

Bibliometric visualization analysis of 'World Heritage' topic in web of science database using citespace



Suhua Wang^a  | Norliza Mohd Isa^a   | Lintong Li^b  | Keyi Shi^a 

^aFaculty of Built Environment and Surveying, Universiti Teknologi Malaysia, Johor Bahru, Malaysia.

^bFaculty of Design and Architecture, Universiti Putra Malaysia, Serdang Seri Kembangan, Malaysia.

Abstract On November 22-23, 2023, UNESCO will convene its 24th session of the General Assembly of States Parties in Paris. In light of this, to ensure the ongoing dynamism and adaptability of knowledge pursuits in the realm of world heritage, this paper conducts a quantitative analysis of world heritage documents within the Web of Science (WOS) database. Leveraging CiteSpace 6.1.R6 software, we visually examine 5,208 documents with the topic "World Heritage" retrieved from 1979 to 2023. The research outcomes reveal the following key insights: (1) The literature in the field of world heritage research demonstrates a steadily increasing trend, with notable explosive growth starting in 2009 and reaching its peak in 2019. (2) Examination of collaborations with prominent authors, affiliated institutions, and contributing countries highlights the absolute superiority of the United States and Australia in the world heritage domain, attributed to their rich heritage and robust academic systems. Despite China ranking second in document publications, there is a need for increased international collaboration. (3) The most influential keywords include "Community", "The Great Barrier Reef" and "Managing World Heritage". (4) Heritage tourism, encompassing satisfaction, motivation, loyalty, and place attachment, emerges as the largest keyword cluster in the field of world heritage. (5) Recent research trends and hotspots include "Risk", "Building", "Intention", "Support", and "Stone". The research results provide a more comprehensive and systematic overview perspective for the world heritage field, which fills the gap and promotes the knowledge pursuit in the world heritage field.

Keywords: world heritage, thematic trends, review

1. Introduction

On 22-23 November 2023, the United Nations Educational, Scientific and Cultural Organization (UNESCO) will be in the 24th session of the General Assembly of States parties in Paris. The proposed revisions to the Rules of Procedure of the General Assembly of States Parties to the 1972 Convention are hereby presented as part of the Culture Sector's effort to harmonize the equivalent rules for the seven assemblies of the culture conventions. The General Conference also requested the Director-General to submit a report at its next session 'on the follow-up to this resolution on raising the effectiveness of UNESCO's conventions in the field of culture' (UNESCO, 2023b). UNESCO aims to identify, protect, and preserve cultural and natural heritage worldwide, recognizing its outstanding value to humanity. This mission is outlined in the 1972 Convention concerning the Protection of the World Cultural and Natural Heritage. (UNESCO, 1972a). Heritage is the legacy for future generations from the past. Cultural and natural heritage are invaluable sources of life and inspiration, lived today and passed on to future generations. (UNESCO, 1972b). In short, UNESCO has exceptional cultural and natural value as a World Heritage Site. These sites reflect the diversity of the world's natural and cultural heritage and are considered to be of 'outstanding universal value' (Chen et al., 2023).

The perpetuation and prosperity of the world heritage paradigm necessitate incessant scholarly scrutiny to safeguard its inherent value (Zwegers, 2022). This demands a sustained commitment to scholarly inquiry that extends beyond the periphery of immediate exigencies (Er, 2023), acknowledging the dynamic nature of world heritage and the perennial need for informed custodianship. Continuous scholarly engagement, therefore, emerges not only as an intellectual obligation but also as an ethical imperative to ensure judicious stewardship (Giroux, 2020). Moreover, the rapid development of academics underscores the need for comprehensive retrospection, which is also needed for better prospects (Groom & Allen, 2014). Analyzing and reviewing the literature can provide insights into the hotspots and trends within a research field. This serves as a reference for related studies (Yang & Liu, 2022) and guides practical applications (Guo et al., 2022). Based on this, a literature review of the world heritage research published in all years will help us to understand and grasp the overall trend of world heritage development, guiding future scholars toward more informed, contextually resonant investigations.



The WoS is the world's oldest, most widely used, and most authoritative database of research publications and citations (Birkle et al., 2020; Liu et al., 2023). A meticulous examination of the Web of Science highlights a prevailing trend where most articles in the world heritage domain predominantly take the form of case studies. While these studies have contributed significantly, a conspicuous gap emerges, marked by the absence of systematic and comprehensive commentary and records within academic discourse (Allioui & Mourdi, 2023; Salloum et al., 2022). To address this deficiency, this paper endeavors to rectify the existing lacuna using CiteSpace 6.1.R6 bibliometric tool. CiteSpace 6.1 was used. R6, for an in-depth analysis of authors, countries, institutions, and keywords, systematically explores and analyzes the literature on world heritage from 1979 to 2023 ("First Twelve Sites Selected for World Heritage List," 1979). It can be used to visualize the evolution of knowledge structure, research hotspots, and research topics to help researchers obtain an overview of a field, find classic literature in this field, explore the research frontier in this field, and explain its trend evolution (Chen, 2016; Han et al., 2024).

The objective of this paper is to achieve the following three research objectives: (1) establish the number of publications in the field of world heritage and summarize each development period and critical article; and (2) discuss and analyze the published documents of authors, research institutions and countries and select representative documents for interpretation. (3) Determine the current research hotspots in world heritage, trace the evolution of research hotspots from 1979 to 2023, and determine the frontier and development trend of world heritage research. The research results can guide scholars in past dynasties to sail in the same academic field. Through this retrospective analysis, a systematic review provides a detailed explanation for promoting a multidimensional understanding of world heritage.

2. Research Methodology

2.1. Data collection

The data source for knowledge mapping analysis is significant because it is critical to the quality of subsequent analysis and reviews (Chen & Song, 2019; Zhuang et al., 2022), and a highly reputable and comprehensive database could provide a more accurate and reliable outcome. Our study selected the Web of Science core collection platform as the data source. This database covers a broad range of publications worldwide and has been proven to be reliable for knowledge mapping or scientometric analysis (Li et al., 2018; Zhang et al., 2020).

Web of Science (WoS) is one of the core global providers of knowledge, encompassing more than 50,000,000 articles covering 250 scientific categories and approximately 150 research areas; the articles' performance is assessed through different indicators, quantifying their impact in terms of citations (Gupta, 2021; Vlas & Lähdesmäki, 2023). Since the 2000s, publication output volume and citation metrics have become important parameters for assessing and ranking academic researchers' performance (Hall, 2011; Wahid et al., 2022). The Web of Science core collection platform includes ten individual databases related to journal articles, conference papers, and books for different research areas (Visser et al., 2021). Here, the Science Citation Index Expanded (SCI-E), Social Sciences Citation Index (SSCI), Arts and Humanities Citation Index (AHCI), Conference Proceedings Citation Index-Science (CPCI-S), and Conference Proceedings Citation Index Social Science and Humanities (CPCI-SSH), which cover more than 1200 representative journals worldwide and conference proceedings, were chosen as the data sources (Bornmann et al., 2014; Petr et al., 2021). These five databases not only offer rich bibliographic information but also citation information related to other publications; therefore, they are considered to be ideal sources for knowledge mapping analysis (Fang et al., 2018; Zhuang et al., 2022).

Table 1 shows the data collection process of this study. By introducing "World Heritage" and "Should include" UNESCO World Heritage " into the topic (TS), including the search title, abstract, author keywords, and Keywords Plus search field of the Web of Science (WOS) core collection, and keeping quotation marks, the data of the WOS (Web of Science) core collection are collected. The following 5,469 results were retrieved from the Science Citation Index Expanded (SCI-Expanded), Social Sciences Citation Index (SSCI), Arts & Humanities Citation Index (A&HCI), Conference Proceedings Citation Index – Science (CPCI-S), and Conference Proceedings Citation Index – Social Sciences & Humanities (CPCI-SSH) databases. In addition, since the first article on World Heritage was recorded in 1979, our research will span from 1979 to 2023 to cover necessary research to the greatest extent, especially early research. English was selected as the publishing language, and publications in other languages were excluded. There were 5256 results, and the retrieval date was October 25, 2023. Plain text documents, fully recorded and cited references, and CiteSpace were exported to ensure the accuracy of the data. Duplicate removal was carried out, and 5208 articles were obtained.

2.2. Selection of analysis tool

CiteSpace is a scientific knowledge mapping tool that uses a set of bibliographic records in the field of scientific research to generate a systematic review and visualize it (Chen, 2016; G. Wang et al., 2023). It was developed by Chen Chaomei of Drexel University and is based on a Java environment. The structure and dynamics of specific fields can be explored through cocitation analysis, keyword co-occurrence analysis and collaborative analysis (Zhuang et al., 2022). Using CiteSpace, authors, institutions, countries, keywords, citations, journals, and other information can be visualized with various color graphics.

CiteSpace provides a variety of visualization mode software(Wang & Lu, 2020). For example, collaborative analysis focuses on how researchers work together to produce new scientific knowledge (Li & Li, 2018), and a joint research in a research field is analyzed using a bibliometric approach in terms of collaborative networks among authors, institutions, and countries. (Zhang et al., 2023). Co-occurrence analysis evaluates information across different carriers to uncover the hidden meanings behind the co-occurrence of keywords and topics. It helps clarify the structure of scientific knowledge and identifies key research areas and trends.(Zhang et al., 2022; Zhang et al., 2023). Cluster analysis depends on clustering, the process of dividing objects into groups. Each element in a cluster is highly similar, whereas the degree of difference between different clusters is high(Kaufman & Rousseeuw, 2009; Wierzchoń & Kłopotek, 2018).

With respect to cluster view, timeline, and time zone, we can identify the knowledge base, essential milestones, critical hotspots, emerging trends, and key points of research articles (Shi & Yin, 2023). In addition, the graphics generated by CiteSpace are executed with nodes and lines. The types of nodes can represent authors, institutions, countries, terms, keywords, categories, cited authors, cited references, cited journals, etc., according to various research needs. The size of the node indicates the frequency of references or occurrences. The larger the node is, the greater the frequency. These lines represent the relationships between nodes. The thicker the line is, the closer the relationship between nodes(Fu et al., 2023).

In short, the software is developed by scientometrics and knowledge visualization technology and can objectively process a large amount of scientific literature data (Chen, 2006; Zhang et al., 2023). To date, CiteSpace has been used by users in more than 100 countries and regions around the world, and more than 28,000 related academic papers have been published (Zhang et al., 2023).

Table 1 The data collection and analysis process.

Research Protocol	Retrieve results and contents
Research Database	Web of Science Core Collection Science Citation Index Expanded (SCI-EXPANDED)--1970-present, Social Sciences Citation Index(SSCI)--1970-present, Arts & Humanities Citation Index(AHCI)--1975-present, Conference Proceedings Citation Index - Science(CPCI-S)--1990-present, Conference Proceedings Citation Index - Social Science &(CPCISSH)--1990-present
Editions	English
Language	All types
Publication type	January 1979-October 2023
Year span	Topic= "World Heritage"
Retrieval criterion	5208
Number of samples	6.1.R6(64-bit) Advanced
Data analysis CiteSpace	Collaboration analysis, cocitation analysis, co-occurrence analysis, cluster analysis
Analysis paths	

Source: Web of Science (WoS) Database.

2.3. CiteSpace parameter setting

The parameters were set in advance before processing the data (Dang et al., 2021): (1) the node type was selected according to the corresponding analysis; (2) the time slicing occurred from 1979 to 2023; (3) the length per time slice was "1"; (4) the threshold selection criterion was set for the top 25, which means extracting the top 50 data points of each time slice; and (5) the remaining parameters were set to default settings.

3. Results and Discussion

This section discusses three main topics: (1) an analysis of publishing volume to understand the annual number of published articles; (2) a collaboration analysis to identify relationships among authors, academic institutions, and countries; and (3) co-occurrence frequency of keywords, clustering, and hot keywords studied in the last five years to understand the development trend of the whole world heritage field.

