Analysis of the Collaborative Governance Mecharnism of public Emergency Events —— Take the Rainstorm in Henan and Beijing as an Example

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Abstract. In the context of climate change, the increase in extreme weather events and natural disasters has caused a certain degree of damage to economic development, social life, and the physical and mental health of the people. Therefore, further research, promotion, and optimization of the collaboration mechanism between various emergency departments and relevant departments have become particularly important. The research topic of this article is how to establish and optimize the collaboration mechanism of various emergency departments in emergency events, and propose some specific measures and suggestions. The research methods of this paper are as follows: using the case analysis method, through combing and comparing the emergency measures taken in the two cases of extremely heavy rainstorm in Henan Province in 2021 and rainstorm in Beijing in 2023, this paper focuses on the analysis of the shortcomings of the specific emergency cooperation measures taken in the two events, and points out the links that can be improved; Using the comparative analysis method, this paper conducts a comparative study on the collaborative governance mechanism of rainstorm disasters in Beijing and Henan from the three stages of preparation, response and recovery. Finally, this article proposes specific suggestions for the allocation of emergency coordination materials, the implementation of extensive and effective public publicity, the improvement of communication equipment establishment, the promotion of emergency management information sharing, the strengthening of the rights and responsibilities of the emergency management department, and the establishment of a unified governance center to establish emergency cooperation mechanisms.

Keywords: Emergency management; Collaborative mechanism; Natural disasters; Public safety incidents.

1. Introduction

In recent years, urban public security emergencies have occurred frequently. Especially in the context of climate change, extreme weather events and natural disasters have increased more than before, causing physical and psychological damage to the people to a certain extent. Meanwhile, the impact on urban public facilities has also aroused the attention of the general public. For example, in the extremely heavy rainstorm in Henan Province in 2021,398 people were killed and missing due to the rainstorm of which 380 were in Zhengzhou, accounting for 95.5% of the province. The direct economic loss was 120.16 billion yuan, of which 40.9 billion yuan was lost in Zhengzhou, accounting for 34.1% of the province [1]. This not only poses new challenges to the government's emergency management capabilities, but also it is important for meteorological departments to strengthen the ability of forecasting and monitoring and promote the cooperation between emergency management departments and relevant departments. In addition, North China is generally regarded as a relatively arid region, but in recent years, more and more irregular rainstorms have been presented. In the heavy rain events in Beijing in 2023, 33 people died due to the disaster and 5 people died due to rescue which had a great impact on people's travel and work activities. Therefore, in this case, it is one of the very important topics to analyze the emergency management system under extreme weather

disasters for areas that are not well prepared. In the face of sudden disasters, the government should come up with a new plan to cooperate with social organizations and grassroots organizations to improve the coordination mechanism of emergency management. The construction of emergency management system is an important part of the modernization of national governance, and the report of the 20th National Congress of the Communist Party of China has made clear instructions and requirements for the construction of China's modern emergency management system and capacity. At present, the Ministry of Emergency Management also needs to achieve high-quality development of high-level safety services from four aspects: improving the system, focusing on prevention, special rectification and enhancing capacity.

Based on the analysis and comparison of the extremely heavy rainstorm event in Zhengzhou in 2021 and the that in Beijing in 2023,this paper summarizes the problems existing in the two cities in the face of disasters and their causes and analyzes the cooperation between the emergency management department and other relevant departments in two cases which is expected to form a set of departmental cooperation mechanism engaged in forecasting and prevention, rescue in the event in order to cope with natural disasters better. Therefore, through the analysis of the response of the emergency management departments in Henan and Beijing rainstorm and flood, people can improve them according to local characteristics. Theoretically speaking, this is of great significance for improving the policy effectiveness, establishing a more perfect emergency management mechanism and improving the comprehensive management capacity of China's emergency management. From a practical point of view, improving the coordination mechanism of the emergency management system can make the government have a theory to follow when it encounters extreme weather. Also, they can carry out early warning and rescue work in a more orderly manner, and safeguard the lives and health of the people and public property.

