Research Content and Framework of Major Emergencies in China Based on Literature Cluster Analysis

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Abstract: Major emergencies have a great impact on society, and relevant studies have important theoretical and practical significance. The research status, content and framework of major emergencies in China in the past two decades were explored by sorting out the relevant studies. The CSSCI journal (including the expanded edition) in CNKI was used as the data source to query the research papers related to major emergencies from 2000 to 2019. The research content and framework of the relevant theoretical research on major emergencies in China were explored through the method of keyword clustering. The clustering results show that the research contents can be mainly summarized into eight aspects: emergency experience, news report, emergency warning, e-government, emergency capability evaluation, emergency treatment, information disclosure, and emergency system construction, covering the whole life cycle of major emergencies.

1 INTRODUCTION

In recent years, emergencies occur frequently due to social development, environmental deterioration, globalization and many other factors, which have caused serious social impact and huge loss of lives (Chinese Public Administration, 2004; Helen, 2017; National Bureau of Statistics, 2020). Major emergencies influence widely and deeply, which requires the provincial even central government to participate in dealing with (Xue, 2005). "SARS" (2003), the Wenchuan earthquake (2008), freezing snow disaster in south China (2008), catastrophic debris flow accident in Zhou Qu (2010), serious fire and explosion accident In Tianjin (2015) (Wen, 2017), global pandemic COVID-19 (2020) and so on. All of these major emergencies have a great influence on society, which requires global governments to improve their emergency response capacity. Therefore, the research topics have attracted the attention of academia (Han, 2012; Wu, 2019). Theoretical research on major emergencies related to people's health, social stability and national security has been gradually enriched.

Some scholars (Han, 2012) have carried out a quantitative analysis on literature related to emergencies from 2000 to 2011, but due to the timeliness of literature analysis, the existing research contents can't be fully presented. Therefore, this paper further extends the time range based on previous research to analyze the relevant research on major emergencies systematically. The research content and framework of major emergencies have been explored through keywords cluster analysis.

2 DATA ACQUISITION AND PROCESSING

2.1 Data Sources and Pre-Processing

The research data are all from the China Knowledge Network (CNKI) database. Chinese Social Sciences Citation Index (CSSCI) includes representative authoritative journals in various disciplines (Chen, 2020), so the source of the Journal is set as CSSCI periodicals (including the extended edition). Literature from 2000 to 2019 has been selected by setting the subject word or keyword as "major emergency" and the way of advanced search. A total of 424 papers were retrieved on March 8, 2020. Finally, 300 papers were selected by eliminating the

papers with irrelevant topics and incomplete contents, such as conference papers, a summary of concluding topics and news reports.

2.2 Data Processing

Keywords have been extracted, combined, unified and deleted by using the Bicomb2 software, whose frequency greater than or equal to 3 were selected as high-frequency keywords, as shown in Table 1. It can be seen that emergency management is the most popular in the researches related to major emergencies, followed by news reports, emergency countermeasures, emergency plans, online public opinions, etc. In addition, there are many kinds of major emergencies, including public emergencies, unconventional emergencies, environmental emergencies, ethnic minority conflicts, etc. Due to the particularity of these emergencies, differentiated researches should be conducted.

Keywords are the succinct summary of the core content of academic papers. Therefore, the co-occurrence frequency of keywords in different literatures has been counted, and then the co-occurrence coefficient has been calculated to construct the keyword co-occurrence matrix (Wu, 2019; Xu, 2016; Yan, 2014). The calculation formula of the co-occurrence coefficient is: $I_{ij} = C_{ij} / \sqrt{C_i * C_j}$, C_i and C_j are the occurrence frequency of keywords I

and j respectively, and C_{ij} is the co-occurrence frequency of keywords I and j (Yan, 2014). In order to reduce the influence on the clustering effect of too many zero values, the co-occurrence matrix is transformed into a dissimilarity matrix for cluster analysis.

The matrix is imported into SPSS 25.0 statistical software, and the systematic clustering method is adopted. After several tests, the method called wards deviation sum of squares is selected, and the square Euclidean distance is selected as the metric standard. Finally, the cluster spectrum graph is generated, which is shown in Figure 1.

