



Visual Analysis of Human Resources in the Field of Deep Ocean Oil and Gas Emergency

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Abstract. In order to provide a reference for the research on emergency human resources in emergency support resources, the relevant literature in this field included in the CNKI database from 2001 to 2020 is used as the basic data. Based on CiteSpace V (5.7 R5), it draws knowledge maps, and conducts bibliometric and visual analysis of domestic emergency human resources and its allocation field through the annual number of articles, authors, institutions, keywords, etc. The results show that: Today, the annual number of publications in this field is on the rise. The research team represented by Yue Maoxing is the most active in the co-occurrence of authors, and institutional cooperation needs to promote cooperative research and academic exchanges between institutions and universities. Among the existing research, safety science and disaster prevention, medical and health fields account for the largest proportion, while there is almost no related research in the deep ocean oil and gas field. The research hot topics mainly focus on emergency human resources and allocation in medical health and emergency rescue. In summary, strengthening the research on emergency human resources and its allocation is the development trend of improving our country's emergency security system.

Keywords: Emergency Human Resources · Human Resources Allocation · CiteSpace V (5.7 R5) · Knowledge Graph

1 Introduction

Emergency support resources are one of the important contents of the emergency support system, which mainly include manpower, capital, materials, facilities, technology, information, and special support resources. Among them, emergency human resources, as the primary resource for properly handling emergencies, have the characteristics of high flexibility, strong variability, high initiative, and strong creativity [1]. More and more disciplines are also beginning to focus on emergency human resources. Related research. At present, my country's exploration and development of energy resources is developing into the open sea area of the South China Sea. Compared with the offshore, the deep sea is far from the inland and the environment is harsh. If there is no support

for the reasonable allocation of emergency human resources, once a serious accident occurs, it will directly affect the emergency command from the emergency command to the on-site disposal, and even the emergency rescue, which will lead to the overall emergency resources. Can't maximize its effect. However, in the field of high-risk, multi-disaster, and multi-unknown deep-sea oil and gas exploration and development, there is very little research on emergency human resources and allocation. Therefore, in order to improve the resource allocation of our country's emergency support system and maximize the emergency response, the research on emergency human resources and its allocation will surely become the future development trend [2, 4–6].

Based on the CiteSpace V software, this paper extracts knowledge units from a large number of documents and performs data conversion, and then draws and analyzes the knowledge visualization map, that is, scientific knowledge map analysis. This method allows researchers to more intuitively understand scientific knowledge, understand research hot topics and frontier dynamics in related fields, and reveal the inter-relationships between hot topics. Therefore, from the beginning of 2001 to the end of 2020, the relevant research literature in the field of emergency human resources and its allocation is analyzed by knowledge graph, and then the hot and frontier issues of emergency human resources and its allocation are studied [7–15].

2 Data Sources and Research Methods

2.1 Data Source

All the data in this article comes from CNKI. The collected literature data includes author, title, keywords, author unit, literature source, publication time, etc. First use the advanced search through CNKI. The search terms are (Subject: Emergency Human Resources Configuration) OR (Subject: Emergency Personnel Configuration) OR (Subject: Emergency Human Resources) OR (Emergency Rescue Personnel) OR (Emergency Rescue Human Resources) OR (Emergency Rescue Personnel) Search and rescue personnel) OR (Emergency Search and Rescue Manpower) OR (Emergency Experts), a total of 1853 documents were retrieved. By excluding notices, policies, newspapers and other non-related documents, a total of 867 documents including core journals, conferences, and master and doctoral papers were collected from the beginning of 2001 to the end of 2020. Finally, the literature data is exported in RefWorks plain text format, which is a data basis for the use of CiteSpace V (5.7 R5) for knowledge graph analysis.

2.2 Research Method

This paper mainly uses the information visualization software CiteSpace V (5.7 R5) developed by the team of Dr. Chen Chaomei as the scientific knowledge graph analysis software, which can realize the data mining of the literature, draw the visual image, and complete the visual analysis [3]. Therefore, first use the format conversion function of CiteSpace V to convert the document data exported by CNKI search into a format that can be identified and analyzed by the software, and then use the software about the author, research institution, keyword co-occurrence, clustering and other functions

to perform data processing. Visualized processing, so as to further analyze the current research hot topics and research trends in the field of emergency human resources and its allocation in my country.