2. Literature Review

In terms of emergency plans, Xue Lan et al. analysis of China to "three case" as the basic framework of the limitations of emergency management system, thought the emergency plan is fixed template, lack of practicability and put forward to achieve the top of emergency management system design and mode reconstruction, from the concept, system, mechanism and policy tools to improve the emergency management system [2]. Chen Zhouying and others took Henan rainstorm as an example, proposed the emergency plan for flood disaster emergency action and the problem of emergency plan guidance and emergency fragmentation, and used big data technology to help it scientific [3].

In terms of emergency organization, Zhang Haifeng et al. analyzed and compared the physical characteristics of multi-subject emergency management in the three societies, among which the emergency management department which established in 2018 was the leading one in China. At the same time, China integrated information between relevant departments and local organizations, and carries out emergency rescue activities [4]. Liu Bing et al. took the prevention and control of the novel coronavirus epidemic as an example to analyze the functions of social organizations in it and proposed to pay attention to the strength of social organizations [5]. Yao Chen proposed that in response to emergencies, the status quo of government overarching should be broken. The government should build a "government-society-market" cooperation framework in order to improve the social participation mechanism and comprehensively improve the capacity and level of emergency management [6].

In terms of emergency information dissemination and sharing, Zhang Yong pointed out the necessity of modernization of emergency management system and capacity in the era of big data, proposed that emergency management information sharing promoted by big data technology is the key to improving emergency management capacity [7]. Zhang Feng rationally reflected on the emergency management model of mega cities and discovered issues such as response efficiency, synergy, early warning, forward-looking negative impacts, and rigid mechanisms [8]. Fan Bo and Yu

Jie proposed an information collaboration mechanism, stating that network collaboration/coordination between departments is not perfect enough. They described a theoretical analysis on how to effectively combine network, technology, and resources [9].

In terms of emergency rescue, Zhang Hongwu et al. took the rainstorm in Henan as an example to point out that there are still problems in flood fighting and disaster relief in China, so as to put forward targeted suggestions on rescue methods - establishing a sound emergency management and accountability system [10].

In terms of emergency supervision and evaluation, Sheng Mingke et al proposed the problem of "emergency failure". To promote the joint emergency response of public emergencies, government must reshape the emergency concept, innovate the governance mechanism with the holistic orientation, correct the disadvantages of decentralization with comprehensive organization as the carrier, and promote the integrated operation of the government through information sharing [11]. Starting from the concept of resilience, Yi Chengzhi describes the transformation of the existing urban emergency management from the traditional problem-oriented rigid response mode to the dynamic adjustment of the flexible governance mode [12].

It can be seen from the above literature that the emergency management system has been basically formed, covering a wide range of contents, and enriches the management system. This paper puts forward the concept of fragmented emergency management by comparing the cases of rainstorm in Henan and Beijing, and puts forward suggestions and ways to improve the shortcomings. Firstly, there is little research on the disadvantages of information communication. Secondly, there are few systematic studies on how to better play the cooperation among various departments in extreme weather. Finally, most of the literature has recognized the necessity of transformation of emergency management, but the direction and path are lacking, so the transformation cannot be accomplished overnight.

3. Analysis of Emergency Management System in Zhengzhou and Beijing Rainstorm Disaster

3.1. Zhengzhou "7.20" Heavy Rain Disaster Summary

From July 17 to 23, 2021, Henan Province suffered a sudden rainstorm rarely seen in history. On the 19th and 20th, the rainstorm center moved southward to Zhengzhou, and a long period of heavy rain occurred. From July 17 to 23, 2021, Henan Province suffered a sudden rainstorm rarely seen in history. On the 19th and 20th, the rainstorm center moved from southward to Zhengzhou and a long period of heavy rain occurred. This round of rainfall is the most extensive and strongest rainstorm process since meteorological observation records in Zhengzhou city. The National Meteorological station in Zhengzhou recorded a maximum daily rainfall of 624.1 mm which is close to the average annual rainfall of 640.8 mm in Zhengzhou and 3.4 times higher than the maximum recorded since the establishment of the station. At the same time, the three major rivers in Zhengzhou all had large floods exceeding the guaranteed water level and the flood volume exceeded the historical measured maximum value. The main urban area of the river was generally serious water, the maximum water depth of the road was nearly 2.6 meters, resulting in more than half of the city underground space and important public facilities flooded. Plus, a number of areas of power cut off the water, network and traffic.