3 ANALYSIS OF RESEARCH CONTENTS ON MAJOR EMERGENCIES

According to the clustering results and the contents of literature, eight clustering categories have been integrated, respectively named emergency experience, news reports, emergency warning, e-government, evaluation on emergency response capacity, emergency treatment, information disclosure and emergency system construction, as shown in Table 2.

Table 1: Statistics of high-frequency keywords.

| Number	Keyword	Frequency	Number	Keyword	Frequency
1	Emergency	119	17	Information transmission	8
2	Emergency management	60	18	Emergency decision	8
3	Major emergency	48	19	CPC	7
4	Public emergency	22	20	Early warning mechanism	7
5	Wenchuan earthquake	15	21	Information disclosure	6
6	Media	15	22	Minority areas	6
7	Emergency report	13	23	The law on response to emergency	6
8	Emergency countermeasure	13	24	Colleges	6
9	Contingency plan	12	25	Environmental emergency	5
10	Internet public opinion	11	26	Early warning management	5
11	Emergency handling	11	27	Natural disasters	5
12	Unconventional emergencies	10	28	Crisis	5
13	Emergency mechanism	10	29	Crisis management	5
14	Emergency law	10	30	China central television	5
15	Public opinion Guidance	8	31	Xinhua News Agency	4
16	Public opinion	8	32	Government	4
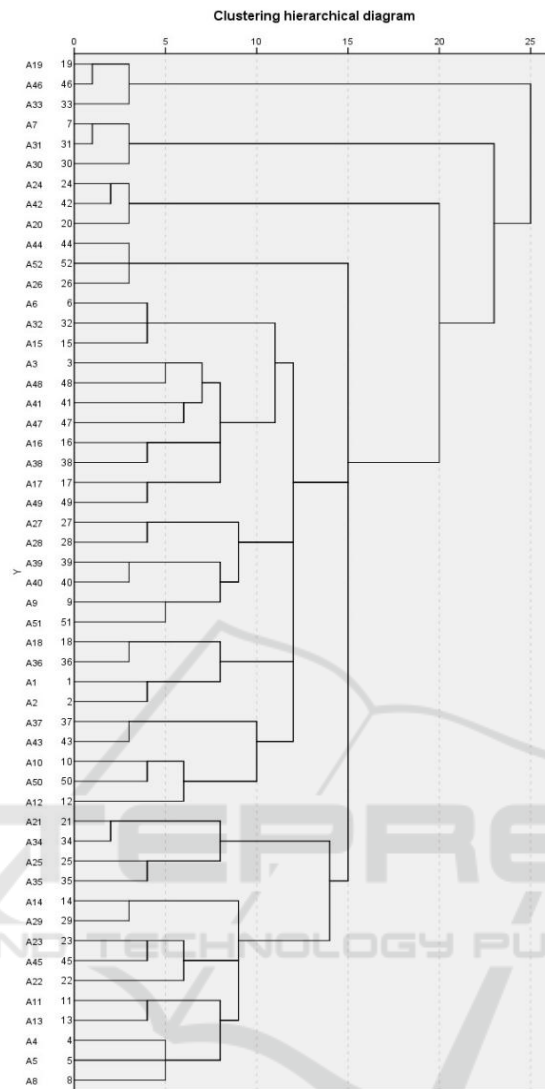
Figure 1: Clustering hierarchical diagram of keywords.

Table 2: High-frequency keywords' clustering results.

Cluster label	High-frequency keywords
A. Emergency experience	Communist Party of China (CPC); reform and opening up; emergency experience
B. News report	emergency report; Xinhua News Agency; China central television
C. Emergency warning	colleges; mass emergencies; warning mechanism; emergency response capacity; public health emergencies; warning management
D. E-Government	media; government; public opinion guidance; major emergencies; scientific and technological support; emergency system; emergency linkage; public opinion; e-government; information dissemination; information management
E. Emergency capability evaluation	natural disasters; crisis event; evaluation on emergency response capacity; earthquake; emergency plan; People's Republic of China
F. Emergency treatment	emergency decision-making; information system; emergency; emergency treatment; scenario analysis; emergency response; internet public opinion; cluster analysis; unconventional emergency
G. Information disclosure	information disclosure; information release; environmental emergencies; a state of emergency
H. Emergency system construction	contingency legality; crisis management; the law on response to emergencies; emergency response; minority areas; emergency management; emergency mechanism; Wenchuan earthquake; emergency countermeasures

