

# Covid-19 Epidemic and Urban Crisis Management

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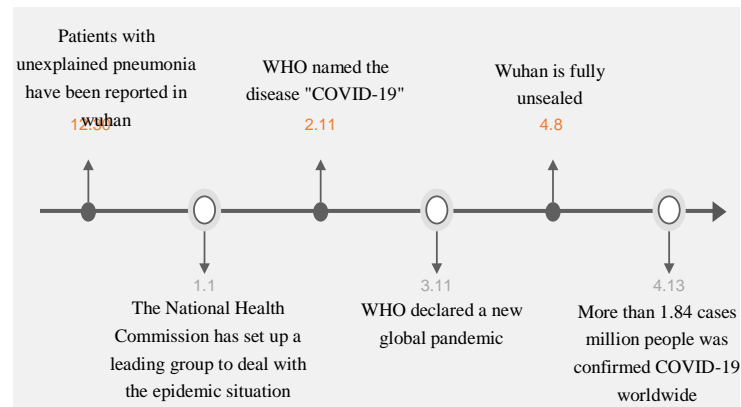
**ABSTRACT.** *COVID-19 is rampaging around the world. City crisis management measures such as city closure and home confinement have been widely implemented in various countries. However, in order to prevent and solve such major public health problems and reduce risks, it is necessary to think about urban risk management and improve the urban risk management mechanism. Based on the AHP-FCE method, this paper proposes three stages of “before, during and after” to improve the urban crisis management system, and establishes the basic model of urban crisis management, carries out risk weight assessment, and accumulates for urban risk management Experience.*

**KEYWORDS:** *Covid-19, Ahp-fce, Crisis management*

## 1. Introduction

The central committee of the Communist Party of China (CPC) and the State Council have launched a national emergent response after a group of unexplained pneumonia cases were found in Wuhan. The Central leading group for epidemic prevention has been founded and a joint prevention and control mechanism of the State Council has been established. General secretary Xi Jinping personally guided the deployment and prevention and control of COVID-19, and made it a top priority for governments at all levels to prevent and control the epidemic. Premier Li Keqiang led the central leading group for epidemic prevention to Wuhan to inspect and coordinate the prevention and control work of relevant departments and provinces (autonomous regions and municipalities directly under the central government). Vice premier Sun Chunlan, who has been working on the frontline in Wuhan, led and coordinated the frontline prevention and control of the epidemic. After more than two months of fighting against the epidemic, the number of confirmed COVID-19 cases in China has been less than 300. As of April 13, 2020, more than 1.8 million people has been infected by COVID-19 worldwide, posing a major threat to global public health. The COVID-19 epidemic reminds us that we are in a typical risk society. In 1996, Peter I. Bernstein said in *Against the Gods: the Remarkable Story of Risk* that the mark to distinguish modern times from the past is not science, technology, or democracy, but man's mastery of risk. Indeed, China is promoting the modernization of national governance, and risk management should

be an integral part of the modernization of national governance. This major epidemic situation has greatly challenged the urban crisis risk management in China, and it is urgent to establish a quick response, multi-functional and efficient urban crisis emergency management system.



*Fig.1 Timeline of Covid-19 Epidemic*

## 2. Urban Crisis Management System

The key to solve the problem of urban risk management is to improve the social risk management mechanism. As the main body of social risk management, the government should constantly strengthen and update the risk management concept, start from improving the risk management mechanism of the city, pay attention to the theoretical construction of risk management, consciously fulfill the responsibility and obligation of risk control, do a good job in public opinion guidance of risk, and actively deal with the real and potential risks. In the three stages of “before -- during -- after”, the urban crisis management system is constantly improved so as to face the future positively and confidently.

### 2.1 Before the Event

#### 2.1.1 Establish an Advanced Social Risk Prevention Mechanism

Under the background of modern risk society, the way of emergency management “fire fighting” have been out of date. We need to update the risk management mechanism, to reflect on the existing disadvantages of the traditional risk management, awareness of social risks, assessment and prevention of normalized management, changing from “fire fighting” to cope with the risks of sudden events to active prevention assessment of risk. We also need to keep

improving the prevention system of risk management based on national conditions and real needs, in response to the potential risk of complex society.

