

Visualized Analysis on Research Progress of Tourism Environment Carrying Capacity of World Heritage

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ABSTRACT. *Tourism environment carrying capacity (TECC) is one of the focuses of tourism research at home and abroad. The formulation of a reasonable carrying capacity is not only a guarantee of a good tourist experience for tourists, but also a basis for sustainable development of World Heritage. The empirical study of TECC research was conducted based on the data of the CNKI with the method of Excel and Citespace. Its research vein could be looked into and given some suggestions for the future research through analyses of the articles published time, authors and key words. The results show that: (1) There is a step change of the number of articles, which can be divided into three stages, initial stage, connecting the preceding and the following, and transformation stage; (2) The size of research group is small and scattered, the connection between groups is not so much; (3) Sustainable development, eco-tourism and heritage protection are high frequency keywords in research articles, showing the research trend from TECC to heritage tourism to sustainable development and protection countermeasures.*

KEYWORDS: *World heritage, Tourism environment carrying capacity, Visualized analysis, Citespace*

1. Introduction

In 1972, United Nations Educational, Scientific, and Cultural Organization (UNESCO) adopted the “Convention Concerning the Protection of the World Cultural and Natural Heritage” (hereinafter referred to as the “World Heritage Convention”) in order to help and promote the protection of cultural relics and historic sites, and natural landscapes with outstanding universal value worldwide recognized by all mankind[1]. China officially became a state party to the “World Heritage Convention” in 1985, and has been starting the world heritage declaration since 1986 with the Great Wall, the Forbidden City, Mount Tai and other tourist resorts as its first batch of world heritage sites. Over more than three decades, China has developed into a well-deserved country of world heritage. As of 2019, China ranked as the first in the world together with Italy with 55 world heritage sites at the 43th session of the World Heritage Conference. World heritage tourism, as a new kind of theme tourism, has become one of the fastest growing tourism products in China and occupies an important position in the tourism market[2], therefore, study on world heritage and heritage tourism has also become a hot research subject for scholars[3].

Domestic research on world heritage mainly involves world heritage value, world heritage development, world heritage protection and sustainable development, world heritage and interest related party, etc.[4] in which the contradiction between heritage development and heritage protection has seriously threatened the heritage value of “authenticity” and “integrity”. The opening of heritage to the public through tourism is both a trend and a social responsibility[5], however, in recent years, the hot development of world heritage tourism, to some extent, has destroyed the fragile ecological environment of heritage sites, reducing the tourism value of world heritage, while bringing good tourism experience to tourists[6]. The over-exploitation of heritage sites not only interferes with the natural environment, destroys cultural relics and historic sites, but also causes serious problems of artificialization and commercialization of landscape, which can not reflect the authenticity of heritage, destroying the original intention of world heritage declaration, and even interferes with the normal production and life of residents of heritage sites, damaging the legitimate environmental interests of future generations and the real historical and cultural inheritance relationship, therefore, establishing a reasonable carrying capacity of tourism environment is not only the guarantee for tourists’ good tourism experience, but also the basis of the sustainable development of world heritage.”

China carried out the research on tourism environment carrying capacity of world heritage later than other countries. Although Zhao Honghong [7], taking Suzhou Garden as the object, evaluated the tourism

environment capacity of each garden in 1983, the relevant literature began to appear in 1992 after Chinese first batch of world heritage[4]. With world heritage tourism becoming a new tourism hotspot in China [8], and tourism environmental carrying capacity as one of the focuses of tourism research at home and abroad[9], this paper combs the research on tourism environment carrying capacity of Chinese world heritage based on bibliometric method in order to provide a useful reference for future research.

2 Research Method and Source of Data

Subject search was conducted on Jan. 3rd, 2020 via advanced retrieval of “tourism environment carrying capacity” with “world heritage” or “tourism environment capacity” with “world heritage” on CNKI, together with manual screening. The relevant data were analyzed by Excel, including the number of literature, author, research institution, etc. and the keywords were also analyzed by Citespace, a bibliometric tool, which presents the research focus and trend of tourism environment carrying capacity of Chinese world heritage.

