Visual Analysis of Emergency Plan Research Based on Citespace

Mengxin Zhang[1], Bihao Yu[2], Hui Huang[1](✉), Yating Sun[1], and Shiying Tao[3]

[1] School of Materials and Chemical Engineering, Ningbo University of Technology, Ningbo, China
huihuang@nbut.edu.cn
[2] Emergency Management Bureau of Ningbo Daxie Development Zone, Ningbo, China
[3] Faculty of Science and Engineering, The University of Nottingham, Ningbo, China

Abstract. With the establishment of the emergency management department, the state pays more and more attention to emergency management. Many scholars have carried out various studies on the important content of emergency management - emergency plan. This paper clarifies the development context of the emergency plan in recent years through the bibliometric method, and explores its main research hotspots and research directions from the perspective of keyword co-occurrence, keyword emergence, co-occurrence of authors and co-occurrence of institutions with the help of CiteSpace software. The following findings are made: from the perspective of the number of documents, the output speed of the results of the emergency plan is generally stable; Some of the authors have formed a small research team to form a core author group, but on the whole, the degree of cooperation between scholars and institutions is still low. The research is mainly based on emergency management, emergency response and emergencies, but there is still room for development in research methods. Chemical enterprises, environmental risks and practices have emerged to a high degree in recent three years, which can be used as the development direction of follow-up research and promote the further improvement of China's emergency plan management system.

Keywords: Emergency plan · CiteSpace · Visualization

1 Introduction

Emergency plan is a work plan prepared in advance to deal with emergencies. The formulation of corresponding emergency plan by the unit can improve the emergency management mechanism of emergencies, improve the response and handling capacity of emergencies, ensure that the emergency rescue can be timely, orderly and efficient after emergencies, and control the losses and social hazards caused by emergencies to a minimum, Ensure the safety of people's lives and property, maintain social stability and promote the sustainable development of the national economy [1, 7]. This paper attempts to use the method of literature measurement [12], borrow the CiteSpace software developed by Professor Chen Chaomei's team to sort out the relevant research of the

A. Luqman et al. (Eds.): PMIS 2022, AHCS 6, pp. 82–90, 2023.
https://doi.org/10.2991/978-94-6463-016-9_11

emergency plan in recent 20 years [2], outline the basic overview of the research field from a macro perspective, and provide coordinate reference for the follow-up academic research and practical promotion of the emergency plan.

2 Data Sources and Method

This study is based on CNKI database, and the search conditions are set as follows: "(subject% = 'emergency plan' or title% = 'emergency plan') and (publication time between ('2000–01', '2021–09'))" search scope: journals. In order to ensure the reliability and preciseness of the articles, the articles were screened and duplicated, and finally 1411 effective literatures were obtained.

The document analysis software CiteSpace used in this paper is a citation visual analysis software. It is a new document analysis software gradually developed under the background of Scientific Metrology and data visualization. It can make the studied documents present the structure, law and distribution of scientific knowledge in the form of visualization through certain algorithms [15], According to the obtained knowledge map, we can identify the new trends in the subject field and speculate the development trend. Export the obtained effective literature in refworks format, use the software to convert the data into the format recognized by the software itself, and then set the source of clustering words and node types for the next step of visual analysis.

3 Results

3.1 Document Quantity Analysis

Select the research on emergency plan in HowNet database to visualize its annual document volume data, so as to reflect the research situation in different time periods. It can be seen from the Fig. 1 that the research on China's emergency plan can be roughly divided into two stages: the rapid growth stage from 2000 to 2008, and the gradual transition to the stable development stage since 2009. Due to the late start of the research on the emergency plan in China, it began to enter the preparation and use stage of the comprehensive emergency plan in 2001 [6]. Therefore, there were few literatures related to the emergency plan from 2000 to 2002. However, it has increased exponentially since 2003, which is related to the frequent occurrence of the term emergency plan in the government's response to public emergencies. For example, in 2006 and 2007, the State Council successively issued the opinions of the State Council on Comprehensively Strengthening emergency management and the opinions of the general office of the state Council on strengthening grass-roots emergency management [14]. The State Council requires all streets, communities, townships, villages and various enterprises and institutions to prepare emergency plans and arouse the attention of the society to the study of production safety and emergency rescue system through policy guidance [10]. After a period of rapid growth, the research in this field has gradually entered a mature development period, and the average number of papers published in recent five years is about 150. The decrease in the number of papers indicates that the research in this field pays more attention to quality, rather than blindly pursuing the number of papers to shoddy.

