Article

Assessment of Regional Emergency Performance Capabilities in China Based on DIIS Method

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Abstract: The evaluation of emergency performance capability is an important link to analyze the effect of emergency management in different regions of the country and sum up the experience of emergency response. Starting from the four processes of "prevention-preparation-response-recovery", this paper uses DIIS theory and method to carry out data collection, information disclosure, comprehensive research and judgment and plan formation, etc., and systematically evaluates the emergency management work in 31 regions of China (excluding Hong Kong, Macao and Taiwan). Based on the analysis of the common problems in the emergency performance capabilities of provinces from 2016 to 2022, suggestions were put forward to strengthen the basic information of production safety and improve the intensity of training and exercises by using big data, so as to comprehensively improve the emergency management capabilities of all regions.

Keywords: Provinces and cities of China; Emergency performance capabilities; Emergency management

1. Introduction

Emergency performance capability refers to the basic quality shown by the government, organization or individual in the daily emergency response behavior. This capability is shown in the various stages of emergency preparedness, emergency response, emergency rescue and emergency recovery, and directly affects the efficiency of emergency management activities, and is a necessary condition for the smooth implementation of emergency work [1]. China's emergency management started late, and the level of emergency management in various provinces and autonomous regions is uneven. Once natural disasters or other emergencies occur, if they are not handled in a timely manner and in place, heavy losses will be caused. Based on this, it is of great practical significance to evaluate the emergency performance capabilities of all provinces and autonomous regions in China.

The evaluation of emergency performance capabilities is an important work in emergency management research. Scientific and objective evaluation method and the design of comprehensive and effective evaluation index system are related to the reliability of evaluation results. Scholars have produced abundant research results on emergency performance capabilities of different types and scenarios of emergencies such as natural disasters, accidents, public health events and social security events. Based on the whole process of emergency management, He Shanfeng et al. (2016) established an evaluation index system of urban disaster emergency response capability from four aspects, pre-disaster preparation, pre-disaster warning, disposal during disaster and post-disaster recovery. Then they applied analytic hierarchy process and expert investigation to build an evaluation model to evaluate the disaster emergency response capabilities of cities in Henan

Province [2]. Liu Yong et al. (2019) constructed an evaluation index system for emergency response capability of hazardous chemical storage fire emergencies from four dimensions, including accident emergency prevention and preparation, emergency monitoring and early warning, emergency response and rescue, and post-recovery capability. An evaluation model of emergency response capability of hazardous chemical storage fire emergencies based on improved AHP coupled TOPSIS was proposed [3]. Li Qian et al. (2023) made a systematic review of China's health emergency capability evaluation system from the aspects of evaluation subject and object, evaluation method, evaluation index and evaluation application, summarized the advantages and disadvantages of the construction of health emergency capability evaluation system, and provided references for enriching and improving the construction of health emergency system in the next step [4]. There are few studies on the evaluation system of social security incident emergency warning capabilities. Yuan Zhenlong (2012) summarized the emergency warning capability of social security incident as the ability of social security intelligence information collection, circulation, screening, sorting, analysis, judgment, early warning and guarantee, and proposed five aspects to strengthen the emergency warning capabilities of social security incident [5]. In addition, the emergency response capabilities of communities [6], highways [7], subways [8], coal mines [9], hospitals [10] and other scenarios were evaluated.

Based on the classic 4-process concept of "prevention-preparation-response-recovery" in emergency management, this paper uses the data-information-intelligence-solution (DIIS) theoretical method [11] to collect Data, reveal Information, conduct comprehensive research and judgment, and form plans. The Delphi method was used to construct an evaluation index system of the emergency performance capability of provinces, municipalities and autonomous regions from four aspects: emergency preparedness, emergency response, emergency rescue and emergency recovery, and systematically evaluated the emergency performance capabilities of 31 provinces, municipalities and autonomous regions in China (excluding Taiwan, Hong Kong and Macao). After observing the gradient distribution results of the emergency performance capabilities of provinces and municipalities from 2016 to 2022, the overall emergency performance capabilities of typical provinces and municipalities and autonomous regions in response to emergencies was analyzed at the vertical level, and the weaknesses of the emergency performance capabilities of provinces and autonomous regions were analyzed at the horizontal level. Finally, from the four dimensions of emergency preparedness, emergency response, emergency rescue and emergency recovery, suggestions were put forward to enhance regional emergency performance capabilities by using big data to strengthen basic safety production information and improve the intensity of training and exercises, so as to comprehensively improve the emergency management ability of all regions.