3 Analysis of the Status Quo of the Research Field of Emergency Human Resources and Allocation

3.1 Annual Publication Volume Analysis

Through the statistical analysis of the annual publication volume, as shown in Fig. 1, it can be found that China's research on emergency human resources and its allocation began in 2002, after which it can be roughly divided into four stages: rising period (2003–2012): average It is in a steadily rising stage, which proves that research scholars have begun to pay attention to the content of emergency human resources and gradually achieved some results; decline period (2013–2014): the research literature has declined significantly compared with the previous ten years; recovery period (2016–2019): Although there has been a slight decline in 2018, it has generally shown an upward trend; peak period (2020): With the sudden outbreak of the new crown epidemic, the number of postings reached its peak in the past 20 years, achieving a sudden increase of nearly twice. Generally speaking, the curve shows a gradual upward trend, which shows that the academic community is paying more and more attention to the research on emergency human resources and allocation; from the quantitative point of view, the number of publications on emergency human resources and allocation is still small every year, indicating the need to strengthen research in this area.

3.2 Analysis of Important Authors

By analyzing the cooperation map of research authors and institutions, it is possible to discover the relationship between scholars and institutions in a certain research field, providing a new perspective for evaluating the academic influence of researchers and

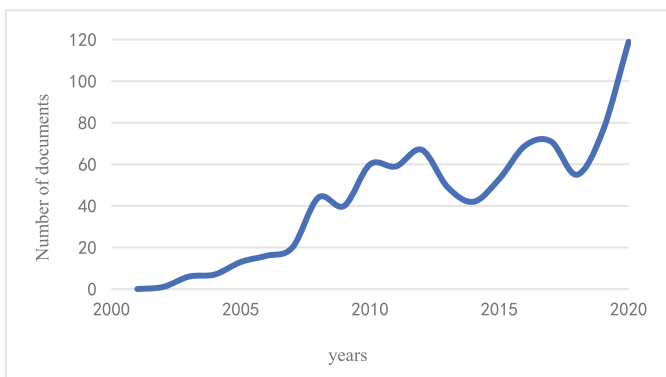


Fig. 1. Statistical analysis chart of annual publication volume

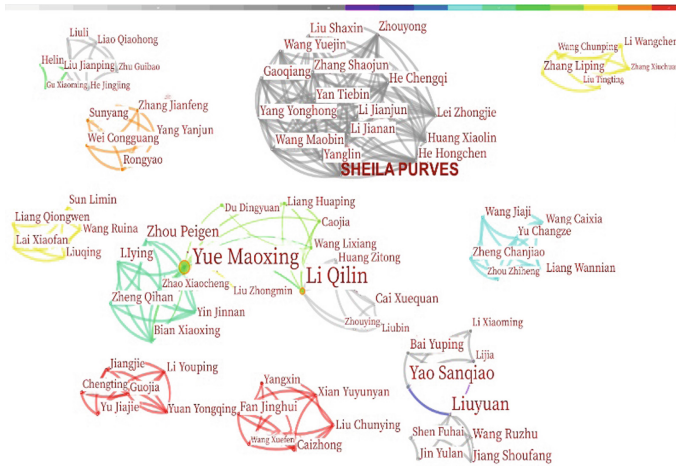


Fig. 2. The co-occurrence map of the author's cooperation network

institutions, and at the same time, it is more conducive to discovering some researchers worthy of attention Or institutions, and by interpreting its research content, digging deep into the research frontiers of the field is also the key to the development of the field.

Co-occurrence between authors can reflect representative authors and teamwork in the field, and the size of the node represents the number of articles published by authors can reflect their research status in the field. Therefore, this article counts the authors in the CNKI database from 2001 to 2020, and uses CiteSpace software to use "Author" as the node type to generate the author's cooperation network graph, as shown in Fig. 2. By screening and showing the top ten clusters with large co-occurrences, combined with the map and node information, it can be seen that the research team with Yue Maoxing as the core has issued the most articles and has the closest cooperation. It is mainly dedicated to the research on the direction of medical and health emergency rescue. In recent years, most of them have been research on medical and health human resources, and the research on emergency rescue is the most prominent; the second is the research content of emergency rescue in mines, emergency drills and so on. Through the study of the research content of typical teams, we can further study and develop the core content and key technologies of emergency human resources and configuration.

3.3 High-Impact Organization Analysis

The analysis of the research institutions in the literature can reflect the status of the institution in the field and the close degree of cooperation between the research institutions. This article counts the research institutions in the CNKI database over the past 20 years. Among them, the research institutions with higher rankings are the Health Emergency Professional Committee of the Chinese Research Hospital Association, the Disaster Medicine Professional Committee of the Chinese Association of Integrated Traditional Chinese and Western Medicine, and the China Earthquake Emergency Search



Fig. 3. The co-occurrence map of institutional cooperation network

and Rescue Center. At the same time, CiteSpace software is used to generate a cooperative network map of research institutions with “Institution” as the node type, as shown in Fig. 3. Observing the map, we can find that most of the types of institutional cooperation are cross-institutions (such as ② number group), cross-university cooperation, and cooperation between universities or institutions (such as ① number group), but there is still a lack of cooperation. Research in collaboration between institutions and institutions. More cooperation between institutions and institutions should be encouraged to better promote academic exchanges between research teams or institutions.

