

Article

Research Context and Prospect of Green Railways in China Based on Bibliometric Analysis

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Abstract: The CiteSpace bibliometric software was used to quantitatively analyze the research papers on green railways retrieved from the China National Knowledge Infrastructure (CNKI) database during 1985–2021. Combined with content association analysis, the development stages, frontier hotspots, and evolutionary trends of green railway research in China were summarized in the Chinese context. The results show that in the past 36 years, China’s green railway research has experienced four main stages: the emerging stage (1985–1997), the horizontal expansion stage (1998–2010), the vertical deepening stage (2010–2015), and integrated expansion stage (2016–present). The research topics emerging in the four stages are green design and green construction, green channel and green logistics, energy conservation and emission reduction and green evaluation, multimodal transportation, and green development. In general, the research topics are diversified, but green construction of railway infrastructures and green manufacturing of railway equipment have been the research hotspots all the time. Both external and internal paths drive the transmutation of academic frontiers, and the push effect of the external path is more evident than the internal path. Interdisciplinary integration and innovation gradually become a new force to promote green railway research. As the railway development slowly enters a “big operation era”, it can be inferred that the development trend of green railway research could throw light on the following three areas: from the research perspective and topics, it should be based on a framework of life cycle management to explore, systematically and deeply, the correlation and integration of railway green design, green construction, green operation and maintenance; in terms of the research content, more focus should be on new theories, new methods, and new technologies of railway green operation and green maintenance on the basis of railway green design, construction, and manufacturing research, such as railway green operation strategies and evaluation systems and green transportation organization theories and methods; from innovation paths, academic progress still needs both external and internal paths, interdisciplinary integration and innovation as the primary internal driving force to promote green railway research, and more focus on the use of big data and artificial intelligence and other technologies to innovate green railway development.

Keywords: green railway; CiteSpace; knowledge map; research hotspot; evolutionary trend

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1. Introduction

Since the 18th CPC National Congress, the CPC Central Committee has attached greater importance to sustainable development than ever before. Ecological progress has become essential to the five-sphere integrated plan, and green growth has been incorporated into the new development concept. With the deepening of theoretical research on green development, relevant research on green railways is also promoted [1]. Green railway research is an important measure to promote the sustainable development of railway and enhance the international competitiveness of China’s railway industry. The International Union of Railways (UIC) set the goal of sustainable development of railways as “making railways greener, quieter and more energy efficient” [2]. The European Railway

Community (CER) points out that railway sustainability is embodied in environmental friendliness, energy saving and high efficiency, transportation economy, and inclusiveness. Sun Yongfu et al. [3] proposed that the narrow concept of green railway is the environmental friendliness of the railway system itself. In contrast, the broad concept is the means and method to achieve sustainable development and achieve the goals of safety, efficiency, low consumption, environmental protection, and economy. Since the 1980s, the number of research achievements in green railways has increased yearly, the research content has evolved, and the topic has gradually deepened. However, the existing research lacks a systematic review of the research in this field. The development stage, frontier hot spots, and evolution trend in green railway research have not been sufficiently understood. It is necessary to summarize how, over time, to promote and better the green development of railways from the research perspective. In the face of a large number of documents, it is necessary to use scientometrics to conduct a quantitative analysis of the atlas [4]. CiteSpace knowledge visualization software, developed by Professor Chen Chaomei's team, is one of the most popular knowledge-graph-drawing tools for literature analysis. It integrates cluster analysis, social network analysis, and other methods to analyze and judge a particular field's basic knowledge and research frontier and explore the research characteristics and evolution trends of disciplines. It has the advantages of simple operation, good visualization effects, and many kinds of maps [5]. At present, bibliometrics has been widely used in research hotspot analysis [6], cooperation analysis [7], co-citation analysis [8], and development analysis of the whole subject field [9]. Based on this, this paper uses the method of scientific metrology to carry out a quantitative study of the atlas of domestic green railway research literature, summarize the frontier hotspots and evolution trends of green railway research in the Chinese context, and reveal the theme evolution process, characteristics, and research and development trends of this research field through a detailed reading of some key national policy documents and critical events to help deepen the understanding of China's green railway research.

The rest of this paper is organized as follows: the second part introduces the methods and data sources used in this study; the third part describes the research results in detail, including research institutions and cooperative network analysis, hotspots and stage division, and research topic evolution characteristics; the fourth section summarizes the full text and prospects the future research trends.

2. Research Methods and Data Sources

The development of information technology and the improvement of literature statistics, provides a new method to analyze, draw, and visualize the scientific map of literature data using visual information processing software [10]. However, CiteSpace can only outline the general situation of the whole research field and cannot provide more in-depth literature details. Therefore, this paper carries out correlation analysis based on the analysis results of CiteSpace, combined with national policy documents and critical events.

2.1. Research Methods

- 1 The knowledge map of green railway research was constructed by quantitative atlas analysis method. By using the data format conversion tool provided by CiteSpace, RefWorks literature exported from CNKI was converted into a data format recognized by CiteSpace. The period was set from 1985 to 2021, and the time slice was set to 1 year. The research institution cooperation map, keywords co-occurrence network map, keyword emergence map, and clustering map were drawn.
- 2 The content correlation analysis method is used to analyze the characteristics of the development stage and topic evolution. Based on the quantitative analysis results of the atlas, key events and national policy documents in the development process of green railways are searched and used as literature sources for content correlation analysis. We reveal the evolution process and characteristics of the topic and the development trend of the research and provide a reference for subsequent researchers.