2. Data

This study collected natural disaster events and human-caused events that occurred in 31 provinces and municipalities in China except Hong Kong, Macao and Taiwan from January 1 to December 31 of each year from 2016 to 2022. Then the collected events was screened according to whether the regional level I or II emergency response plan was activated and caused significant economic or human losses. Five emergencies with them were selected from each province. At the same time, information on the above emergency response process, such as accident investigation report and accident notification, was collected through the websites of the provincial and municipal emergency management offices, and emergency case databases were prepared and compiled as the basis for subsequent expert scores.

3. Information

3.1 Establishment of evaluation index system of emergency performance capability

In this paper, Delphi method is used to construct the evaluation index system of emergency performance capability. The first step is to select experts. This study selects experts based on the principle of combining authority and representativeness, and selects experts with rich experience in the field of emergency management, who are all from universities and research institutes. According to previous studies, the number of experts consulted should be 10-30, and the accuracy of Delphi method will be improved with the increase of experts [12]. In view of the number of experts in the field of emergency management in China, this paper intends to select about 15 experts.

The second step is to construct the evaluation index system. On the basis of extensive reading of literature on the four stages of emergency management, namely prevention, preparation, response and recovery, and through brainstorming and group discussion, this paper preliminarily constructs four first-level indicators, including emergency preparedness, emergency response, emergency rescue and emergency recovery. The index system of emergency performance capability is based on 16 indexes including emergency plan, emergency personnel and emergency materials. According to these preliminary indicators, the expert consultation questionnaire is formed to carry out expert consultation.

The third step is expert consultation. Two rounds of expert consultation were conducted in this study. Expert questionnaires were sent to experts by email, and then feedback was summarized and analyzed. The first round of expert questionnaire was designed according to the preliminary evaluation index system; When conducting the second round of expert questionnaire consultation, the results of the first round of expert ratings are provided to the experts for their reference, and the second round of experts are invited to put forward suggestions for modifying the existing evaluation index system.

The fourth step is to determine the final index system. The evaluation index system initially formulated in this paper includes 4 primary indexes and 16 secondary indexes. After 2 rounds of expert consultation, 2 new secondary indicators, a total of 18 secondary indicators. The final evaluation index system is as follows: emergency preparedness, emergency response, emergency rescue and emergency recovery four first-level indicators; There are 18 secondary indicators including emergency plan, emergency personnel, emergency materials, monitoring and early warning, information release, command and coordination, action timeliness, resource allocation, on-site control, incident investigation, media response, on-site protection, public guidance, casualty treatment, personnel reassurance, impact mitigation, incident assessment, and management improvement (Table 1).

Table 1. Evaluation index of emergency performance capability of provinces and autonomous regions.

Primary index	Secondary index
Emergency Preparedness (A1)	Emergency Plan (B1)
	Emergency Personnel (B2)
	Emergency supplies (B3)
	Monitoring and Early Warning (B4)
Emergency Response (A2)	Information Release (B5)
	Command Coordination (B6)
	Limitation of Action (B7)
	Resource Allocation (B8)
	Field Control (B9)
	Incident Investigation (B10)
	Media Response (B11)
Emergency Rescue (A3)	Field Protection (B12)
	Public Guidance (B13)
	Casualty Care (B14)
	Personnel Comfort (B15)

	Impact Mitigation (B16)
Emergency Recovery (A4)	Incident Assessment (B17)
	Management Improvement (B18)

3.2 Description of regional features

By analyzing and studying the case database formed by the collective events and natural disasters of all people from 2016 to 2022, some basic characteristics of emergencies in various regions can be found, such as the frequent natural disasters and traffic accidents in Northwest China and the frequent work safety accidents in developed eastern provinces and regions, etc. Specific characteristics of regional emergencies are shown in Table 2.

Table 2. Characteristics of emergencies in provinces and autonomous regions.

