that the Green Cluster highlights a series of interrelated topics that coalesce around the concept of tourism, particularly within the contexts of sustainability, ethical practices, and economic considerations. Tourism Development is the most prominent topic within the Green Cluster, exhibiting the highest strength of keyword linkages. This indicates a considerable focus within the literature on how tourism is developed, including discussions on policies, economic strategies, infrastructural considerations, and the social impacts of tourism growth. Tourism Market is another significant topic, with a notable strength of keyword linkages. Its presence underscores the importance of market dynamics, consumer behavior, and market segmentation within the tourism industry's research discourse.

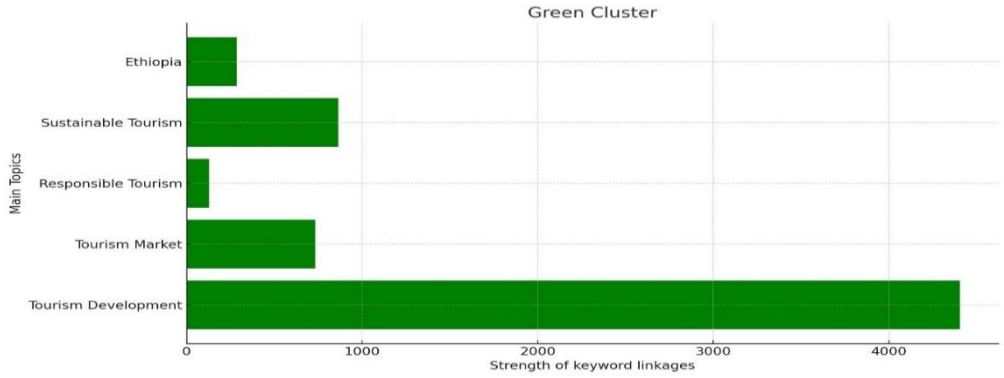

Figure 7. The green cluster

Responsible Tourism and Sustainable Tourism are closely related themes with a strong emphasis on ethical and sustainable practices in the tourism sector. The presence of these topics with a substantial degree of keyword linkages reflects a research trend towards environmentally and socially conscious tourism development. Ethiopia is featured as a geographical focus within the Green Cluster. While it has the fewest keyword linkages among the topics listed, its inclusion signifies the country's emerging or established role in the field of tourism research, possibly as a case study or a region of particular interest for sustainable and responsible tourism practices. Green Cluster revolves around the broader theme of 'Tourism Development' with a substantial emphasis on 'Sustainable Tourism (Jurkus et al., 2022).'The frequent mention of 'Tourism Market' points to an economic perspective, while 'Ethiopia' emerges as a case study within this cluster. The significant linkage strength denotes a robust discourse around the economic sustainability of tourism and its development.

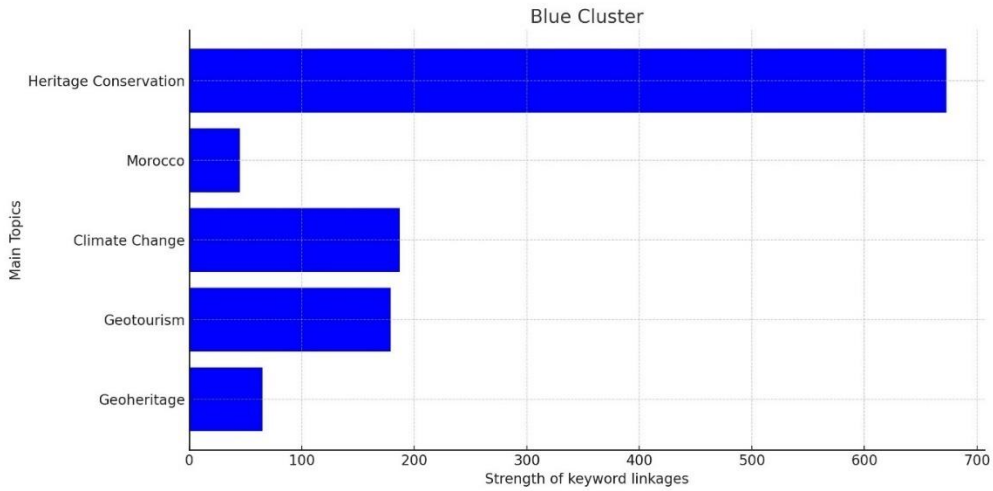

Figure 8. The blue cluster

The Blue Cluster chart in Figure 8 presents a quantitative overview of the research interest and interconnectedness between