3.1. Number of published documents

The search results show that from January 1979 to October 2023, there were 5,208 documents related to world heritage. Figure 1 shows the distribution trajectory of selected research documents from 1979 to October 2023. The number and characteristics of papers published in the World Heritage Site were divided according to publication year. Since 1979, the



number of documents on World Heritage sites has been increasing. It can be divided into three stages: the initial starting period (1979-1995), the steady growth period (1996-2008), and the prosperous development period (2009-present).

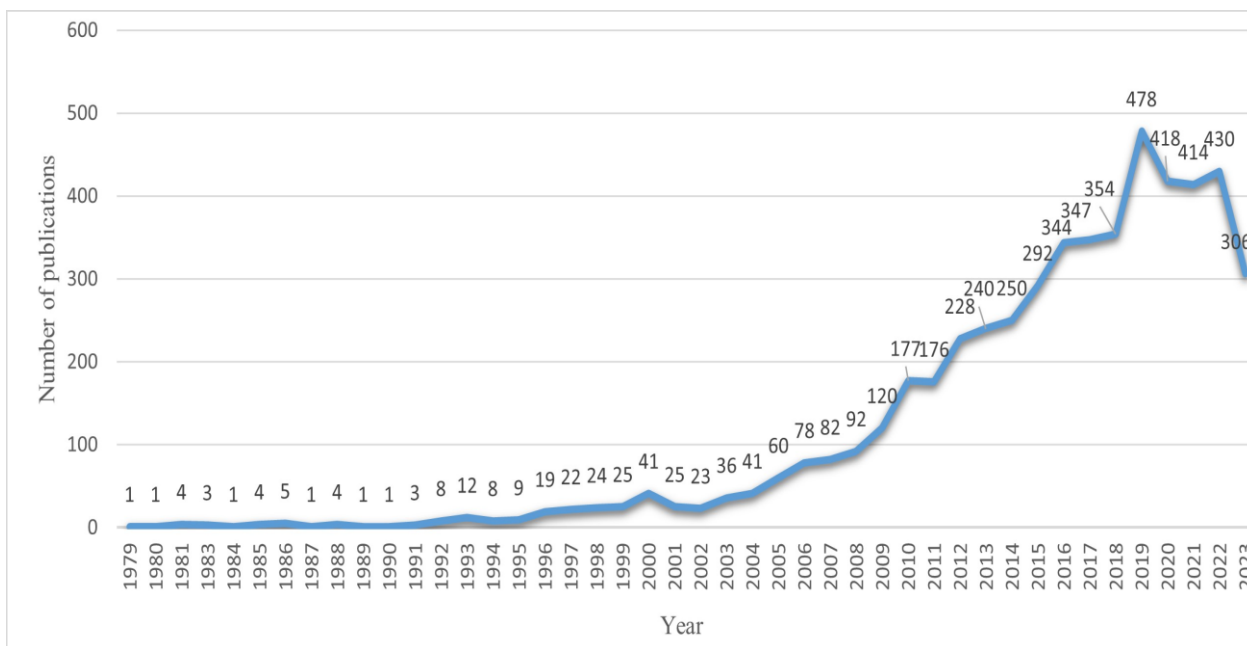


Figure 1 The distribution of the number of selected research documents from 1979 to October 2023.

Source: Web of Science (WoS) Database.

3.1.1. Initial start-up period (1979-1995)

The study of world heritage is in its infancy. 1979, the article "First Twelve Sites Selected for World Heritage List" (1979) was published in Environmental Conservation. This article clarifies that twelve cultural and natural sites in seven countries have become the first locations to be included in a World Heritage List, setting them aside for preservation for humanity. The Committee decided that every government party to the 1972 Convention could propose outstanding and universally important sites for addition to the List. This paper has opened the prelude to world heritage documents.

From 1979 to 1995, 66 documents were published, with an average of 5 per year. The peak of this period occurred in 1993, when 12 papers were published. The main reason was that the Canadian Seminar on the World Heritage Convention, toward a Greater Understanding and Use, was held at the Waterloo (1992), Canada.

3.1.2. Steady growth stage (1996-2008)

At this stage, the research and development of world heritage is more evident than before, and the importance of literature research has increased, showing a steady growth trend. During this period, 568 articles were published, accounting for 10.9% of the literature. The Affiliations of James Cook University and the Commonwealth Scientific Industrial Research Organization (CSIRO) published the most articles, which contributed to the research and protection of the Great Barrier Reef. For example, McKergow et al. (2005) reduced the amount of sediment discharged to the Great Barrier Reef (GBR) and determined the source of the exported sediment. Mapstone et al. (2008) evaluated the line fishing management strategy of the Great Barrier Reef, balanced protection and multisectoral fishery objectives, and fairly evaluated the performance of alternative management schemes according to diverse and often competing stakeholder agendas. Many studies have been conducted at the University of New South Wales in Australia in the Riversleigh World Heritage Area in northwestern Queensland, Australia, as Kear (2003) described two macropodoid endocranial casts from the early Miocene of the Riversleigh World Heritage Area in northwestern Queensland. Arena (2008) studied the Cenozoic terrestrial invertebrate fossil record in Australia and the Cenozoic plant giant fossil record in northern Australia.

During this period, humanity had a deep understanding of world heritage. Most developing countries have also actively declared that they are joining world heritage camps, and more scholars in developing countries have also noted the need for the protection of world heritage (Labadi et al., 2021). The growth of the world economy has promoted the development of tourism (Khan et al., 2020). Thai scholars Peleggi (1996) discussed the potential challenges of Thailand's heritage attractions and international and domestic tourism. They also analyzed the National Tourism Administration's promotion of heritage and the ideological meaning of heritage tourism related to the official historical narrative. Chinese scholars Li et al. (2008) have recognized a conflict between heritage protection and tourism development, especially in developing countries. Against the



background of extensively using world heritage to attract tourists, they studied and discussed the sustainability of the tourism development of these sites.

3.1.3. Prosperity and development period (2009-present)

Since 2009, all aspects of world heritage have attracted people's attention. With more developed countries and developing countries and regions joining the World Heritage Organization Committee, the number of world heritage sites has gradually increased. X. Wang et al. (2022) and documents on world heritage have also entered a new period of prosperity and development. During this period, the number of research documents on world heritage boomed and developed rapidly yearly. The total number of documents in the third stage was 4574 papers, accounting for 87.8% of the total documents. The themes of hotel, leisure, sports, and tourism became the main research directions in this period. Yang et al. (2010) analyze the determinants of international tourists in China, especially at world heritage sites and various tourist attractions. Prayag et al. (2013) studied the role of tourists' emotional experience and satisfaction in understanding behavioral intentions at World Heritage sites. Eslami et al. (2019) explained community attachment, tourism impact, quality of life, and residents' support for sustainable tourism development at world heritage sites. In 2019, the number of world heritage documents reached the historical maximum, with the number of documents reaching 478. Among them, research in the field of architecture had the most results in 2019. Shekofteh et al. (2019) assessed the characterization and damage of stones used at the Pasargadae World Heritage Site during the Achaemenian period. Briseghella et al. (2020) investigated the overall seismic response of Hakka Tulous, a massive traditional earth construction in Fujian Province, China, and part of the UNESCO list of World Heritage buildings.

In short, World Heritage sites have become the focus of research. Many local governments have introduced policies to strive to incorporate excellent local resources into world heritage, which has become a political obligation (Labadi et al., 2021).

3.2. Published authors and cooperative analysis

An author's publication count in a research field reflects their centrality, while coauthors' co-occurrence in a paper indicates the strength of their collaboration. (S. Zhang et al., 2023). We obtained an atlas of author cooperation by choosing the R6 software CiteSpace 6.1, the time interval 1979-2023, and the "go" cluster. In the author's cooperative analysis, 1,078 nodes and 955 lines were connected (see Figure 2).

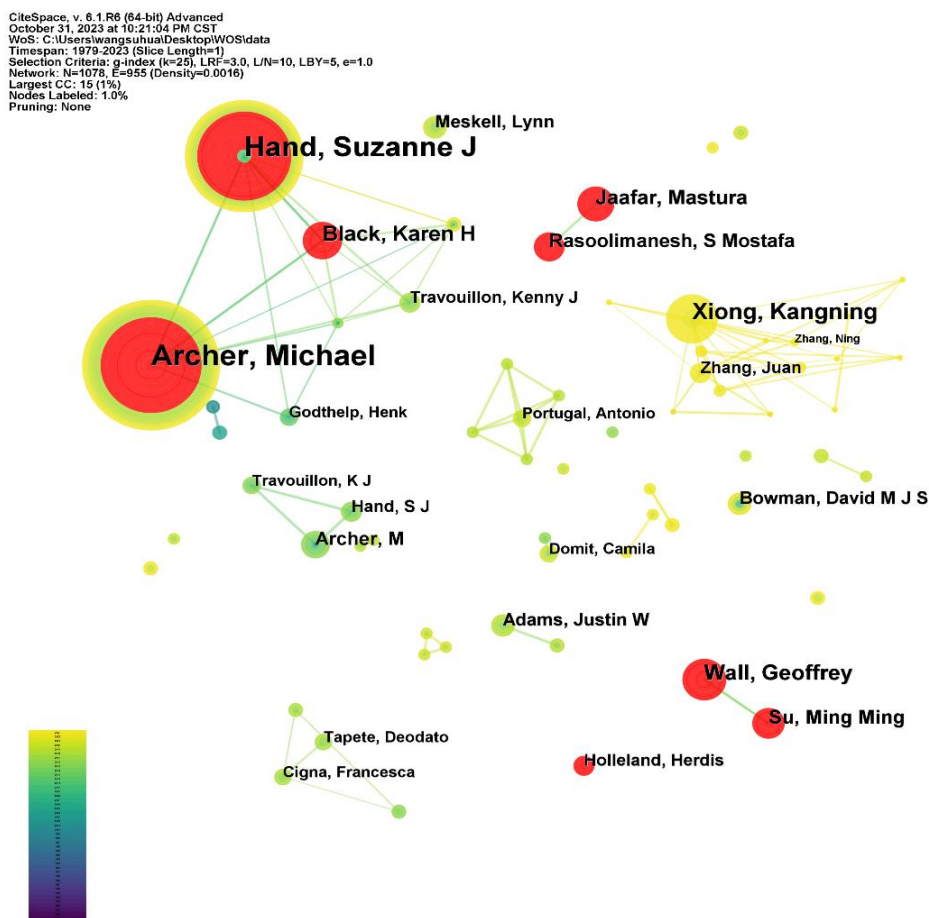


Figure 2 Network diagram of collaborative research of world heritage authors from 1979 to 2023.



Nodes and lines represent the map, and the corresponding author marks each node. The size of a node reflects the frequency of relevant data, and the larger the node is, the greater the frequency (Chen, 2016; Dang et al., 2021). The thickness of the lines indicates a solid cooperative relationship. As shown in Figure 2, the lines are thin and scattered, indicating that most authors are independent in academic research and that their cooperative relationships are weak (Dang et al., 2021; Li & Chen, 2016). The red dots on the map indicate that the author has also had many recent literature bursts, and the larger the dots are, the more documents there are.

In Figure 2, the most significant nodes and connections show that Archer, Michae, has published the most significant number of papers, reaching 46 academic papers (see Table 2 for details). Suzanne J is the second most published author, with 39 papers; Black Karen H is the fifth most published author, with 13 papers. The connections between the three nodes show that the authors have conducted cooperative research in many papers. They and a group from the University of New South Wales Sydney, Australia, have significantly contributed to the study of World Heritage. Most representatively, three scholars have conducted radioactive U–Pb dating for mammalian fossil sites in the Riversleigh World Heritage Area in northwestern Queensland, Australia, which provided a robust chronological framework for explaining the biological changes in Australia in the Neogene (Woodhead et al., 2016). This year, they studied a new category of old world trident bats (*Rhinonycteridae*) described in the cave sediments of the Riversleigh World Heritage Area in northwestern Queensland, Australia, in the early Miocene (Hand et al., 2023).

