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Visual Analysis of Ecotourism Resources Development Research in China Based on Citespace

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Abstract: *With the rapid development of national economy and the improvement of people's awareness of environmental protection, ecotourism has gradually become a new trend and focus of tourism development. China has unique ecotourism resources, from vast forests and wetlands to majestic mountains and grasslands, and each place carries rich ecological values and cultural connotations. This paper makes a scientific quantitative analysis of a series of documents on the research field of "ecotourism resources development" selected from Web of Science database. The author uses CiteSpace software to visualize the development of ecotourism resources in the scientific field. This paper reveals the research status of ecotourism resources development in China at this stage, and then probes into the development strategy of ecotourism resources in China in order to realize the sustainable development of ecotourism. The analysis results can provide reference for future ecotourism research.*

Keywords: *Development of ecotourism resources, CiteSpace, Knowledge map*

1. Introduction

In this paper, CiteSpace visual analysis tool is used to draw various knowledge maps [1] ,Citespace determines the research frontiers and emerging trends of ecotourism resources development by analyzing the number and growth trend of publications every year, exploring the cooperation network between authors/institutions/countries, determining the common cited references, and capturing the keywords with high citation intensity over time. There are different nodes and links in various visual knowledge graphs, and the nodes with high centrality are usually identified as hotspots or turning points in this field [2] .We downloaded the records retrieved by Web of Science, then converted these data into plain text format for export, including complete records and references, named download_xxx, and finally imported them into citespace6.3.R1 for bibliometrics and visual analysis. One of the core functions of the software is to detect and analyze the research frontier and knowledge relationship.

The data used for bibliometrics analysis were collected from the Web of Science database. Therefore, the time span of retrieval is from 1991 to 2024, and the keyword of subject retrieval is "ecotourism resources development". A total of 580 records were retrieved in this retrieval. In addition, categories and non-academic papers set as periodical types, such as reports and meeting minutes, have been deleted. Finally, 560 articles meet the screening conditions. Export the article document type records to CiteSpace for further analysis.

2. Research overview

2.1 Research status and trend analysis

The evolution of the number of documents over time, like a mirror, clearly reflects the vigorous development of the subject of ecotourism resources development. Figure 1 shows the dynamic change of the number of research papers in this field from 1991 to 2024, which profoundly reveals the continuous increase of academic attention to this topic.

In 1991, the research on the development of ecotourism resources was still in its infancy, but with the passage of time, the number of articles published was like the rising sun, rising slowly and firmly.

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This trend gradually became clear in the following years, indicating that this field is gradually becoming a hot spot and focus of academic exploration. What particularly remarkable is that from 2018 to 2019, the research fever suddenly warmed up, and the number of published articles achieved an amazing leap-forward growth of 104.5%. This data is not only a breakthrough in quantity, but also an intuitive manifestation of the surge in research interest and investment.

In the following years, this growth momentum was maintained. Until 2022, the number of papers on ecotourism resources development research reached an unprecedented peak, showing the continuous expansion of the depth and breadth of research in this field. During this period, scholars have devoted themselves to it and explored the potential and value of ecotourism resources development from different angles and levels, which promoted the deep integration and innovation of theory and practice.

However, it is worth noting that although the overall trend is improving, the data of the last two years show a slight decline in the number of articles published. This phenomenon may reflect that the academic community is entering a more rational and in-depth stage of reflection and adjustment after a long period of rapid growth. It may also be due to the change of research methods, data sources or research focus, which leads to some research results not being presented in the form of documents in time. But in any case, this change should be regarded as a part of the natural evolution of academic research, rather than a denial of the importance of this field.

To sum up, despite the short-term fluctuations and adjustments, the overall popularity and attention of ecotourism resources development research are still rising. This trend not only highlights the importance and urgency of research in this field, but also provides a broad space and unlimited possibilities for future academic exploration and practical innovation. As is shown in Figure1.