A total of 14.786 million people were affected by the disaster in 150 counties (cities and districts) in Henan province, and 398 people were killed and missing due to the disaster, of which 380 were in Zhengzhou, accounting for 95.5% of the province. The direct economic loss was 120.16 billion yuan, of which 40.9 billion yuan was lost in Zhengzhou, accounting for 34.1% of the province [1].

3.2. Beijing "7.31" Rainstorm Disaster Summary

On July 28, 2023, as super typhoon "Du Suri" landed in Fujian, China's Central Meteorological Observatory issued the red alert of the highest level of rainstorm, which is expected to cause heavy rain in the Beijing-Tianjin-Hebei region, and some areas will have particularly heavy rain, with rainfall reaching 200 to 450 mm. According to the data of the Beijing Meteorological Observatory, from 20 PM on July 29 to 7 PM on August 2, the maximum rainfall record appeared in Changping's Wangjiayuan Reservoir, which was 744.8 mm, breaking the strong rainfall record of 609 mm on July 23, 1891 and 519 mm on July 21, 2012 [12].

On August 9, 2023, Xia Linmao, Vice Mayor of Beijing, said at the press conference on flood control and relief work in Beijing: The flood disaster caused a total of nearly 1.29 million people affected, 59,000 houses collapsed, 147,000 houses seriously damaged and crops affected an area of 225,000 mu. As of 24 o 'clock on August 8, 2023, Beijing due to the disaster killed 33 people, 18 people missing [13].

3.3. Comparison of Crisis Handling Measures in Emergency Management System

3.3.1. Comparison of preparation for extreme weather

The pre-preparation of emergency management departments should focus on prevention, aiming at establishing early warning platforms and issuing early warning information before disasters occur. At the same time, the publicity department issued extreme world self-protection and self-rescue measures, and organized citizens and various organizations to conduct drills in accordance with the relevant plans. The relevant departments of urban construction check the urban drainage and flood control system, and re-work the projects that fail to meet the standards, so as to strengthen the drainage capacity of the city.

On July 20, 2021, "Zhengzhou Meteorological" micro blog issued seven red warning signals for heavy rain at different times, indicating the need to focus on urban waterlogging and they were able to make early warnings for extreme weather. However, the main person in charge of the municipal government still did not pay sufficient attention and take precise measures to deal with the heavy rain, for instance, they did not stop classes, work, gatherings and other activities in accordance with the red alert.

On July 29, 2023, the Beijing Meteorological Bureau issued a red alert for heavy rain and quickly issued information asking the public not to go out if necessary which sounding the alarm for the masses. They also forecast hard-hit areas in advance, and transfer people in advance according to the plan to reduce casualties.

3.3.2. Comparison of management in response to extreme weather

Management in the event aims to respond to the disasters that have occurred and make appropriate strategic countermeasures, mainly including communication and cooperation between relevant departments, with unified command and dispatch, to implement rescue measures and not causing waste of rescue personnel.

First of all, Zhengzhou lacks overall and coordinated command. After the disaster worsened, major officials of the Zhengzhou municipal government rushed to the scene, but were unable to get immediate information on the rescue situation due to communication difficulties caused by heavy rain. The command of rescue work among various leaders is also lack of coordination, such as overlapping management agencies, repetitive functions and lack of specific arrangements. Some tasks are repeatedly issued and some places are not interested. And in the rescue process, the lack of unified management has led to continued deaths. Also the warning to the entire population came too late. When the command's emergency notice was published on media websites, people were already on their way to work and school, missing the opportunity to effectively prevent mass casualties which resulted in major casualties and social concerns such as the Zhengzhou Metro Line 5 incident.

Beijing has long issued a red alert for flood control, requiring citizens to stay indoors if necessary and conduct drills in areas with high risk of flooding. In the process of rescue transfer, a specific

platform was established to collect rescue information and ensure the orderly progress of rescue work. What the Beijing rainstorm incident needs to reflect on is that in addition to the government making plans and issuing early warnings, the masses should also pay attention to the alarm, enhance the awareness of flood control, and understand how to save themselves.