2.1 Characteristics Analysis on the Number of Literature

After China owned the first batch of its world heritage, domestic scholars began to pay attention to world heritage tourism. According to the retrieval results, the research trend of tourism environment carrying capacity of world heritage is similar to that of tourism environment carrying capacity as a whole, which can be divided into three stages (as shown in Figure 1): From 1993 to 2003 as Stage I, Wu Chengzhao published the first article about tourism environmental capacity of Mount Huang in a journal. At this stage, the domestic research on tourism environmental capacity was in its infancy with less published relevant literature, namely, a total of 11 articles; From 2004 to 2013 as Stage II, the domestic research on tourism environment carrying capacity of world heritage has increased rapidly and steadily with the total number of papers published reaching 165, and the double peaks of papers published in the whole process of historical research were formed by 22 and 24 articles in 2006 and 2008 respectively; From 2014 to 2019 as Stage III, the number of papers published decreased compared with the previous stage, but research contents and methods became more diversified.

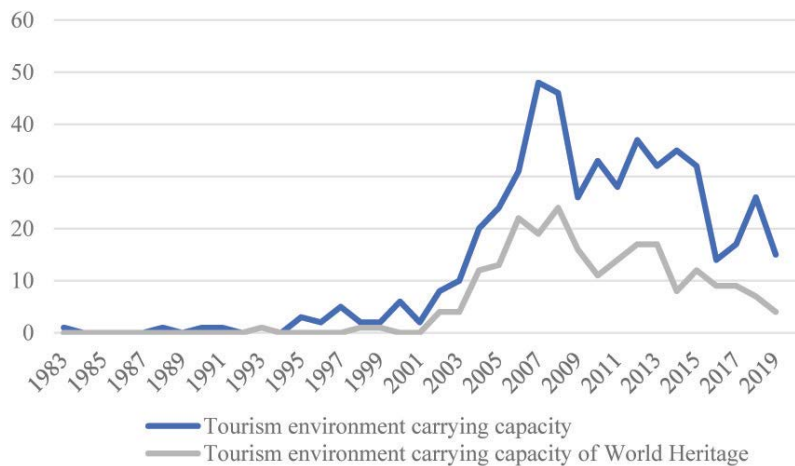


Figure.1 Research Progress of Tourism Environment Carrying Capacity of World Heritage

2.2 Distribution Analysis on Author and Research Institution

In 225 articles on tourism environment carrying capacity of world heritage, there are only 1 author who published 3 articles, 11 authors who published 2 articles, and the rest who published 1 article through the analysis on authors. Most scholars are in the state of independent research. The Liu Min team, with the largest number of papers published, studied tourism environment carrying capacity of world heritage from three aspects, namely, dynamic research, resource evaluation and management measure; The Xiong Ying, the Yang Xiaozhong, the Ma Bo, and other teams, with all 2 articles published, studied temporal and spatial changes of tourist flow and tourist psychology, life cycle of tourist resort and space carrying capacity of resource respectively.

Among all the 225 literatures, there are total 103 publishing units, of which 23 with more than 3 articles published, with 110 articles published, accounting for 49% of the total (as shown in Figure 2). China University

of Geosciences (Beijing) has the highest number of papers published with a total of 13 articles, mainly focusing on tourism environment carrying capacity and sustainable development of world heritage; Seven units, such as Fujian Agriculture and Forestry University and Central South University of Forestry and Technology all have more than 5 articles published, belonging to the second echelon of paper publishing, with contents involving tourist volume predication and tourist management, evaluation and development of heritage resources, development planning and control of heritage sites, etc. As for the regional analysis of publishing unit, Beijing has the highest number of paper published, reaching 29 articles, followed by Hunan, Fujian and Shandong.

