



Knowledge Graph Analysis of Landscape Design Research Based on Citespace

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Abstract. The literature related to landscape design research in the China National Knowledge Infrastructure (CNKI) database from 2010 to 2020 was taken as the research object of the present paper. The CiteSpace software is used to explore research hotspots and review the current research status and development. Through this study, it is determined that the number of works is on an upward trend. There is less cooperation between research institutions and authors. Furthermore, there is a single research direction and less cross-fusion. Professional journals have apparent advantages in the number of published papers significantly contributing to landscape design research. According to the statistical analysis of the academic literature, landscape design, landscape architecture, landscape planning, and design will continue to be the key point. Moreover, hotspots, residential areas, plant landscaping, ecological landscape, cultural landscape, and plant community will be the next topics of research focus.

Keywords: Landscape design · Citespace · Study · Knowledge graph

1 Introduction

Landscape design integrates geography, humanity, religion, architecture, ecology, planning, and other disciplines into one field of research. Its content covers landscapes and gardens, with its components mainly incorporating natural and artificial landscapes. Although it inherits traditional landscape, it is not limited to just the landscape. With the development of the social economy, the pursuit of landscapes is no longer simply for people to selfishly achieve a sense of self-satisfaction, but rather to achieve the “harmony between nature and man” [1].

There was once a saying in ancient times concerning the study of landscape design, “I live in the city, but I doubt myself in the mountains,” which was praised by Shi Weize of the Yuan Dynasty for landscape design. The research on landscape design is more fruitful in modern times, as reflected in the comparative analysis of the traditional garden and modern landscape design. Specifically, the design method of modern landscape is considered to be more refined [2]. Based on the dynamic relationship among landscape patterns, service, and people, the science of landscape sustainability has been established, and a new direction of landscape development has been constructed [3]. To improve the living quality of rural residents, it is necessary to rationally plan and allocate rural land

to achieve the construction of beautiful countryside landscapes [4]. It is also vital to promote sponge city construction through urban wetland landscape design [5], as well as to implement “cultural” elements to strengthen landscape design connotation [6, 7]. In the present paper, inter-active landscape design is discussed and analyzed, the process of interactive land-scape design is summarized, and the design strategy is analyzed [8].

2 Method and Data Source

2.1 Research method

Knowledge graphs provide a visualization analysis of the author, keywords, research institution, and other units in a visual way, which has the advantages of being fast, efficient, intuitive, and quantitative. The CiteSpace software developed by Professor Chen Chaomei has been widely used in many fields and has produced a number of research achievements since it was introduced [9]. CiteSpace was implemented to conduct a metrological analysis of literature related to landscape design, study its development trend, understand its research hotspot and focus, and provide new suggestions for landscape design research [10].

2.2 Data source

The CNKI Chinese Academic Journals Network Publication Database was selected as the data source for the present paper. The theme was “landscape design,” the time range was chosen from “2010 to 2022,” the literature source was selected as “core journals, Engineering Index (EI) source journals, Chinese Social Sciences Citation Index (CSSCI) source journals,” and any content unrelated to landscape design was removed. A total of 7,460 records were searched, and 7,021 were collected after data screening and reprocessing.

3 Interpretation of Result

Through retrieval and analysis, it is found that the literature retrieval data of the CNKI database are mainly concentrated in the subject range of landscape design, landscape planning and design, garden landscape design, plant landscape, landscape planning, landscape, landscape architecture, urban landscape, planning and design, regional culture, park landscape, ecological landscape, and cultural landscape. The data is distributed in the fields of building science and engineering, highway and waterway transportation, environmental science and resource utilization, horticulture, tourism, fine arts, calligraphy, sculpture and photography, forestry, higher education, and water conservancy and hydropower engineering. From the time dimension analysis (Fig. 1), a relatively stable CNKI database was posted years ago in 2019. However, as a national macro policy for economic development, many experts and scholars have conducted relevant research since 2020 to reach new heights.