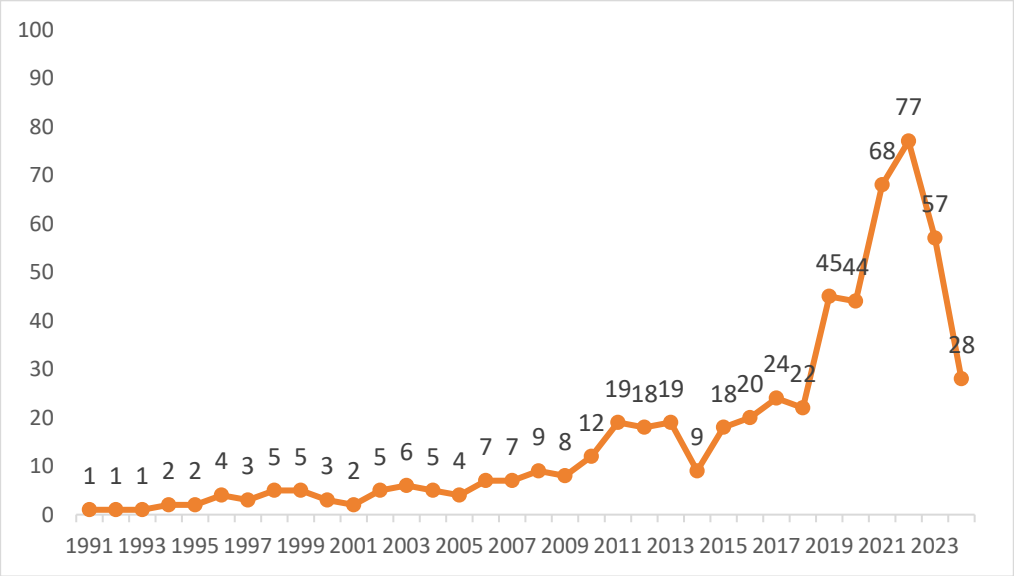

Figure 1: Statistical Chart of Annual Article Volume (WOS)

2.2 Analysis of research institutions

Through CiteSpace software, 560 carefully selected documents on the field of ecotourism resources development were deeply analyzed at the institutional level, and we drew a revealing institutional co-occurrence map. On the broad stage of this map, the role and influence of each research institution can be clearly displayed: the size of the node seems to be an intuitive measure of the activity and contribution of the research institution. The larger the node, the more times the research institution is exposed in the literature, and the more significant its contribution to the field research. The thickness of the lines connecting these nodes subtly reflects the close cooperation between institutions. The thicker the lines, the stronger the cooperative relationship.

After in-depth analysis of the details of the atlas, we found several striking highlights. First of all, Chinese Academy of Sciences, State University System of Florida and Beijing Forestry University and other institutions, with their prominent positions in the map and huge node scale, show their outstanding research and leading position in the field of ecotourism resources development. Specifically, China Academy of Sciences takes the lead with 18 papers, while Florida State University

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System and Beijing Forestry University follow closely with 9 papers, which together constitute a solid pillar of research in this field.

However, while affirming these achievements, we also have to pay attention to another important phenomenon reflected in the atlas: the contact lines between institutions are sparse and slender, which reveals to some extent the lack of cooperation and weak contact between research institutions in the field of ecotourism resources development. This phenomenon may limit the rapid circulation of knowledge and the deep integration of innovation, and then affect the further improvement of the research level in the whole field.

In order to illustrate this point more specifically, we further counted the institutions that published five or more papers. As shown in Table 1, there are seven institutions that meet this standard, and their total published papers account for 10.5% of the total number of papers counted. Although this data shows the concentration of the publishing organizations to a certain extent, it also reflects that the research of most organizations in this field is still in a relatively isolated state, and the cooperation network has not been fully rolled out.

Therefore, in view of the current lack of cooperation between research institutions, we strongly call for strengthening academic exchanges and cooperation. By building a more open cooperation platform and promoting resource sharing and complementary advantages, we can not only accelerate the pace of scientific research and innovation, but also effectively enhance the research quality and influence in the whole field of ecotourism resource development. As is shown in Figure 2 and Table 1.

