

Emergency Policies of Chinese Cities in Response to Flood Disasters in the Era of Climate Crisis

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Abstract

In the context of climate change, the most direct impact of global warming is the widespread occurrence of extreme weather events and natural disasters. Among all kinds of catastrophe events, rainstorm and flood disasters are the types of natural disasters with the fastest and highest frequency increase and the greatest impact of secondary disasters.

Therefore, this study mainly uses the literature review method and case analysis method to analyze the current situation of domestic urban emergency management policies in response to flood disasters. This paper focuses on three heavy rain and flood disasters in China and studies the emergency management policies of flood disasters. Based on the cases of the 7.20 rainstorm in Zhengzhou, the Zhuozhou rainstorm and the 8.20 rainstorm in Chengdu, this paper makes a detailed understanding of the emergency management situation when the flood occurs, and finds that different city governments have adopted different emergency management measures in the response to the rainstorm and flood disaster, and have their own problems. The first chapter describes the research background, purpose and research methods of this paper. The second chapter is theoretical analysis and conceptual analysis. The third chapter describes the current flood emergency management system in China. Chapter four is a case study. The fifth chapter explains the problems existing in each city when disasters occur. Chapter six puts forward solutions to the existing problems.

Key words: climate change, crisis management policy, global warming, rainstorms, floods

I. Introduction

1. Research background

In the context of climate change, the most direct impact of global warming is the increasing frequency of extreme weather events and natural disasters (World Economic Forum, 2021). Among all kinds of catastrophe events, rainstorm and flood disasters are the types of natural disasters with the fastest and highest frequency increase and the greatest impact of secondary disasters (United Nations Office for Disaster Risk Reduction(UNDRR), 2021). The Global natural disaster assessment report and a series of recent major floods show that floods are still a major security

challenge threatening the survival and development of mankind around the world. Global climate change has affected the water and energy cycle process, and severe weather phenomena such as extreme precipitation have become more frequent, and the intensity and frequency of flood events have increased, making it more difficult to prevent (Hu,et.al., 2023 (14) :16). In the era of climate crisis, the sudden flood disasters all over the world have caused a large number of direct and indirect losses, among which the economic losses are the most serious, not only affecting the lives and property losses of citizens, but also affecting social stability and development. China is also facing the same challenge. According to a survey conducted by the Ministry of Housing and Urban-Rural Development on 351 cities in China in 2010, 213 cities, accounting for 62% of the surveyed cities, had experienced waterlogging of varying degrees, of which 137 cities had more than three waterlogging disasters. "Every rain must be flooded" has become one of the major urban disasters in China (Ma, et.al., 2017, 28(02): 76-81). When dealing with floods, the emergency management system is not yet perfect, especially when sudden floods and floods are a huge test for the grass-roots government. In order to avoid greater losses to the safety of life and property of citizens, it is necessary to continuously improve the disaster emergency management ability of the grass-roots government, which is an inevitable requirement for the grass-roots government to perform its functions. Emergency management capacity is an important part of the governance capacity of grassroots governments. It is impossible and unrealistic to rely solely on emergency management departments to deal with sudden flood disasters. (Wang, 202:1-3)

In recent years, the thinking of governments and international organizations has changed from crisis management focusing on post-flood prevention and rescue to advocating systematic flood disaster risk management. As an important part of flood disaster risk management, the flood disaster risk management system is receiving increasing attention (Hong, 2012:1-3). Flood disasters are becoming more frequent and severe, and the disastrous consequences are often concentrated in urban areas, seriously affecting urban development and residents' life. Therefore, the state has issued a series of policies to deal with and solve the problem of urban flood disasters, but the traditional flood disaster management measures and disaster prevention and reduction system still have some room for optimization and improvement (Zhu, 202:1-3).

2. Research significance

The flood disaster is one of the main factors restricting the stable and sustainable growth of China's economy. Disaster emergency management plays a key role in disaster prevention, disaster management and disaster control

(Zhang, 2019:236-237).

The management of flood disasters requires close coordination and cooperation among multiple departments, and at this time, the improvement of the overall emergency management capacity of the government is very important. Only by further improving the overall emergency management capacity can we better cope with sudden flood disasters, which is an inevitable requirement for improving emergency management capacity (Wang,2022:1-3).

As the manager of public affairs and the provider of public services, the government is bound to play a major role in public crisis management. Flood disaster management is one of the important measures to maintain social stability and reduce the loss of national and social property in sudden disasters. Therefore, the research on flood disaster management mechanism has become one of the important issues to be solved in China's public crisis management (Liu, 2011:1-6).

Improving China's emergency management system and improving its emergency management capacity is an important aspect of realizing the modernization of the national governance system and governance capacity. Therefore, it is of great practical significance to strengthen the study of risk and disaster crisis management to guide China to effectively deal with the occurrence of risk and disaster crises (Kuang, 2023:40).