2.2. Data Sources

In CNKI, the “advanced search” type was selected, the “subject” search was set, and the search conditions were “sustainable & railway”, “green & railway”, and “low-carbon & railway”. A total of 3278 relevant pieces of literature were retrieved. Through manual screening, reports, meeting notices, documents, solicitation notices, forewords, and so on were deleted, and 3259 practical pieces of literature were finally obtained, all containing author, author unit, title, abstract, keywords, and other information.

3. Results and Discussions

This paper analyzes and draws the knowledge map of the green railway research literature collected by CNKI and interprets and discusses the literature from the perspectives of research institutions, keywords, and publication time.

3.1. Research Institutions and Cooperative Network Analysis

This study counts each research institution’s published papers to determine China’s leading institutions and academic groups of green railway research. There are 18 first-level institutions with more than 20 publications, including universities, research institutes, and enterprises. In addition to disciplines closely related to railways, such as rail transit information and control and traffic engineering, the research institutions’ disciplinary backgrounds show the characteristics of multi-disciplinary participation, such as environmental studies, sociology, information and computing science, physical geography and resources and environment, and material science and engineering. It shows that green railway research has been widely undertaken by many departments, institutions, and disciplines.

This study generates the cooperation map of green railway research institutions to investigate the cooperation among different institutions, as shown in Figure 1. Where the node is the organization name, the node size represents the number of published papers. The node ring represents the citation ring and the citation history of the literature. Different colors and sizes represent the corresponding citation time and number. Label size indicates centrality. The line between the two nodes indicates institutional cooperation. There are a total of 562 nodes and 163 connections in the institutional cooperation network, and the overall density of the network is 0.0011, which is relatively sparse. It can be seen that in green railway research, cooperation results between different institutions are few.

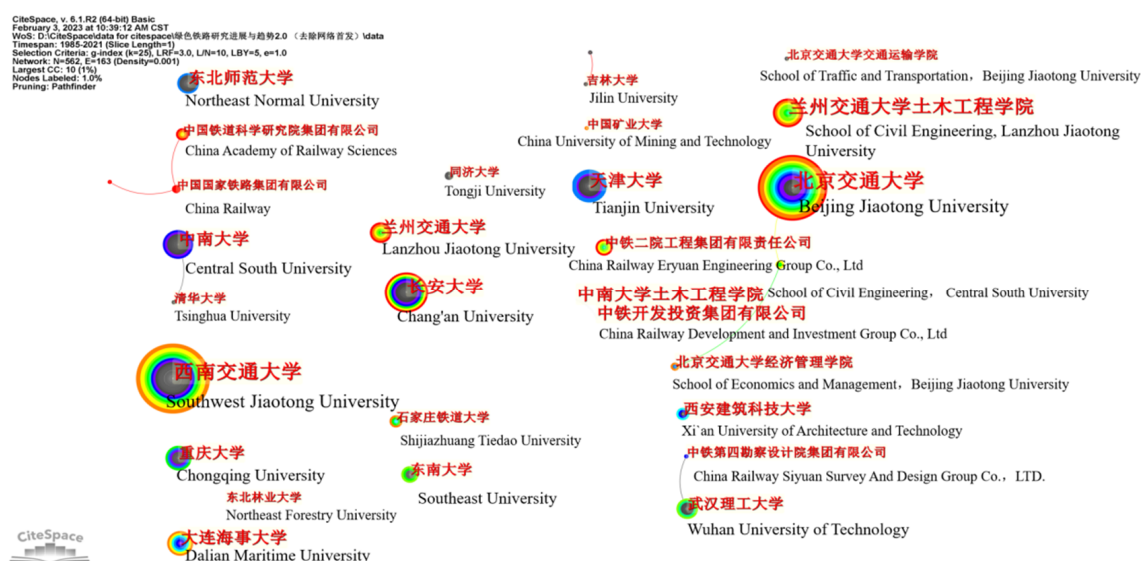


Figure 1. Cooperative map of green railway research institutions, 1985–2021.

3.2. Research Hotspots and Stage Division

Keywords are the high-level summary and extraction of the core of an article. As an essential part of an academic paper, they can directly reflect the subject content of literature research [11]. Through co-occurrence analysis, cluster analysis, and emergent word analysis of keywords, this paper helps to gras the hot spots in the green railway field; according to this, the research stages are divided.

3.2.1. Analysis of Research Hotspots

The research hotspots refer to the scientific issues discussed by a group of papers that are intrinsically related and published in a large number within a certain period [12]. By analyzing the changes in co-occurrence keywords in different years, we can judge the richness of the research field’s expansion, the update speed of the field’s content, and the vitality of scientific research [13]. The node type was selected in the keywords co-occurrence analysis with CiteSpace, and the year when the keywords first appeared in the green railway research literature was set. A total of 664 keywords were obtained. In the keyword co-occurrence network map, there are 1376 connections, and the network density is 0.0063, as shown in Figure 2.