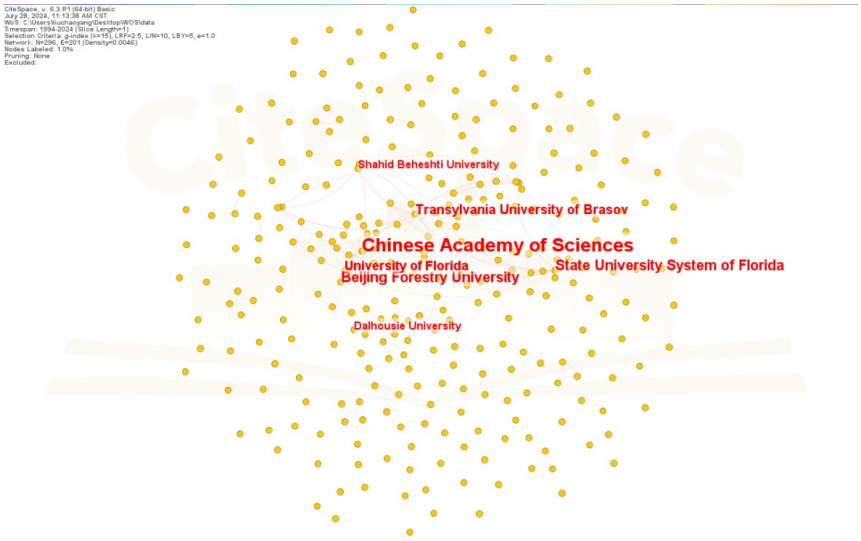

Figure 2: Atlas of Cooperative Network of Research Institutions

Table 1: Organizations with More than 5 Articles

No.	Organization	Quantity of documents issued
1	Chinese Academy of Sciences	18
2	State University System of Florida	9
3	Beijing Forestry University	9
4	Transylvania University of Brasov	7
5	University of Florida	6
6	Dalhousie University	5
7	Shahid Beheshti University	5

2.3 Analysis of the authors of the articles

CiteSpace, an advanced bibliometrics tool, is used to make an in-depth analysis of the authors in the field of ecotourism resources development from 1991 to 2024, and we draw a detailed co-occurrence map of authors. In this map, each node symbolizes an active researcher in this field, and the size of the node directly reflects the number of articles published by the author, that is, the co-occurrence frequency. At the same time, the number and thickness of lines connecting these nodes subtly reveal

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the closeness of academic exchanges and the strength of cooperative relations between different authors.

Specifically, the map has gathered 300 author nodes, which are closely connected by 240 connecting lines, forming a complicated academic network [3]. However, despite the huge scale of the network, its density is only 0.0054, which reveals that on the whole, the direct contact between authors is still sparse, but it is enough to observe the formation and gathering of some core inquiry teams. The members of these teams have close cooperation and jointly promote the in-depth development of ecotourism resources development research.

Further analysis of the data in Table 2 shows that only five authors have published three or more articles, which accounts for only 4.1% of the total number of papers counted. This ratio not only highlights the relative scarcity of high-yield authors in this research field, but also reflects the low level of concentration of authors. This situation may mean that the research in this field is still in a relatively scattered state and has not yet formed a situation dominated by a few leading figures, but it also provides more scholars with space and opportunities to show themselves and contribute their wisdom.

To sum up, the research in the field of ecotourism resources development presents a complex situation of both dispersion and concentration. On the one hand, although the cooperative network among authors has begun to take shape, it still needs to be further strengthened as a whole; On the other hand, although high-yield authors are scarce, it also provides the possibility for diversified exploration and innovation in the field. In the future, with the deepening of research and the continuous strengthening of cooperation, we have reason to believe that more excellent research teams and leading figures will emerge in this field to jointly promote the vigorous development of ecotourism resources development research. As is shown in Figure 3 and Table 2.