various keywords related to heritage and environmental concerns within an academic context. Each topic's prominence is represented by the strength of its keyword linkages, which likely. Heritage Conservation emerges as the most significant topic within the Blue Cluster, with the highest strength of keyword linkages, suggesting a robust and complex network of research related to this topic, possibly indicating its centrality to the cluster's overarching theme. The value indicated on the chart is over 600, which outpaces other topics by a considerable margin. Morocco is the second most significant topic but with a substantially lower linkage strength, signifying a focused but less intricate web of research. This suggests that while Morocco is a relevant location for studies within this cluster, its research network might not be as dense or as interconnected as Heritage Conservation. Climate Change is presented with moderate importance, indicating a significant but lesser degree of integration into the cluster's main research themes. The strength of keyword linkages here is indicative of active, though not dominant, academic interest and study. Geotourism and Geoheritage have the least strength of keyword linkages within this chart, suggesting that these areas are emergent or niche fields within the cluster, with more isolated research networks. The linkage strength for these topics falls below 200, reflecting a nascent or specialized position within the academic discourse. The numbers provided in the chart are critical for understanding the weight and interconnection of each topic within academic discussions, shaping an understanding of current research priorities and potential future directions within the Blue Cluster's thematic scope.

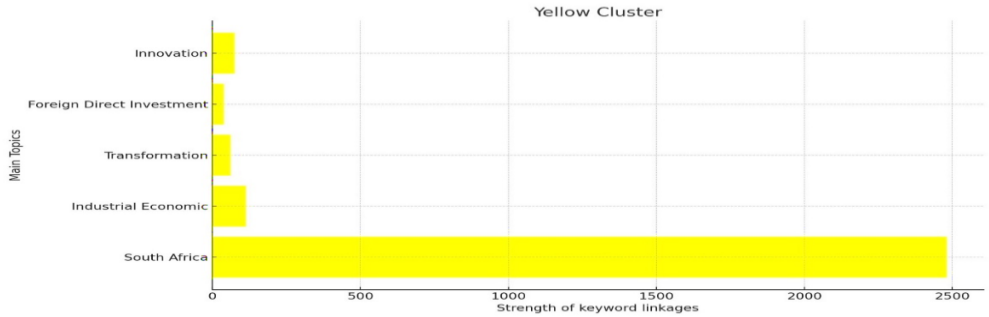

Figure 9. The yellow cluster

The Yellow Cluster chart in Figure 9 demonstrates an analysis of the main topics within a certain academic or thematic field, as indicated by the strength of keyword linkages, which quantifies the interconnections between keywords in the literature. The most prominent topic in the Yellow Cluster is “South Africa,” which has the highest strength of keyword linkages, exceeding 2000. This suggests that South Africa is a central focus within this cluster, potentially indicating extensive research and discussions linked to the country within the thematic scope of the cluster. “Innovation” is the next topic, with a strength of keyword linkages of just under 500. Although significantly lower than in South Africa, this indicates that innovation is a well-established topic in the cluster, with a moderate level of interconnected research. “Foreign Direct Investment” and “Transformation” have similar strengths of keyword linkages, both just above 100. This shows that these topics are part of the academic conversation within the Yellow Cluster but to a lesser extent than Innovation. Their relatively low linkage strength could suggest that they are either more specialized within the cluster or in newer areas of academic focus. Lastly, “Industrial Economic” has the lowest strength of keyword linkages, marginally above 0. This indicates that Industrial Economics is the least discussed or the most nascent topic within the Yellow Cluster. It may represent an emerging area of interest or a highly specialized niche that has yet to develop a robust network of research.