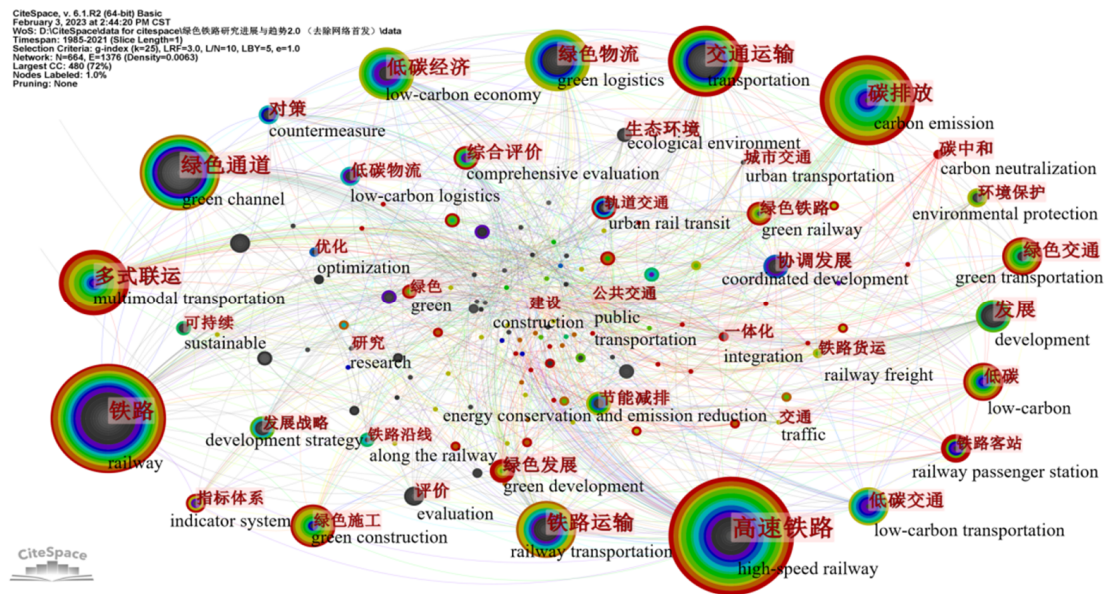


Figure 2. Green railway research keywords co-occurrence network map, 1985–2021.

The larger the keyword node radius, the higher the keyword frequency. The thicker the line between keywords is, the more co-occurrence times between the two keywords there are, and the closer the connection is [14]. The top 30 keywords in the word frequency ranking are selected as high-frequency keywords. High-frequency keywords with similar meanings are merged and classified, and high-frequency keywords of different categories are obtained, as shown in Table 1.

Table 1. High-frequency keywords in the field of green railway research.

Category	High-Frequency Keywords
Research object	high-speed railway; green channel; multimodal transportation; railway transportation; railway passenger station; urban rail transit
Research perspective	low-carbon economy; green transportation; green logistics; green construction; comprehensive assessment; countermeasure; environmental impact; energy conservation and emission reduction; coordinated development; development strategy

As can be seen from Table 1, the objects of green railway research include high-speed railway, green channel, multimodal transportation, railway transportation, railway passenger station, and urban rail transit. From the research perspective, it mainly focuses on low-carbon economy, green transportation, green logistics, green construction, comprehensive assessment, countermeasure, environmental impact, energy conservation and emission reduction, coordinated development, and development strategy.

3.2.2. Research Stage Division

This paper aims to understand the changing trend of published green railway pieces of literature in China by statistical analysis of 3259 samples of literature collected from CNKI. As can be seen from Figure 3, before 1997, less attention was paid to green railways in China, and the number of articles published annually was five or fewer. Since 1997, the number of published papers has shown a trend of fluctuating rise, especially in 2009, which indicates that the study of green railways has gradually attracted the attention of domestic scholars. The number of published papers decreased slowly from 2010 to 2015 and increased steadily from 2016 to now.