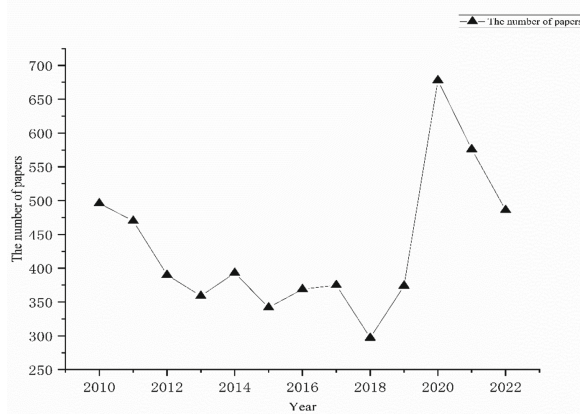


Fig. 1. Number of articles published in CNKI database from 2010 to 2022

3.1 Analysis of Characteristics of Research Institutions and Authors

According to the statistical analysis of the citation database of CNKI from 2010 to 2022, the top three authors in the published papers are Wang Hao from Nanjing Forestry University, and Zhang Jianlin and Zhou Jianhua from Southwest University. More than 100 authors have published more than five articles, and the top 20 authors are presented in Table 1. The top three published institutions are Nanjing Forestry University, Beijing Forestry University, and Tongji University. From the perspective of authors and research institutions, there is a single correlation between one another and the overall dispersion. There are few links between research institutions and authors, indicating less cooperation between authors and research institutions, independent research between one another, and a lack of cross-research fields.

Table 1. Top 20 authors

Author	Number of papers	Author	Number of papers
Liu Binyi	8	Luo Yanyun	11
Wang Hao	22	Ji Wenli	8
Hu Xijun	13	Wang Kun	11
Li Shuhua	7	Zhang Jianlin	20
Long Yuelin	17	Yang Rui	7
Duan Yuanguu	17	Zhou Jianhua	19
Liu Hailong	7	Lin Baosteel	7
Bao Zhiyi	12	Jiang Fang	11
Du Chunlan	8	Zhang Jianjian	8
Gong Bi	14	Zheng Yanning	10

Table 2. Top 20 journals in terms of the number of published literatures

Publications	Number of documents	Publications	Number of documents
Chinese landscape architecture	656	Edible Fungi of China	82
Journal of Anhui Agricultural Sciences	268	Shanghai Textile Science & Technology	77
Decoration	154	Architectural Journal	76
Planners	133	Ecological Economy	67
Tea In Fujian	133	Highway	66
NORTHERN HORTICULTURE	131	Environmental Engineering	66
Industrial Construction	115	DAWUTAI	64
Journal of Northwest Forestry University	103	Journal of Southwest China Normal University (Natural Science Edition)	63
Building Structure	101	Art Observation	62
Hundred Schools in Arts	95	Art Panorama	54

3.2 Analysis of Publishing Journals

According to the number of publications in cited journals, as show in Table 2, the largest number of publications since 2010 were in the journals *Chinese Landscape Architecture*, *Journal of Anhui Agricultural Sciences*, and *Decoration*, which mainly focus on land-scape architecture, landscape design, design methods, planning, and design. These journals also primarily focus on the landscape node, design, and layout.

3.3 Keyword Analysis

To further analyze the research hotspots of landscape design, specific keywords were selected from the retrieved literature to construct the distribution map of the re-search hotspots of landscape design, as shown in Fig. 2. Among them, the size of the nodes represents the word frequency of keywords, and the keywords of high-frequency words reflect the research hotspot of landscape design over a long period. According to the search topic, landscape design is the keyword with the highest frequency, appearing 558 times, and has a high degree of 218. The whole keyword co-occurrence knowledge map represents centrality, which is consistent with the search target presentation and reflects the correctness of the research.

As shown in Table 3, the intensity of tea culture is the highest, reaching 18.36. In the same period, many words related to “tea” appeared. The essence of their interpretation is the rural landscape, which presents sustainable development and is the focus of landscape design research. According to the keyword emergence time, landscape design