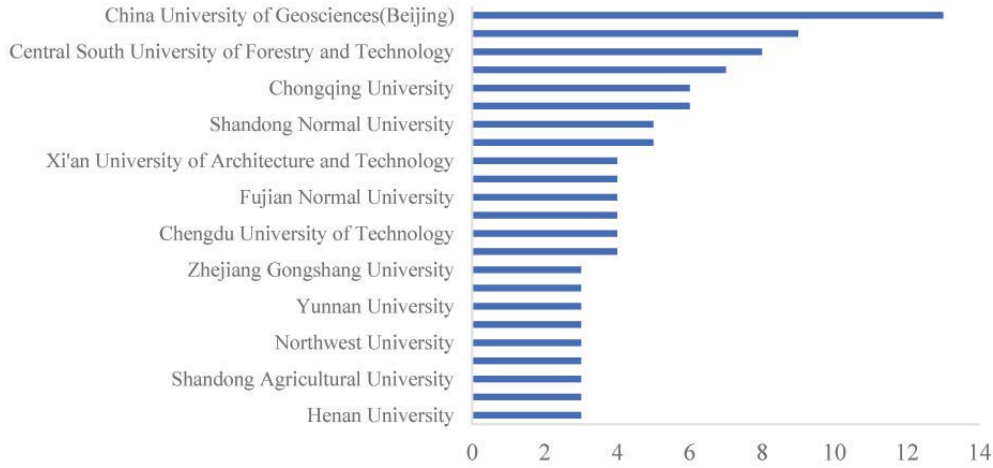


Figure.2 The Number of Issued Literatures by Research Institute of World Heritage Tourism Environment Carrying Capacity

3 Research Hotspot and Development of Tourism Environment Carrying Capacity of Chinese World Heritage

3.1 Co-Occurrence Analysis on Keyword

Keywords are some words used to condense and generalize the topic of an article. Two or more papers often use same keyword in periodicals and magazines, dissertations, etc. This phenomenon is called keyword co-occurrence [10]. Citespace can realize the analysis of keyword co-occurrence and draw Knowledge Graph of Keywords of Tourism Environment Carrying Capacity of World Heritage (Figure 3). The larger (smaller) the range of nodes in the graph, the higher (lower) the frequency of occurrence of keywords; The thicker (finer) the line between keywords, the closer they are. As shown in Figure 2, the graph includes 462 nodes, 1199 lines, with the network density of 0.0113, indicating a strong connection among keywords. Chinese research on tourism environment carrying capacity of world heritage is mainly aimed at “sustainable development”, supplemented by the concept of “ecotourism”, forming a research network with relatively perfect scale and connection.

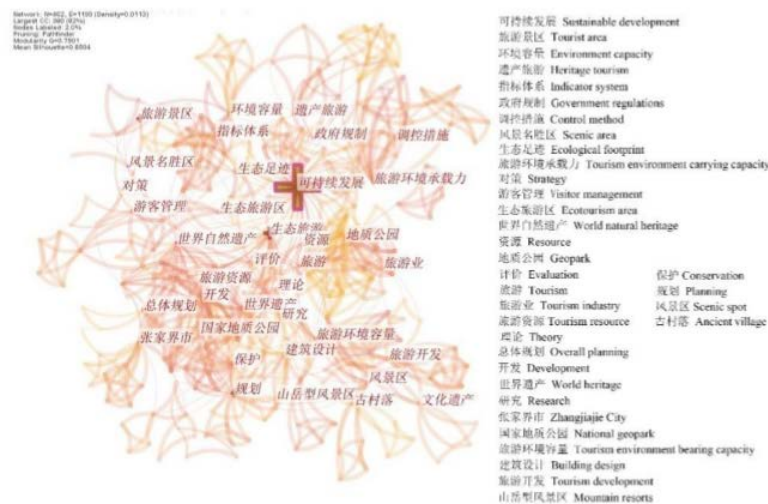


Figure.3 Knowledge Graph of Keywords of Tourism Environment Carrying Capacity of World Heritage

Furthermore, the recognition of burst term based on burst detection provided by Citespace can also effectively help to identify hot issues in this field [11]. Burst term refers to a term appears with a sudden increase in a short period of time (i.e. a faster increase) or a significant increase in frequency of using. The higher the visibility, the higher the likelihood of the term becoming a research hotspot [12]. Burst terms about tourism environment carrying capacity of Chinese world heritage from 1993 to 2019 are shown in Figure 4, among which the word with the highest degree of outburst is “world heritage”, and the attention of scholars to world heritage reached the highest during 2013-2017.