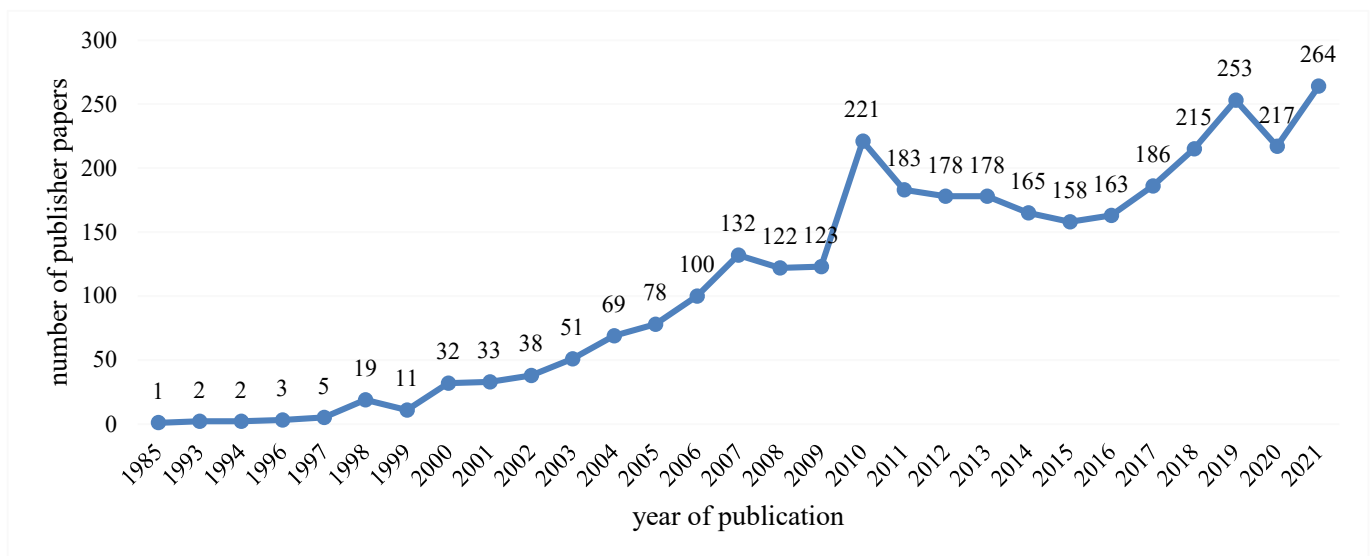


Figure 3. Number of published domestic green railway research documents, 1985–2021.

Emergent words are keywords that indicate the sudden increase of occurrence frequency or apparent increase of use frequency in a short period, which can directly reflect the research focus and hot spots of green railway research in a certain period [15]. Fifty-seven emergent words are obtained from the literature keyword analysis. The top 30 emergent words are shown in Figure 4. The red line indicates that a particular keyword, as an emergent word, has received special attention from the academic circle in a certain period.

As can be seen from Figure 4, the objects of green railway research are canyon area, Luohe Bridge, railway bridge, green channel, spatial structure, Qinghai-Tibet Railway, high-speed railway, multimodal transportation, and railway freight in chronological order. The research perspectives in chronological order are environmental impact, comprehensive evaluation, development strategy, coordinated development, low-carbon economy, low-carbon logistics, energy conservation and emission reduction, low-carbon transportation, and green development. Overall, the research objects and perspectives have experienced the evolution process of “green design–green construction–green evaluation–green development”. Many scholars gradually pay attention to other aspects besides design and construction and begin introducing the concept of full life cycle management into their research to achieve the goal of the best overall benefit of the whole life cycle [16].



Figure 4. Top 30 emergent words in Green railway research, 1985–2021.

In terms of the occurrence time nodes and existence cycles of emergent words, “low-carbon economy” is the longest (12.79 years), “game theory” (10.47 years), and “green channel” (10.31 years) are more than ten years, and most other emergent words are concentrated in 6–7 years. The figure also reflects the different research topics at different time stages. Although the specific issues concerned—“great leap”, “low-carbon”, “green”, and “sustainable”—have been consistent throughout. As shown in Figure 4, the red line indicates that emergent words have specific time and stage change characteristics. Therefore, the relationship between emergent words and time and stage in green railway research can be sorted out by combining the characteristics of time and stage and the changing trend of the number of published studies, as shown in Table 2.

Table 2. Emergent words in the field of green railway research in different stage.

Research Stage	Emergent Words
1985–1997	game theory; canyon area; Luohe Bridge; mixed algorithm; cloud model; railway bridge; environmental impact; comprehensive evaluation
1998–2010	development; green channel; development strategy; research; evaluation; spatial structure; Qinghai-Tibet Railway; ecological environment; coordinated development; countermeasure
2011–2015	low-carbon economy; low-carbon logistics; energy conservation and emission reduction; high-speed railway; low-carbon transportation; low carbon
2016–present	carbon emission; green development; route optimization; multimodal transportation; railway freight; green

3.3. Research Topic Evolution Characteristics

To further analyze the evolution process and characteristics of the topic in the research stage, the timeline view is first used for the cluster analysis of keywords. Through calculation, the Modularity Q in this paper is 0.5897, and the Mean Silhouette = 0.8748, which exceeds the minimum threshold standard, indicating that the clustering results are reasonable [10]. Figure 5 shows the timeline view of keyword clustering in green railway research, in which the horizontal axis represents time, and the vertical axis represents ten clustering keywords: multimodal transportation, development, high-speed railway, green channel, green transportation, comprehensive evaluation, transportation, green logistics, connectivity, and railway passenger station (labeled #0 to #9). The smaller the label, the larger the keyword clustering scale, the more keywords are contained in this category.