Another rapidly rising cluster is Xiong, Kangning, Zhang, Juan, and other scholars from Guizhou Normal University, China, whose primary research point is the relationship between tourism and protection and sustainable development in world heritage. Xiong, Kangning published 17 papers on world heritage from 2022–2023, and Zhang and Juan published seven papers. Among them, Xiong et al. (2023) actively contributed to protecting world natural heritage and sustainable tourism development. At the same time, the contents and objectives of the aesthetic value protection of world heritage sites were analyzed, the scope of protection and tourism display were clarified, and strategies for protection and sustainable tourism development based on aesthetic value identification were proposed. J. Zhang et al. (2023) described the conflict between heritage protection and development. The authors used KWHS Libo Huanjiang, a karst heritage site in southern China, as a case study to address the relationship between heritage protection and tourism industry development in the buffer zone and to realize the synergy between the two subsystems.

Su, Mingming from Renmin University of China and Wall, Geoffrey from the University of Waterloo of Canada have published more than 10 academic papers on the study of world heritage, and they have led some scholars to make contributions. Recent research has focused on the complex relationships among world heritage, tourism and communities in China and has proposed measures for important global agricultural cultural heritage systems and other heritage sites or protected areas to enhance the positive impact of tourism (Su et al., 2023).

Jaafar, Mastura, and Rasoolimanesh, S Mostafa, two scholars from Malaysia, have published more than ten papers, leading Malaysian scholars to achieve rich research results. They investigated and compared the influence of residents' perceptions of the impact of tourism on community participation and support for tourism development at urban and rural world heritage sites. The results reveal the significant differences between residents' perceptions and community participation in supporting tourism development in urban and rural tourist destinations (Rasoolimanesh et al., 2017). The relationships between these authors are usually between teachers and students but also between colleges and universities.

Table 2 lists 23 core authors in the field of World Heritage who have published more than six papers. Among them, nine authors have published more than ten papers. At the same time, the number of published papers, the first publication year, and the centrality of these scholars are counted. (Song et al., 2021). In Table 2, each author's centrality in the cultural heritage tourism field is 0. This confirms that the cooperation between authors in world heritage is low and needs to be strengthened (Freeman, 2002; S. Zhang et al., 2023).

3.3. Analysis of published institutions and cooperation

Understanding which institutions have participated in world heritage research will help in understanding the overall situation of this research and international cooperation between institutions. Therefore, this research conducted a mechanism-based analysis in CiteSpace 6.1.R6. Using institutions as network nodes generates 935 lines and 733 nodes, representing 733 core research institutions in world heritage research. Node size is determined by the number of papers published between them, and line strength varies according to the intensity of contact and cooperation between institutions. See Figure 3.

Table 3 shows that from 1979 to 2023, among the 733 major research institutions, 22 published 25 or more papers, accounting for 19.5% of the total published papers. Combined with Figure 3 and Table 3, we can see that the University of Queensland has the most significant number of points, with 120 papers published, and the strongest centrality is 0.07, which indicates that it has a strong influence in the field of world heritage research—followed by James Cook University, with 119 papers. Both institutions have conducted detailed research on various aspects of the World Heritage Great Barrier Reef and other World Heritage sites in Australia. For example, Wolfe and Byrne (2022), who studied the general situation of sea cucumber fisheries in the Great Barrier Reef, a world heritage site, synthesized knowledge about fish population parameters, determined the knowledge gap, and proposed measures to reduce the impact of fisheries, focusing on vulnerable and

endangered species. In addition, the Australian institutions include the University of New South Wales, the University of Tasmania, Griffith University, and the Australian National University. See Table 3 for details. Australian institutions have made significant contributions to the study of world heritage and have strongly cooperated. Centrality shows that these institutions in Australia have an in-depth influence on research worldwide.

Table 2 Core authors who have published more than 6 articles in the field of World Heritage, 1979-2023.

Serial number	Count	Centrality	Year	Authors
1	46	0	2007	Archer, Michael
2	39	0	2010	Hand, Suzanne J
3	17	0	2022	Xiong, Kangning
4	15	0	2014	Wall, Geoffrey
5	13	0	2010	Black, Karen H
6	12	0	2014	Jaafar, Mastura
7	11	0	2014	Su, Ming Ming
8	10	0	2015	Rasoolimanesh, S Mostafa
9	10	0	2000	Archer, M
10	8	0	2006	Bowman, David M J S
11	8	0	2016	Meskill, Lynn
12	8	0	2015	Adams, Justin W
13	7	0	2022	Zhang, Juan
14	7	0	2013	Hand, S J
15	7	0	2015	Travouillon, Kenny J
16	7	0	2018	Holleland, Herdis
17	6	0	2016	Domit, Camila
18	6	0	2009	Godthelp, Henk
19	6	0	2016	Tapete, Deodato
20	6	0	2019	Portugal, Antonio
21	6	0	2013	Travouillon, K J
22	6	0	2016	Cigna, Francesca
23	6	0	2019	Kaur, Gurmeet

Note: The year indicates the time when the author's paper was first published. *Source:* Web of Science (WoS) Database

CiteSpace v. 5.1.R6 (64-bit) Advanced
 November 1, 2023 at 10:07:41 PM CST
 WOS: C:\Users\wang\hual\Desktop\WOS\data
 Timespan: 1979-2023 (Slice Length=1)
 Selection Criteria: g-index (k=25), LRF=3.0, L/N=10, LBY=5, e=1.0
 Network: N=725, E=658 (Density=0.0035)
 Largest CC: 333 (45%)
 Nodes Labeled: 1.0%
 Pruning: None

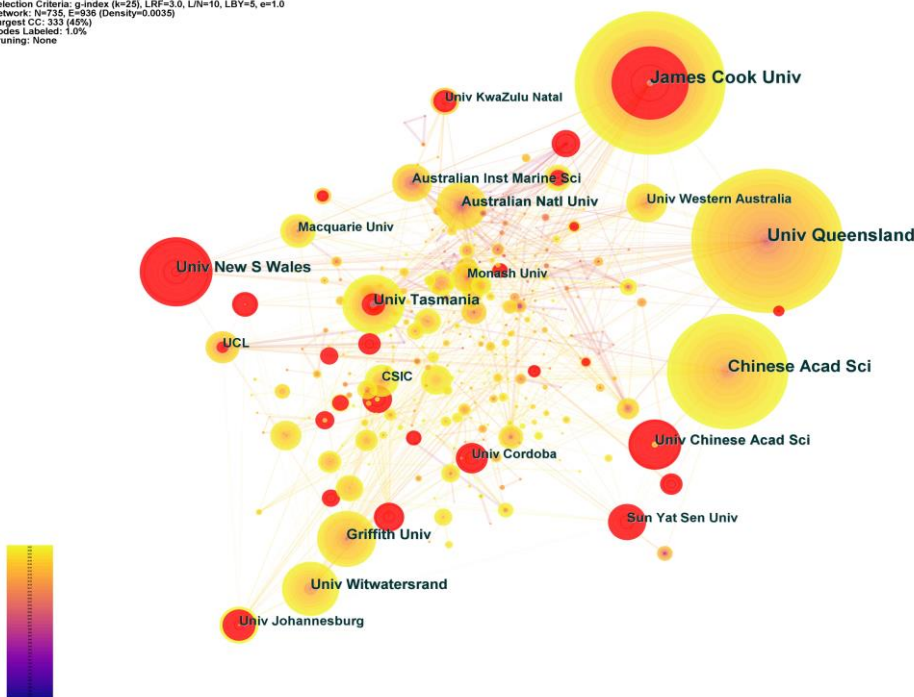


Figure 3 Network diagram of cooperative research of world heritage institutions from 1979 to 2023.



On the other hand, China once again added the Cultural Landscape of Old Tea Forests of Jingmai Mountain in Pu'er (China) as a world cultural heritage site in 2023 (UNESCO, 2023a), and the number of world heritage sites in China ranks second in the world (as of October 30, 2023). In Table 3, institutions that have published more than 25 articles occupy three positions: the Chinese Academy of Sciences, the University of Chinese Academy of Sciences, and Sun Yat-Sen University. There were 96, 42, and 30 articles published, respectively. Because China is rich in local world heritage resources, the main scope of research by these institutions, as mentioned above, is also local world heritage. For example, the Chinese Academy of Sciences and the University Chinese Academy of Sciences co-operation studied the premonsoon air quality of the Himalayas, a world heritage site at the world's highest peak (Rupakheti et al., 2017). To understand brand formation at world heritage sites, data from over 10,000,000 Sina Weibo users was analyzed to explore the branding process of four popular WHSs in Beijing: the Palace Museum, Great Wall, Summer Palace, and Temple of Heaven (Z. S. Wang et al., 2023).

At the same time, the Commonwealth Scientific Industrial Research Organization (CSIRO), University College London, and Oxford University are in Britain. Consejo Superior de Investigaciones Científicas (CSIC) in Spain. Witwatersrand University and Johannesburg University are in South Africa, and University Sains Malaysia is in Malaysia. Institutions and scholars in these countries have made outstanding contributions to the academic research of world heritage.

Judging from the connections of institutions, the regions of the British Commonwealth (of Nations) countries cooperate relatively closely. Although there are many published studies in China, there are few contacts with the institutions mentioned above globally, and the research is still independent. In the future, there is still much room for improvement in cooperation and exchanges between institutions in China and other countries.

Table 3 Institutions that have published 25 or more papers on World Heritage topics, 1979-2023.

Serial number	Count	Centrality	Year	Institutions
1	120	0.06	1998	Univ Queensland
2	119	0.05	2005	James Cook Univ
3	96	0.06	2004	Chinese Acad Sci
4	90	0.05	1990	Univ New South Wales
5	51	0.03	1997	Univ Tasmania
6	48	0.03	1999	Griffith Univ
7	46	0.02	2010	Univ Witwatersrand
8	42	0	2015	Univ Chinese Acad Sci
9	41	0.04	1999	Australian Natl Univ
10	34	0.01	1998	Australian Inst Marine Sci
11	33	0.02	2005	Univ Western Australia
12	31	0.02	2017	Univ Johannesburg
13	30	0.04	2018	Sun Yat Sen Univ
14	29	0.01	2004	Macquarie Univ
15	28	0.03	2006	CSIC
16	27	0	2013	Univ Sains Malaysia
17	27	0.04	1998	UCL
18	26	0	2019	Univ Cordoba
19	26	0.02	1999	Monash Univ
20	25	0	2016	Univ Castilla La Mancha
21	25	0.06	2014	Univ Oxford
22	25	0.02	2018	Univ Granada

Note: The year indicates the time when the institutional paper was first published. *Source:* Web of Science (WoS) Database

3.4. Analysis of published countries (or regions) and cooperation

To understand the cooperation between countries (or regions) and the influence of countries (or regions) in the field of world heritage, this study analyzes the number of national papers and cooperation options through CiteSpace6.1 R6. The National Cooperation Network of World Heritage Site data were obtained from 1979 to 2023. Using the social network analysis function of CiteSpace software, this paper explores the social network relations of different countries (or regions), which directly reflect the cooperative relations between countries and regions and, on this basis, determine the differences in their degree of influence (Chen et al., 2014; S. Zhang et al., 2023).

In the network diagram, each node represents a country or region, and connecting lines indicate cooperation between them. Thicker lines denote closer cooperation, while the size of the annual rings reflects the number of publications. The larger the annual rings are, the more publications there are. The purple outer ring represents countries (or regions) with centrality exceeding 0.1 (Yu et al., 2023), indicating that the country significantly influences world heritage, as shown in Figure 4. A total

of 151 nodes and 1199 connecting lines were generated, indicating that the authors who published world heritage-related documents came from 151 countries from 1979 to 2023.