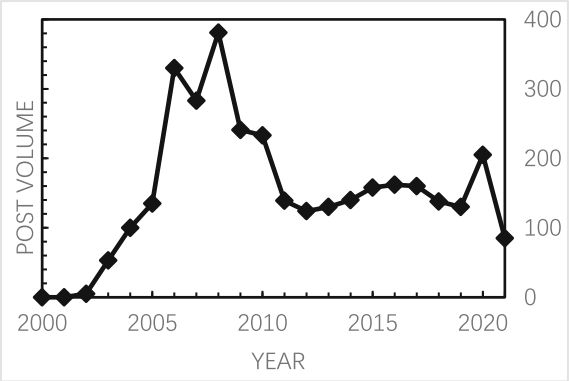

Fig. 1. Number of relevant documents.

3.2 Keyword Analysis

In order to better obtain the relationship between keywords, CiteSpace algorithm is used to cluster keywords [4]. When the keywords of multiple documents show consistency, it shows that there is correlation between articles [3]. By analyzing the keyword map, we can better grasp the research hotspot and research direction in this field. That is, the higher the frequency of keywords, the higher the research heat of the subject content represented by the keywords. The size of nodes in the Fig. 2 indicates the number of documents sent by the mechanism, and the connection between nodes reflects the density of cooperation between institutions. It can be seen from the Fig. 2 that the keyword emergency plan map obtained through CiteSpace analysis has 653 keywords and 1516 links. Some keywords are closely related to each other, indicating that these keywords are more likely to be involved in the study of emergency plan [8]. It can be seen from the Fig. 2 that the hot research in this field are emergency plans, emergencies and emergency management, with the frequency of 753, 158 and 34. The research on emergency plan is mainly based on emergency management and emergency response.

Academic circles generally believe that the sudden change of a key word in a certain period of time represents the change direction of a certain research field [5]. The higher the value of keyword emergence, the higher the frequency change rate of the keyword in that period of time. Using the "detect bursts" function of CiteSpace software, we can detect the sudden surge of professional terms in some years in the paper, and analyze these emerging professional terms, which is helpful to obtain the research hotspots and development trends in relevant fields. This study identified 25 prominent words in the field of emergency plan from 2020 to 2021, as shown in Fig. 3. It can be seen from this that the accident disaster with the greatest outburst intensity is concentrated in 2006–2007, and the key words with high outburst degree in recent three years are the following five:

"Preparation", "emission reduction measures", "practice", "environmental risk" and "chemical enterprises". Among them, "preparation" as the key word of the emergency plan, the emergence lasts the longest. It has lasted for six years since 2016, indicating that its frequency change rate has been high in these six years (Table 1).

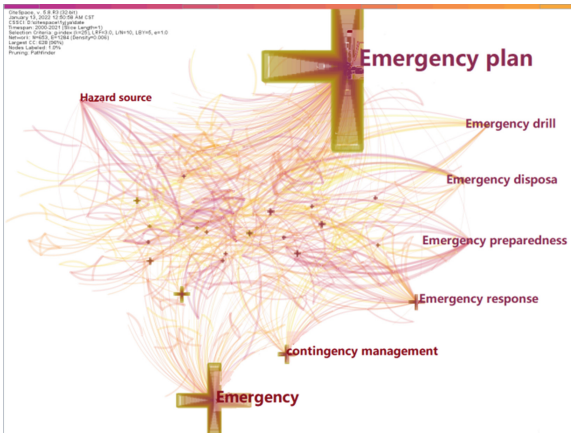

Fig. 2. Keyword analysis of emergency plan related literature.

Table 1. Statistical results of the top ten keywords in the research literature in the field of emergency plan in China from 2000 to 2021.

Number	Frequency	Keyword
1	753	Emergency plan
2	158	Emergency
3	34	Contingency management
4	30	Emergency response
5	24	Organization
6	21	Emergency drill
7	18	Emergency rescue
8	17	Emergency disposal
9	17	Safety accident
10	17	The State Council

3.3 Author Analysis

Analysis of the author and cooperative network the author is the main body of scientific research [9]. Through the analysis of the structural characteristics of the author and his cooperative network, we can reflect the core author group and its cooperative relationship in this field. The author's cooperative collinear map obtained through CiteSpace software analysis is shown in Fig. 4. The connecting line indicates the cooperative relationship. The thickness of the line represents the degree of cooperation, and the color of the line represents the time of cooperation. Due to the large number of authors involved, only the author tags with a number of papers greater than 4 are displayed in this study. On the whole, the cooperation density in the Fig. 4 is only 0.002, indicating that the cooperation