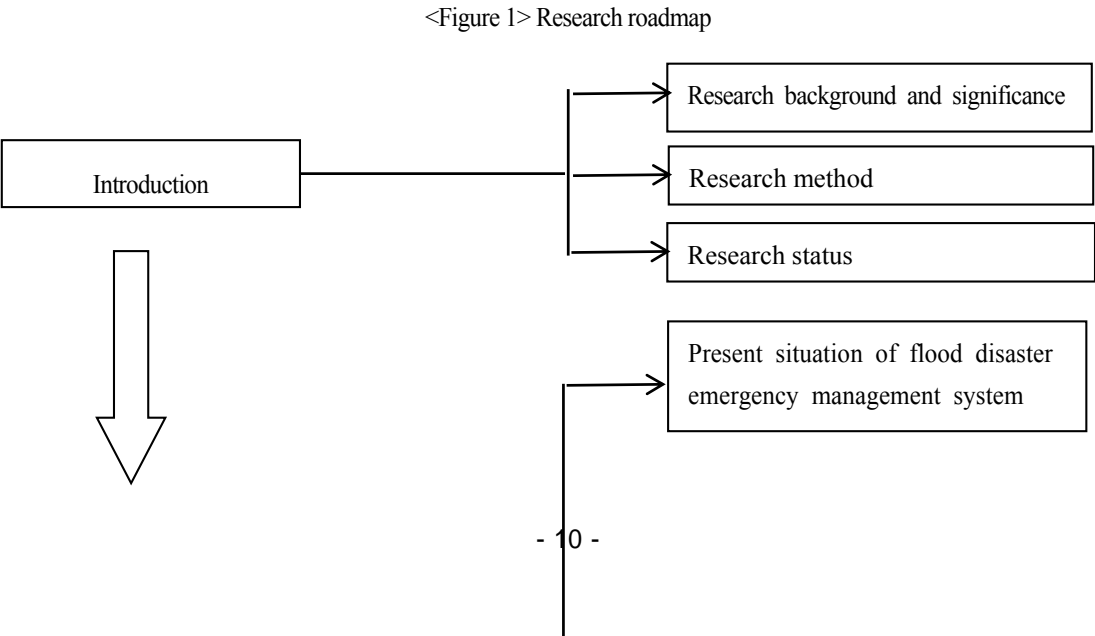
3.Research method

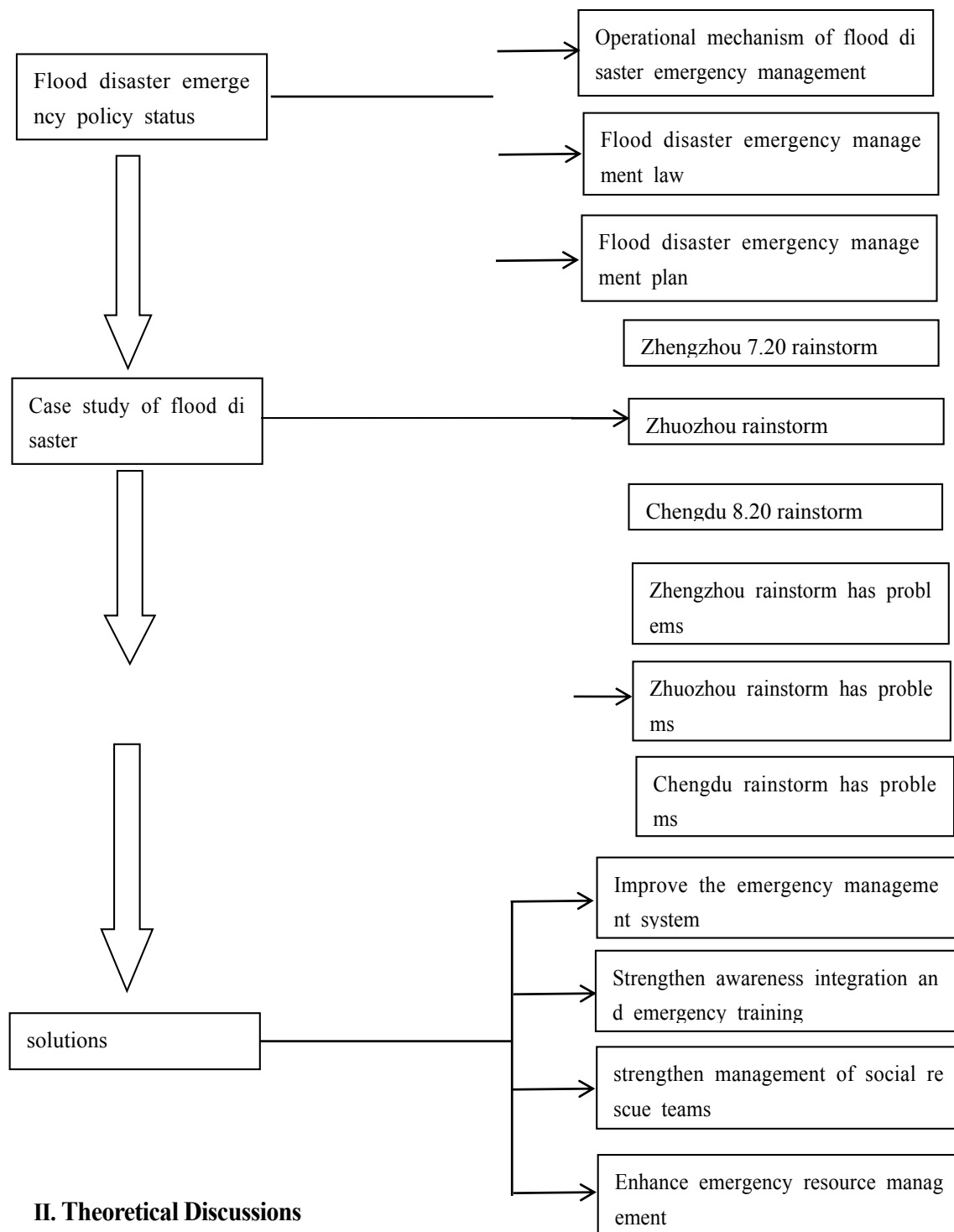
This paper mainly uses literature review method and case analysis method, combining theory with empirical analysis, to analyze the current situation of China. Firstly, the relevant theoretical basis is found out on the basis of China's research, and the reasonable ways and countermeasures of China's flood disaster crisis management mechanism are put forward through the analysis and summary of China's flood disaster management situation.