Region	Trait
Anhui	Frequent natural disasters and accidents, of which the 2019 "Likima" typhoon has a deep impact on the province
Beijing	No major emergencies, accidental accidents and disasters
Chongqing	Frequent natural disasters and accidents, of which the nature of the "10.28" Chongqing bus falling into the river in 2018 is more severe
Fujian	Multiple accidents and disasters, of which the "11.4" carbon 9 leakage accident in Fujian Quangang in 2018 affected a large number of people
Gansu	Multiple accidents and disasters, of which the 2021 silver "5.22" 100-kilometer trail run was affected by extreme weather, causing major deaths
Guangdong	Frequent natural disasters and accident disasters, natural disasters are mainly floods and secondary geological disasters
Guangxi	Frequent natural disasters and accidents, including heavy rain in Lingyun County of Baise City in 2019, causing huge losses
Guizhou	Frequent accidents and natural disasters, including coal and gas outburst accidents frequently
Hainan	Frequent natural disasters, mostly affected by tropical winds and thunderstorms
Hebei	Multiple accidents and disasters, occasional social security incidents, of which the 2022 "6.10" Tangshan barbecue restaurant beating incident is bad in nature
Henan	Multiple accidents and disasters, occasional natural disasters, 2021 Zhengzhou "7.20" heavy rain disaster has a wide range of impact
Heilongjiang	Multiple accident disaster
Hubei	Frequent natural disasters and accidents, of which in 2021 Shiyan market "6.13" major gas explosion caused huge losses; The outbreak began in Wuhan
Hunan	Frequent natural disasters and accident disasters, of which in 2022 Changsha "4.29" especially major resident self-built house collapse accident casualties, causing huge losses
Jilin	Frequent natural disasters and accidents, and occasional social security incidents, of which the 2018 Changchun Changsheng vaccine incident affected a wide range and was extremely bad in nature
Jiangsu	Multiple accidents and disasters, of which the 2019 Xiangshui "3.21" particularly major explosion caused heavy casualties and direct economic losses
Jiangxi	Frequent natural disasters and accidents

Liaoning	Frequent natural disasters and accidents, including the sudden tornado disaster in Kaiyuan City in 2019, a large number of houses were damaged and crops were affected
Inner Mongolia	Frequent natural disasters and accident disasters, of which the natural disasters are mainly heavy snow, and the production safety accidents of enterprises are frequent
Ningxia	Multiple accidents and disasters, concentrated in enterprise production safety accidents
Qinghai	Frequent natural disasters and accidents, earthquakes, wildfires, heavy snowstorms have occurred
Shandong	Frequent accidents and natural disasters, explosions and poisonings
Shanxi	Frequent accidents, including chemical accidents in coal industry; 2020 Linfen Juxian Hotel collapse caused more casualties
Shaanxi	Multiple accidents and disasters, occasional natural disasters, including the 2021 flood in Dali County of Weinan City caused a huge area of farmland flooded and significant direct economic losses
Shanghai	In 2019, it was affected by Typhoon "Lekima"
Sichuan	Frequent natural disasters and accidents, earthquakes, fires, floods, mudslides and other natural disasters occur frequently, affecting a large number of people and a wide area, and causing significant direct economic losses
Tianjin	Multiple accident disaster
Tibet	Frequent natural disasters and accidents, frequent fires and earthquakes, the response effect is good
Xinjiang	Frequent natural disasters and accidents, heavy rains, fires and earthquakes
Yunnan	Frequent natural disasters and accidents, earthquakes and fires
Zhejiang	Frequent natural disasters and accidents, including Typhoon "Lekima" in 2019 and Typhoon "Hagupit" in 2020, caused significant direct economic losses, and the number of people affected and the area of crops affected were huge