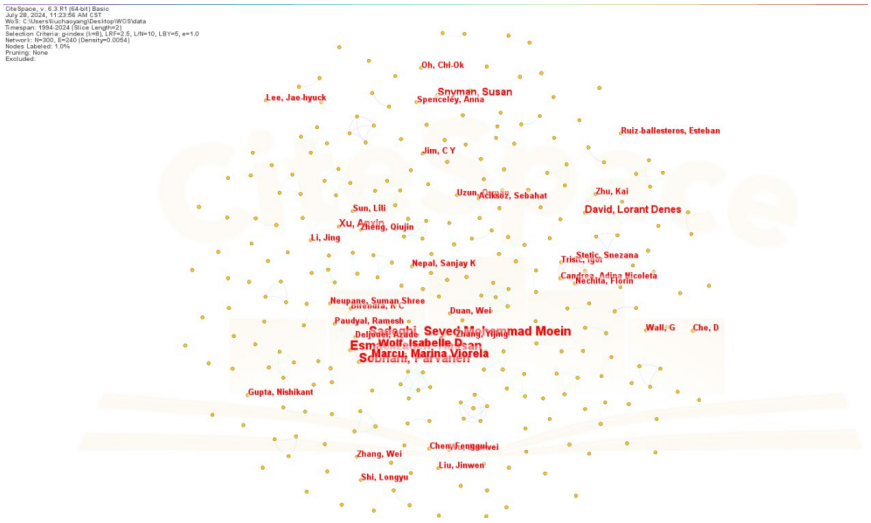

Figure 3: The Cooperative Network Map of the Authors

Table 2: Authors with More than 3 Articles Published

No.	Author	Quantity of articles published
1	Sadeghi, Seyed Mohammad Moein	5
2	Sobhani, Parvaneh	5
3	Esmaeilzadeh, Hassan	5
4	Marcu, Marina Viorela	5
5	Wolf, Isabelle D	5

3. Research hotspots and frontiers

3.1 Keyword co-occurrence analysis

In the process of constructing the keyword co-occurrence map of ecotourism resources development research [4]. We used CiteSpace tool to analyze 560 articles in depth. By setting the threshold to 10, a network map showing the relationship between keywords intuitively is generated (see

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Figure 4). This map includes 267 keyword nodes, and their respective sizes directly reflect the frequency of the corresponding keywords in the literature collection-the higher the frequency, the larger the node size. At the same time, 1184 connecting lines in the atlas symbolize the internal connection strength between keywords, and the density of the whole network is 0.0333, which reveals the close degree of interaction between keywords [5] .

Further observation shows that the most conspicuous node in the map is undoubtedly "ecotourism", which ranks first with a co-occurrence frequency of up to 128 times, demonstrating its core position in this research field. The high-frequency keywords followed closely include "conservation"(113 times)," management "(91 times)," tourism "(88 times)," protected areas "(66 times)," sustainable development "(61 times) and" biodiversity "(39 times). "impacts" (38 times), "community" (37 times), "sustainable tourism" (36 times) and "national park" (35 times), etc., these keywords together constitute the eleven hot areas of ecotourism resources development research since the new century. In particular, the popularity of four key words "ecotourism", "conservation", "management" and "tourism" is obviously different from other key words and has become the focus of research.

However, hot spot identification based only on the frequency of keywords is intuitive but also has limitations, which may lead to the overlapping of hot topics or the omission of important but low-frequency topics. Therefore, in order to grasp the research trends and trends more comprehensively and accurately, it is necessary to adopt a more in-depth and multi-dimensional analysis method to reveal the deep structure and logical connection hidden behind the frequency. As is shown in Figure 4 and Table 3.