Figure.4 Keywords with the Strongest Citation Bursts of World Heritage

3.2 Cluster Analysis on Keyword and Timeline View

Cluster analysis were carried out based on co-occurrence analysis on keywords and timeline view was generated (as shown in Figure 5). After clustering, the module value (Q) is 0.7901, and the average contour value is 0.8504. The study shows that when Q value is greater than 0.3, it means that the community structure of the division is significant, and when S value is greater than 0.5, the clustering can be considered reasonable [13], so the result of the clustering is reasonable and significant. Through the analyses of cluster label words and timeline, the research and development path of tourism environment carrying capacity of world heritage should be: tourism environment carrying capacity-world heritage-sustainable development-protection countermeasure.

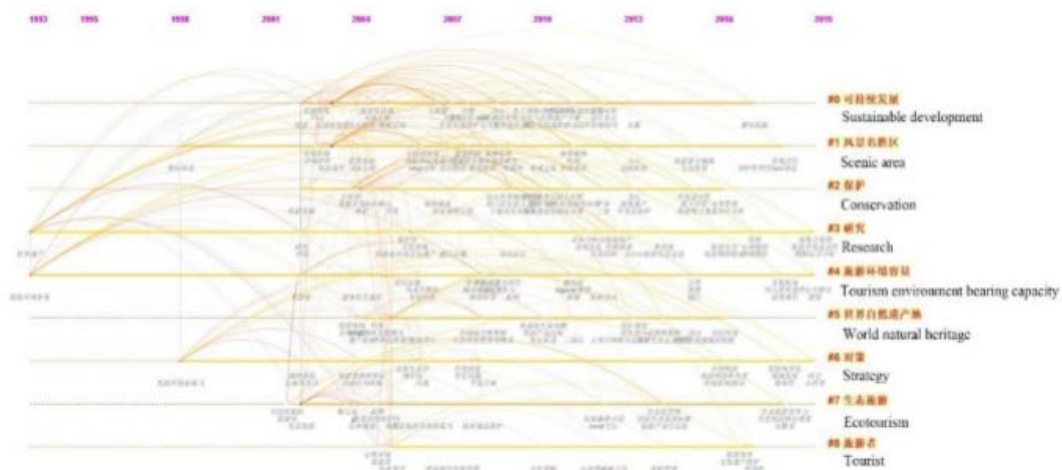


Figure.5 Timeline View of Tourism Environment Carrying Capacity of World Heritage

3.2.1 The Concept of Tourism Environment Carrying Capacity

The concept of tourism environment carrying capacity comes from environmental carrying capacity. Lowell

Sumner, an American wildlife technician, is the first person who applies the concept of “environmental carrying capacity” into tourism discipline. He proposed “the number of people in suburban recreation must be kept within the environmental carrying capacity” in a research report about California Marine Park published in 1936[14]. In 1963, Lapage, a scholar, first put forward the concept of tourism environment carrying capacity [15]. By the 1970s, the World Tourism Organization formally put forward the concept of tourism environment carrying capacity in its work plan report of 1978-1979[16]. Since then, the issue of tourism environment carrying capacity has entered the international scope of discussion. In China, at the early stage, tourism environment carrying capacity is also called “tourism environmental capacity”. Zhao Honghong, the first scholar engaged in this field, defined the concept of tourism environmental capacity as “the upper limit of tourist density that can be accommodated in a specific environment such as a scenic spot, scenic zone or even a scenic city in a certain time”. However, with the deepening of research, Cui Fengjun believes that there are defects in the using of tourism environmental capacity, for example, “objective quantity” cannot highlight the initiative of tourism environmental system, not having the characteristics of controllability of tourism carrying capacity, etc. while tourism environment carrying capacity is “the number of tourists that can be sustained by a tourist resort in a certain period under the premise of the existing state and structure combination of a tourist resort not having harmful changes to contemporary and future people”, which can provide a coordinated basis for tourism economy and environment [17]. After that, relevant scholars have been using the concept of tourism environment carrying capacity in their researches [18]. Currently, scholars still have differences in the concept of tourism environment carrying capacity, however, they basically reach several consensus, such as, thought of sustainable development as the guide, exploration of development limits of tourism destination as the direct purpose without destruction to local natural, economic, social and other elements, and attention being paid to the improvement of tourist satisfaction [19].