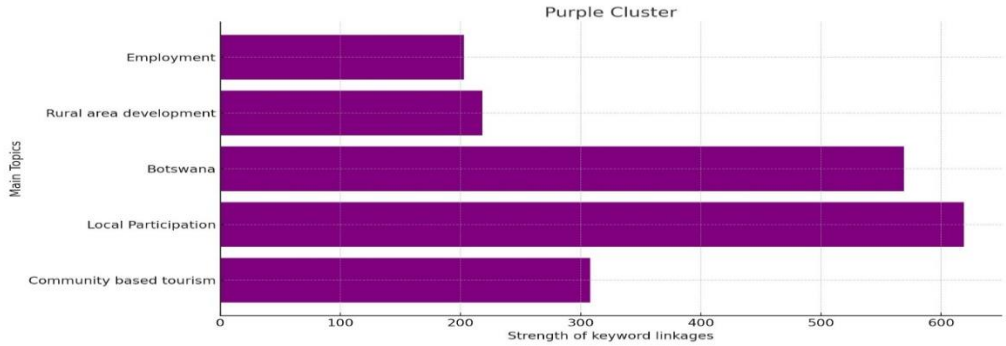

Figure 10. The purple cluster

The Purple Cluster chart in Figure 10 depicts a range of main topics distinguished by their strength of keyword linkages, which likely represent the interconnectedness and frequency of these topics within a specific field of academic research or discourse. "Community-based tourism" stands out as the topic with the highest strength of keyword linkages in this cluster, with a value

close to 600. This indicates a robust academic interest and a dense network of research related to community-based approaches in tourism, suggesting its importance and prevalence in the literature. "Local Participation" follows, with a linkage strength of slightly over 400. This shows substantial academic engagement with the topic, implying that local participation is a key subject within the Purple Cluster, possibly about community development or other socio-economic contexts. The topic of "Botswana" shows a moderate strength of keyword linkages, around 300 marks. This suggests that Botswana is a significant geographical focus within the cluster, with a reasonable amount of research interest and literature connections. "Rural area development" has a linkage strength of just above 200, indicating that this topic is actively discussed within the cluster but has fewer connections within the literature compared to the previously mentioned topics. The least linked topic, though still significant, is "Employment," with a linkage strength nearing 200. This indicates that employment is a relevant topic within the Purple Cluster, but it might not be as central or as heavily interconnected with other topics as community-based tourism or local participation.

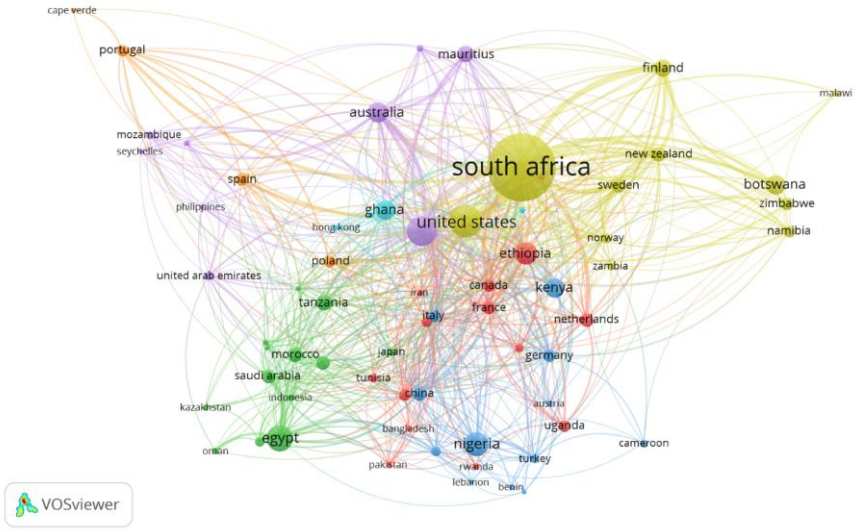

Figure 11. Regional centrality of sustainable tourism research in Africa

Figure 11 visualizes and represents the co-authorship network between various countries in the domain of tourism sustainability research with a focus on Africa. The network analysis reveals several prominent nodes and clusters that signify the intensity and scope of research collaborations. Key Observations: Dominant Nodes: South Africa stands out as the most dominant node, indicating its pivotal role in tourism sustainability research on the African continent. The United States also appears as a major contributor, reflecting significant international collaboration. Network Density: The dense interconnections between countries such as Germany, the Netherlands, France, and the United Kingdom suggest a strong European interest and contribution to the research field. Clusters and Regional Ties: The visualization exhibits distinct clusters, likely indicating geographical or thematic commonalities in research collaboration. Notably, there is a visible cluster comprising countries such as Egypt, Saudi Arabia, and Morocco, which may indicate a regional focus within the broader research context. Peripheral Contributors: Several countries appear as peripheral nodes, like Nigeria and Rwanda, which may be indicative of emerging involvement or specialized contributions within a niche of the broader research theme. Intercontinental Links: The network extends beyond Africa, with substantial contributions from countries across different continents, highlighting the global significance of sustainability in African tourism.