According to analysis, the relevant departments of the two departments in the management stage of the incident have responded. First of all, the person in charge rushed to the scene after the incident, making an example role. However, it can be found that due to the lack of preparation in Zhengzhou, it is difficult to carry out rescue activities between various departments. The notice of suspension of work and school was issued late, so many people were trapped. Beijing, on the other hand, issued an early warning, which greatly reduced casualties.

3.3.3. Comparisons of reconstruction after dealing with extreme weather

The purpose of post-disaster reconstruction is to restore the buildings in the affected areas, reflect on the post-disaster related systems and build a standardized emergency management system and working mechanism.

After the "7.20" heavy rain event in Zhengzhou, the National Development and Reform Commission issued a reconstruction plan. First, the government should ensure the reconstruction of infrastructure, restore residents' electricity and water, and lay new power supply equipment. At the same time, the water company repairs the equipment. Second, they should actively mobilize social forces. According to local needs, the Red Cross Society of China assists in the reconstruction, repair and purchase of school and hospital facilities.

After the heavy rain in Beijing, first, public transport quickly resumed, until August 10, the main water damage problems have all been repaired, ensuring the safe travel of the people. Second, infrastructure has recovered quickly. August 5, China Mobile Beijing company repair personnel in Beijing Mentougou district laid fiber optic cable, which quickly restore communication, water, power, access and other maintenance work.

After the disaster, both cities first carried out repair work on water, electricity and transportation to ensure the normal development of daily life of residents. After that, Henan Province further carried out detailed planning for the affected areas. They issued the "Zhengzhou July 20" heavy rain disaster Accountability case to promote reform work implementation plan "and" Henan Zhengzhou and other places after the heavy rain flood disaster recovery and reconstruction master plan ".

4. Analysis of Causes

4.1. Subject Cooperative Fragmentation

Emergency departments still have multiple governance and fragmentation of subject coordination. The fire department, medical and health department and public security departments do their own duties, but there is a lack of a unified department to issue dispatch and orders. The main body of emergency coordination is not limited to the government departments, but also needs the participation of social organizations, the market and the public [3]. An important reason for the occurrence of floods in Henan province is that the emergency department did not pay attention to the warning from the meteorological department and did not release warning information to the public in accordance with regulations. The Beijing government and the meteorological department attach great importance to the warning of the rainstorm, but some of the public ignore the warning information and still go out in extreme gas, leading to the disaster. How to improve the efficiency of the collaboration between the subjects is still an urgent problem to be solved. Not only that, Beijing in the rainstorm disaster also exposed the uneven distribution of relief funds and goods, which led to some affected people did not get the due rescue and material support. An important reason for this phenomenon is that the linkage mechanism of material mobilization is not perfect.

4.2. Lack of Information-sharing Platforms

During the rescue period in Henan, the lack of a unified platform for distress messages led to a mix of distress messages on the internet. During the rescue period in Beijing, a new information sharing platform was launched, with special managers to collect, organize and ensure authenticity. However, the lack of information sharing platform was due to problems such as failure of communication equipment in the later stage. In the modern society with the developed internet, the real and false information of the internet is mixed. The distress information on the internet may come from the real affected people or from the anchors who need heat flow. Therefore, one of the reasons behind the chaotic information is the delay of rescue information transmission.

4.3. Lack of Awareness and Response Experience of Extreme Disasters

The amount of precipitation is affected by global warming. A large number of observation data show that the middle and high latitudes and the tropics areas generally show a trend of increasing precipitation, while the subtropical areas generally show a trend of decreasing precipitation, the total annual precipitation in China increases, and the precipitation structure has changed. In the past 50 years, the number of light rain days in China has decreased significantly, while the number of rainstorm days shows an increasing trend, which means that the risk of drought and the risk of short-term precipitation have increased. The data showed that the extreme heavy precipitation events increased in the northwest and the Yangtze River basins, and the increasing trend in the middle and lower reaches of the Yangtze River was more significant [14]. Henan and Beijing are located in the northwest of China. With the increase of extreme precipitation time, the probability of flood disaster increases, but the public and the government still lack their understanding and coping strategies. One of the public and relevant departments ignoring the negative effects of extreme weather can cause severe disasters.