Firstly, data were collected and consulted through the academic database of CNKI and the official website of the government emergency management department. Through reading a large number of literatures and materials, the research status of flood emergency management in China is clarified.

Secondly, the case analysis method is used to study the current situation and existing problems of flood in representative cities in China. Through detailed description and systematic analysis of specific research objects, case study comprehensively presents the context and evolution process, which is an important path and method for comprehensive and overall understanding of specific issues. Case study is an important and frequent method in case study, which enables researchers to present a fuller analysis on the basis of full grasp of information (Yu,

This paper focuses on three heavy rain and flood disasters in China and studies the emergency management policies of flood disasters. Based on the cases of the 7.20 rainstorm in Zhengzhou, the Zhuozhou rainstorm and the 8.20 rainstorm in Chengdu, this paper makes a detailed understanding of the emergency management situation when the flood occurs, and finds that different city governments have adopted different emergency management measures in the response to the rainstorm and flood disaster, and have their own problems. Therefore, the research core of this paper is to explore and compare the general situation and countermeasures of three heavy rain and flood disasters in China in the context of global climate change, so as to systematically understand the current situation of emergency management in response to flood disasters in various cities, and deeply analyze the common causes of emergency response failure of the government and multiple social entities in disaster emergency management in the case. On the basis of this, it puts forward the countermeasures of integrated management of rainstorm flood disaster risk. Look at Figure 1.





II. Theoretical Discussions

1. Research on existing problems in emergency management

Chen Xiaochun believes that China has problems in emergency management legislation, which tends to be social emergency disaster legislation and lacks legal provisions on flood disasters. Thus, China's disaster emergency management mode is not perfect enough and needs to be standardized (Chen, et. al., 2018 (4) : 74-84). Zhang Haibo

pointed out that China's emergency management mechanism has the following problems. The first is the neglect of risk prevention and mitigation; the second is the lack of continuity and cross-stage monitoring; the third is the separation of early warning mechanism from other links; the fourth is the lack of information release and public opinion dissemination and governance; and the fifth is the lack of post-disaster learning and reflection mechanism (Zhang, 2020(03): 123-130). Zhao Wei believes that under China's national conditions, the emergency management mechanism needs to be optimized. In the face of most disasters, China's existing emergency management system construction needs innovation and reform, so as to better promote the construction of flood disaster emergency management system and optimization of countermeasures and suggestions (Zhao, et. al., 2018 (24) : 59-61). Wu Zichen believes that there are two key problems in China's current emergency management mechanism, one is the inefficiency of emergency response; Another problem is that the information disclosure mechanism of emergencies is not perfect. Citizens have the right to know about social emergencies, and rumors are easily generated by public opinion in the case of opaque information (Wu, et. al., 2018 (08) : 60-61).

2. Research on emergency management countermeasure system of flood disaster

Guo Hao suggested a combination of government departments and ngos, with government departments taking the lead and ngos assisting to supplement and improve relevant functions. In light of the characteristics of flood disasters under China's national conditions, Guo Hao suggested that the unique advantages of ngos be actively used to resolve the difficulties faced by government departments in flood disasters. This not only improves the utilization rate of rescue workers, improves the main functions of emergency rescue and disposal, but also strengthens the construction of the emergency management system of ngos and helps cultivate the collective civic consciousness of the general public (Guo, et. al., 2011 (3) : 13-18). Based on the analysis of "Shangcheng District of Hangzhou" and the discussion of relevant typical cases, Jin Xiaoming proposed in Journal of Natural Disasters that flood disaster emergency management should be combined with China's actual national conditions to study the important links, coping flow charts, methods and experience, and countermeasures and suggestions. This has important reference value for flood disaster emergency management response practice (Jin, et. al., 2018 (1) : 106-112). Starting from the current situation of natural disaster emergency management in China, Ke Han (Ke, 2007) made a comparative study on the natural disaster management and relief systems of developed countries. It is proposed to improve the level of natural disaster management and relief in China from the aspects of disaster management legal system, information

management system, rescue team and rescue equipment construction, disaster relief materials reserve, disaster relief fund guarantee system, relief, recovery and reconstruction work. Chen Biao (Chen, 2010) comprehensively studied the characteristics of China's disaster management system changes, revealed the internal laws of the changes, built a performance model of China's disaster management system, analyzed the overall trend of China's disaster management system changes from a long time scale, and proposed to innovate China's disaster management system.