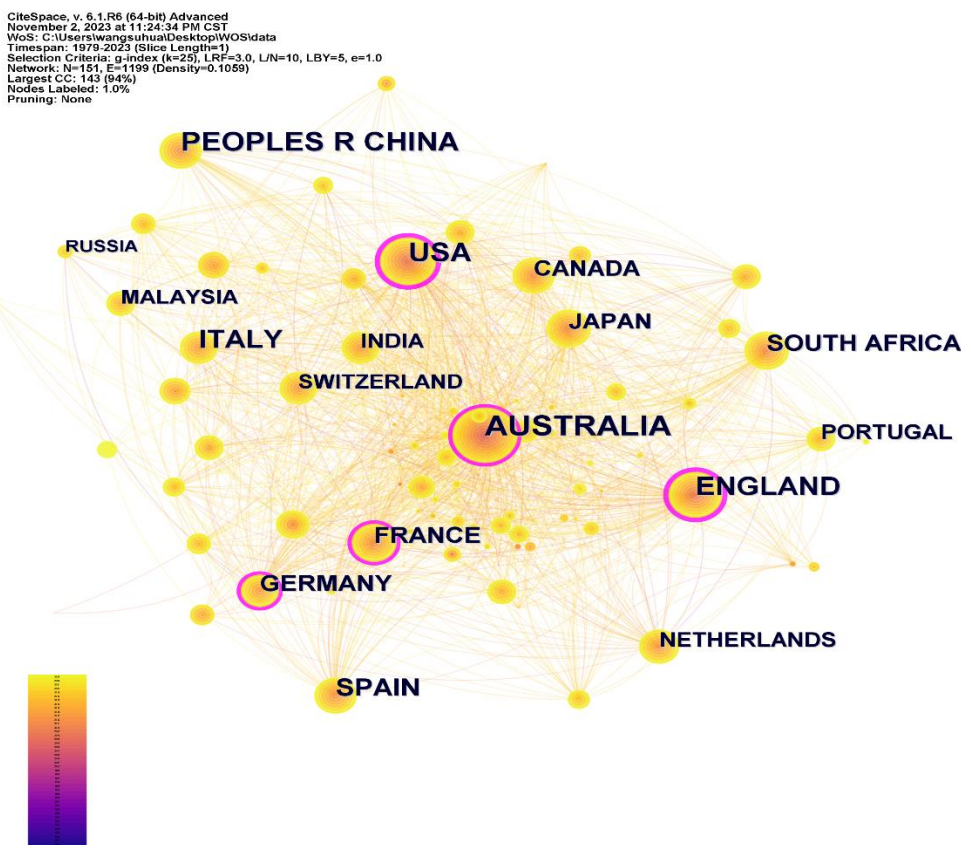


Figure 4 Network diagram of cooperative research of world heritage countries from 1979 to 2023.

As shown in the figure, Australia has published the most research papers on world heritage, with 991 papers accounting for 17.64% of the total, surpassing any other country. China, the United States, England, Italy, and Spain followed closely, accounting for 12.50%, 10.90%, 8.54%, 8.48%, and 7.37%, respectively.

Centrality represents the importance of each node in the network. The greater the correlation between nodes is, the greater the centrality value of the node, and the greater the participation of the node in national cooperation (D. Wang et al., 2022). Table 4 presents 16 countries that have published more than 100 articles on world heritage. Although Australia ranks first, the United States ranks third in the publication of world heritage documents, and the USA centrality value is the first, at 0.32, indicating that the United States is the leader in this field. For England, the centrality value is 0.3, and the centrality values for Australia, Germany, and France exceed 0.1. The above discussion shows that the United States, England, Australia, Germany, and France cooperate more with other countries in terms of world heritage. At the same time, although China ranks second among 151 countries in the number of documents on world heritage, its centrality is low, at 0.05, which is only higher than that of Japan, India, Malaysia, and Switzerland. It also shows that China, as a country with the most significant number of world heritage sites, needs more cooperation with other countries in world heritage. In the future, Chinese scholars can take this as a direction and strengthen exchanges and cooperation with scholars from other countries.

3.5. Keywords analysis

Keyword analysis is the most appropriate means to identify the evolution of this research field and related research hotspots and frontiers (Chen, 2006; Dang et al., 2021). Keyword co-occurrence analysis is also an effective way to clarify the structure of scientific knowledge, explore research, and discover hot research trends (Su et al., 2019). In the following sections, CiteSpace is used for keyword analysis to generate three maps: a keyword co-occurrence network map, a keyword cluster knowledge map, and a keyword timeline view.

3.5.1. Keyword co-occurrence network analysis

Because the keyword network is dense, it can be cut through, and essential connections are retained to improve its readability. In CiteSpace, two network-aided clipping strategies are provided: pruning sliced networks and pruning merged networks. We first choose Pathfinder as the network clipping method, while pruning sliced networks and pruning merged



networks are both selected (Chen, 2016). Using CiteSpace, we created a keyword co-occurrence map of world heritage research keywords from 1979 to 2023, with 849 and 2946 links. By merging overlapping keywords, such as "site" and "World Heritage site", the search term "world heritage" was removed. Figure 5(a) shows the keyword co-occurrence network map that appeared in the literature on world heritage from 1979 to 2023. According to the size of the nodes, we list the top 20 high-frequency keywords in Table 5.

Table 4 Countries (or regions) that have published more than 100 papers on World Heritage Topics, 1979-2023.

Serial number	Count	Centrality	Country
1	919	0.19	AUSTRALIA
2	583	0.05	PEOPLES R CHINA
3	568	0.32	USA
4	445	0.3	ENGLAND
5	442	0.08	ITALY
6	384	0.07	SPAIN
7	239	0.17	GERMANY
8	213	0.07	SOUTH AFRICA
9	194	0.1	FRANCE
10	181	0.02	JAPAN
11	173	0.06	CANADA
12	138	0.01	INDIA
13	133	0.06	PORTUGAL
14	125	0.07	NETHERLANDS
15	108	0.01	MALAYSIA
16	101	0.02	SWITZERLAND

Source: Web of Science (WoS) Database

High-frequency keyword co-occurrence analysis can reveal research hotspots in world heritage. In general, the greater the frequency of keywords being cited is, the greater the influence, and the greater the influence of keywords with a centrality value exceeding 0.1 (Fang et al., 2018). In the co-occurrence analysis, nodes with high frequency and high centrality are generally considered vital nodes, which shows that they strongly influence the whole network. By looking at these critical nodes, we can mine the rich information behind the nodes (Chen & Chen, 2003; Pan & Zhang, 2022). According to Table 5, the three keywords with the highest frequency of high centrality are Community, Great Barrier Reef, and Management, three research hotspots. The following subsections will discuss the main articles and related research hotspots related to these three aspects.

Table 5 Co-occurrence of the top 20 High-Frequency Keywords in World Heritage Research, 1979-2023.

Serial number	Count	Centrality	Keyword
1	446	0.03	world heritage site
2	334	0.05	cultural heritage
3	312	0.13	management
4	298	0.02	conservation
5	230	0.09	impact
6	228	0.08	climate change
7	166	0.08	world heritage area
8	158	0	model
9	146	0.04	tourism
10	115	0.05	biodiversity
11	110	0.04	protected area
12	103	0.14	great barrier reef
13	93	0.18	community
14	93	0.02	evolution
15	93	0.01	perception
16	92	0.01	landscape
17	91	0.09	diversity
18	78	0	behavior
19	76	0.04	sustainable tourism
20	76	0.04	vegetation

Source: Web of Science (WoS) Database



3.5.1.1. Community

In 2007, the World Heritage Committee added a fifth 'C'—Community—to its Strategic Objectives, highlighting the critical role of local communities in preserving World Heritage (UNESCO, 2007). In June 2019, we held the 17th International Forum on World Heritage and Legacy: Culture, Creativity, Contamination in Italy. The value of cultural heritage for sustainable and resilient human settlements is recognized in international documents and agendas. These documents underline the importance of protecting and enhancing places' identity values to create a heritage community and strengthen community resilience (Pinto et al., 2019). Community engagement is becoming a crucial part of heritage management processes, as participation and community engagement are often complex, multifaceted, open-ended, and unpredictable (Van Knippenberg et al., 2022).

At the same time, Dragouni and Fouseki (2018) point out community views and their potential to influence involvement in participatory decision-making to inform policy approaches to collaborative heritage tourism strategies that community ideals mainly drive intentions to participate, while their positive influence is more evident for community members with high place attachment. Gravagnuolo et al. (2021) believe that, regarding the sustainable development of world heritage, the Community is the fundamental actor that can promote positive reflection and implement civic responsibility and (cross-)cultural policies and that building a heritage community can be a practical starting point for the "circular" adaptive reuse of cultural heritage, stimulating not only its recovery but also community bonds, civic responsibility, and potential entrepreneurial activities for longer-term sustainable development. The latest research shows that with the development of the world heritage community, the reorganization community has also become the focus of scholarly research. For example, Jiang et al. (2023) suggested that during the transition to a tourism service community, the heritage community has absorbed an increasing number of new residents, and the community needs to undergo constant reorganization. All these explorations have developed a strong foundation for the world heritage community.

3.5.1.2. Great barrier reef

According to the analysis of the previous section, the Great Barrier Reef located in Australia has always been the focus of research on cooperation maps of scholars, institutions, and countries, and the status of the Great Barrier Reef in the world heritage field can be inferred. In the Outstanding Universal Value, the World Heritage Committee's Brief Synthesis states that as the world's most extensive coral reef ecosystem, the Great Barrier Reef is a globally outstanding and significant entity. The entire ecosystem was inscribed as a World Heritage site in 1981, covering an area of 348,000 square kilometers. The Great Barrier Reef (hereafter referred to as the GBR) includes extensive cross-shelf diversity, stretching from low water marks along the mainland coast up to 250 kilometers offshore. This wide range includes vast shallow inshore areas, mid-shelf and outer reefs, and waters more than 2,000 meters deep beyond the continental shelf to oceanic waters. The Great Barrier Reef is a site of remarkable variety and beauty on the northeast coast of Australia. It contains the world's largest collection of coral reefs, with 400 types of coral, 1,500 species of fish, and 4,000 types of mollusks. It also holds great scientific interest as a habitat for species such as the dugong ('sea cow') and the giant green turtle, which are threatened with extinction (UNESCO, 1981).

In more than 40 years of research on the Great Barrier Reef, the protection and pollution of the Great Barrier Reef have attracted the most attention from scholars. Haynes et al. (2000) studied the abundance of AB pesticides and herbicides, including organochlorine compounds, which have had extensive current and past applications in the intensive coastal agriculture industry of Queensland, as well as for a wide range of domestic, public health, and agricultural purposes in urban areas; the persistent nature of these types of compounds together with possible continued illegal use of banned organochlorine compounds increases the potential for continued long-term chronic exposure to plants and animals of the Great Barrier Reef. Devlin and Brodie (2005) pollution in the coastal regions of the Great Barrier Reef World Heritage Area and advanced differential transport of particulate versus dissolved nutrients are vital for the potential management of their generation in the Great Barrier Reef catchment. Smith et al. (2012) suggested that pesticide transport and potential toxicity in Queensland (QLD) catchments in agricultural areas are crucial concerns for the Great Barrier Reef (GBR). In 2009, a pesticide monitoring program was established as part of the Australian and QLD Governments' Reef Plan (2009). The latest research by Lubicz-Zaorski et al. (2023) revealed that manual macroalgal removal can provide rapid benefits and enhance inshore coral reef recovery. Through the involvement of community groups and citizen scientists, large-scale removal of macroalgae is a low-tech, high-impact, and achievable method for local reef management.

3.5.1.3. Management

As a result of strict selection criteria and scarce inscriptions under current inscription procedures, World Heritage inscription brings immense fame to property and is thought to increase the visibility of World Heritage host sites through public announcements of that inscription (Drost, 1996). Some studies show that World Heritage sites attract tourists and thus promote tourism development (Gao & Su, 2019; Su & Lin, 2014). Therefore, the management of world heritage becomes very important. However, Li et al. (2008) recognized that a conflict exists between heritage protection and tourism development, a

conflict pronounced in developing countries against the backdrop of widespread exploitation of World Heritage sites to attract tourists; management of this issue becomes critical for the sustainability of tourism development at those sites. Caust and Vecco (2017) indicated that this is particularly true for World Heritage sites in developing countries, which need more sustainable tourism and management skills and resources to manage their sites properly. Wang and Yotsumoto (2019) take China as an example. Local government participative management identified eight major conflict issues: land expropriation, ticket revenue distribution, vending rights, tourism management rights, house demolition, house building, entry restrictions, and village elections. This study has several practical implications for local authorities and UNESCO. Because of the uniqueness of World Heritage sites in the management of world heritage, more articles have focused on case studies, such as Ghimire et al. (2022) on the management of the socioeconomic impacts of these small businesses around the World Heritage site, Pashupatinath temple. Switzer et al. (2023) explored Shark Bay Marine Park, a UNESCO World Heritage Site. The sustainable management of this unique environment under climate change requires a quantified understanding of its vulnerability to natural hazards.