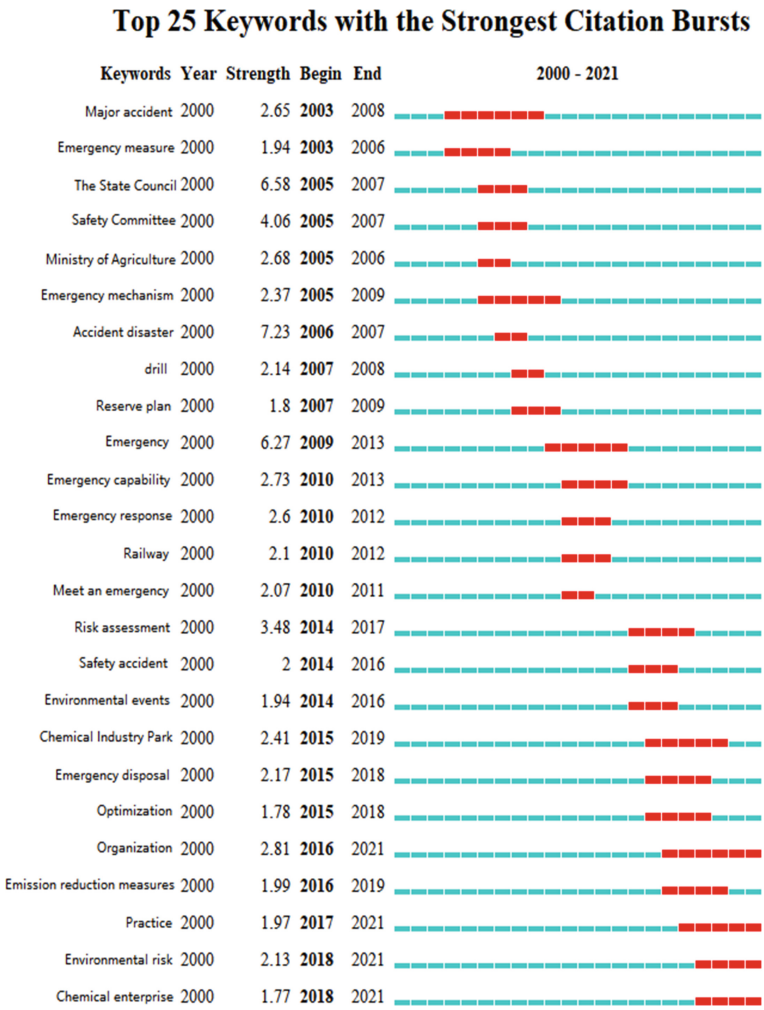

Fig. 3. Keywords co-occurrence of research literature in the field of emergency plan in China from 2000 to 2021.

among relevant authors of emergency plans in China is still relatively loose, with more authors issuing documents alone and fewer groups cooperating. The larger cooperation group is the multi person cooperation group composed of Chen Yucai, Wang Zhiyan and others circled at the bottom left of the picture, but the amount of documents is not high. The top three authors are Sun Yu, Deng Yunfeng and Li Wenjie, with 6, 5 and 5 articles respectively. Most authors have only 1–2 studies on emergency plan software, which is not conducive to the construction of knowledge system in this discipline (Table 2).

Fig. 4. Cooperation among authors

Table 2. Statistical results of the top ten authors of research literature in the field of emergency plans in China from 2000 to 2021.

Number	Paper number	First author's name
1	6	Sun Yu
2	5	Deng Yun Feng
3	5	Li Wen Jie
4	5	Yin Wei
5	5	Zhou Xiaofan
6	5	Liu Tieming
7	4	Shan Chunchang
8	4	Wang Lian
9	4	Pan Zhen
10	4	Liu Yongfa

3.4 Mechanism Analysis

The number of documents issued by a research institution reflects the scientific research competitiveness of the scientific research institution to a certain extent. Researchers engaged in a certain field may be more inclined to pay attention to the main academic research institutions that have an important academic impact in this field in their daily research, The research on the distribution of document issuing institutions in the subject field is also one of the important and meaningful research contents of the spatial dimension distribution of documents [11, 13]. Using CiteSpace to visually analyze the document issuing institutions can grasp the research status and cooperation of various institutions in relevant fields. Analyze the sending organization, that is, the node type selection Organization (institution), and run the CiteSpace software to obtain the collinear map of institutional cooperation. As can be seen from Fig. 5, for the research

Fig. 5. Organization cooperation chart.

Table 3. Statistical results of the top ten issuing institutions of research literature in the field of emergency plan in China from 2000 to 2021.