III. Case study

1. Zhengzhou 7.20 rainstorm

The "July 20" rainstorm lasted for a long time, accumulated precipitation was large, the range of heavy rainfall was wide, and the short-term rain intensity broke the historical record. From July 17 to 22, 2021, heavy rain lasted for six days in Henan Province, China, during which the maximum daily rainfall was 624.1 mm and the strongest point rainfall in the hour was 201.9 mm/h. The strongest point rainfall broke the historical extreme hourly rainfall since meteorological records were kept in mainland China (Ministry of Emergency Management, 2022). Heavy rain caused extremely serious urban waterlogging in the urban area of Zhengzhou city. The 24-hour average rainfall of each drainage area on July 20 was 318.4 ~ 497.5mm, which reached 1.6 ~ 2.5 times of the planned drainage standard of Zhengzhou urban planning area. A total of 14.814 million people in 1,664 towns and townships in 150 counties (cities and districts) in 16 cities were affected by the torrential rain and floods, with 398 people dead and missing, and direct economic losses of 120.06 billion yuan (17.6 billion US dollars). The affected area of crops was 1.0802 million hm². More than 35,000 households and nearly 100,000 houses collapsed due to the disaster (Ministry of Emergency Management, 2022). In Zhengzhou, 292 people were killed and 47 were missing (Henan Provincial People's Government portal, 2021).

In addition, the interruption of urban critical infrastructure business promoted the escalation of disasters, resulting in qualitative changes in the form of disasters, and the interruption of urban "lifeline" further increased the difficulty of rescue. In the "July 20" disaster, flooding of underground distribution rooms and structural damage to power facilities led to cascading failures of key infrastructure such as power, communication and transportation, resulting in urban paralysis and increasing the difficulty of emergency response.

Before and after the rainstorm in Zhengzhou, relevant departments of emergency management at all levels in China

made emergency response respectively. Zhengzhou Metro was the first to respond and activated the flood prevention emergency plan on July 19. Provincial Water resources Department on July 20, according to the "Henan Provincial Water Resources Department flood and drought disaster Prevention emergency Plan", the flood and drought disaster prevention emergency response level IV was upgraded to level III emergency response; The Zhengzhou Municipal government upgraded the emergency response from Level IV to Level II in the morning of July 20 (People's Information, 2021.07.20), and then adjusted it to level I in the afternoon (China Youth Daily, 2021.07.20); The city's emergency response was downgraded to level III on July 22, and then to level IV on July 23, ending Zhengzhou's flood emergency response. It is not difficult to find from the emergency response process of Zhengzhou flood disaster that there are some problems such as delayed response and poor linkage of various departments, which lead to delayed rescue and heavy casualties in the disaster. At about 2 PM on July 20, 2021, the special service brigade of Zhengzhou Fire and Rescue Detachment rushed to the scene, and the Central Theater Command dispatched the PLA volunteer team to participate in the rescue and rescue. On July 20, 2021, the Ministry of Emergency Management launched the cross-regional reinforcement plan for fire rescue teams, and dispatched seven provincial fire rescue and water rescue professional teams overnight to Henan for rescue work. In the rescue work, the emergency management department played an important coordinating role and improved the efficiency of rescue (Mi and Kong, 2023,54(3):21-34).

2. Zhuozhou, Hebei rainstorm

The Zhuozhou rainstorm event in Hebei Province refers to the extreme rainstorm disaster and flood disaster caused by the typhoon landing in coastal areas from July 29 to August 2, 2023 (Qin and Wu, 2024 (03) : 1-9). First of all, the rainstorm has long duration, large rainfall, wide range and strong intensity, and the cumulative rainfall, single station extreme rainfall and maximum heavy rain intensity all exceed the extreme rainstorm processes in 1996 and 2016 (Interface News, 2023).