3.5.2. Keyword cluster knowledge map

CiteSpace 6.1 was used. R6 software was used to analyze keyword clustering and research hotspots. Keyword clustering is a keyword with similar research topics in the research field, forming an interconnected network cluster (Lu et al., 2021). Each cluster is identified by the high-frequency keywords contained in the articles, and the clusters are numbered from 0. #0 is the largest cluster, #1 is the second largest cluster, and so on. A keyword clustering network diagram is generated using the Pathfinder algorithm to slice one year based on world heritage document data from 1979 to 2023. The top 50 publications in terms of annual frequency were used to construct the keyword cluster network for each year. The network contains 23 clusters, and the Q value is 0.8214; $Q > 0.3$ means that the obtained network graph structure is significant. (Chen, 2016; Zheng et al., 2022). Figure 5(b) shows the top 20 clusters. The size of each cluster depends on the number of articles it contains (Dang et al., 2021). To better illustrate the results of keyword clustering, we combined the keyword timeline map (see Figure 6) and selected the top five keyword clusters as examples for explanation and analysis.

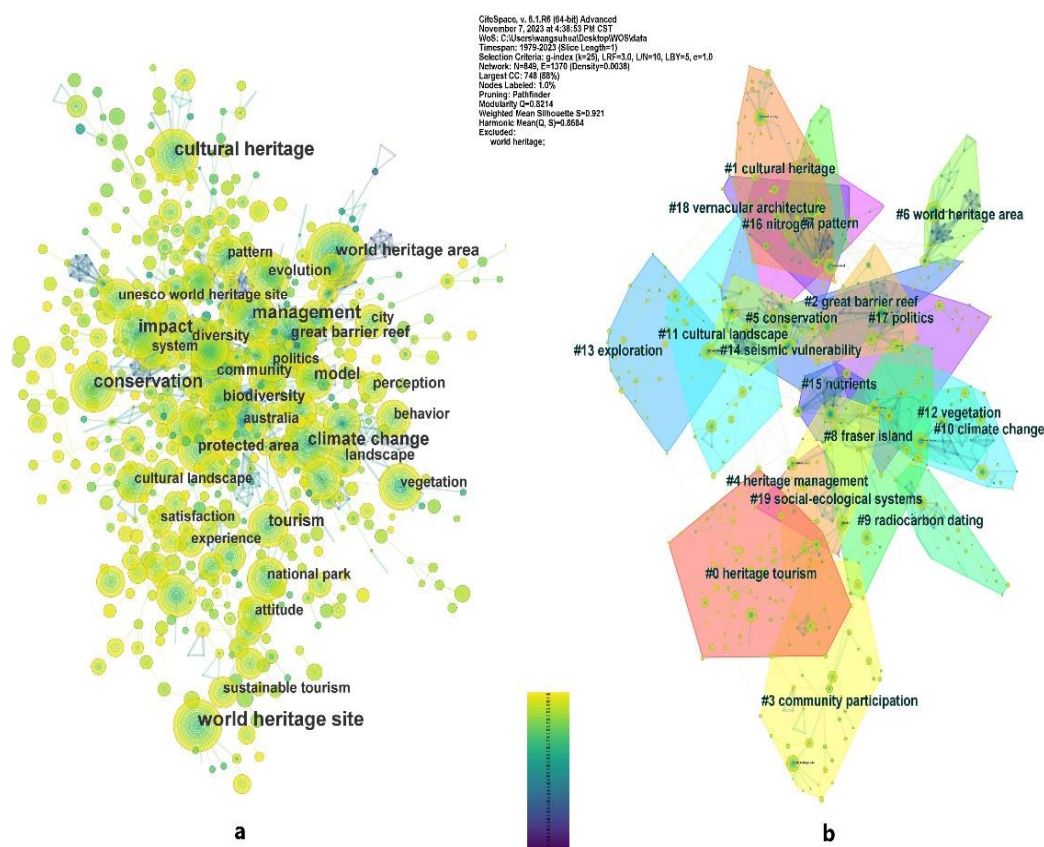


Figure 5 (a) Keyword co-occurrence network map of world heritage research from 1979 to 2023; (b) Top 20 clustering knowledge maps of keywords in world heritage research from 1979 to 2023.



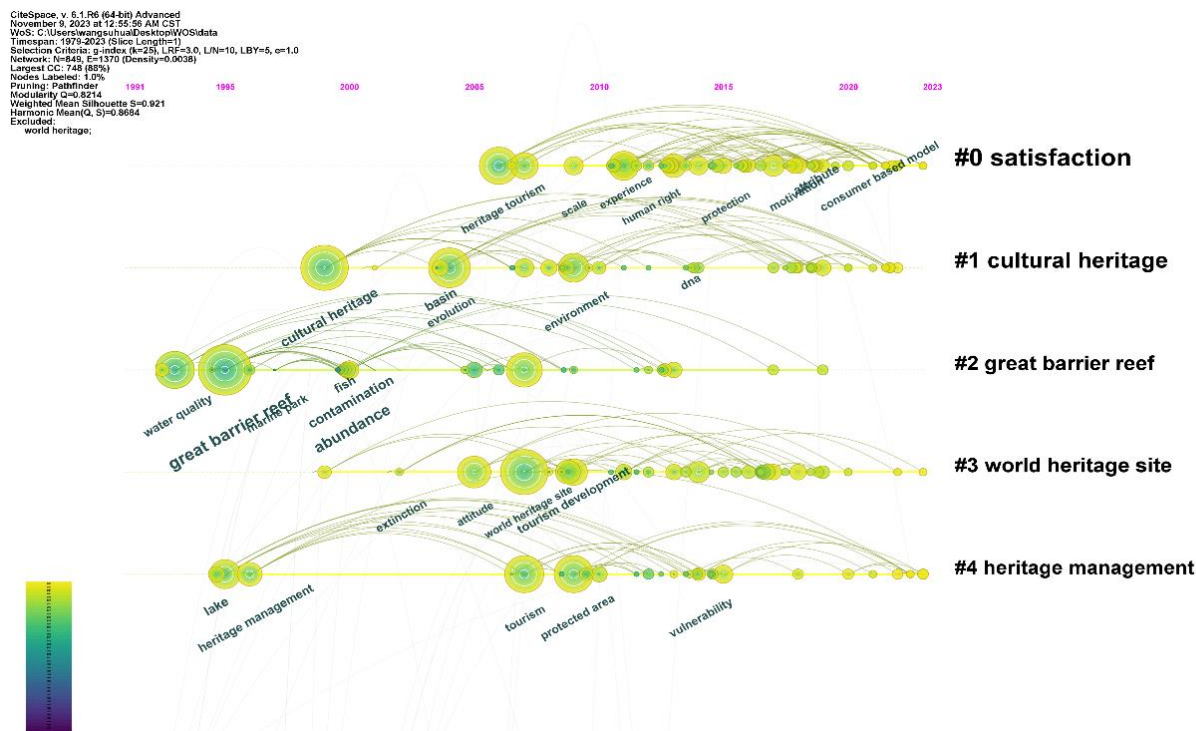


Figure 6 Timeline map of the top 5 world heritage keyword clusters from 1979 to 2023.

3.5.2.1. Cluster #0: Heritage tourism

As the largest cluster, heritage tourism contains keywords such as satisfaction, motivation, loyalty, and place attachment, as shown in Figure 6. This cluster keyword started in 2005, and there are still many related studies, such as the newly emerging keyword “consumers basic model”. representative research Jimura (2011) has examined economic, sociocultural, physical, and attitudinal changes in/around the World Heritage Site (WHS) Ogimachi since the WHS designation from the local communities' standpoint and proposed three main factors behind these changes: extensive and rapid tourism development after the WHS, the high level of appeal of a WHS status for domestic tourists, and local people's attitudes toward the conservation of the cultural environment and WHS status. In addition to its conservation plan, WHS Ogimachi must have a comprehensive tourist destination. Zhang and Smith (2019) aimed to extend the understanding of how Chinese domestic tourists and local communities understand and use the World Heritage Ancient Villages of Xidi and Hongcun. Understanding the affective and emotional content of the cultural and social interactions of tourists and residents at these sites illustrates the agency of both tourists and residents in making and remaking heritage values and meaning. Elassal et al. (2023) The survey was based on partial least squares (PLS) structural equation modeling and a structured questionnaire; the research aimed to analyze the satisfaction of visitors to historical mosques in the context of heritage tourism in Cairo, Egypt, Ibn Tulun Mosque.

3.5.2.2. Cluster #1 Cultural heritage

Cultural heritage is the second-largest cluster. Reconstruction, outstanding universal value, evolution, and urban heritage are included in this cluster, which began in 1997. Cultural heritage spans the whole-time axis. As the central cluster, scholars worldwide are trying to make contributions. Labadi (2007) presents the central values for which 106 sites have been nominated for inclusion on the World Heritage List. It analyses how these values have been used to represent the nation, the past, and cultural diversity and to construct national collective identities. Algeciras et al. (2016) take the Old Town of Camaguey in Cuba as an example. This World Heritage Site is a vital resource for promoting city liveability and sustainable development in the context of global climate change. The urban guidelines presented enable urban planners to rehabilitate and design cities that can reduce the impact of thermal stress in hot and humid climates. Koch and Gillespie (2022) considered the Greater Blue Mountains World Heritage Area (GBMWHA), which is located in New South Wales, Australia. The authors found that a development proposal to raise a storage dam wall triggers significant problems for protecting natural and cultural heritage features across the GBMWHA landscape. This paper focuses on protecting natural World Heritage properties for sites with significant cultural assets that fall short of the World Heritage designation 'outstanding universal value' standard for cultural significance. In this context, we recommend reconsidering the rigid natural/cultural heritage binary of World Heritage classifications.

3.5.2.3. Cluster #2 Great barrier Reef



This cluster's keywords include water quality, heavy metals, model, and soil. Scholars worldwide, especially Australian scholars, have thoroughly studied the Great Barrier Reef, a famous world heritage site. This cluster was studied earlier in the keyword timeline diagram, but research on the Great Barrier Reef keyword cluster decreased after 2010. Kroon et al. (2016) support management decisions that will achieve desired ecological outcomes for the GBR and identify potential improvements to current policies and incentives and changes to current agricultural land use based on overseas experiences and Australia's unique potential. The Great Barrier Reef World Heritage Area (GBRWHA) hosts one of the world's most prominent seagrass meadows and provides many ecosystem services to the associated communities (e.g., nursery habitat, coastal protection, carbon sequestration, etc.) (Losciale et al., 2022). Through an online survey of recreational marine users, Losciale et al. (2022) assessed public awareness of the role seagrasses play, their benefits, and threats to seagrasses in the GBRWHA compared to coral reefs.

3.5.2.4. Cluster #3 World Heritage Site

The cluster of world heritage sites mainly studies various problems of heritage sites, including tourism development, sustainable tourism, community participation, and resident perceptions. World heritage sites have a massive number of keywords. In Figure 6, the larger the point is, the more keywords there are, which benefits from the increase in the number of world heritage sites. Research on this cluster of world heritage sites began in 1998 and is still developing. For example, Turton (2005) describes the environmental impacts of tourism and recreation activities in the World Heritage-listed rainforests of northeast Australia; tropical rainforests are characterized by their low resistance and present management strategies for sustainable visitor use of the protected area. Compton et al. (2013) explored the spatial variation in the assemblage composition of benthic macrofauna across the intertidal part of the World Heritage Dutch Wadden Sea using three years of biomass data. He then identified the relative importance of six environmental variables for explaining and predicting changes in assemblage composition across the intertidal areas of the Wadden Sea using generalized dissimilarity modeling (GDM). Li et al. (2023), using a case study of the Wulingyuan Scenic and Historic Interest Area, a World Heritage Site in China, found that residents' sense of place and place meanings were diverse, varied, and affected by changes in their livelihoods and the economy resulting from increased tourism. Adaptive comanagement planning that pays attention to residents' diverse and changing place meanings is essential, even though it may be challenging to implement in heavily touristified areas.