4. Intelligence

4.1 Result Analysis

The ranking of emergency performance capabilities is based on a comprehensive consideration of natural disasters, human-caused disasters and other risk factors, based on expert scores and weighted calculations. In the process of constructing the index evaluation system, the dimensions of pre-risk warning and preparation, response and rescue in the event and recovery after the event are selected, and the evaluation system including multiple indicators is synthesized. FIG. 1 shows the schematic diagram of the emergency performance capabilities of provinces and autonomous regions from 2016 to 2022. The higher the performance capabilities score of each province and autonomous region in the process of emergency response, the darker the color in the diagram.
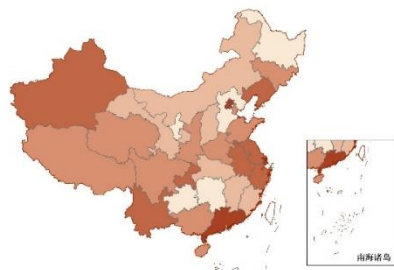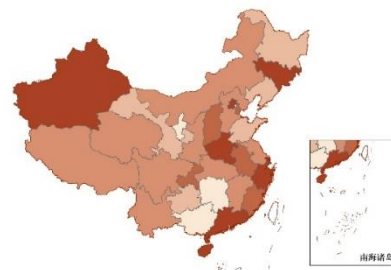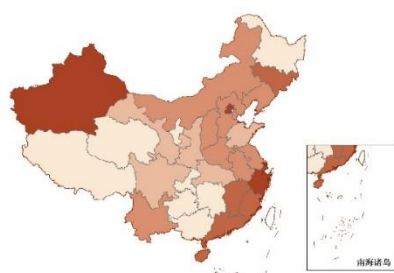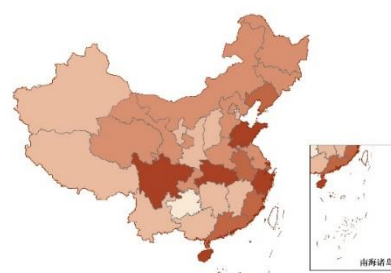
Figure 1（a） 2016

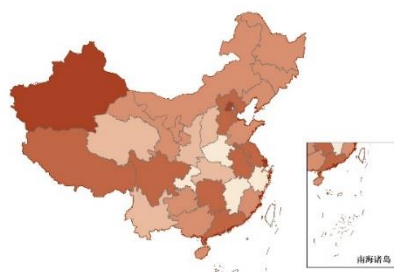Figure 1（b） 2017

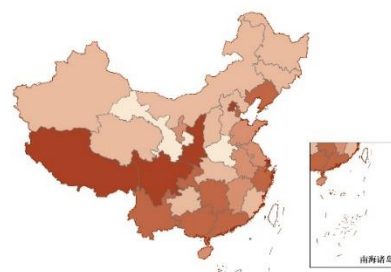Figure 1（c） 2018

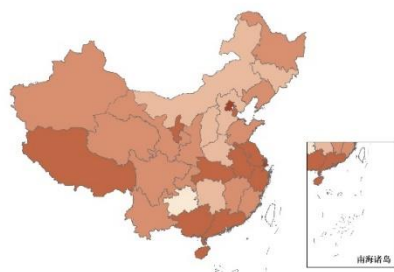Figure 1（d） 2019

Figure 1（e） 2020

Figure 1（f） 2021

Figure 1（g） 2022

Figure 1. Schematic diagram of emergency performance capabilities of provinces and autonomous regions from 2016 to 2022

4.2 Typical provinces and analysis:

4.2.1 High average over the years: Beijing, Shanghai

The emergency performance capabilities of Beijing and Shanghai from 2016 to 2022 is very high, indicating that these two regions have done sufficient work in advance risk warning, and paid special attention to risk monitoring and emergency handling in daily operation. For example, on August 3, 2018, the 12th typhoon "Lark" landed in the coastal area of Jinshan, Shanghai. Shanghai's emergency response bodies responded actively and dealt with it in a timely manner, without causing serious consequences. In 2019, affected by typhoon "Lejima", Shanghai issued a typhoon warning in time, and the emergency response lasted for 65 hours from the start to the end of flood control and typhoon prevention, during which more than 259,000 people were evacuated, more than 100,000 flood control officials at all levels of the city and 125,000 rescue and rescue forces were deployed. It ensures the safety of people's lives and property and the normal operation of the city. In January 2021, a wall collapse accident occurred on the north side of a residential building in Beijing, and the Beijing Municipal Government responded quickly and actively to rescue, and the fire rescue detachment successively sent several rescue forces to rescue the trapped workers and rescued all the buried personnel. In the face of natural disasters and major safety accidents, Shanghai and Beijing can manage orderly, timely response and rescue in place.