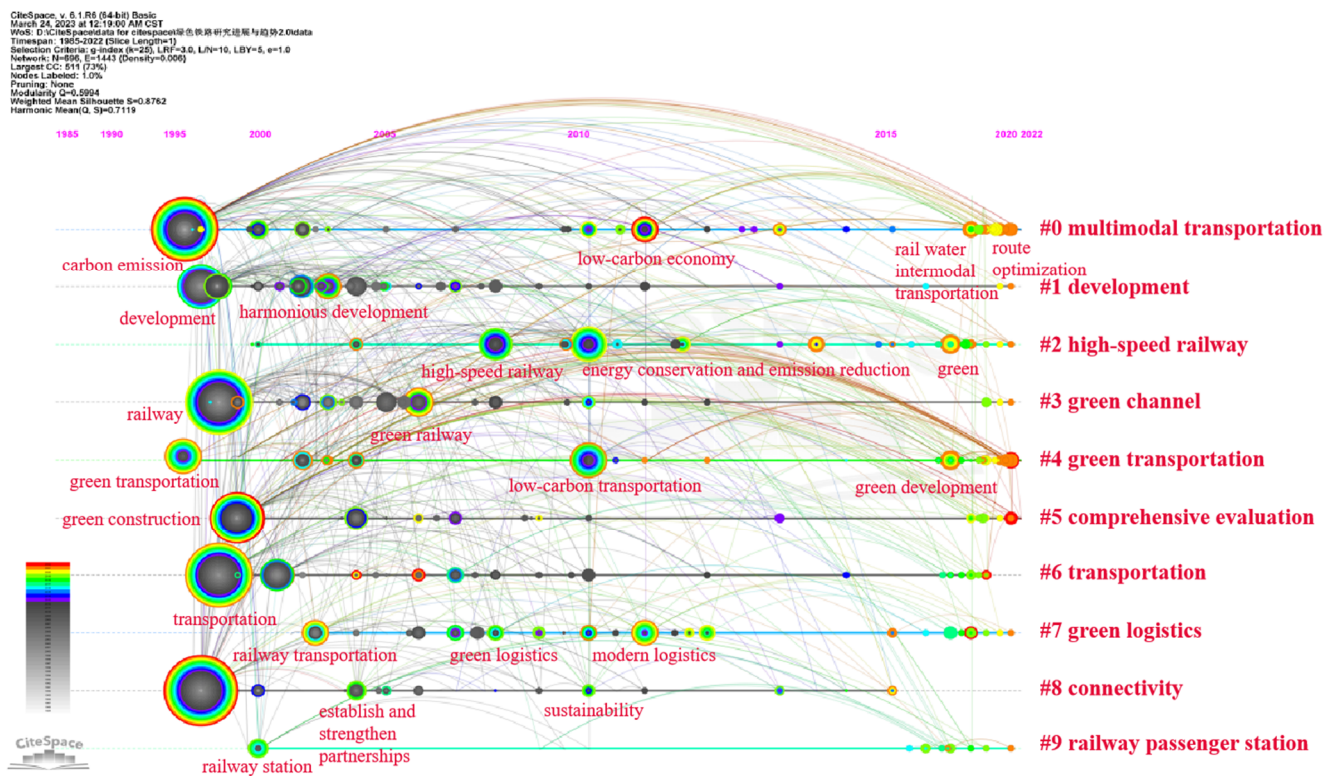


Figure 5. Keywords of green railway research time line view of clustering map, 1985–2021.

As can be seen from the size of keyword nodes in each cluster in Figure 5, the keyword development of each class is different. The larger nodes are high-speed railway, railway, carbon emission, multimodal transportation, green channel, transportation, green transportation, low-carbon economy, green logistics, green construction, diesel locomotive, and other keywords. The nodes connected by these keywords have a considerable period involving green design, green construction, green logistics, green operation, and other aspects, reflecting the diversity of research objects and perspectives on green railways. With time, research keywords are also changing; the composition of keywords is particularly complex from 1998 to 2010, and the research heat continues to increase. Generally speaking, the evolution of the academic frontier is influenced by driving forces [17]. Table 2 and Figures 4 and 5 show that since 2016, carbon emission, green development, and multimodal transportation have become hot topics at the forefront of green railway research, which may be closely related to the establishment of a safe, convenient, efficient, green, and economical modern comprehensive transportation system and the introduction of relevant policies.

The research category reflected by the above clustering keywords has certain fuzziness. To further explore the evolution characteristics and driving forces of the frontier research field of green railways, the current research on green railways mainly involves

three aspects—railway construction, railway equipment, and railway transportation—and starts to promote the research on green railways from the perspective of the whole life cycle [3]. Therefore, around the green goal, from the perspective of the whole life cycle of a railway, the research on green railways is divided into four stages by integrating the development of research objects and research perspectives, sorting out relevant policy documents; they are the stages of emerging (1985–1997), horizontal expansion (1998–2010), vertical deepening (2011–2015), and integrated expansion (2016–present). The research topic and stage characteristics are summarized and extracted, as shown in Table 3.

Table 3. Description of topic evolution and characteristics of green railway research stage.