3.5.2.5. Cluster #4: Heritage Management

This cluster includes keywords such as sustainable development, rock art, historic cities, and protected areas. Figure 6 shows that the heritage management cluster is still a research hotspot. As world heritage develops, more problems will arise, and effective management can better protect it (Somuncu & Yiğit, 2005). The representative cases are Stenseke (2009) in his article, and several Swedish World Heritage cases serve as points of departure for a better understanding of the prerequisites and critical aspects of increased local involvement in heritage landscape management. The findings show that trust, communication and local influence are vital ingredients in a participatory approach. Communication and comanagement are central competence areas for landscape management and planning executives. Allan et al. (2017) used globally consistent data sets to show that human pressure has increased in 63% of World Natural Heritage Sites (NWHSs) since 1993 and across all continents except Europe. This suggests that many NWHSs are rapidly deteriorating and are more threatened than previously thought, requiring human beings for sustainable development and more protection. This study offers new insights into the most significant threats to natural and mixed World Heritage sites in developed countries as considered by their management. In addition, management's capacity to deal with threats is examined.

3.5.3. Keyword burst node analyses

In CiteSpace, the burst nodes represent the most active area of the field or the emerging trend of the research (Chen, 2016). Keywords burst nodes refer to keywords with a sharp increase in frequency. Keyword burst node analysis is a helpful analysis method for finding keywords that have received special attention from relevant scientific circles in a certain period (Cheng et al., 2018). This approach is valuable for analyzing research frontiers, predicting trends, and mining hot spots (Liu et al., 2019). Table 6 lists the use of CiteSpace, keyword burst analysis, and the strength and duration of keyword bursts in the last five years from 2019 to 2023; as shown in Table 6, risk, building, intention, support, and stone are emerging and active research hotspot keywords in recent years until 2023. The following subsections analyze these keywords.

3.5.3.1. Risk

In recent years, human beings have realized that improving world heritage protection requires a reasonable risk assessment of world heritage to prevent irreversible damage from occurring again (Dastgerdi et al., 2022). Prabowo et al. (2023) suggested that the context of the World Heritage site on the possible urban-scale support services customized for urban heritage areas reduces the risk of sudden integration of urban-scale support services, which must be aligned with the purpose of the city, or the World Heritage site, to be specific.

Table 6 Keyword burst node strength and duration in the world heritage field in the past five years, 2019-2023.

Serial number	Keywords	First Year	Strength	Outbreak duration (year)
1	authenticity	2008	6.67	2019 ~ 2020
2	satisfaction	2017	5.4	2019 ~ 2020
3	power	2019	5.13	2019 ~ 2020
4	performance	2014	5.05	2019 ~ 2021
5	stable isotope	2019	4.67	2019 ~ 2020
6	tourist	2019	4.67	2019 ~ 2020
7	risk assessment	2019	4.23	2019 ~ 2020
8	place attachment	2018	4.09	2019 ~ 2020
9	community participation	1999	5.07	2020 ~ 2021
10	risk	2020	5.06	2020 ~ 2023
11	trend	2020	4.69	2020 ~ 2021
12	preference	2020	4.22	2020 ~ 2021
13	building	2014	4.55	2021 ~ 2023
14	intention	2019	4.51	2021 ~ 2023
15	support	2018	4.24	2021 ~ 2023
16	stone	2016	3.94	2021 ~ 2023

Source: Web of Science (WoS) Database

3.5.3.2. Building

There are 34 published documents in this research hotspot, among which the number peaked in 2021, and 11 documents were published. The latest researcher is Mangeli et al. (2023). His manuscript discusses preliminary results on the structural and seismic performance of the Mosque-Cathedral of Cordoba, a UNESCO World Heritage site. To the authors' knowledge, this is the first time that a macromodeling approach with solid elements has been presented for the seismic assessment of heritage buildings using the OpenSees framework. The methodology to do so is also presented. Apart from showing how advanced numerical analyses can provide helpful information for assessing existing damage to monumental buildings, this work aims to assess the vulnerability and safety of one of the most emblematic mosque-like buildings in the world.

3.5.3.3. Intention

The keyword "intention" first appeared in 2019 with 20 documents. In the past three years, 15 articles broke out, accounting for 75% of the total keywords, followed by four articles in 2021, 7 in 2022, and 4 in 2023. The primary analysis unit of this keyword is the intention of tourists and residents; for example, Dai et al. (2022) aimed to investigate the respective impact of visitors' awareness of the world and national heritage status on the existential authenticity perceived at the heritage site, affective city image, and behavioral intention. The results demonstrate that cultural heritage designation, whether a world or a national designation, when recognized by domestic visitors, determines the shaping of a positive affective image of the city hosting the heritage site and visitors' future intentions. In addition, visitor awareness of the world and national status do not condition affective city image or behavioral intentions similarly.

3.5.3.4. Support

As shown in Table 6, this keyword first appeared in 2018 and mainly broke out from 2021 to 2023. By 2023, a total of 28 documents had been published. The documents of these keywords mainly discuss government or community residents' support for world heritage. For example, Darvishmotevali et al. (2023), design/methodology/approach Partial least squares structural equation modeling using SmartPLS 3 software was applied to analyze data collected from 473 residents of the Miankaleh Biosphere Reserve, Iran, to introduce and evaluate a model of host community support for sustainable tourism

development (SSTD) based on the influential factors contributing to community support in a biosphere reserve. The findings reveal that locals' community support is affected by their environmental awareness, opportunity, and attitudes toward SSTD.

3.5.3.5. Stone

This research hotspot first appeared in 2016, and the primary outbreak was 14 related research publications from 2021 to 2023. The most recent representative article is Ilinca et al. (2023), which explores and documents Eocene limestones/stones from Albesti village (Arges County, Romania) regarding the relationships among geology, heritage, and cultural heritage. This study emphasizes Albesti Limestone as an essential heritage site (the Albesti Nummulitic Limestone Nature Reserve, established in 1954) and a significant heritage stone of national interest that could play a substantial role in heritage preservation, geoeducation, and tourism development.

5. Final Considerations

This paper embarked on a transformative journey, leveraging the potent analytical capabilities of Citespace to scrutinize the multifaceted dimensions of world heritage research. The results provide a profound understanding of the development and evolution of the world heritage tourism field from 1979 to 2023. The study transcends a mere empirical overview, offering subsequent scholars a panoramic understanding of the intellectual lineage they inherit. This comprehension extends beyond the chronological sequence of scholarly works, empowering scholars to discern lacunae, build upon existing knowledge, and chart innovative trajectories for future exploration. This summary emphasizes three key points.

First, world heritage is characterized by its multidisciplinary nature and expansive scope, with an annual increase in topics covered and publications. This upward trajectory reflects dynamic changes over the past 44 years. We divide this process into three stages and introduce them, which are shaped by the intricate interplay of societal, technological, and environmental transformations. This evolution underscores the adaptability of the world heritage paradigm to the ever-shifting landscape of our global context.

Second, with the cooperation of lead authors, affiliated institutions, and contributing countries, the USA and Australia have achieved an absolute advantage. This advantage, rooted in their rich and diverse heritage, effective protection laws, academic achievements, international cooperation, government support, and robust propaganda culture, positions the country as a leader in world heritage research and conservation. Despite China having the most significant number of world heritage sites, there is a call to strengthen research and cooperation across all facets, providing a directive for future scholars. This global perspective deepens our understanding of how cultural, regional, and geopolitical factors influence the thematic and methodological contours of world heritage research. Third, identifying high-frequency keywords such as community, management, protection, and impact proves invaluable in determining the central theme of world heritage research. Cluster analysis of the top five keywords, particularly in heritage tourism, visually maps the knowledge structure within the field. Combined with the keyword timeline, it allows us to trace the evolutionary path of research themes, unveiling shifts in academic emphasis over the years and adding a dynamic dimension to the research. In the last five years, keywords such as risk, building, intention, support, and stone have emerged as new areas of interest and innovation in world heritage research. These analytical components significantly contribute to the academic rigor and relevance of the paper, facilitating a meticulous exploration of the prospects of world heritage research and providing readers with a multifaceted understanding beyond traditional literature reviews.

However, this study has limitations. The data exclusively sourced from the Web of Science (WOS) database neglect potentially valuable information from other databases. The focus on English-language articles excludes research findings from non-English scholars studying local, regional, or national cases. Quantitative bibliometric analysis requires a more in-depth exploration of specific periodicals and cited documents. Additionally, integrating qualitative methods or textual analysis could enhance the richness of the study, offering a more comprehensive understanding of the world heritage research landscape. It is hoped that future scholars will delve more deeply into these aspects, contributing to the overall academic influence and development of world heritage research.

Acknowledgments

I wish to express my deepest gratitude and appreciation to my supervisor, Dr. Norliza Mohd Isa, for the consistent support, patience, motivation and immense knowledge through my PhD journey, especially in the unexpected times of turbulence. Her wealth of expertise, advice, and encouragement made my doctoral involvement achievable.

Ethical considerations

Not applicable.

Conflict of interest

The authors declare no conflicts of interest.

Funding

This research did not receive any financial support.