4 Analysis of Research Hot Topics and Stage Frontiers of Emergency Human Resources and Its Allocation

4.1 Research Hot Topics

The keyword co-occurrence map is conducive to the analysis and research of research hot topics and directions in a certain field. As the keywords that most intuitively represent the core content of the literature, CiteSpace can be used to extract keywords from related literature and analyze the literature to quickly and intuitively understand the research direction of the field; at the same time, through the high and low distribution of the keyword word frequency, it can be displayed. Research hot topics in the field, the higher the frequency of keywords, the more representative the research hot topics in the field, so as to further judge the future development trend.

Select the node type as “Keyword”, the time slice is one year, and the network clipping method is “Pathfinder”, “Purning sliced networks”, “Purning the merged network”, and the co-occurrence network visualization of keywords in emergency human resources and configuration related documents After analysis, the keyword co-occurrence map is finally obtained, as shown in Fig. 4, and the keyword information of the central

Table 1. TOP12 Of Keywords

Centricity	Counts	Starting of the years	Keywords
0.56	190	2004	Emergency rescue
0.48	116	2003	Emergency management
0.44	57	2003	Human resources
0.29	50	2008	Emergency
0.28	16	2008	Human Resource Management
0.27	2	2004	Accident treatment
0.25	22	2004	Emergency rescue team
0.23	4	2008	Public health
0.22	34	2004	Emergency response plan
0.21	10	2004	Accident rescue
0.20	7	2007	Emergency human resources
0.18	11	2004	Individual protection

TOP12 is shown in Table 1. In the keyword co-occurrence map, each node corresponds to a keyword, and the size of the node is positively correlated with the frequency of occurrence of the keyword; the different colors in the map correspond to the year when the keyword appears, and the outermost circle of the node is Purple, it indicates that although the keyword appeared early, it is still a hot topic of current research; the line between nodes indicates the frequency of two keywords appearing together in the same article, and the thickness of the line reflects the relationship between the two Degree.

Combining Table 1 and Fig. 4, we can see that the five keywords corresponding to the largest nodes are emergency rescue, emergency management, human resources, emergencies, and human resource management in descending order. These five keywords not only have a large number of posts, but also Judging from the starting year, the year of its first appearance is generally earlier, and the outermost color is purple, which proves that these keywords have been hot topics in academic research and discussion to this day. Whether it is the SARS in 2003 or the Wenchuan earthquake in 2008, scholars have noticed the lack of research content in emergency management, emergency rescue, and emergency human resources in my country, and they have begun to focus on the development of relevant research content of the emergency security system. And in the next ten years, it will cover all walks of life.

At the same time, this article uses the LLR algorithm to cluster keywords, and the calculation formula is as follows:

$$S = 2 \times (H_m - H_c - H_r) \quad (1)$$

$$H_m = - \left(\sum_{i=1}^n \sum_{i=1}^m \frac{k_{nm}}{N} \log \left(\frac{k_{nm}}{N} \right) \right) \quad (2)$$



Fig. 5. Local commander commands fire detection

Top 10 Keywords with the Strongest Citation Bursts

Keywords	Year	Strength	Begin	End	2001 - 2020
Emergency response plan	2001	4.63	2004	2007	[Timeline bar with red burst from 2004-2007]
Earthquake disaster	2001	5.5	2008	2011	[Timeline bar with red burst from 2008-2011]
Human resources	2001	3.78	2008	2010	[Timeline bar with red burst from 2008-2010]
Emergency ability	2001	3.54	2008	2012	[Timeline bar with red burst from 2008-2012]
Emergency	2001	5.14	2011	2014	[Timeline bar with red burst from 2011-2014]
Emergency rescue capability	2001	3.32	2014	2017	[Timeline bar with red burst from 2014-2017]
Health emergency	2001	4.5	2015	2018	[Timeline bar with red burst from 2015-2018]
Expert consensus	2001	7.43	2016	2020	[Timeline bar with red burst from 2016-2020]
Emergency disposal	2001	5.54	2016	2020	[Timeline bar with red burst from 2016-2020]
Hazardous chemicals	2001	4.25	2016	2020	[Timeline bar with red burst from 2016-2020]

Fig. 6. Burstiness of keywords

evolutionary trend from macro to micro, from single to diversified; at the same time, it is possible to review or predict when certain key technologies become hot spots, or even predict them. The explosive trend will continue in the future. The starting year and the intensity of the mutation in the mutation word list can intuitively show the interactive relationship and evolution path between the research frontiers.