Research Stage	Characteristics	Research Topic	Content Relates to Policy Documents and Important Events
emerging stage 1985–1997	The number of relevant journals and papers published is small, and the keyword category is relatively simple. The research focuses on green construction, green design, environmental impact, and other keywords.	(1) green design (2) green construction	(1) 1987: Regulations on the Design of Environmental Protection for Construction Projects [18]; (2) TBJ501-87: Technical Regulations on Environmental Protection of Railway Engineering Design [19]; (3) 1989: Environmental Protection Law of the People's Republic of China, amended in 2014 [20]; (4) 1994: White Paper on China's Population, Environment and Development in the 21st Century [21]; (5) TB 10501-98: Code for Design of Railway Engineering Environmental Protection [22]; (6) 2000: Notice of The State Council on Further Promoting the Construction of National Green Channels [23]; (7) In 2001, the second phase of the Qinghai-Tibet Railway (Golmud-Lhasa) began construction, and an environmental supervision system was introduced [24]; (8) The 16th National Congress in 2002 set "continuously enhancing the ability of sustainable development" as one of the goals of building a well-off society in an all-round way [25]; (9) 2005: Several Opinions of The State Council on Accelerating the Development of Circular Economy [26]; (10) 2011: Notice of The State Council on Issuing a Comprehensive Work Plan for Energy Conservation and Emission Reduction during the 12th Five-Year Plan Period [27]; (11) 2011: Guidelines on Building a Low-carbon Transport System, Ministry of Transport; (12) 2013: Guidelines of the Ministry of Transport on Accelerating the Development of Green, Circular and Low-carbon Transport [28]; (13) TB/T 10429 2014: Evaluation Standard of Green Railway Passenger Station [29]; (14) The report to the 19th National Congress of the Communist Party of China in 2017 put forward the strategy of "building China through transportation" [30]; (15) 2021: Notice of The General Office of the State Council on Printing and Distributing the Work Plan for Promoting the Development of Multimodal Transportation, Optimizing and Adjusting the Transport Structure (2021–2025) [31].
horizontal expansion stage 1998–2010	The number of published papers fluctuated, and the keyword categories were diversified. Green protection, landscape design, modern logistics, and other keywords appeared, and the research field gradually expanded.	(1) green channel (2) green logistics	
vertical deepening stage 2011–2015	The number of published papers decreased slowly, the expansion of keyword categories slowed, and the research literature in the same field increased. Low carbon economy, evaluation index, influencing factors, and other keywords are the main contents of the research.	(1) energy conservation and emission reduction (2) green evaluation	
integrated expansion stage 2016–present	The number of published articles increased steadily, and the keyword categories grew. Keywords such as railway intermodal transport, intelligent transportation, scientific and technological innovation, and information system appear, and the research field is further diversified and multi-disciplinary integration and innovation.	(1) multimodal transportation (2) green development	

As can be seen from Table 3, national policies are the primary external driving force for the evolution of research topics. Compared with the process of quantitative change to qualitative change in the academic frontier of green railways promoted by the academic community, the evolution of research topics at each stage depends more on the strong support and traction of national policies. One is that national policies are introduced before academic research results are published. From 1994, when Chris Bradshaw first proposed the concept of "green transportation" [32], to 2003, when the "Notice on the Construction" of "Green Transportation Demonstration City" was issued, to 2009, the number of papers and periodicals related to green railways increased sharply. It can be seen that our green railway has experienced the development path of "the real need–national policy–academic research", the academic community took a certain time to integrate "green development" and "transport" and produced the academic results of green railway research. Second, national policies are more evident than academic research. As seen from Figure 4 and Table 3, the research topics in the field of green railways, in chronological order, are green design and green construction, green channel and green logistics, energy conservation and

emission reduction, green evaluation, multimodal transportation, and green development. In combination with the time nodes of emergent words, the promulgation years of policy documents, the occurrence time of critical events, and the funding funds of related papers, it can be seen that the research topic has an obvious national policy orientation. This result also confirms the research conclusions of relevant scholars; that is, national policies are the urgent reflection of the whole society and the shared focus of academic groups from all walks of life, which can drive the academic community to explore and thus trigger the evolution of the academic frontier [33].

4. Conclusions and Prospects

The China National Knowledge Infrastructure database is currently regarded as a dynamic resource system with the most comprehensive resource collection, the most significant amount of literature information, the most advanced knowledge service platform and digital learning platform, and the world's largest Chinese knowledge portal [34]. By analyzing the content of articles in the field of green railway research, it is representative to understand the characteristics, limitations, and development trends of this field in the Chinese context.

4.1. Conclusions

Based on the above analysis results, it can be concluded that from 1985 to 2021, China's green railway research presents the following three main characteristics.

The evolution of the academic frontier of green railway research is driven by internal (primarily referring to the academic community) and external (mainly referring to national policies) paths. The external path is more evident than the internal one. The reason is that national policies, as an external path, keep up with the needs of social reality and provide support and guarantee for the development of science and technology, thus driving the academic community to explore. The quantity and quality of academic communities are the keys to the smooth development of internal pathways, and the sharing of inner educational experience between academic communities is the basis to ensure the continuation of research. Still, at present, the inner pathways cannot well undertake the critical task of evolving the academic frontier.

The research topics in the field of green railways show diversity. Green construction in railway engineering and railway equipment manufacturing has always been a research hotspot. As a transportation concept of sustainable development, developing green railways aims to promote the sustainable development of Chinese railway construction, manufacturing, operation, and management [35]. So far, the research topics mainly involve the standards and requirements of green channel construction, the development of railway equipment with low carbon emission reduction, the green construction in line with "four sections and one environmental protection", and the green development of railways against the background of powerful transportation. However, most scholars pay attention to green railway construction, and most of the research teams are from civil engineering. With the continuous development of new railway projects and the continuous increase of operating mileage, many scholars have begun to introduce the concept of whole life cycle management in their research, aiming at enhancing the information interworking at various stages, coordinating all aspects of project construction as a whole and making the management more scientific and systematic. However, as an essential link in the whole life cycle of railway, green operation management is still rarely reflected in the current research.