Of the 93 reservoirs in the city, 10 large and medium-sized reservoirs exceeded the flood limit water level, 67 of the 83 small reservoirs overflowed, and the overflow situation was serious. All 22 counties (cities and districts) in the city were affected by the disaster (CNRCN, 2023.08.06). It directly threatens the safety of downstream public, the safety of surrounding crops, and the safety of major infrastructure such as roads, communication facilities, and power supply stations. Under the combined influence of external floods and rainfall, more than 50% of the residential areas and

many viaducts in the main urban area of Zhuozhou City were flooded, and the urban road traffic was almost paralyzed. In addition, damage to critical infrastructure in cities and villages has promoted the escalation of disasters, resulting in qualitative changes in disaster patterns and further increasing the difficulty of rescue. Roads, Bridges and other transportation facilities were destroyed, which not only increased the rescue activities of disaster relief workers, but also increased the difficulty of timely delivery of disaster relief materials to the hands of trapped people. The damage to infrastructure such as power and communications has caused the rescue team to be unable to contact the trapped people, accurately determine the specific location, shorten the rescue time, and increase the difficulty of emergency disposal.

In conclusion, the combination of extreme natural disasters and special geographical conditions in Zhuozhou is an important cause of Zhuozhou rainstorm events. Damage of critical infrastructure is an important cause of the escalation of disaster destructive power (Qin and Wu, 2024 (03) : 1-9).

3. Chengdu 8.20 rainstorm

Before the disaster, the Chengdu Meteorological Bureau issued a blue alert for heavy rain at 16:00 on August 18, indicating that heavy rainfall is expected in all districts (cities) and counties of Chengdu in the next 6 hours. At 16:00 on August 19, Chengdu Meteorological Bureau issued a blue warning for heavy rain again, and it is expected that the rainy weather will continue. At 16:00 on August 20, Chengdu Meteorological Bureau issued a yellow warning for heavy rain, which is expected to continue to rain in various districts of the city.

At 18:00 on August 20, Chengdu Bureau of Planning and Natural Resources, Chengdu Meteorological Bureau and Chengdu Emergency Management Bureau updated the geological disaster meteorological risk warning for the third time, adjusting the risk warning from the original three-level warning to two-level warning, indicating that the geological disaster risk may be relatively large. The municipal Meteorological Bureau and other departments notified all districts (cities) and counties to prepare for the disaster, timely prepare the early transfer of people who may be threatened by disasters, formulate disaster response plans, and carry out key inspections of areas where disasters may occur for tourists and other foreigners who withdraw from dangerous areas in a timely manner at scenic spots within their jurisdiction (Li, 2022).

According to the provincial and municipal early warning information such as rainstorm, mountain flood and geological disaster, Chengdu and relevant districts (cities) and counties immediately carried out joint consultation and

study. From August 18 to 20, comprehensive early warning information and work tips were developed and sent to 35 member units of the municipal flood control and early fighting headquarters, 23 district (city) and county emergency departments and more than 20 relevant rescue teams, organized accurate dispatch of early warning areas, rolled spot checks on county-level prevention offices (emergency response) to be in place, perform their duties, and deploy defense rescue teams.

On August 18, the coordination and linkage working mechanism of military and local rescue and rescue was immediately launched, and air rescue information and emergency preparedness tips were strengthened with drones and general aviation teams, so as to prepare for air-ground rescue.

After the disaster, the municipal prevention office quickly launched a four-level flood prevention emergency response, and upgraded it to a three-level response according to the disaster situation.

Chengdu flood control and early fighting headquarters mobilized all kinds of professional forces more than 120 people, together with more than 1,500 local rescue forces to carry out rescue and rescue. According to statistics, during the rescue period, the helicopter flew for a total of 35 hours, transporting personnel and materials reached 44 sorties, and transferring 162 trapped people.

After the "August 20" flood in 2019, the D County Flood control and drought Relief Headquarters launched the blue flood warning (Level I) emergency response at 13:00 on August 20, the D County Emergency Committee launched the emergency I response at 15:00 on the 20th, and the D County Flood control and drought Relief Headquarters launched the orange flood situation (Level II) emergency response at 6:00 on the 21st. The county disaster reduction Committee launched the level IV response of the natural disaster relief emergency plan at 12 o'clock on the 21st.

IV. Existing problem

1. Zhengzhou 7.20 rainstorm government emergency management problems

In the "July 20" disaster, local governments failed to take effective measures to avoid the expansion of casualties and property losses, failed to implement the political responsibility and governance requirements of "promoting the development of one side and protecting the safety of the other side", and the efficiency of emergency management was low and seriously deviated from the expected standards. The "July 20" disaster exposed the structural defects in the two key modules of the local government emergency management system in peacetime risk management and

emergency command.

Zhengzhou also issued a number of early warning information on the day of the rainstorm on July 20, but after the municipal Meteorological Bureau issued a red warning of the rainstorm, the municipal government did not stop the normal work of the public according to the regulations, the telecom operators only pushed the news on the whole network when the first warning was issued, the urban management and water conservancy departments did not issue early warnings to the society according to the regulations, and the municipal publicity department lagged behind. The problem of improper handling occurred in all departments, which affected the efficiency of early warning dissemination. In addition, there are also problems such as poor early warning linkage between different departments, lack of unified authority to issue early warning, and confusion between the concepts of meteorological forecast and disaster early warning, which further reduce the effectiveness and efficiency of early warning, resulting in more people in distress under normal life conditions (Mi and Kong, 2023,54(3):21-34).