3.2.2 World Heritage and Tourism Environment Carrying Capacity

World heritage is inscribed in the “*World Heritage List*” because of its unique and outstanding universal value, which is an important carrier for inheriting the past, building the present and opening the future. Nowadays, heritage protection faces many threats, such as, unreasonable tourism development activities, environmental pollution, natural disasters [20], among which, tourism overexploitation leads to crowded tourists, reduce tourists’ playing experience, destroy tourism resources in heritage sites, pollute the environment and damage ecosystem. Tourism environment carrying capacity is an important index to measure the coordination between tourism activities and the environment, and through the study of which, measures can be taken before the irreversible deterioration at the heritage site to ensure its outstanding universal value, and integrity and/or authenticity. The content of tourism environment carrying capacity is extensive, so theories of relevant disciplines are adopted as research methods with the characteristics of multi-disciplinary intersection. The most representative ones are “barrel principle”, Analytic Hierarchy Process, Ecological Footprint Method, System Dynamics Model, etc. Sun Chunhua, taking Mount Huang as an example, took natural, economic and social psychological environmental carrying capacities as the component indexes, measured each component separately, and determined the final comprehensive carrying capacity value by using the minimum limiting factor in the “barrel principle”[21]. Zeng Hui, taking the environment as the starting point, constructed the tourism environment carrying capacity assessment system by focusing on the natural, economic and social environmental systems, and being combined with the actual situation of Wulong Heritage Site, measured the component indexes of carrying capacity by obtaining relevant data, determined the limited indexes of carrying capacity system at each scenic zone, and obtained the comprehensive tourism environment carrying capacity of heritage site through Analytic Hierarchy Process and expert opinions [22]. Pan Jinyu constructed a tourism ecological footprint model composed of seven sub-models of tourism catering, accommodation, transportation, sightseeing, shopping, leisure and tourism solid waste treatment in the study on sustainable development of Wulong Karst World Heritage Site. The quantitative results show that tourism development in Wulong is in a “sustainable” state, but the development degree of this state is becoming lower and lower [23]. By establishing the simulation system dynamics model of the Summer Palace, Liu Min proves that the Summer Palace has the problem of overloading in a specific period and zone through the steps of model establishment, operation and inspection.

3.2.3 Sustainable Development and Protection Countermeasure of World Heritage

There are many existing and potential ways of using world heritage, and its ecologically and culturally sustainable using can improve life quality of its communities. Tourism sustainability is one of the important contents of the sustainable development of world heritage, which aims to promote the management and development of sustainable tourism at world heritage site by raising the awareness, capacity and participation of all interest groups, so as to protect the heritage and its outstanding universal value [24]. According to the scholar Tao Wei, the main problems facing the sustainable tourism development of Chinese world heritage include the