3.1 Emergency Experience

Since the reform and opening up, emergencies occur frequently and have become more and more complicated. As the backbone of emergency response, the Communist Party of China has accumulated a lot of experience in the course of 30 years. Cheng (Cheng, 2010) points out that emergency response in China tends to be legalized, open and international. Feng et al. (Feng, 2012) consider that the CPC gradually improved the theory of emergency management system construction and the legal system to deal with emergencies in the process of accumulating practical experience. In the study of emergency experience, scholars not only put forward to draw lessons from experience but also point to analyze the advantages and shortcomings of foreign countries, to improve the emergency management of emergencies in China. Wang (Wang, 2019) believes that it is necessary for the military to participate in the response to emergencies. By comparing the participation of the Chinese and American militaries in emergency management, he thinks that the Chinese military should learn from the American military to focus on improving the professional ability of emergency rescue. Cao (Cao, 2016) considers that the European Union (EU) has also formed a relatively perfect emergency coordination mechanism in the long-term practice, and then puts forward suggestions on improving China's emergency coordination mechanism.

3.2 News Report

In recent years, social media has gradually arisen, which plays a role in news transmission in the process of emergency response together with traditional media. Fan (Fan, 2017) points out that media workers should integrate various new media to construct their reporting networks. Wang et al. (Wang, 2018) believe that emergency reports should form a coordination mechanism with the guidance of mainstream media represented by CCTV and the active participation of other social media so that they can affect together on news transmission. Therefore, the news reports of major emergencies show new characteristics in the era of melting media. Yan (Yan, 2015) points out that due to the suddenness, complexity, high attention, and other characteristics of major emergencies, their news reports also present new characteristics such as high attention, strong information timeliness, great communication influence, diversified communication methods, and high requirements on the quality of the reporting team. In addition, scholars have refined a news mechanism composed of organizational mechanism, information release mechanism and talent training mechanism, to meet the information needs of the public and improve the news communication power of the media (Sun, 2014). With the change of social environment, news reports in major emergencies also play many roles in emergency science popularization, psychological construction, and public opinion guidance.

3.3 Emergency Warning

Emergency warning is the pre-part of emergency management, which includes monitoring, identification, analysis, forecast and response (Li, 2017). The research of emergency warning mainly focuses on warning mechanism and warning evaluation. Xue (Xue, 2003) proposes that government should keep the crisis sensitivity, gradually establish a perfect warning mechanism, and timely adjust the warning mechanism according to the changes of social environment, to strengthen the effect of risk identification. Wang et al. (Wang, 2018) considered that China's emergency system should be guided by risk prevention and control to strengthen the whole process management of emergency work and achieve "integration of risk emergency". An early-warning evaluation index system should be constructed for different types of emergencies, which can promote the monitoring and early-warning of emergencies to be more scientific and professional, such as the warning evaluation of urban power emergencies and large-scale sports events. (Lu, 2010)

3.4 E-government

E-government is the integration of information technology and government work. Government agencies rely on e-government platforms, with the advantage of information technology to manage emergencies effectively. Zhao et al. (Deng, 2020) put forward that the e-government platform provides support for the sharing of information in inter-city emergency management, which can better resist the negative impact of emergencies on cities and strengthen urban space governance. In the case of COVID-19, scientific and technological support plays a key role in the response to major emergencies, so it is necessary to establish a scientific and technological innovation system for emergency management.

In addition, the form of e-government is no longer limited to the network platform, new media forms gradually rise such as WeChat, microblog and so on.

Due to the characteristics of real-time, public and strong intervention of social media, the scope of e-government emergency communication has been expanded. Sun (Deng, 2020) points out that the government microblog in emergency network public opinion control plays an important role, which can effectively control information dissemination, promote the public and the government's real-time communication and prevent the spread of false statements, etc. At the same time, some scholars (Rong, 2009) think that government official microblogs should integration with individual ones to realize the network transmission matrix for information coordination and public opinion guidance. Chen et al. (Chen, 2014) take the Kunming terrorist incident as an example to illustrate the shortcomings of government WeChat in the dissemination of emergency information, and propose that government should attach importance to the operation of social media, and establish a sound mechanism for public opinion control and information dissemination.