References

- Algeciras, J. A. R., Consuegra, L. G., & Matzarakis, A. (2016). Spatial-temporal study on the effects of urban street configurations on human thermal comfort in the world heritage city of Camagüey-Cuba. *Building and Environment*, *101*, 85-101.
- Allan, J. R., Venter, O., Maxwell, S., Bertzky, B., Jones, K., Shi, Y., & Watson, J. E. (2017). Recent increases in human pressure and forest loss threaten many Natural World Heritage Sites. *Biological Conservation*, *206*, 47-55.
- Allioui, H., & Mourdi, Y. (2023). Exploring the Full Potentials of IoT for Better Financial Growth and Stability: A Comprehensive Survey. *Sensors*, *23*(19), 8015.
- Arena, D. A. (2008). Exceptional preservation of plants and invertebrates by phosphatization, Riversleigh, Australia [Article]. *Palaios*, *23*(7-8), 495-502. <https://doi.org/10.2110/palo.2006.p06-142r>
- Birkle, C., Pendlebury, D. A., Schnell, J., & Adams, J. (2020). Web of Science as a data source for research on scientific and scholarly activity. *Quantitative Science Studies*, *1*(1), 363-376.
- Bornmann, L., Leydesdorff, L., & Wang, J. (2014). How to improve the prediction based on citation impact percentiles for years shortly after the publication date? *Journal of Informetrics*, *8*(1), 175-180.
- Briseghella, B., Colasanti, V., Fenu, L., Nuti, C., Spacone, E., & Varum, H. (2020). Seismic Analysis by Macroelements of Fujian Hakka Tulous, Chinese Circular Earth Constructions Listed in the UNESCO World Heritage List [Article]. *International Journal of Architectural Heritage*, *14*(10), 1551-1566. <https://doi.org/10.1080/15583058.2019.1618973>
- Caust, J., & Vecco, M. (2017). Is UNESCO World Heritage recognition a blessing or burden? Evidence from developing Asian countries. *Journal of Cultural Heritage*, *27*, 1-9.
- Chen, C. (2006). CiteSpace II: Detecting and visualizing emerging trends and transient patterns in scientific literature. *Journal of the American Society for information Science and Technology*, *57*(3), 359-377.
- Chen, C. (2016). *CiteSpace: a practical guide for mapping scientific literature*. Nova Science Publishers Hauppauge, NY, USA.
- Chen, C., & Chen, C. (2003). *Mapping scientific frontiers*. Springer.
- Chen, C., Dubin, R., & Kim, M. C. (2014). Emerging trends and new developments in regenerative medicine: a scientometric update (2000–2014). *Expert opinion on biological therapy*, *14*(9), 1295-1317.
- Chen, C., & Song, M. (2019). Visualizing a field of research: A methodology of systematic scientometric reviews. *PLoS one*, *14*(10), e0223994.
- Chen, G., Yang, R., Zhao, X., Li, L., Luo, L., & Liu, H. (2023). Bibliometric Analysis of Spatial Technology for World Heritage: Application, Trend and Potential Paths. *Remote Sensing*, *15*(19), 4695.
- Cheng, F.-F., Huang, Y.-W., Yu, H.-C., & Wu, C.-S. (2018). Mapping knowledge structure by keyword co-occurrence and social network analysis: Evidence from Library Hi Tech between 2006 and 2017. *Library Hi Tech*, *36*(4), 636-650.
- Compton, T. J., Holthuijsen, S., Koolhaas, A., Dekinga, A., ten Horn, J., Smith, J., Galama, Y., Brugge, M., van der Wal, D., & van der Meer, J. (2013). Distinctly variable mudscapes: distribution gradients of intertidal macrofauna across the Dutch Wadden Sea. *Journal of Sea Research*, *82*, 103-116.
- Dai, T., Li, J., Aktürk, G., & Jiao, J. (2022). The Overlooked Contribution of National Heritage Designation in City Branding and Tourism Management. *Sustainability*, *14*(14), 8322.
- Dang, Q., Luo, Z., Ouyang, C., Wang, L., & Xie, M. (2021). Intangible cultural heritage in China: A visual analysis of research hotspots, frontiers, and trends using CiteSpace. *Sustainability*, *13*(17), 9865.
- Darvishmotevali, M., Rasoolimanesh, S. M., & Dorbeiki, M. (2023). Community-based model of tourism development in a biosphere reserve context. *Tourism Review*.
- Dastgerdi, A. S., Sargolini, M., Allred, S. B., Chatrchyan, A. M., Drescher, M., & DeGeer, C. (2022). Climate change risk reduction in cultural landscapes: Insights from Cinque Terre and Waterloo. *Land use policy*, *123*, 106359.
- Devlin, M., & Brodie, J. (2005). Terrestrial discharge into the Great Barrier Reef Lagoon: nutrient behavior in coastal waters. *Marine Pollution Bulletin*, *51*(1-4), 9-22.
- Dragouni, M., & Fouseki, K. (2018). Drivers of community participation in heritage tourism planning: an empirical investigation [Article]. *Journal of Heritage Tourism*, *13*(3), 237-256. <https://doi.org/10.1080/1743873x.2017.1310214>
- Drost, A. (1996). Developing sustainable tourism for world heritage sites. *Annals of Tourism Research*, *23*(2), 479-484.
- Elasall, I. M. I., Hernandez-Rojas, R. D., & Moreno Quispe, L. A. (2023). Loyalty to World Heritage Cities: A Case Study of the Historic Ibn Tūlūn Mosque in Cairo (Egypt). *Sustainability*, *15*(17), 13154.
- Er, Y. (2023). A Commons beyond the Human. *Environmental Humanities*, *15*(2), 162-180.
- Eslami, S., Khalifah, Z., Mardani, A., Streimikiene, D., & Han, H. (2019). Community attachment, tourism impacts, quality of life and residents' support for sustainable tourism development [Article]. *Journal of Travel & Tourism Marketing*, *36*(9), 1061-1079. <https://doi.org/10.1080/10548408.2019.1689224>
- Fang, Y., Yin, J., & Wu, B. (2018). Climate change and tourism: A scientometric analysis using CiteSpace. *Journal of Sustainable Tourism*, *26*(1), 108-126.
- First Twelve Sites Selected for World Heritage List. (1979). *Environmental Conservation*, *6*(1), 44-44. <https://doi.org/10.1017/S0376892900002198>
- Freeman, L. C. (2002). Centrality in social networks: Conceptual clarification. *Social network: critical concepts in sociology*. Londres: Routledge, *1*, 238-263.
- Fu, Y., Zhao, J., Zhang, W., Du, H., Cao, Z., & Chen, X. (2023). Global research trends in sexual health care: A bibliometric and visualized study. *Journal of Clinical Nursing*.

- Gao, Y., & Su, W. (2019). Is the World Heritage just a title for tourism? *Annals of Tourism Research*, 78, 102748.
- Ghimire, D. K., Gautam, P., Karki, S. K., Ghimire, J., & Takagi, I. (2022). Small business and livelihood: A study of Pashupatinath UNESCO heritage site of Nepal. *Sustainability*, 15(1), 612.
- Giroux, H. (2020). *Critical pedagogy*. Springer.
- Gravagnuolo, A., Micheletti, S., & Bosone, M. (2021). A Participatory Approach for "Circular" Adaptive Reuse of Cultural Heritage. Building a Heritage Community in Salerno, Italy [Article]. *Sustainability*, 13(9), 33, Article 4812. <https://doi.org/10.3390/su13094812>
- Groom, C. R., & Allen, F. H. (2014). The Cambridge Structural Database in retrospect and prospect. *Angewandte Chemie International Edition*, 53(3), 662-671.
- Guo, Y., Xu, Z.-Y.-R., Cai, M.-T., Gong, W.-X., & Shen, C.-H. (2022). Epilepsy with suicide: a bibliometrics study and visualization analysis via CiteSpace. *Frontiers in neurology*, 12, 823474.
- Gupta, M. (2021). Databases and Research Metrics. *Academic Integrity and Research Quality*, 104.
- Hall, C. M. (2011). Publish and perish? Bibliometric analysis, journal ranking and the assessment of research quality in tourism. *Tourism management*, 32(1), 16-27.
- Han, L., Shan, Z., Lei, M., & Long, S. C. (2024). A comparative study of international and Chinese digitization from the perspective of mapping knowledge domains. *International Review of Economics & Finance*, 89, 93-113.
- Hand, S. J., Archer, M., Gillespie, A., & Myers, T. (2023). *Xenorhinos* sp. nov., a new, nasal-emitting trident bat (Rhinonycteridae, Rhinolophoidea) from early Miocene forests in northern Australia. *Anatomical Record-Advances in Integrative Anatomy and Evolutionary Biology*, 306(11), 2693-2715. <https://doi.org/10.1002/ar.25210>
- Haynes, D., Müller, J., & Carter, S. (2000). Pesticide and herbicide residues in sediments and seagrasses from the Great Barrier Reef World Heritage Area and Queensland coast. *Marine Pollution Bulletin*, 41(7-12), 279-287.
- Ilinca, V., Milu, V., Peligrad, S., & Gheuca, I. (2023). The Albești Limestone: a geoheritage and cultural heritage in Romania. *Journal of Maps*, 19(1), 2135465.
- Jiang, H. P., Wu, W. Z., Ye, L., & Ding, Q. J. (2023). The Conflict and Coordination Mechanism of Interpersonal Relationship between New and Old Residents in Community Reorganization at Heritage Sites: A Model Based on Tangkou in Huangshan [Article]. *Sustainability*, 15(14), 17, Article 10989. <https://doi.org/10.3390/su151410989>
- Jimura, T. (2011). The impact of world heritage site designation on local communities—A case study of Ogimachi, Shirakawa-mura, Japan. *Tourism management*, 32(2), 288-296.
- Kaufman, L., & Rousseeuw, P. J. (2009). *Finding groups in data: an introduction to cluster analysis*. John Wiley & Sons.
- Kear, B. P. (2003). Macropodoid endocranial casts from the early Miocene of Riversleigh, northwestern Queensland [Article]. *Alcheringa*, 27(3-4), 295-302. <https://doi.org/10.1080/03115510308619109>
- Khan, A., Bibi, S., Lorenzo, A., Lyu, J., & Babar, Z. U. (2020). Tourism and development in developing economies: A policy implication perspective. *Sustainability*, 12(4), 1618.
- Koch, E., & Gillespie, J. (2022). Separating natural and cultural heritage: an outdated approach? *Australian Geographer*, 53(2), 167-181.
- Kroon, F. J., Thorburn, P., Schaffelke, B., & Whitten, S. (2016). Towards protecting the Great Barrier Reef from land-based pollution. *Global change biology*, 22(6), 1985-2002.
- Labadi, S. (2007). Representations of the nation and cultural diversity in discourses on World Heritage. *Journal of social archaeology*, 7(2), 147-170.
- Labadi, S., Giliberto, F., Rosetti, I., Shetabi, L., & Yildirim, E. (2021). Heritage and the sustainable development goals: Policy guidance for heritage and development actors. *International Journal of Heritage Studies*.
- Li, J., & Chen, C. (2016). CiteSpace: Text mining and visualization in scientific literature. *Capital University of Economics and Business Press: Beijing, China*, 149-152.
- Li, J., Stoffelen, A., Meijles, E., & Vanclay, F. (2023). Local people's sense of place in heavily touristified protected areas: Contested place meanings around the Wulingyuan World Heritage Site, China. *Landscape and Urban Planning*, 237, 104792.
- Li, K., Rollins, J., & Yan, E. (2018). Web of Science use in published research and review papers 1997–2017: A selective, dynamic, cross-domain, content-based analysis. *Scientometrics*, 115(1), 1-20.
- Li, M., Wu, B., & Cai, L. (2008). Tourism development of World Heritage Sites in China: A geographic perspective. *Tourism Management*, 29(2), 308-319.
- Li, X., & Li, H. (2018). A visual analysis of research on information security risk by using CiteSpace. *IEEE Access*, 6, 63243-63257.
- Liu, H., Liu, Y., Wang, Y., & Pan, C. (2019). Hot topics and emerging trends in tourism forecasting research: A scientometric review. *Tourism Economics*, 25(3), 448-468.
- Liu, P., Wang, F., Xu, W., Li, Y., & Li, B. (2023). Trends and frontiers of research on telemedicine from 1971 to 2022: A scientometric and visualisation analysis. *Journal of Telemedicine and Telecare*, 29(9), 731-746.
- Losciale, R., Hay, R., Rasheed, M., & Heron, S. (2022). The public perception of the role, importance, and vulnerability of seagrass. A case study from the Great Barrier Reef. *Environmental Development*, 44, 100757.
- Lu, W., Huang, S., Yang, J., Bu, Y., Cheng, Q., & Huang, Y. (2021). Detecting research topic trends by author-defined keyword frequency. *Information Processing & Management*, 58(4), 102594.
- Lubicz-Zaorski, C., Newlands, M., & Petray, T. (2023). Fuelling the climate and science 'denial machine' on social media: A case study of the Great Barrier Reef's 2021 'in danger' recommendation on Twitter, YouTube and Facebook [Article; Early Access]. *Public Understanding of Science*, 20. <https://doi.org/10.1177/09636625231202117>
- Mangeli, M., Aram, F., Balderlu, S. A., Babayi, S., & Mosavi, A. (2023). Assessing indoor thermal comfort of rock-cut architecture in Meymand world heritage site during winter and summer. *Energy Reports*, 10, 439-450.
- Mapstone, B. D., Little, L. R., Punt, A. E., Davies, C. R., Smith, A. D. M., Pantus, F., McDonald, A. D., Williams, A. J., & Jones, A. (2008). Management strategy evaluation for line fishing in the Great Barrier Reef: Balancing conservation and multi-sector fishery objectives [Article]. *Fisheries Research*, 94(3), 315-329. <https://doi.org/10.1016/j.fishres.2008.07.013>