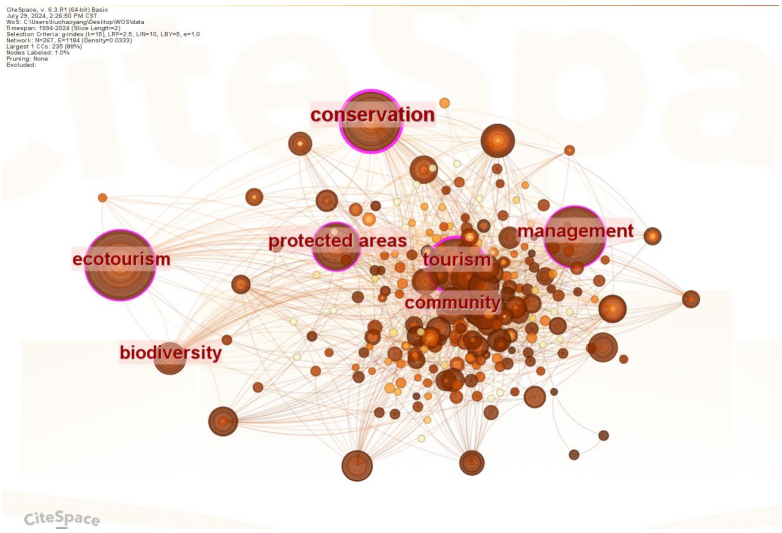

Figure 4: Keywords Co-occurrence Network Map

Table 3: Keywords Co-occurrence Frequency Table (more than 30 times)

	Keywords	Frequency	Year of first appearance
1	Ecotourism	128	2005
2	Conservation	113	1996
3	Management	91	1999
4	Tourism	88	1996
5	Protected areas	66	2000
6	Sustainable development	61	2004
7	Biodiversity	39	2002
8	Impacts	38	2010
9	Community	37	1994
10	Sustainable tourism	36	2008
11	National park	35	2006

3.2 Research frontiers-keyword mutation and timeline map analysis

Keyword mutation, as a keen indicator of the dynamic changes in academic research, marks the sudden high-frequency appearance of a specific keyword at a certain time node, and the duration and

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intensity of its heat are vividly displayed in the keyword mutation diagram-the red line outlines the continuous trajectory of the mutation phenomenon, while the green line cleverly divides the breakpoint and continuity in time [6]. Through in-depth analysis of these mutant keywords, we can not only trace back the historical evolution track of the research topic, but also review which words jumped into the focus of academic attention when and where, and the time span of their popularity. Based on this, we can gain insight and predict the potential trends and frontier hotspots of future academic research.

In Figure 5 shows the top 25 keywords in the field of ecotourism resources development, which is a vivid history of research hotspot changes. Among them, in 1996, as an important time node, witnessed the first citation outbreak of keywords such as "tourism", "conservation" and "knowledge", which appeared as a new star, indicating a new round of expansion and deepening of research direction in this field. It is particularly noteworthy that the word "conservation" stands out from the crowd with its emergent intensity of 4.73, which shows the core position and urgent need of ecological protection in the development and research of ecotourism resources. Followed by "satisfaction", "tourism" and "behavior" with the emergent intensity of 4.16, 3.32 and 3.09, respectively, further enriched the multiple perspectives and levels of research.

It is particularly worth mentioning that the keyword "carrying capacity" has been a hot topic in the research field since 1997, and its popularity has continued until 2015. This phenomenon not only directly reflects the deep concern and extensive discussion on the environmental carrying capacity in the process of ecotourism resources development, but also reveals the firm pace of research in this field towards sustainable development. The sudden change and continuous popularity of these keywords not only outline the core research hotspots in the field of ecotourism resources development for us, but also illuminate the frontier direction and potential space for future exploration in this field like a lighthouse, which provides valuable reference and guidance for scholars' scientific research work.