4.2.2 Relatively stable provinces: Heilongjiang, Hunan and Guizhou

The emergency performance capabilities of Heilongjiang, Hunan and Guizhou provinces was stable from 2016 to 2022. In recent years, the emergency performance capability of Heilongjiang Province was average, while that of Hunan and Guizhou Province was poor. Heilongjiang Province is greatly affected by production safety accidents and frequent explosion accidents, which is reflected in the fact that the local government and industry supervision departments do not detect illegal incidents in a timely manner, the law enforcement is weak, the safety publicity and education are not in-depth, the social security awareness is weak, and the emergency preparedness, emergency response and emergency rescue capabilities need to be further improved. For example, at 4:36 am on August 25, 2018, a fire broke out in Belong Warm Spring Leisure Hotel, No. 18 Plain Street, Sun Island Scenic Area, Songbei District. As early as in the process of three fire control inspections before the fire, the relevant departments proposed rectification suggestions to the hotel but were not taken seriously by the hotel, and the relevant departments did not enforce the update and maintenance of fire fighting equipment. The fire killed 19 people and injured 23 others. Hunan Province has a high incidence of natural disasters and accidents, lack of emergency preparedness and safety supervision, and lack of emergency risk identification and hidden dangers investigation and management.   The relevant departments have problems such as slow and simple centralized management deployment, mutual evasion of contradictions in daily supervision, inadequate investigation and rectification, ineffective investigation of violations, chaotic management of housing testing agencies, and out-of-control source of self-built housing planning and construction. In Guizhou Province, coal mine accidents account for the majority of accidents and disasters, resulting in heavy casualties and economic losses. The government's emergency preparedness capability is weak, and emergency response and rescue capabilities need to be improved. In addition, the response to natural disasters also reflects the weakness of emergency response and preparedness. For example, the "July 23" landslide disaster in Shuicheng County on July 23, 2019, caused 43 deaths, 1,600 people were affected, more than 2,300 houses were damaged to varying degrees, and the direct economic loss was 190 million yuan.

4.2.3 Provinces with a decline: Henan, Shanxi and Jilin

From 2016 to 2022, the emergency performance capabilities of Henan, Shanxi and Jilin provinces was average, and decreased year by year, indicating that these two regions were somewhat lax in emergency preparedness and response, and some emergencies had a greater impact on the social order of the provinces. For example, from July 17 to 23, 2021, Henan Province suffered a historically rare heavy rain, resulting in serious flooding disasters. Zhengzhou Municipal Government did not pay enough attention to this round of heavy rainfall process, the meteorological department issued the fifth red warning at 16:01 on the 20th, Zhengzhou City only started a level I emergency response at 16:30, but did not declare an emergency flood control period as required by the plan. At the time of rescue, the main person in charge of the municipal Party committee and the municipal government had poor communication and information due to the disaster. On consequence, no specific unified command was arranged, the overall disaster situation of the city was not understood, and major dangers such as subway Line 5, Beijing-Guangzhou Expressway tunnel, and mountain and hilly areas were not timely mastered. In 2020, the Juxian Hotel in Shanxi Province collapsed, the Xiangfen County government of Linfen City and relevant departments were not strict in administrative approval and regulatory law enforcement, and illegally extended expired licenses; In the long-term actions, the supervision and law enforcement personnel have not effectively stopped the hotel's long-term violations of the law. This shows that the government's supervision and inspection of relevant responsible entities are not in place, and emergency preparedness is seriously insufficient. At noon on September 28, 2022, a major fire accident occurred at Hongyu small oil cake people's restaurant in Changchun, Jilin Province. The restaurant carried out a "gas to oil" transformation in violation of regulations, did not work under the state of closure as required, and the construction operation was selected during the business peak and crowded period, and the welding personnel did not have welding and cutting operation qualification certificate, and took risks to work in violation of regulations. Some of the Windows were blocked by advertising plaques and security Windows, resulting in a tragedy that killed 17 people and injured three others. It can be seen that there are still deficiencies in public safety production education in Jilin Province, and related enterprises' emergency preparedness is insufficient. In the rescue process, there are some phenomena such as delayed rescue and untimely treatment.