Interdisciplinary integration innovation becomes a new force to promote green railway research. According to the existing research, the institutions involved in green railway research mainly include universities, research institutes, governments, and enterprises. The disciplinary background of these institutions involves multi-disciplinary characteristics such as traffic engineering, economics, geography, and environmental science. On the one hand, under the guidance of national policies, the research team on green railways keeps growing, which promotes the movement of research on green railways from the

academic edge to the central hotspot. On the other hand, green railway research is a comprehensive interdisciplinary study involving knowledge from multiple disciplines. Scholars in different fields cooperate to produce more innovative results. For example, the current research topics involve intelligent railway, multimodal transportation, high-speed rail economy, intelligent logistics, and other aspects. These are the products of interdisciplinary integration and innovation, and this trend of integration and innovation will be conducive to developing China's railway in a greener and more innovative direction.

4.2. Prospects

In terms of research objects, this paper considers the evolution process and characteristics of green railway research in the Chinese context. It selects Chinese literature collected by the China National Knowledge Network (CNKI). With the strengthening of international academic exchanges, many articles on China's green railways have been published in languages other than Chinese. Subsequent researchers can select several databases, such as Web of Science, Elsevier, etc., to carry out integrated research in Chinese and English contexts and conduct a comparative analysis to further deepen the understanding and grasp of green railway research at home and abroad. In terms of research content, with the in-depth implementation of development concepts such as sustainable development, green development, green economy, and high-quality development, and looking forward to the future, this study puts forward the following important issues and directions for the reference of subsequent researchers.

Based on the concept of full life cycle management, it is necessary, systematically and deeply, to discuss the correlation and integration cooperation between green railway design, green construction, green operation, and green maintenance. The whole life cycle of a railway can be divided into design, construction, operation, maintenance, and other stages, with specific constraints and mutual feedback relations. Given that the current research on green railways is mainly focused on green design and construction, it is necessary to introduce green operation and green maintenance into the whole life cycle management process, define their connotation, discuss their application, sort out their correlation, and solve the problem of multi-stage integration and coordination.

Based on the research on green railway design, construction, and manufacturing, it is necessary to focus on the new theory, new technology, and new method of green railway operation and maintenance. With the increase in railway mileage put into operation, the Chinese railway is gradually entering a "big operation era". At the same time, with the thorough implementation of a high-quality development concept, green railways need to embody the green management value of the three-way integration of society, economy, and environment from the angle of sustainable development. Therefore, it is urgent to expand the study of new theories, new technologies, and new methods in green railway management, such as the study of railway green management strategies and evaluation systems, green transportation organization, and green maintenance and repair.

Green railway research still needs to be driven by both external and internal paths. Still, more importantly, it needs to promote the development of green railways from the perspective of science and technology through multidisciplinary integration and innovation. The external drive of national policies plays a vital role in promoting the green research and development of the Chinese railway. In the future, it is more necessary to innovate the research and development of green railways via the interdisciplinary integration of academic communities with multidisciplinary backgrounds, especially integrating new technologies such as cloud computing, big data, and artificial intelligence into the railway field.