Although Zhengzhou has set up a perfect emergency management administrative system, due to the overlapping, overlapping functions and overlapping work of various agencies, the linkage of various departments is poor and management is fragmented during the "July 20" rainstorm and flood (Chen and Kong, 2022, 53(8): 1-14), reflecting the inadequacy of the construction of China's flood risk management administrative system. Zhengzhou's urban flood emergency management organization system is dominated by government agencies, which ensures that emergency management policies and actions can be implemented from the official level. However, the internal setting of the emergency management administrative system is not reasonable, and there are inherent problems in the bureaucratic system. At the same time, various social organizations and individual citizens were not mobilized to participate in the management system, resulting in incomplete government decision-making and society's indifference to flood risk (Mi and Kong, 2023,54(3):21-34).

In addition, the flood control and drought relief offices of the districts and counties (cities) under the jurisdiction of Zhengzhou City and the city lack professional personnel and technical support institutions, and the prevention office personnel have limited understanding of flood control laws, regulations, plans and processes, leading to problems such as delayed emergency response and lack of research and judgment (He, 22, 32 (3) : 37-40, 51).

2. There are problems with heavy rain in Zhuozhou, Hebei

2.1 pre-disaster

According to the government website, after the Hebei provincial government launched a level IV emergency response to a major meteorological disaster (rainstorm) on July 21, a series of work were carried out by the Ministry of Water Resources, PRC to deploy rainstorm flood prevention work in the Haihe River basin, and the provincial meteorological disaster Prevention Headquarters Office issued a Notice on doing a good job in preventing and responding to the recent Heavy Precipitation weather. In Zhuozhou City, after the important weather forecast was issued on July 19, 2023, the Municipal Emergency Management Bureau checked and sorted out the flood control materials in the municipal emergency materials reserve on July 20, and issued flood control emergency materials to various towns and offices. On July 28, the emergency dispatching meeting of the city's flood control work was held, and the deployment arrangement of flood control related work was launched for the first time, and the rainstorm had begun at 08:00 on July 29. After the important weather forecast has been issued, the relevant flood control work arrangements have not been carried out for a long time, and after the launch of a major meteorological disaster (rainstorm) III emergency response, an emergency dispatching meeting was held to deploy relevant work.

Local governments do not pay enough attention to natural disaster prevention and control projects, and there are still misunderstandings that focus on post-event response and neglect prevention and prediction (Yang and Jiang, 2022(09):65-74).

Compared with big cities, Zhuozhou municipal government sets lower flood control standards for reservoirs and rivers, which makes it difficult to make a correct judgment of floods in time and increase the harm caused by floods. The early warning transmission mechanism is not smooth, the early warning information of the grass-roots government is not timely, and the timeliness is poor, resulting in the lagging of information transmission. In addition, due to the failure of the communication system, some residents did not receive the flood discharge notice.

2.2 In disaster

Through the Zhuozhou Municipal People's Government website with the theme of "emergency plan", we can only find the information about the drill according to the relevant emergency plan, but we cannot find the specific content of the emergency plan, and it is difficult to judge whether the content of the emergency plan has the characteristics of The Times, the lack of operability and other problems, and whether it can effectively adapt to the new situation.

On July 28, after the main Party and government comrades in Zhuozhou City held an emergency dispatch meeting on flood control and disaster relief, the relevant responsible comrades did not rush to the scene. From July 29 to

August 1, the most serious period of the disaster, the municipal leadership as a whole sat in the emergency command center to direct the flood control work, not only could not timely grasp the severity of the disaster on the scene, the first time to make reasonable rescue arrangements; Even less able to calm the masses in time.

In the process of emergency rescue, Zhuozhou government assisted social forces to participate in rescue by issuing invitations to social rescue teams. However, in the process of implementation, the rescue force can not go to the disaster area as soon as possible to participate in the rescue, and some civil rescue teams need to contact the local emergency departments or rescue teams point-to-point before they can smoothly carry out rescue operations. In addition, the disaster relief situation was not disclosed, resulting in some civilian rescue teams still going to areas where the rescue force was already saturated, resulting in a waste of rescue force (Qin and Wu, 2024).

3. Chengdu 8.20 heavy rain has problems

3.1 pre-disaster

Around August 20, Chengdu Meteorological Bureau and Chengdu Municipal Bureau of Planning and Natural Resources issued weather forecast and geological disaster risk warning information respectively, reminding relevant departments and the general public to prepare for severe natural disasters and disaster emergency management. However, such information is holistic and not targeted, and its information covers a wide range. The judgment of geological disasters such as flood disaster and debris flow cannot be accurately grasped. At the same time, the affected areas are not sensitive to the relevant information of short-term imminent risk warning, and the flow restriction of personnel and evacuation work can not be effectively followed up.

3.2 In disaster

A more prominent problem is that when a disaster occurs, more disaster statisticians rely on common sense to estimate the disaster situation, and less accurate investigation of the disaster situation, resulting in the collection and reporting of disaster information is not accurate enough. On the other hand, the force of the rear command center is obviously insufficient, and the disaster situation is not reported in time, and in the process of verifying information, there are many cases of unclear, inaccurate, and non-nuclear.