*4.2.4 Provinces with an increase: Shandong, Guangxi and Ningxia*

Shandong Province, Guangxi Zhuang Autonomous Region and Ningxia Hui Autonomous Region showed an upward trend in emergency performance from 2016 to 2022. For example, a number of production safety responsibility accidents occurred in Shandong Province in 2019, especially in the "4.15" major fire poisoning accident, exposing the government's poor emergency performance, inadequate emergency plans, insufficient monitoring of special enterprise risk factors, and inadequate emergency measures. On September 25, 2022, the scaffolding collapsed during the reconstruction and construction of the preheater decomposition furnace of Shandong Pinani Rongan Cement Co., LTD., Juxian County, Rizhao City. After the accident, the relevant departments responded quickly, fully carried out emergency rescue and aftermath treatment, and disclosed the information related to the accident in a timely manner, and the investigation was carried out in an orderly manner. On the whole, the occurrence of accidents derived disasters is avoided, and the emergency rescue and aftermath work are handled properly. On May 20, 2019, a steel structure roof collapsed at 0776 bar, Dongzhou Avenue, Youjiang District, Baise City, Guangxi Zhuang Autonomous Region, killing 6 people, injuring 87 others and causing a direct economic loss of 17.3257 million yuan. Guangxi Zhuang Autonomous Region has frequent production safety accidents and insufficient emergency preparedness,

and in 2019, after supervision by The State Council, Guangxi was required to comprehensively rectify problems in the field of production safety. At around 7 am on September 10, 2022, Wujiashan Quarry in Liuzhou City was preparing to set up scaffolding for slope greening operations, and the scaffolding on the left side suddenly collapsed, resulting in 4 deaths and 2 injuries, with a direct economic loss of 4.91 million yuan. After the accident, the municipal government attached great importance to find out the cause, and the two injured were also quickly sent to the city's Longtan Hospital for treatment. The local government can respond quickly, carry out rescue and disposal in time, and the emergency recovery process is also more appropriate. The most frequent emergencies in Ningxia Hui Autonomous Region are concentrated in the field of production accidents. In 2019, the emergency preparedness of Ningxia Hui Autonomous Region was slightly insufficient, and the emergency response speed was slightly slow. In recent years, when dealing with emergencies, its emergency response and emergency recovery performance is good, but the emergency preparedness and emergency rescue capabilities need to be further improved.

4.3 Common problems of emergency performance of provinces, cities and autonomous regions

Figure 2 and Figure 3 respectively show the box diagram and the equal distribution of the four dimensions of emergency preparedness, emergency response, emergency rescue and emergency recovery of all provinces and autonomous regions from 2016 to 2022. It can be found that the emergency preparedness of all provinces and autonomous regions is relatively poor in the horizontal comparison of the four kinds of emergency performance capabilities. Emergency preparedness, such as emergency plans, emergency personnel, emergency materials, monitoring and early warning, is the basis and guarantee for all provinces and autonomous regions to better deal with all kinds of emergencies. Typical cases of different types of emergencies, such as natural disasters, accidents, public health events and social security events, were selected to analyze the weaknesses of various provinces and autonomous regions in emergency preparedness.
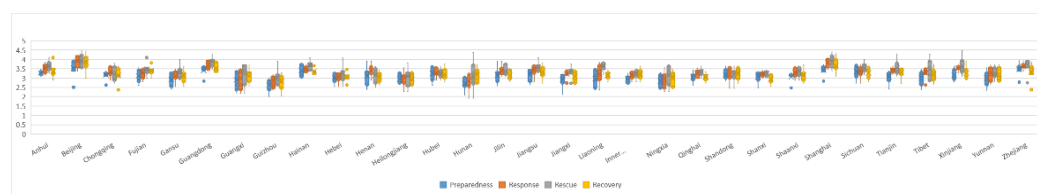
Figure 2. Emergency preparedness, emergency response, emergency rescue, and emergency recovery box for each province from 2016 to 2022
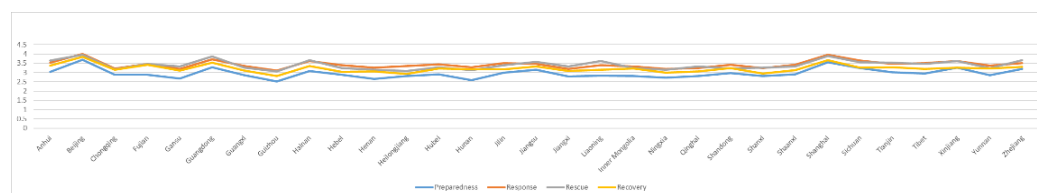
Figure 3. Average map of emergency preparedness, emergency response, emergency rescue, and emergency recovery of provinces and autonomous regions from 2016 to 2022

Natural disasters can cause great casualties, economic losses and social impacts. At around 18:00 on March 30, 2019, a forest fire broke out in Lier Village, Yalong River Town, Muli County, Liangshan Prefecture, Sichuan Province. The ignition point was about 3,800 meters above sea level. The terrain was complicated, the slope was steep and the valley was deep, and the transportation and communication were inconvenient. As of 15:15 on April 4, the forest fire has confirmed the death of 31 people. In addition to the devastating

nature of the natural disaster, it has exposed the shortcomings of Sichuan Province in emergency preparedness, including disaster early warning, hidden danger detection and timely and effective response to early warning information.