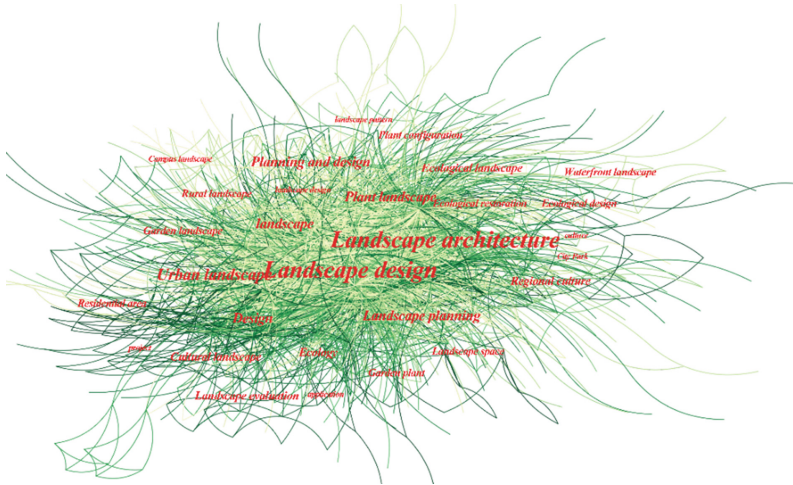


Fig. 2. Keywords co-occurrence knowledge graph

research can be divided into two stages from the time dimension. From 2010 to 2017, three burst terms appeared: residential area, tea culture, and tea garden. From meeting basic design needs to combining ecology and culture, landscape design is no longer limited to a single function. Experts and scholars are now exploring the landscape’s primary role and ecological culture’s harmonious development. So far in 2019, there have been six landscape design research burst terms from the micro to macro perspective. With the overall improvement of poverty alleviation in China and the continued development of rural revitalization, relevant themes continue to be emphasized, such as “edible fungi” and “system layout.” These themes have attracted the attention of experts and scholars, illustrate the trend of innovative development, and show the landscape design methods and concepts with Chinese characteristics. In addition, constructing an eco-logical civilization further promotes the continuous progress of landscape design and keeps pace with the development of the times.

Table 3. Top 10 Keywords with the Strongest Citation Bursts

Keywords	Year	Strength	Begin	End	2010 - 2022
Residential area	2010	8.29	2010	2011	█
Tea culture	2016	18.36	2016	2017	███
Tea garden	2016	6.44	2016	2017	███
Design sketch	2015	12.2	2018	2021	██████████
Park Landscape	2015	7.73	2019	2021	██████████
Landscape design	2010	7.19	2019	2021	██████████
Rural vitalization	2018	6.56	2019	2021	██████████
Edible fungi	2019	6.29	2019	2021	██████████
System Layout	2019	6.19	2019	2022	██████████
Landscape Architecture	2010	5.74	2019	2022	██████████

4 Conclusion and Suggestion

The number of research results in landscape design has shown a steady trend for more than ten years. Relevant experts and scholars have conducted in-depth studies on the primary application, element design, multi-element integration, and ecological construction of landscape design. However, there are only a few interdisciplinary studies, and a distinct gap exists between them and foreign studies in auxiliary design elements. Furthermore, high-quality research results are mainly concentrated in the scope of a few authors and institutions. The overall centrality is low, and mutual communication and cooperation are insufficient. From the analysis of cited journals, *Chinese Landscape Architecture* is far ahead in the number of published papers. It has a strong influence on landscape design research, while the cited instances of other journals show a rapid gradient decline, and their attention is relatively low, showing insufficient power. From the perspective of research hotspots, the relevant research hotspots mainly focus on landscape design application, landscape design, landscape architecture, landscape planning and design, plant landscape, urban landscape, landscape planning, landscape design, regional culture, rural landscape, and landscape plants.

The above analysis shows that landscape design has important economic and practical value in the future economic and social development process and will become the focus point. In combination with reviewing the available literature and conducting the graphical knowledge analysis, future research should address the following areas:

First of all, the cooperation among relevant institutions and authors should be strengthened, the scope of landscape design research should be expanded, the combination of depth and breadth among authors should be realized, and the needs of practical applications should be met. In addition, the integrated platform of scientific research institutions and enterprises should be integrated to realize the rapid transformation of scientific knowledge into practical application.

Moreover, the standardization of landscape design should be explored. Landscape application design is one of the main hotspots in landscape architecture, promoting high-quality development of the field through norms, standards, and orderly processes. Presently, the research of relevant experts and scholars on landscape design still focuses on application analysis and pays little attention to the process, effect, and quality of landscape design. An in-depth analysis of landscape design's internal and external causes is needed to identify main patterns and to provide a solid foundation for landscape design.

Last but not least, future research efforts should explore the paths available to achieve the high-quality development of landscape design. Different regions greatly differ in terms of their natural, humanitarian, societal, and ecological attributes. Based on this, the generalization and particularity of landscape design are summarized. The suggested method to achieve its realization is put forward, which is conducive to the comprehensive development level of landscape design and has important practical significance.

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