3.5 Emergency Capability Evaluation

Emergency response capacity refers to the functional level of government to reduce social losses and maintain social stability when emergencies happen, including early warning ability, emergency ability, overall planning ability, communication and coordination ability, etc. Although some achievements have been made in China's emergency construction, the current emergency environment has put forward new requirements for it. Only an objective and comprehensive understanding of the deficiencies of the existing capacity can promote the improvement (Guo, 2010). In the study of emergency response evaluation, the research objects can be divided into specific types of emergencies, emergency plans and emergency units. Wang et al. (Wang, 2017) propose an evaluation index system for Marine disaster emergency response from three dimensions: elements, processes and functions. Rong et al. (Xu, 2019) judge the emergency capacity of the emergency plan through the balance between the emergency knowledge demand and supply, and revise the emergency plan accordingly. Guo et al. (Guo, 2010) emphasize the important role of key units in emergencies, and sort out the evaluation index system and methods of the emergency capacity of key units.

3.6 Emergency Treatment

Emergency treatment should be implemented in all aspects of the work, such as efficient emergency decision-making, the proper use of information systems, network public opinion control, emergency production and logistics deployment, etc. Xu et al. (Xu, 2020) propose an emergency decision method based on user-generated content, that is, immediate public information should be taken into account in the process of emergency treatment. Later, they propose a method to divide major emergencies into sub-events based on users' data. In this way, the emergency decision scheme can be dynamically adjusted according to the change of event scenario (Liu, 2020).

Information is important content to promote scientific emergency decision-making. By mining massive unstructured data to obtain useful information resources, intelligent management of emergencies can be realized (Zeng, 2017). However, the current emergency information system in China still has problems such as information fragmentation and a low level of sharing, so it is urgent to build an interconnected intelligence system and improve the level of emergency cooperative governance.

Public opinion control is also an important work in emergency handling. The propagation and diffusion of false public opinions often lead to mass incidents and increase the difficulty of controlling emergencies. Through big data technology (Xu, 2020), evolution simulation and other methods (Chong, 2018), public opinions can be accurately determined and controlled at all stages.

During the period of major emergencies, the needs of emergency materials and basic living should be guaranteed, which puts forward higher requirements for China's emergency production, emergency reserve and emergency logistics in response to major emergencies. For example, in the early days of the COVID-19 outbreak, there is a serious shortage of medical supplies. Through the mobilization and coordination of production, logistics and other industries, the government departments finally ensure the demand for supplies during the emergency.

3.7 Information Disclosure

With the popularization of the Internet, the speed of information dissemination is faster and the scope is wider. Moreover, the public pays high attention to the information related to emergencies. Therefore, information disclosure is very important in emergencies treatment. In recent years, there are still

many deficiencies in the work of government information disclosure in China, especially on how to improve the information disclosure mechanism and relevant laws and regulations in the "Internet +" era (He, 2017). In this study, scholars focus on the impact of the Internet, information technology and new media on government information disclosure. Shi (Shi, 2020) points out that information disclosure should coordinate with news propaganda to guide the trend of public opinion. Wang et al. (Wang, 2018) propose that mainstream media should play a major guiding role in information disclosure and social media should rationally participate. He et al. (He, 2017) consider that information disclosure should be combined with e-government.

3.8 Emergency System Construction

China's emergency management system has been gradually enriched from the previous "one case, three systems", and developed into the one guided by the overall national security concept. Sub-systems such as social security system, material production, transportation and deployment system, science and technology support system, information coordination system, public opinion management system and information dissemination system are also included. Meanwhile, the emergency systems applicable to different types are also gradually improved. The establishment of the Emergency Response Law is the beginning of the standardization of China's emergency management system. However, Wen et al. (Wen, 2017) point out that the law still has many

shortcomings after ten years of practice, such as the contradiction between theory and practice, the lack of legal cultural environment for an emergency, etc., which need to be further summarized and improved from practical experience. Jiang (Jiang, 2017) also believes that efforts should be made to strengthen the construction of the supervision mechanism in emergency management, especially the coordination between urban and rural areas. It can be seen that the improvement of the emergency management system also needs the accumulation of practical experience, and with the change of social environment, the construction should be constantly updated to achieve dynamic optimization.