The proportion of accident disaster is the highest among all emergencies. At 12 o 'clock on March 17, 2021, a minibus carrying 6 workers on the Siming village section of Fucheng Town, Wuming District, Nanning City, slipped and fell from the side of the construction bridge on the way back to their residence, resulting in 1 death and 6 injuries to different degrees. Employees have the necessary knowledge of production safety, Xinruida company also did not carry out production safety education and training for employees, did not organize the development and implementation of hidden danger investigation and management system and other safety rules and regulations and operating procedures, did not organize the development and implementation of the unit's production safety accident emergency rescue plan.

In terms of public health emergencies, take the COVID-19 outbreak as an example. The novel coronavirus was first detected in Wuhan at the end of 2019, and since late January 2020, many hospitals in Wuhan and even in Hubei Province have been in short supply of medical protective materials such as masks and protective suits. The epidemic is spreading throughout the country, and the phenomenon of urgent medical supplies is also spreading throughout the country. Take masks as an example, as the world's largest producer and exporter of masks, China's annual output accounts for about 50% of the world's, but the reason for the emergency reserve after the outbreak is far from the actual demand.

In terms of social security events, take Silver Jingtai "5·22" Yellow River Shilin 100-kilometer cross-country race as an example. On May 22, 2021, the 100-kilometer cross-country race and competition of the Yellow River Shilin Mountain Marathon encountered sudden high impact weather of cooling, precipitation and wind, resulting in the death of 21 participants and 8 injuries. This is due to the event organization and management is not standardized, unprofessional operation and execution, leading to heavy casualties of public safety responsibility incidents. The main reason is that the organizers of the event lack the corresponding emergency plan and the awareness of risk prevention is not strong. After receiving the special report of meteorological information and the blue warning of strong wind before the race, they did not take effective countermeasures; The special emergency plan and security measures for the event were not developed in accordance with the prescribed standards, and the emergency rescue force was seriously inadequate. This incident has exposed the widespread problems of no emergency plan, imperfect plan, no drill or even post-revision forgery plan at all levels and industries, which not only affects risk prevention but also restricts rescue disposal.

5. Solution

According to the score results of regional emergency performance capabilities from 2016 to 2022, this paper puts forward the following suggestions from four aspects: emergency preparedness, emergency response, emergency rescue and emergency recovery.

5.1 Emergency Preparedness

First of all, for industries and enterprises with hidden security risks, big data technology should be used to strengthen the basic information work of safety production, establish a basic data collection system, establish a database of big data risk sources of safety production in some high-risk industries, and make corresponding emergency preparations. Secondly, in view of the major safety production risk sources in China, professional rescue teams and equipment should be rationally distributed to establish a multi-level, whole-of-society emergency rescue system. On the one hand, improve the emergency

management expert base, and formulate management methods. On the other hand, comprehensively improve the skills and quality of rescue workers, especially rescue workers in the hazardous chemical industry to ensure that they are certified to work. More importantly, the fire brigade should have a professional division of labor and actively promote the professionalism of fire personnel. Finally, popularization education and training should be strengthened. It is very necessary to train the people's awareness and ability to deal with disasters and achieve orderly rescue of self-rescue, mutual rescue and public rescue. Gradually strengthen the national emergency knowledge training and emergency drills, so that emergency drills from "acting" to "exercise".

5.2 Emergency Response

First of all, the intensity of training and exercises should be increased. In emergency rescue, personnel at all levels must be clear about their responsibilities. The emergency response capability of a professional team depends on the quality of training and exercises. The experience and professional skills accumulated in peacetime are fully reflected in the event of emergencies. In the event of emergencies such as accidents and disasters, the coordination and cooperation between the emergency command team and relevant linkage departments can effectively support emergency res-cue operations to a certain extent, thus reducing the scope of the impact of accidents. Secondly, the standardization of emergency response procedures directly affects whether rescue bodies can quickly take corresponding emergency actions in the event of an emergency, so as to achieve the rescue effect of calm, effective decision-making and efficient. The accuracy and effectiveness of emergency response decision-making can effectively reduce casualties and facility damage. Only when the speed and standardization of emergency response are effectively strengthened, can the overall emergency response capability be improved.