The centrality of South Africa in the network could be attributed to its status as a major tourist destination in Africa, as well as its research infrastructure and academic leadership in the field. The strong presence of the United States and European countries suggests a high level of interest and investment in the sustainability of African tourism, possibly due to its economic and environmental implications. The clustering of countries within the network might reflect shared research interests or socio-economic ties that facilitate collaboration. For instance, historical, linguistic, and cultural affinities can play a role in forming these clusters. The regional cluster including Egypt, Morocco, and Saudi Arabia suggests that North African and Middle Eastern countries are forming a collaborative research front, perhaps due to shared ecological concerns or tourism strategies. Peripheral countries in the network, while fewer in connections represent a critical component of the research ecosystem. Their specialized contributions can offer unique insights into local aspects of tourism sustainability, which are essential for a holistic understanding of the subject. The intercontinental links underscore the transnational nature of tourism sustainability challenges and the need for collaborative solutions (Musavengane et al., 2020; Khalid et al., 2022). They reflect the cross-border impact of tourism on ecological systems and the importance of sharing knowledge, policies, and practices to foster sustainable tourism that benefits all stakeholders. the network analysis offers valuable insights into the collaborative dynamics of tourism sustainability research related to Africa. It reveals the key players, the intensity of their interactions, and the potential for future collaborative attempts. The data suggests that while there is a strong core of collaborative activity, there is also room for increased participation from more countries, especially those within Africa, to ensure that local perspectives and knowledge are integrated into the global discourse on sustainable tourism.

Conclusion

The bibliometric analysis conducted over 20 years from 2003 to 2023 provides a comprehensive overview of the sustainability discourse within African tourism research. South Africa's leading position in sustainable tourism research is evident, with approximately 930 publications. This significantly surpasses Egypt's 144 and Nigeria's 122 publications, reflecting South Africa's established research institutions and historical focus on tourism as a key economic sector. The analysis shows fluctuating publication numbers with peaks in 2023 (210 publications), 2022 (208), and 2021 (185). However, there is an overall decline from 2018 onwards, suggesting shifts in research focus or changes in academic and socio-economic influences on sustainable tourism research. Institutional Contributions: The University of Johannesburg, with its 344 publications and a notable citation count (40,693 for a single document), emerges as a key player. Similarly, the University of Cape Town, with its substantial total publication count (83,875), underlines the importance of these institutions in the field. The field's interdisciplinary nature is highlighted by the prominence of Social Sciences (34.7%) and Business, Management, and Accounting (24.4%) in the research themes. The inclusion of institutions like Oulun Yliopisto (Finland) with significant citations (11,714) indicates the global relevance and collaborative nature of African sustainable tourism research. South African researchers dominate the list of top contributors, with C.M. Rogerson from the University of Johannesburg leading with 48 documents and 8,736 citations. The presence of authors from diverse countries like Mauritius, the United States, and New Zealand, including C.M. Hall with an h-index of 84, reflects the field's global reach. The most cited article in the Scopus database is "Is overtourism overused? Understanding the impact of tourism in a City Context" by Koens et al. (2018), with 447 citations, indicating its significant influence in the field. The VOSviewer visualization categorizes related topics into distinct clusters, with 'Ecotourism' and 'Sustainable Tourism' as central nodes. The Red Cluster, for example, focuses on biodiversity and ecotourism, while the Green Cluster revolves around tourism development and sustainable practices. The network analysis reveals South Africa as a central node in research collaborations, with significant international involvement from countries like the United States, Germany, the Netherlands, France, and the United Kingdom. This indicates the global significance of sustainability in African tourism and highlights the potential for increased collaborative efforts.

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