5. Suggestions

5.1. Linkage and Coordination of Material Allocation

In the case of Beijing, there was an issue of uneven distribution of relief funds and materials, resulting in some affected people not receiving the necessary rescue and support. The demand for emergency supplies will significantly increase during emergency events, so supplies need to be reasonably allocated to maximize public demand. When a disaster occurs, a centralized emergency material management system should be established, with unified management from the four stages of procurement, storage, distribution, and consumption. In terms of material coordination, an open network platform can be established to make the direction and distribution of materials transparent, achieve information sharing and linkage scheduling between regions, and improve the efficiency of responding to emergencies.

5.2. Implement Extensive and Effective Public Promotion

Based on the above summary, it can be found that both Beijing and Henan have reported flood season predictions and disaster warnings in their disaster relief efforts. However, due to inadequate organization and promotion of disaster information by the propaganda department, some members of the public are still unable to respond positively to them. So implementing extensive and efficient public publicity is the key to improving the public's ability to self-rescue in disaster situations. On the one hand, the propaganda department can use various channels for releasing warning information. With the increasing use of microblog, TikTok, Kwai and other software by the public, in addition to traditional media such as news and newspapers, the use of these new online platforms for early warning and publicity can expand the publicity area, improve the strength and speed of early warning information dissemination, so that the public can get disaster information at the first time and do a good job in prevention. On the other hand, it is necessary to promptly inform the public of disaster

information and actively respond to public concerns [9]. During the flood season, the focus of publicity is to implement responsibilities and educate the public on crisis awareness, such as how to self-rescue in the event of floods, promoting knowledge and response measures for flood disasters, in order to improve the public's ability to respond to emergencies [9]. After a flood occurs, the government should immediately release the disaster situation, casualties, response measures, and rescue and disaster relief situation through a press conference, authoritative, timely, and rolling, in order to create a positive public opinion atmosphere, respond to public concerns, stabilize social order, and ensure that rescue and disaster relief work can proceed in an orderly manner [9].

5.3. Improve the Establishment of Communication Equipment and Promote the Sharing of Emergency Management Information

It is crucial to improve rescue communication equipment and establish a complete and standardized communication system. The government can establish a unified platform to centralize the transmission of rescue information, avoid problems such as chaotic transmission routes, and improve rescue efficiency and accuracy. In addition, it is necessary to increase technological investment to ensure the safety and effectiveness of communication equipment, and try to avoid transmission obstacles caused by communication equipment damage. In addition, flexible application of big data for emergency information sharing is also the key to improving emergency management capabilities [6]. Taking the COVID-19 as an example, during the epidemic period, the country launched a series of emergency information sharing programs, such as health codes, travel codes, etc., to monitor the disaster situation in real time and obtain massive information in real time, making information transmission more rapid and efficient [6].

5.4. Strengthen the Powers and Responsibilities of the Emergency Management Department and Establish a Unified Governance Information Center

The fundamental reason for the inadequate deployment and failure of emergency departments to fulfill their rescue and disaster prevention responsibilities is a lack of understanding of extreme meteorological disasters. Therefore, emergency departments should first have a comprehensive understanding of such disasters, and secondly need to establish a more comprehensive emergency management mechanism. By analyzing the characteristics of the emergency management system, it is proposed that an integrated model should be formed for emergency management, with the emergency management department as the lead, subordinate departments playing a role, integrating information between relevant departments and local organizations to carry out emergency rescue activities, thereby strengthening the rights and responsibilities of the emergency management department and establishing a unified governance center [3].