4 A RESEARCH FRAMEWORK ON MAJOR EMERGENCIES

According to the existing studies on emergencies (Xue, 2005), these eight research topics can be further summarized according to their different life cycles-- early, middle and late stages, and the research framework of major emergencies can be integrated as shown in Figure 2. Emergency warning belongs to the early stage; news report, e-government, emergency treatment and information disclosure belong to the middle stage; and emergency capacity evaluation, emergency management system, emergency experience belong to the late stage. The early monitoring and warning is the basic work of the whole process, which affects the response effect of major emergencies. The warning work in the early
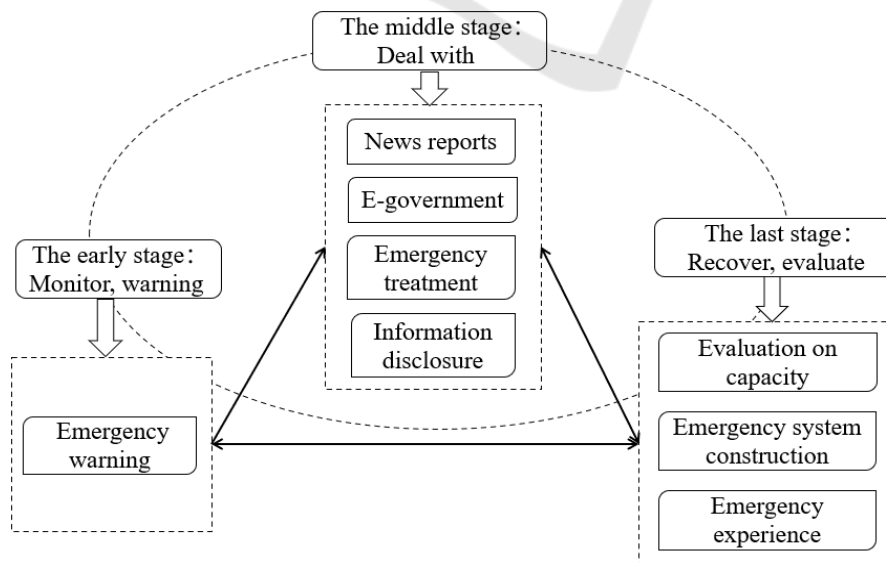

Figure 2: A research framework on major emergencies.

stage and the emergency treatment in the middle stage are the basis for the investigation, evaluation and improvement in the later stage, which will react to the early and middle stages of the event, providing reference and improvement directions for the response to major emergencies in the future.

A systematic reference can be provided for the actual response to major emergencies by sorting out the research content framework. Relevant researches on major emergencies cover the whole life cycle. First of all, early monitoring and warning is very important. Timely and accurate identification and assessment of potential risks can effectively give early warning to major emergencies, which can improve the initiative of response and reduce the adverse impact brought by major emergencies to a greater extent.

Then, in the early part of the middle period, it is necessary to respond quickly to major emergencies and carry out emergency treatment. In the later part of the middle period, when emergency management makes phased progress, it is necessary to reduce emergency measures and gradually restore normal social order. In the whole process, new media should be used for timely news reports and information disclosure to guide public opinion and control the development of social public opinion. At the same time, it should also pay attention to the application of big data, blockchain and other information technologies in major emergencies, and assist decision-making and emergency management through information management and intelligence system. Finally, the last period is not only to restore the normal operation of the society as soon as possible but also to solve the remaining problems and summarize the emergency experience to provide reference suggestions and improvement directions for future response. Through the evaluation of government capacity, emergency plan, emergency system and so on, the deficiencies of each subject in the response to major emergencies are summarized, and the improvement of each subject is promoted.

5 CONCLUSION

In this paper, it is extracted by cluster analysis that there are eight important themes named emergency experience, news report, emergency warning, e-government, emergency capability evaluation, emergency treatment, information disclosure and emergency system construction, covering the whole life cycle of a major emergency. The response to major emergencies should be carried out systematically according to their life cycle. In the future, the research related to major emergencies will be guided by social needs, and there will be more integration and crossover of disciplines, in addition, the application of new media and information technology in this field will be more extensive.

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