Number	Paper number	Organization name
1	21	China Academy of work safety
2	12	State Administration of work safety
3	5	Safety and Environmental Protection Technology Research Institute of CNPC
4	4	People's Public Security University of China
5	4	Chinese Center for Disease Control and Prevention
6	4	Sinopec Safety Engineering Research Institute
7	3	Scientific Research Institute of Transportation Safety Engineering Research Institute of Sinopec
8	3	School of safety engineering, North China University of science and technology
9	3	School of civil engineering, Tongji University
10	3	Office of national flood control and Drought Relief Headquarters

of emergency plan, the research institutions are relatively independent and have not formed disciplinary cooperative research, and the research institutions are mainly concentrated in enterprises, governments and university research institutes. Among them, the institutions with more documents are the China Academy of work safety, the State Administration of work safety and the safety and Environmental Protection Technology Research Institute of CNPC. The frequency of documents is 21, 12 and 5 (Table 3).

4 Conclusions and Recommendations

This paper takes the emergency plan as the theme, takes the relevant papers in China HowNet database from January 2000 to September 2021 as the research object, analyzes the time distribution, research theme, author and organization of the literature by using CiteSpace, and draws the following conclusions and suggestions.

(1) The relevant research on emergency plan in China mainly started in 2002 and is now in the stage of stable development. The study of emergency plan is closely related to social development. From the phenomenon that the amount of literature increased significantly in 2003 and 2008, social emergencies have an important impact on the research of emergency plans, which reflects the guiding role of emergency plans in the process of emergency disposal.
(2) Through in-depth analysis of the research status of emergency plan, it is found that the research topics focus on emergency management, emergency response and emergencies, but there is less research on implementation and improvement. Most of the research contents focus on the research of single risk, and lack of in-depth research on compound events. Future research should strengthen the research on the implementation and improvement of emergency plan and deepen the research on complex events, so as to provide theoretical support for the revision of emergency plan.
(3) The degree of cooperation between authors and institutions is low. Institutions and relevant researchers should strengthen exchanges, comply with the trend of discipline integration and development, and work together to conduct more in-depth research and application of emergency plans.

Acknowledgments. This work was supported by Ningbo Education Science Planning Project (2021YGH040), Ningbo Daxie Development Zone and the Student Research Program of Ningbo University of Technology (2021035).

References

1. Carly L (2021) Equipping tomorrow's emergency responders. Eng Mining 222:6
2. Chen CM (2017) Science mapping: a systematic review of the literature. J Date Inf Sci 2:1–40
3. Chen JJ (2021) Bibliometric analysis of Chaihu Guizhi Ganjiang decoction based on CiteSpace. J Pract Internal Med Tradition Chin Med 35:8–11+144–145
4. Chen WH, Wang WQ (2021) Review and analysis of enterprise fixed assets investment project archives management based on CiteSpace software. Electromechan Warship Archiv 5:28–30
5. He XR, Huang CH, Yang K (2020) Research progress of healthy urban planning at home and abroad based on CiteSpace. Chin Foreign Architect 12:121–125
6. Lai JY, Zhang Y, Nan YY (2021) Preliminary study on standardized construction of emergency plan system. Disast Sci 1–8
7. Ling LL (2021) Preparation and significance of environmental emergency plan for chemical enterprises. Chem Manag 36–37

8. Liu X, Li N (2021) Hot spots and development trend of hermeneutic translation research in China from 1991 to 2019 – a bibliometric visual analysis based on CiteSpace. Mod Trade Indust 42:159–160
9. Rawat KS, Sood SK (2021) Knowledge mapping of computer applications in education using CiteSpace. Comput Appl Eng Educ 29:1324–1339
10. Wang X, Wang X, Zou SL (2019) Research on time in nuclear accident emergency management - literature analysis based on CiteSpace. Value Eng 25:295–297
11. Wang YB, Zhao Z (2021) Research progress and enlightenment of international forest ecotourism – analysis based on CiteSpace knowledge map. China's Forest Econ 5:87–90
12. Xiang C, Yuan W, Liu H (2017) A scientometrics review on nonpointsource pollution research. Ecol Eng 99:400–408
13. Xie WJ, Liu ZM, Li XL (2021) Analysis on research hotspots of independent innovation at home and abroad – knowledge map analysis based on CiteSpace. Econ Res Guide 27:147–149
14. Yang Y, Kong SL, Jia Y (2021) Discussion on key points of emergency plan revision from the perspective of Trinity. Fire Sci Technol 40:754–758
15. Zhang WL, Su R (2018) Hot spots, trends and enlightenment in the research field of overseas project-based learning – data visualization analysis based on CiteSpace. J Dist Educ 36:91–102