- McKergow, L. A., Prosser, I. P., Hughes, A. O., & Brodie, J. (2005). Sources of sediment to the Great Barrier Reef World Heritage Area [Article; Proceedings Paper]. *Marine Pollution Bulletin*, 51(1-4), 200-211. <https://doi.org/10.1016/j.marpolbul.2004.11.029>
- Pan, Y., & Zhang, L. (2022). Modeling and analyzing dynamic social networks for behavioral pattern discovery in collaborative design. *Advanced Engineering Informatics*, 54, 101758.
- Peleggi, M. (1996). National heritage and global tourism in Thailand [Article]. *Annals of Tourism Research*, 23(2), 432-448. [https://doi.org/10.1016/0160-7383\(95\)00071-2](https://doi.org/10.1016/0160-7383(95)00071-2)
- Petr, M., Engels, T. C., Kulczycki, E., Dušková, M., Guns, R., Sieberová, M., & Sivertsen, G. (2021). Journal article publishing in the social sciences and humanities: A comparison of Web of Science coverage for five European countries. *PloS one*, 16(4), e0249879.
- Pinto, M. R., Fabbicatti, K., & Bosone, M. (2019, Jun 06-08). Heritage Community Resilience for sustainable and resilient human settlements. *Architecture Heritage and Design* [World heritage and legacy: Culture, creativity, contamination]. 17th International Forum on World Heritage and Legacy: Culture, Creativity, Contamination, Italy.
- Prabowo, B. N., Temeljotov Salaj, A., & Lohne, J. (2023). Identifying Urban Heritage Facility Management Support Services Considering World Heritage Sites. *Urban Science*, 7(2), 52.
- Prayag, G., Hosany, S., & Odeh, K. (2013). The role of tourists' emotional experiences and satisfaction in understanding behavioral intentions [Article]. *Journal of Destination Marketing & Management*, 2(2), 118-127. <https://doi.org/10.1016/j.jdmm.2013.05.001>
- Rasoolimanesh, S. M., Ringle, C. M., Jaafar, M., & Ramayah, T. (2017). Urban vs. rural destinations: Residents' perceptions, community participation and support for tourism development. *Tourism management*, 60, 147-158.
- Rupakheti, D., Adhikary, B., Praveen, P. S., Rupakheti, M., Kang, S. C., Mahata, K. S., Naja, M., Zhang, Q. G., Panday, A. K., & Lawrence, M. G. (2017). Pre-monsoon air quality over Lumbini, a world heritage site along the Himalayan foothills [Article]. *Atmospheric Chemistry and Physics*, 17(18), 11041-11063. <https://doi.org/10.5194/acp-17-11041-2017>
- Salloum, S., Gaber, T., Vadera, S., & Shaalan, K. (2022). A systematic literature review on phishing email detection using natural language processing techniques. *IEEE Access*, 10, 65703-65727.
- Shekofteh, A., Molina, E., Arizzi, A., Cultrone, G., Ahmadi, H., & Yazdi, M. (2019). Characterization and damage assessment of stones used in the Pasargadae World Heritage Site, Achaemenian period [Article]. *International Journal of Architectural Heritage*, 13(4), 521-536. <https://doi.org/10.1080/15583058.2018.1436728>
- Shi, S., & Yin, J. (2023). Trends in the evolution of sustainable development research in China: a scientometric review. *Environmental Science and Pollution Research*, 30(20), 57898-57914.
- Smith, R., Middlebrook, R., Turner, R., Huggins, R., Vardy, S., & Warne, M. (2012). Large-scale pesticide monitoring across Great Barrier Reef catchments—paddock to reef integrated monitoring, modelling and reporting program. *Marine Pollution Bulletin*, 65(4-9), 117-127.
- Somuncu, M., & Yiğit, T. (2005). World heritage sites in Turkey: Current status and problems of conservation and management. *World*, 2006(17).
- Song, H., Chen, P., Zhang, Y., & Chen, Y. (2021). Study progress of important agricultural heritage systems (IAHS): a literature analysis. *Sustainability*, 13(19), 10859.
- Stenseke, M. (2009). Local participation in cultural landscape maintenance: Lessons from Sweden. *Land use policy*, 26(2), 214-223.
- Su, M. M., Wang, M. H., Yu, J. J., Wall, G., & Jin, M. (2023). Measuring Tourism Impacts on Community Well-being at the Hani Rice Terraces GIAHS Site, Yunnan Province of China. *Society & Natural Resources*, 36(7), 796-820. <https://doi.org/10.1080/08941920.2023.2185844>
- Su, X., Li, X., & Kang, Y. (2019). A bibliometric analysis of research on intangible cultural heritage using CiteSpace. *Sage Open*, 9(2), 2158244019840119.
- Su, Y.-W., & Lin, H.-L. (2014). Analysis of international tourist arrivals worldwide: The role of world heritage sites. *Tourism management*, 40, 46-58.
- Switzer, A. D., Christensen, J., Aldridge, J., Taylor, D., Churchill, J., Watson, H., Fraser, M. W., & Shaw, J. (2023). The utility of historical records for hazard analysis in an area of marginal cyclone influence. *Communications Earth & Environment*, 4(1), 193.
- Turton, S. M. (2005). Managing environmental impacts of recreation and tourism in rainforests of the wet tropics of Queensland World Heritage Area. *Geographical research*, 43(2), 140-151.
- UNESCO. (1972a). *Recommendation concerning the Protection at National Level, of the Cultural and Natural Heritage*. <https://www.unesco.org/en/legal-affairs/recommendation-concerning-protection-national-level-cultural-and-natural-heritage>. Accessed on October 28, 2023.
- UNESCO. (1972b). *UNESCO World Heritage Centre*. <https://whc.unesco.org/en/about/>. Accessed on October 28, 2023.
- UNESCO. (1981). *World heritage list - Great Barrier Reef*. <https://whc.unesco.org/zh/list/154#top>. Accessed on October 29, 2023.
- UNESCO. (2007). *The World Heritage Committee adds a fifth 'C' - Community -to its Strategic Objectives, highlighting the important role of local communities in preserving World Heritage*. <https://whc.unesco.org/en/decisions/5197/>. Accessed on November 1, 2023.
- UNESCO. (2023a). *Decision 45 COM 8B.9, Cultural Landscape of Old Tea Forests of the Jingmai Mountain in Pu'er (China)*. <https://whc.unesco.org/en/decisions/8390>. Accessed on October 30, 2023.
- UNESCO. (2023b). *Revisions to the Rules of Procedure of the General Assembly of the States Parties to the Convention*. <https://whc.unesco.org/en/sessions/24GA>. Accessed on October 25, 2023.
- Van Knippenberg, K., Boonstra, B., & Boelens, L. (2022). Communities, Heritage and Planning: Towards a Co-Evolutionary Heritage Approach [Article]. *Planning Theory & Practice*, 23(1), 26-42. <https://doi.org/10.1080/14649357.2021.1998584>
- Visser, M., Van Eck, N. J., & Waltman, L. (2021). Large-scale comparison of bibliographic data sources: Scopus, Web of Science, Dimensions, Crossref, and Microsoft Academic. *Quantitative Science Studies*, 2(1), 20-41.
- Vlase, I., & Lähdesmäki, T. (2023). A bibliometric analysis of cultural heritage research in the humanities: The Web of Science as a tool of knowledge management. *Humanities and Social Sciences Communications*, 10(1), 1-14.
- Wahid, N., Warraich, N. F., & Tahira, M. (2022). Factors influencing scholarly publication productivity: a systematic review. *Information Discovery and Delivery*, 50(1), 22-33.
- Wang, D., Huangfu, Y., Dong, Z., & Dong, Y. (2022). Research hotspots and evolution trends of carbon neutrality—visual analysis of bibliometrics based on CiteSpace. *Sustainability*, 14(3), 1078.



- Wang, G., Li, S., Zhang, Z., Hou, Y., & Shin, C. (2023). A Visual Knowledge Map Analysis of Cross-Border Agri-Food Supply Chain Research Based on CiteSpace. *Sustainability*, *15*(14), 10763.
- Wang, L., & Yotsumoto, Y. (2019). Conflict in tourism development in rural China. *Tourism management*, *70*, 188-200.
- Wang, W., & Lu, C. (2020). Visualization analysis of big data research based on Citespace. *Soft Computing*, *24*, 8173-8186.
- Wang, X., Xiong, K., Zhang, M., & Zhao, X. (2022). The Aesthetic Value of World Heritage Karst: A Literature Review and Implication for Huangguoshu Scenic Area Outstanding Universal Value. *Sustainability*, *14*(23), 15961.
- Wang, Z. S., Liu, W., Sun, Z., & Zhao, H. (2023). Understanding the world heritage sites' brand diffusion and formation via social media: a mixed-method study [Article; Early Access]. *International Journal of Contemporary Hospitality Management*, *30*. <https://doi.org/10.1108/ijchm-02-2023-0190>
- Waterloo, H. r. c. f. e. s. U. o. (1992). Canadian Seminar on the World Heritage Convention - Toward Greater Understanding and Use of, UNIV WATERLOO, HERITAGE RESOURCES CTR, WATERLOO, CANADA.
- Wierzchoń, S. T., & Kłopotek, M. A. (2018). *Modern algorithms of cluster analysis* (Vol. 34). Springer.
- Wolfe, K., & Byrne, M. (2022). Overview of the Great Barrier Reef sea cucumber fishery with focus on vulnerable and endangered species [Review]. *Biological Conservation*, *266*, 15, Article 109451. <https://doi.org/10.1016/j.biocon.2022.109451>
- Woodhead, J., Hand, S. J., Archer, M., Graham, I., Sniderman, K., Arena, D. A., Black, K. H., Godthelp, H., Creaser, P., & Price, E. (2016). Developing a radiometrically-dated chronologic sequence for Neogene biotic change in Australia, from the Riversleigh World Heritage Area of Queensland. *Gondwana Research*, *29*(1), 153-167.
- Xiong, K. N., Zhang, S. R., Fei, G. Y., Jin, A., & Zhang, H. P. (2023). Conservation and Sustainable Tourism Development of the Natural World Heritage Site Based on Aesthetic Value Identification: A Case Study of the Libo Karst [Article]. *Forests*, *14*(4), 25, Article 755. <https://doi.org/10.3390/f14040755>
- Yang, C., & Liu, T. (2022). Social media data in urban design and landscape research: A Comprehensive literature review. *Land*, *11*(10), 1796.
- Yang, C. H., Lin, H. L., & Han, C. C. (2010). Analysis of international tourist arrivals in China: The role of World Heritage Sites [Article]. *Tourism management*, *31*(6), 827-837. <https://doi.org/10.1016/j.tourman.2009.08.008>
- Yu, K., Lu, J., Bu, F., Liu, Z., Wang, L., Jian, T., Chen, S., & Liang, X. (2023). Knowledge structure and emerging trends of AR variants in prostate cancer: a bibliometric analysis based on CiteSpace and VOSviewer. *Journal of Men's Health*, *19*(7), 57-70.
- Zhang, D., Xu, J., Zhang, Y., Wang, J., He, S., & Zhou, X. (2020). Study on sustainable urbanization literature based on Web of Science, scopus, and China national knowledge infrastructure: A scientometric analysis in CiteSpace. *Journal of cleaner production*, *264*, 121537.
- Zhang, J., Xiong, K. N., Liu, Z. J., He, L. X., Zhang, N., Gu, X. Y., & Chen, D. (2023). Exploring the synergy between Karst World Heritage site's OUV conservation and buffer zone's tourism industry development: a case study of the Libo-Huanjiang Karst [Article]. *Heritage Science*, *11*(1), 19, Article 202. <https://doi.org/10.1186/s40494-023-01036-w>
- Zhang, R., & Smith, L. (2019). Bonding and dissonance: Rethinking the interrelations among stakeholders in heritage tourism. *Tourism management*, *74*, 212-223.
- Zhang, S., Liang, J., Su, X., Chen, Y., & Wei, Q. (2023). Research on global cultural heritage tourism based on bibliometric analysis. *Heritage Science*, *11*(1), 139.
- Zhang, X., Xie, Q., Song, C., & Song, M. (2022). Mining the evolutionary process of knowledge through multiple relationships between keywords. *Scientometrics*, *127*(4), 2023-2053.
- Zheng, J., Hou, M., Liu, L., & Wang, X. (2022). Knowledge structure and emerging trends of telerehabilitation in recent 20 years: a bibliometric analysis via CiteSpace. *Frontiers in public health*, *10*, 904855.
- Zhuang, Q., Hussein, M., Ariffin, N., & Yunus, M. (2022). Landscape character: a knowledge mapping analysis using CiteSpace. *International Journal of Environmental Science and Technology*, *19*(10), 10477-10492.
- Zwegers, B. (2022). *Cultural heritage in transition*. Springer.