In this flood emergency management, individual districts (cities) counties, towns (streets) copied the emergency management plans of other areas, the formulation of plans does not conform to the characteristics of local rain and

water conditions, the identification and assessment of the resulting risks lack accuracy, and the base number of relevant emergency resources is biased, which leads to the proposed emergency plans cannot be integrated with the sudden natural disasters in the jurisdiction. The nature and consequences of the flood disaster were not adequately predicted.

In the process of rescue and disaster relief, especially in the early stage, the rescue team often lacks the necessary emergency rescue tools, such as the number of kayaks and assault boats is insufficient, and such situations exist in various districts (cities) and counties in Chengdu to varying degrees. Towns (streets) and villages (communities) have prepared emergency plans for natural disasters, and have clarified the command and organization system and the division of responsibilities and tasks of each unit. However, after the flash flood disaster, the territorial towns (streets) did not set up front and rear headquarters in accordance with the plan in time, and the response and disposal were very arbitrary, resulting in the on-site rescue teams not being able to keep up with the guarantee, and there were problems of cases not being used and being detached from the plan. Please look at table 1.

<Table 1> problems in flood crisis management in Zhengzhou, Zhuozhou and Chengdu

city	problem		
	Pre-disaster - Planning	Pre-disaster - Warning	In disaster
Zhengzhou	1.The prediction of rainfall and displacement is not accurate 2.Urban flood control infrastructure is not up to standard 3.Lack of professional staff	1.Risk assessment is not accurate 2.The relevant authorities did not issue warnings in accordance with regulations 3.The public is not fully informed about flood risks	1.Insufficient participation of social organizations 2.The main body linkage of emergency management is poor 3.The early warning response of relevant departments lags behind 4.Relevant departments have not formed unified management
Zhuozhou	1.Urban flood control infrastructure is not up to standard	1.The early warning system is not perfect	1.The relevant departments did not respond in time

	<p>tandard</p> <p>2.The emergency plan is inadequate</p> <p>3.Local governments lack risk awareness</p>	<p>2.The warning was not issued in time</p> <p>3.The communication facilities are not perfect</p>	<p>2.The staff dispatch of relevant departments is inadequate</p> <p>3.Rescue information was not released in time</p> <p>4.The distribution of materials is not timely</p> <p>5..Inadequate communication equipment and support capacity</p>
Chengdu	<p>1.The emergency plan is not scientific</p> <p>2.Managers do not have a strong sense of crisis warning</p>	<p>1.Disaster information research and judgment is not accurate</p> <p>2.Fuzzy early warning information</p>	<p>1.The implementation of emergency plan is not scientific</p> <p>2.Emergency rescue tools are in short supply</p> <p>3.The relevant departments have insufficient risk awareness</p>

□. Conclusions

1. Improve the emergency planning system of local governments

The type of plan should be guided by comprehensive plan, supplemented by special plan and special plan (State Flood Control and Drought Relief Headquarters, 2015). Update the prepared plan in time, and increase the applicability of the plan based on risk analysis and zoning classification; Clarify the responsibilities and obligations of departments at all levels at different stages before, during, and after disasters in the plan to enhance the operability of the plan (Zhang, et. al., 2020, 30 (7) : 5-9,77).

The government should standardize the preparation, approval, issuance and revision of emergency plans according to the requirements of the general emergency plan, and strengthen the management of emergency plans. Second, while formulating and revising the emergency plan, each functional department should fully consider the characteristics of the object of the plan, and formulate the emergency plan suitable for the characteristics of the region according to the characteristics of the region, so as to ensure its thorough and feasible; Third, the power and

responsibility of each department and subject should be clearly defined in the emergency response plan. In order to ensure the authority of the government in emergencies, the general emergency plan should be submitted to the local people's Congress for review, and the sub-plans should also be submitted to the People's Congress for the record (She, 2011,29(05):184-188).

2. Improve the emergency management mechanism

At present, the early warning capacity of local governments is weak, and the monitoring means are backward. It is necessary to increase the intensity of risk monitoring, strengthen disaster monitoring, establish a sound early warning system, and build a risk information intelligent platform. Second, improve the information communication mechanism. First, improve the information reporting and sharing mechanism among relevant departments, and form a set of rapid response mechanism for reporting information and public opinion collection and analysis mechanism based on the emergency management platform. Second, improve the government information disclosure system (Liu and Li, 2023,30(03):104-114.)

Establish an advanced monitoring and early warning system. Monitoring and early warning refers to the identification, analysis and assessment of possible risks, timely disclosure of early warning information to the society, through real-time monitoring of floods, identification, analysis and assessment of possible risks, timely release of early warning information to the society, so that the public can take timely action and take emergency measures to minimize the possible losses caused by emergencies. To do a good job of comprehensive monitoring and early warning, we must do the following key work: First, the technical foundation is sound. It is necessary to rely on modern science and technology to effectively strengthen the monitoring, analysis, evaluation and evaluation of disasters, improve the accuracy of disaster prediction and early warning information, and provide a basis for disaster management and management agencies to respond to disaster emergencies. The second is to establish a disaster information disclosure system. After the occurrence of natural disasters, disaster information is communicated to the affected people and relevant emergency workers through various communication channels, so that the public can take corresponding measures to quickly avoid disaster risks.