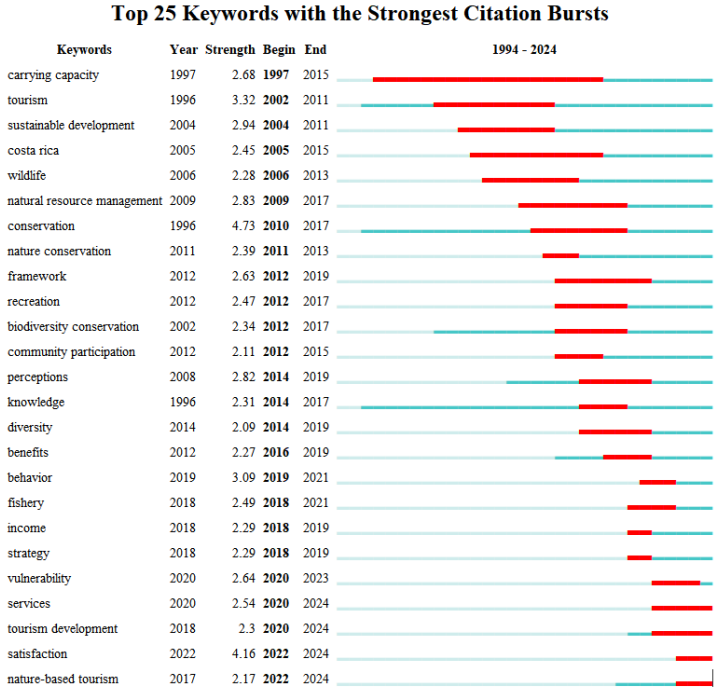

Figure 5: Keywords Mutation Diagram

As a powerful analytical tool, the core value of the keyword timeline map lies in showing the time span of the research topic in the field of ecotourism resources development and its dynamic evolution track with time. This map gives us insight into which keywords have been leading research trends at different stages of history, which is a sign that these keywords may continue to be a hotspot for cutting-edge research in the future. Combined with the comprehensive consideration of keyword mutation map and timeline map, we divide the research process of ecotourism resources development from 1991 to 2024 into seven distinctive stages, as shown in Figure 6. This division not only reveals the evolution of research topics, but also provides strong support for understanding the historical changes and future development trends in this field. As is shown in Figure 6.

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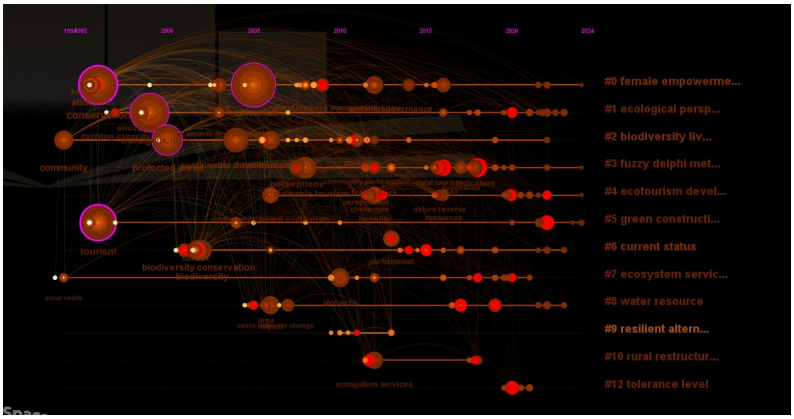

Figure 6: Keywords Timeline Atlas

4. Conclusion

First, the research overview. Through the comprehensive knowledge map analysis of Web of Science database from 1991 to 2024 and domestic "ecotourism resources development" literature by CiteSpcace software system, through the correlation analysis of various researchers and research institutions, it is found that most of them are independent research, and the cooperation density between them is low. In order to create a better academic atmosphere, it is expected to strengthen academic exchanges and cooperation among scholars and research institutions in the future.

Second, research hotspots. Through keyword co-occurrence analysis and keyword cluster map analysis, the research hotspots of ecotourism resources development from 1991 to 2024 mainly focused on research topics such as "ecotourism", "conservation" and "knowledge". Through cluster analysis and mutation map analysis, it is obvious that most of the research on ecotourism resources development still focuses on the two themes of ecotourism and satisfaction. And it has always been a hotspot in this research field.

Third, forecast and prospect. In the future, the research in this field will pay more attention to the sustainable utilization of resources, the integrated development of ecotourism and community, and the coordinated promotion of ecotourism and environmental protection. At the same time, with the progress of technology and innovation of methods, the research on ecotourism resources development will show a more diversified and in-depth trend.

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