As shown in Fig. 6, the red line indicates the time period when the emergent keywords appear. You can see the evolution path of domestic emergency human resources and

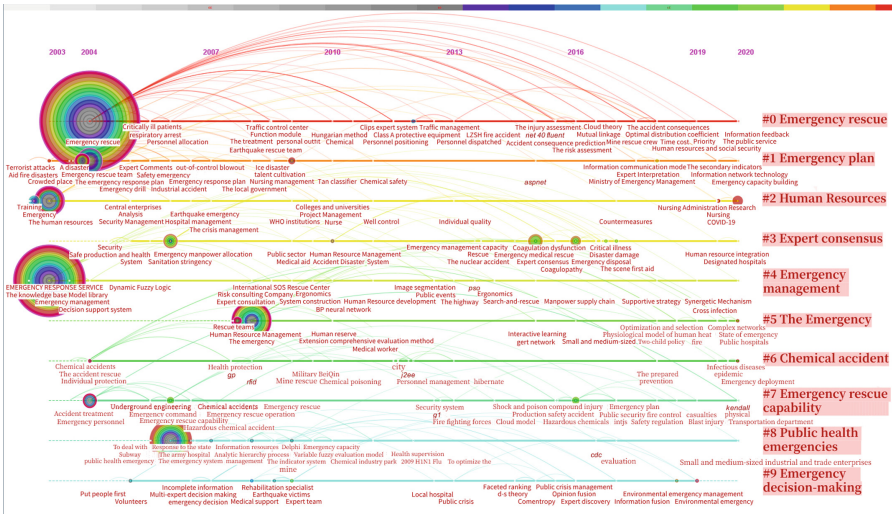


Fig. 7. Timeline map

allocation from 2001 to 2020, highlighting the transfer of main research topics in different years, and the key to research The development of the word from emergency plans to emergency human resource allocation such as emergency rescue, health emergency and expert consensus is the frontier trend of my country’s future research in the field of emergency security system.

At the same time, it can intuitively reflect the time zone and timeline map of keywords for studying future development trends. Usually the time zone or timeline map shows the introduction of a certain branch of the technology. With the upgrade of the software, timeline map analysis was added, and the most primitive time zone map analysis was diluted. Compared with the time zone map, the time line map can not only see the evolution of technology and the historical span and process, but also pay attention to and reflect the relationship between clusters at the same time. Therefore, select “Timeline” in time to get the knowledge graph as shown in Fig. 7.

By selecting the top ten clusters and combining with the graph analysis, it can be found that the research on emergency human resources and its configuration has been paid attention since 2003, and has gradually become a hot spot in the academic community since then. In the timeline map, the color of the connection represents the corresponding time. Through the observation of the evolution of the connection year by year, it is found that the key word of its research is a trend of moving forward along the time axis, and the research scope is also gradually Expand. At the same time, the continuity and time span of research directions such as emergency rescue, emergency plans, emergency management, and human resources are also very good. In addition to the cold in 2011 and 2012, the research on emergency human resources has been paid attention to by the majority of scholars in the past 20 years, and reached a peak at the end of 2020. At the same time, in this era of increasing emphasis on emergency management, research on emergency human resources, allocation, and scheduling can not only improve

my country's emergency support system, but also maximize the emergency response, which is the main frontier and direction of future research.

5 Conclusion and Outlook

Through the use of CiteSpace V software to conduct metrological and visual analysis of relevant domestic documents published in 2001–2020, this sorts out the current research status and development history of emergency human resources and allocation in my country, and summarizes the current research hot topics and the future The development trend and frontier direction, and the final conclusions are as follows:

- (1) China's research on emergency human resources and its allocation has basically received attention since 2003, and has gradually become a hot spot in the academic world. At present, research on emergency human resources and its allocation has been developed in many disciplines, especially in the fields of safety science and disaster prevention and medical and health emergency management, but there is a lack of research in the field of oil and gas. After the outbreak of the new crown epidemic in 2020, the research on the allocation of emergency human resources in the direction of public health emergencies has shown a leap, and has become a current research hot topic.
- (2) Study the research content of the highly active author's cooperative team, dig deeper into the research content of the field, and grasp the latest developments in the research technology in this field. At the same time, it should also encourage more cooperative research on institutions and universities to promote academic exchanges.
- (3) As the most important part of emergency support resources, emergency human resources and their allocation will become the future research direction and development trend. It will not only improve my country's emergency support system, but also maximize the emergency response effect. Therefore, in the face of the seldom involved deep sea oil and gas exploration and development, it is necessary to strengthen targeted emergency support and research on emergency human resources and allocation, so as to effectively guarantee the safety of personnel lives, national property and Marine environment.

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