contradiction between the limited heritage resources and the rapidly increasing number of tourists, the ecosystem and environmental damage caused by unreasonable development and utilization of tourism resources, the decline of tourism quality caused by the impact on local national culture at heritage site, the uncivilized behavior of tourists caused by insufficient environmental protection education[6]. Nevertheless, the effect of tourism on heritage site is “generally positive” (evaluated by the World Tourism Organization). We cannot give up eating for fear of choking and should find a reasonable balance point to reduce the negative impact of tourism on heritage site [25]. Legislative protection for world heritage is an embodiment of respect for human civilization and a requirement for social progress. The “*World Heritage Protection Regulations of Sichuan Province*” were officially promulgated in 2002, and then Gansu, Hunan, Fujian, etc. have also successively issued relevant special protection regulations to promote and encourage interest related parties to actively participate in the protection for world heritage [26]. As for tourist management, publicity and education on the protection for heritage sites should be strengthened, and tourists should be diverted and the number of tourists should be limited by ticket price and the implementation of online reservation system according to the research on tourism environment carrying capacity [27]. Moreover, management level of scenic zone personnel should be strengthened and a perfect scenic zone management mechanism should be established. Meanwhile, participation of local communities at heritage site should be actively guided to build a cooperative platform, so as to realize the sustainable tourism development in a real sense.

4 Conclusions and Discussions

4.1 Conclusions

This paper, based on the CNKI database and with the help of information visualization analysis software, such as Excel and Citespace, quantifies and visualized analyzes the amount, author and keyword, etc. of the literatures on tourism environment carrying capacity of world heritage. The conclusions are as follows:

1) During 1993-2019, a total of 225 papers on tourism environment carrying capacity of world heritage were included in the CNKI database, which can be divided into three stages: From 1993 to 2003 as the initial stage, world heritage has just begun to attract the attention of scholars, and the study on tourism environment carrying capacity was also in its infancy with less relevant literatures; From 2004 to 2013 as the rapid development stage, research papers on tourism environment carrying capacity of world heritage were growing rapidly, and new research hotspots and methods began to appear on the basis of the previous stage; From 2014 to 2019 as the transition stage, the number of related papers began to decline, however, research contents and methods became diversified, with the characteristics of multidisciplinary intersection.

2) Most of the relevant scholars were doing researches independently with less cooperation and exchange among research groups which were scattered. There were more research institutes located in Beijing, Hunan, Fujian and other provinces and cities with rich world heritage resources and better tourism development. Among the 225 papers, the number of dissertations was the highest. In fact, tourism environment carrying capacity is a huge and complex system, dissertation can study the natural, economic and social subsystems more fully while journal article is often unable to expand the study due to length limit, but it can discuss a topic more comprehensively and meticulously in the evaluation of a single index [28].

3) Sustainable development, ecotourism, heritage protection and tourist experience management, etc. all are hot topics in the study on tourism environment carrying capacity of world heritage. “Heritage tourism-sustainable development-heritage protection” are complementary and mutually supportive, so in the study on tourism environment carrying capacity of world heritage, we should focus on the concept of people-oriented and take world heritage as the research object, sustainable development as the research purpose, tourism environment carrying capacity as the management method, ecotourism as the form to realize world heritage protection.

4.2 Discussions

The prominent universal value of world heritage site is rare cultural or natural value that transcends national boundaries and is of universal importance to the present and future of all humankind. From the analysis of keywords, it can be seen that keywords like landscape and famous scenery, scenic zone and tourist attraction are frequently mentioned, which shows that scholars’ researches on tourism environment carrying capacity of world heritage mainly take scenic spot as the starting point. However, world heritage is precious because of its unique outstanding universal value, which is the biggest difference between it and other scenic spots. Therefore, in

future research, maintenance or strengthening of the outstanding the inclusion of heritage site in the “*World Heritage List*” in future research is of great significance to the study on tourism environment carrying capacity of world heritage. Meanwhile, cooperation and exchange among research teams, as well as different disciplines should be strengthened to jointly explore the future research trend of tourism environment carrying capacity of world heritage, so as to promote the sustainable development of Chinese world heritage.

Acknowledgments

Funding: This research was supported by the 111 Project (grant number Waizhuanfa [2017]126/ D17017), the Key Project of Science and Technology Program of Guizhou Province (grant number Qiankehe Sy [2015]3052).

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