From the perspective of the government's early warning and response measures in dealing with rainstorm and flood disasters, the government failed to take timely and effective early warning and response measures after receiving the early warning information. Therefore, in order to improve the pre-disaster prevention level of heavy rain and flood

disasters, it is necessary to solve the problem of delayed government early warning and response decision-making, which can promote the transformation of threshold early warning of natural disasters to risk early warning, formulate and popularize disaster risk maps, fill in the early warning and response measures in emergency plans, and establish and improve the linkage mechanism of early warning and emergency response.

In the face of natural disasters with increasingly complex disaster chains, governments should not only improve their own emergency management capabilities, but also focus on involving multiple actors in governance, and establish and improve multi-actor emergency coordination and linkage mechanisms involving ngos, market players and the public. Among them, ngos can give play to their characteristics of public welfare, self-organization and diversity, and provide help for government governance through emergency knowledge training, think tank services, emergency rescue and other aspects, which can not only relieve the pressure of government governance, but also promote the development of ngos and improve the social governance system. Market players can exert their efficient economic characteristics to provide more insurance products and rescue materials for emergency management(Zhang, et. al., 2023,54(7):1-13).

3. Strengthen awareness integration and emergency training

On the one hand, efforts should be made to enhance the sensitivity and professional skills of managers and executive personnel of government departments to emergency events (Zhou and Chen, 2020(02):4-7). Special training courses on emergency education for cadres can be set up in the University of Emergency Management to improve the sensitivity of government cadres to natural disasters and form standardized emergency management awareness. Improve the ability of local government cadres to cope with natural disasters (Qin and Wu, 2024(03):1-9). On the other hand, crisis education and training for the masses is an important task (Lu and Huang, 2014,34(07):178-185.) Government departments should strengthen the training of emergency knowledge to the public, and do a good job in emergency publicity and education, so as to enhance the public's crisis awareness, prevention awareness and self-rescue and mutual rescue ability. It is necessary to pay attention to the risk prevention of natural disasters, and pay attention to disaster prevention and safety education, promote disaster prevention and relief knowledge into teaching materials, schools, communities, vocational training, and improve the ability and awareness of the whole society of disaster prevention and reduction (Zhang, et. al., 2023,54(7):1-13).In addition, in the training of emergency education, it is also necessary to attach importance to disaster prevention drills, simulate the occurrence of disasters from time to

time, improve citizens' coping ability, and incorporate local governments' emergency education on natural disasters into the performance evaluation system to improve local governments' emphasis on natural disaster emergency management (Qin and Wu, 2024(03):1-9).

4. strengthen overall management of social rescue teams

4.1 Strengthen legal research on social rescue teams

The introduction of a law or regulation on social organizations' participation in emergency management can more effectively absorb emergency forces to participate in rescue and rescue.

4.2 Strengthening research on the management of social rescue teams

We can improve the management regulations on flood disaster emergency management, so that the participation of rescue teams in disaster prevention, rescue and post-disaster reconstruction has legitimacy. Establish a performance evaluation and appraisal mechanism for emergency personnel to motivate them to continue to learn and improve their skills. Through the setting of evaluation indicators and assessment standards, the performance of emergency personnel is comprehensively evaluated, including emergency response ability, emergency response ability, communication and coordination ability. On the basis of the evaluation results, corresponding rewards are given to encourage emergency personnel to continuously improve their quality and maintain professional status (QI, 2023,13 (10) : 187-189) 。

4.3 strengthen financial support for social assistance teams

Relevant departments can also consider giving necessary support to social rescue teams participating in disaster emergency management from the aspects of funds and policies. They can increase the funds of social rescue teams participating in disaster emergency rescue through the establishment of special support funds and preferential tax policies, and guide social rescue teams to purchase relevant rescue equipment. Funding pressure from various aspects such as subsidies for rescue workers (Kang and Chen, 2013,10(04):114-124+142-143).

5. Strengthen the capacity to reserve and deploy emergency resources

First, the reserve and distribution of emergency resources should be reasonably planned, and according to the characteristics and needs of rainstorm disasters, ensure that all regions and departments obtain adequate emergency

resources in time, including material reserves such as food, drinking water, medical equipment, rescue equipment, etc. Second, it is necessary to strengthen the construction of resource allocation mechanisms and establish cross-departmental and cross-regional resource allocation networks to ensure rapid allocation and utilization of resources. Third, the procurement and management of emergency materials should be strengthened to ensure sufficient reserves and reliable quality of materials. The fourth is to regularly inspect and maintain emergency materials to ensure that they are in good condition and ready to be put into use. (Wang and Wang, 2018,38(2):271-280; Li, 2014; Zhang, 2012(30): 135-136).

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