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References

1. Chang, Y.; Dong, S. Study on green ecological assessment of high-speed railway using unascertained measure and ahp. *Teh. Vjesn.-Tech. Gaz.* **2017**, *24*, 1579–1589.
2. Sustainable Development. Available online: <https://uic.org/sustainable-development/UIC> (accessed on 7 October 2020).
3. Sun, Y.; Tang, J.; Wang, M. Connotation explore and research prospects for green railway engineering. *J. Railw. Sci. Eng.* **2021**, *18*, 1–11.
4. An, C.; Li, T.; Zhai, Z. Characteristics and prospects of chinese rural tourism research,1992–2016:an analysis based on citespace maps. *Prog. Geogr.* **2018**, *37*, 1186–1200.
5. Liao, H.; Tang, M.; Luo, L.; Li, C.; Chiclana, F.; Zeng, X.-J. A Bibliometric Analysis and Visualization of Medical Big Data Research. *Sustainability* **2018**, *10*, 166. [[CrossRef](#)]
6. Yeung, A.W.K.; Goto, T.K.; Leung, W.K. A bibliometric review of research trends in neuroimaging. *Curr. Sci.* **2017**, *112*, 725–734. [[CrossRef](#)]
7. Sweileh, W.M.; Al-Jabi, S.W.; Sawalha, A.F.; AbuTaha, A.S.; Saed, H.Z. Bibliometric analysis of publications on Campylobacter: (2000–2015). *J. Health Popul. Nutr.* **2016**, *35*, 35–39. [[CrossRef](#)]
8. Merigó, J.M.; Blanco-Mesa, F.; Gil-Lafuente, A.M.; Yager, R.R. Thirty years of the International Journal of Intelligent Systems: A bibliometric review. *Int. J. Intell. Syst.* **2017**, *32*, 526–554. [[CrossRef](#)]
9. Merigó, J.M.; Yang, J.B. A bibliometric analysis of operations research and management science. *Omega* **2016**, *97*, 37–48. [[CrossRef](#)]
10. Chen, Y.; Chen, C.; Liu, Z. The methodology function of citespace mapping knowledge domains. *Stud. Sci. Sci.* **2015**, *33*, 242–253.
11. Gao, F.; Li, X.; Chen, L. Research progress in response of soil microorganisms to global warming: Based on bibliometric analysis. *Microbiol. China* **2022**, *in press*.
12. Li, W.; Sun, B. The knowledge structure and research hotspots of west economic geography:visualized quantitative research based on citespace. *Econ. Geogr.* **2014**, *34*, 7–12.
13. Yu, G.; Dai, G. Tourism discipline innovation and knowledge system construction based on bibliometric analysis of keywords in tourism tribune. *Tour. Trib.* **2017**, *32*, 99–110.
14. Chen, C.; Hu, Z.; Liu, S.; Tseng, H. Emerging trends in regenerative medicine: A scientometric analysis in CiteSpace. *Expert Opin. Biol. Ther.* **2012**, *12*, 593–608. [[CrossRef](#)]
15. Wu, S.; Wang, X.; Liu, T. Research advances and hotspots evolution of the wetlands restoration based on citespace. *Acta Ecol. Sin.* **2022**, *42*, 1224–1239.
16. Wang, T. Research on life-cycle management framework of intelligent high-speed railway infrastructure. *J. China Railw. Soc.* **2021**, *43*, 1–7.
17. Chen, C. CiteSpace II: Detecting and visualizing emerging trends and transient patterns in scientific literature. *J. Am. Soc. Inf. Sci. Technol.* **2006**, *57*, 359–377. [[CrossRef](#)]
18. State Planning Commission. Regulations on the Design of Environmental Protection for Construction Projects. *Environ. Prot. Petrochem. Ind.* **1988**, *1*, 53–58.
19. The Fourth Survey and Design Institute of the Ministry of Railways. *Technical Regulations on Environmental Protection of Railway Engineering Design TBJ501-87*; China Railway Publishing House: Beijing, China, 1988.
20. Environmental Protection Law of the People’s Republic of China. Available online: http://www.gov.cn/zhengce/2014-04/25/content_2666434.htm (accessed on 4 March 2023).
21. State Planning Commission. *White Paper on China’s Population, Environment and Development in the 21st Century*; China Environmental Press: Beijing, China, 1995.
22. The Fourth Survey and Design Institute of the Ministry of Railways. *Code for Design of Railway Engineering Environmental Protection TB10501-98*; China Railway Publishing House: Beijing, China, 1999.
23. Notice of The State Council on Further Promoting the Construction of National Green Channels. Available online: http://www.gov.cn/gongbao/content/2000/content_60549.htm (accessed on 4 March 2023).

24. Ecological Construction and Environmental Protection in Tibet. Available online: <http://www.scio.gov.cn/zfbps/ndhf/2003/Document/307906/307906.htm> (accessed on 4 March 2023).
25. Build a Well-off Society in an All-Round Way and Create a New Situation in Building Socialism with Chinese Characteristics. Available online: <https://fuwu.12371.cn/2012/09/27/ARTI1348734708607117.shtml> (accessed on 4 March 2023).
26. Several Opinions of The State Council on Accelerating the Development of Circular Economy. Available online: http://www.gov.cn/zwgk/2005-09/08/content_30305.htm (accessed on 4 March 2023).
27. Notice of The State Council on Issuing a Comprehensive Work Plan for Energy Conservation and Emission Reduction during the 12th Five-Year Plan Period. Available online: http://www.gov.cn/zwgk/2011-09/07/content_1941731.htm (accessed on 4 March 2023).
28. Guidelines of the Ministry of Transport on Accelerating the Development of Green. Available online: http://www.gov.cn/gongbao/content/2013/content_2466586.htm (accessed on 4 March 2023).
29. Ministry of Railways Economic Planning Research Institute. *Evaluation Standard of Green Railway Passenger Station TB/T 10429 2014*; China Railway Publishing House: Beijing, China, 2014.
30. Secure a Decisive Victory in Building a Moderately Prosperous Society in All Respects and Strive for the Great Success of Socialism with Chinese Characteristics for a New Era. Available online: http://www.gov.cn/zhuanti/2017-10/27/content_5234876.htm (accessed on 4 March 2023).
31. Notice of The General Office of the State Council on Printing and Distributing the Work Plan for Promoting the Development of Multimodal Transportation. Available online: http://www.gov.cn/zhengce/content/2022-01/07/content_5666914.htmhttp://www.gov.cn/gongbao/content/2013/content_2466586.htm (accessed on 4 March 2023).
32. Bai, Y.; Wei, Q.; Qiu, Q. Discussion of urban transportation development based on green transportation. *J. Beijing Jiaotong Univ. Soc. Sci. Ed.* **2006**, *2*, 10–14.
33. Gan, L.; Li, G. National policies and evolution of academic frontier: Comparative analysis on think tank research in china around 2016. *Doc. Inf. Knowl.* **2020**, *1*, 63–73.
34. Tu, J.; Yang, X.; Wang, Y. Research on the History and Development of China National Knowledge Infrastructure (CNKI). *Libr. Trib.* **2019**, *39*, 1–11.
35. Xiong, F.; Yang, L.; Luo, J. Research on green railway of sustainable development. *J. Railw. Eng. Soc.* **2007**, *5*, 43–46+66.

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