5.3 Emergency Rescue

First of all, the emergency planning system should be further improved with the technical dividend of big data and a large number of intelligent equipment such as drones and robots should be used in rescue. For example, the government can develop a set of three-dimensional intelligent fire emergency plan based on three-dimensional GIS modeling technology, drone technology, fire dynamics model, and emergency res-cue theory in response to the major demand for fire information and intelligence. This system can realize the digitization and deductibility of pre-disaster plan, build a simulated disaster site system, integrate fire fighting theory, control human and vehicle models to arrange troops and realize intelligent deployment. Secondly, the government builds a socialized mechanism for emergency plans. With the local government as the lead, the existing emergency rescue resources are utilized, and relevant elements such as manpower, equipment, information and intelligence are integrated for scientific preparation to achieve the purpose of making plans. The government-led joint meeting studied and discussed and formulated various disaster emergency rescue plans, sub-mitted to industry experts for review, and incorporated into the government emergency platform management application. Relevant government departments should coordinate with each other to complete the comprehensive coverage of disaster and accident rescue plans in the region, realize the sharing of information resources in the region, and improve the efficiency of government emergency rescue. Finally, the government should establish a linkage response mechanism to achieve modular scheduling. When a disaster occurs, fire departments and other relevant departments should start corresponding emergency plans, abandon the previous way of simply increasing the number of vehicles and personnel, establish functional combat modules, dispatch the first emergency response force of the joint department, such as the fire extinguishing module in densely populated places, the fire extinguishing module in high-

rise buildings, and the disposal module of dangerous chemicals, and implement targeted rescue force mobilization. Improve the effectiveness of coordinated combat.

5.4 Emergency Recovery

First of all, it is essential that the mechanism of third-party participation in accident investigation be gradually introduced. Organizing the participation of people from all walks of life, including deputies to the People's Congress, members of the Chinese People's Political Consultative Conference, relevant experts, scholars, lawyers, and other social figures, can improve the independence and impartiality of the investigation, as well as the scientific and authoritative conclusions of the investigation, ease the pressure on the accountability mechanism of the media and society, and in-crease the enthusiasm of the accident units and grass-roots units to report the accident information truthfully. Secondly, it is very significant to strengthen accident investigation to improve the work and improve the system. In addition to the Emergency Response Law and the Regulations on the Investigation of Civil Aircraft Accidents and Flight Accident Symptoms, which emphasize the purpose of summarizing experience and lessons and improving work, the rest of the relevant regulations on incident investigation and accountability are combined, emphasizing the investigation of responsibility for incident investigation, and even directly taking the investigation of responsibility as the purpose of investigation. It is suggested to restore the truth orientation of investigation and strengthen the function of learning from disaster. Finally, it is necessary to strictly follow the principle of "openness is the principle, confidentiality is the exception", further promote the timely disclosure of the investigation process, investigation evidence and investigation conclusions, eliminate public doubts, and improve public recognition of the investigation work and investigation results.

6. Conclusions

This paper adopts the concept of think tank DIIS theory and Delphi method to construct an evaluation index system of China's regional emergency performance capability from four aspects: emergency preparedness, emergency response, emergency rescue and emergency recovery, analyzes and evaluates the emergency performance capabilities of 31 provinces and municipalities from 2016 to 2022, and draws the following conclusions:

(1) In recent years, the emergency response performance of Beijing and Shanghai has been excellent; the emergency response performance of Heilongjiang, Hunan and Guizhou has been relatively stable; the emergency response performance of Henan, Shanxi and Jilin has declined; and the emergency response performance of Shandong, Guangxi and Ningxia has increased.

(2) Put forward suggestions from the four aspects of emergency preparedness, emergency response, emergency rescue and emergency recovery, such as using big data to strengthen the basic information of production safety, improve the intensity of training and exercises, build a digital emergency plan system relying on big data, and gradually introduce a mechanism for third-party participation in accident investigation, so as to provide improvement directions for regions with poor emergency performance in China. Improve the level and capability of handling emergencies.

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