6. Conclusion

China's emergency management has grown from "one case, three system" to the establishment of the Ministry of Emergency Management in 2018, to the 14th Five-Year National Emergency System Plan issued by The State Council, and has gradually formed an emergency management system in line with China's national conditions. However, the future emergency management system is still full of challenges for global warming. By comparing the emergency system of Henan rainstorm and rainstorm in Beijing from three stages of preparation, response and recovery, the emergency management system has been gradually improved from 2021 to 2023, but there are still problems. Emergency management departments still need to strengthening coordination, information sharing platforms and awareness of extreme weather. Through case study and comparative study, this paper finds that there are still loopholes in the operation of China's disaster emergency management system and the ability of cities to resist extreme weather. In view of the existing problems, the emergency management measures and programs should be adjusted dynamically and flexibly, to promote the

improvement of the multi=agent emergency coordination system and mechanism, so as to improve the emergency management level of China to deal with natural disasters such as rainstorm and flood.

This study is a preliminary exploration of comparing the emergency response of rainstorm and flood disaster in Henan and Beijing under the background of climate change, which can provide some reference for the emergency rescue of rainstorm and flood disaster, and still needs to be analyzed according to different situations and subjects. There may be deficiencies in the acquisition and analysis of the research data in this paper. There is lack of further analysis of some more specific problems in collaborative governance. Strengthening coordination and horizontal cooperation is also accompanied by a redivision of powers and responsibilities, which will also be new problems to be overcome. In the future, research still needs to be done in information transmission and effective coordination between emergency departments, which is also the focus of the next research.

Authors Contribution

All the authors contributed equally and their names were listed in alphabetical order.

References

[1] "July 20" heavy rain disaster investigation report in Zhengzhou, Henan province- -Ministry of Emergency Management, PRC. 2022.01.21, 2023.09.23. P020220121639049697767.pdf mem.gov.cn.

[2] Xue LAN, Liu Bing. New challenges of emergency management system and its top-level design. Journal of The National Academy of Governance, 2013, (01): 10-14 + 129.

[3] Chen Zhouying, Kong Feng. Research on fragmentation and comprehensive management of "July 20" heavy rain in Zhengzhou, Henan. Water Resources and Hydropower Technology (Chinese and English), 2022, 53 (08): 1-14.

[4] Liu Bing, Fu Changbo, Guo Cheng. Research on the participation of social organizations in emergency management mechanism with Chinese characteristics —— Continuous observation based on COVID-19 prevention and control. Social Policy Research, 2022, (02): 97-108.

[5] Yao Chen, Fan Bo. Multiple emergency collaboration from a "structure-function" perspective. Southeast Academic, 2023, (04): 114-125.

[6] Zhang Yong. Research on Emergency management information sharing based on the background of big data era. China Production Safety, 2023, 18 (02): 26-29.

[7] Zhang Feng. Reflection and reconstruction of emergency management mode of megacities under the perspective of big data. Research on Urban Development, 2020, 27 (09): 12-18.

[8] Fan Bo, Yu Jie. Research on the information coordination mechanism of public emergency governance. Journal of Shanghai University of Administration, 2015, 16 (05): 16-30.

[9] Zhang Hongwu, Li Linqi, Fu Jian, etc. Problems and solutions to the flood fighting in dealing with the heavy rainstorm: Take the rainstorm emergency relief in Henan province in July 2021 as an example. Water Conservancy and Hydropower Technology (Chinese and English), 2021, 52, (11): 27-38.

[10] Sheng Mingke, Guo Qunying. Research on departmental interest obstruction and management of public emergency response. China Administration, 2014, (03): 38-42.

[11] Yi Chengzhi. From rigid response to flexible governance: Transformation analysis of urban Emergency Management from the perspective of resilience. Nanjing Social Sciences, 2023, (05): 63-71.

[12] Green pupil perspective, the rainfall in Beijing is the largest in 140 years, 2023.08.03, and https://baijiahao.baidu.com/s? Id = 1773159197059580873 & wfr = baike

[13] Securities times, sad! Beijing disaster killed 33 people, 18 people are missing, 2023.08.09, ttps://baijiahao.baidu.com/s? Id = 1773720958377164221

[14] Sujesi, what changes in rainfall under the background of global warming? - -China Meteorologi cal Administration 2020.03.23. 2023.09.23. https://www.cma.gov.cn/2011xzt/2020zt/20200323/2020032301/202003/t20200323_549531.html