### ***2.1.2 Improve the Scientific Social Risk Treatment Mechanism***

General secretary Xi Jinping has pointed out that we need to improve the mechanism for preventing and defusing risks, guard against and defuse major security risks at the source, and truly solve problems before they start to bite. The first is to clarify the responsibility for implementation. When the occurrence of risks is inevitable, the responsibility of each department should be clearly defined, not only to be able to divide the overall responsibility statically, but also to dynamically determine the ownership of decentralized responsibility, to distinguish the upstream and downstream relationship of responsibility and the evolution process, to ensure that all relevant units in charge of affairs to strictly control the risk and fulfill the responsibility for risk prevention and control. The second is the professional third-party supervision and implementation. In terms of risk management, the third-party supervision force should be introduced, and the supervision and implementation should not be carried out only by the government departments. In order to ensure that government departments to strictly implement the responsibility in the prevent and control risk and execute decisions well, the measure of combining a hired professional third-party institution, social media and government internal supervision should be taken with more professional and more objective perspective to prompt the government department dealing with risk correctly neutrally through supervising the whole process of risk management and evaluation.

## ***2.2 During the Event***

The outbreak and global public health emergencies caused by Corona Virus Disease (COVID-19) are not only related to the safety of human life and health, but also have a significant impact on the economy and social life of China and the world. The prevention and control of the epidemic is a major test of China's emergency management mechanism. During the prevention and control period of the epidemic, the party, the government, social organizations at all levels, enterprises and the masses have acted quickly to combat COVID-19. At present, it is imperative to further improve the emergency response system and working mechanism that integrates prevention and emergency preparedness, early warning and system monitoring, and rescue and emergency response. We call it a government-led collaborative governance mechanism.

### ***2.2.1 Highlight the Central Role of the Government in the Emergency Management and Give Play to the Leading Role of the Government in the Emergency Management, Resource Allocation and Behavior Guidance***

General crisis management emphasizes the coordination mechanism of government, social organizations and citizens' interests. However, due to the sudden, extensive and catastrophic nature of the outbreak, the dominant, unified and

authoritative governance of the government must be highlighted, that is, the core of the collaborative governance mechanism of the outbreak is to establish a government-led emergency governance system. The government should actively intervene in emergencies, including the organization of surprise scientific research, the coordinated deployment of medical resources, the guidance of education, the enhancement of information disclosure and the comprehensive supervision of the prevention and treatment process. After the outbreak of the epidemic, many businesses and the people have a strong willingness to participate in the fight against the disease, which requires the government to take reasonable standard positive measures to guide the country and improve the normative and scientific nature of publicity. Through the government guidance, turn the different levels of social organizations and individuals from spontaneous to orderly and turn its behavior into power, forming a scene that all people participate in combating an “epidemic”; At the same time, the few acts that disturb the market, spread disease maliciously and spread false information will be punished more severely. In addition, it is necessary to improve the information disclosure mechanism of public welfare organizations at all levels, especially charity organizations, so as to enhance their credibility, fully mobilize their enthusiasm to participate in the fight against the epidemic, and link social resources with the epidemic area.

Historical experience tells us that in the special crisis period, any deregulation and low quality public services by the government may result in more cost of lives , higher fiscal expenditure and more waste of public resources. In the process of epidemic prevention and control, it can fully mobilize the enthusiasm of the people under the leadership of the government and make efforts to form a situation of social multi-subject collaborative governance, which is the basic support for improving the scientificity and effectiveness of epidemic prevention and control.

### ***2.2.2 Improve the Synergic Policy Effect and Instruction Transmission Efficiency of Government Agencies at All Levels in Guiding, Supervising and Coordinating the Behaviors of Various Enterprises, Social Organizations and the Public***

When faced with the complexity and uncertainty of public affairs and the unclear responsibilities among different subjects, the administrative coordination and supervision of the government become extremely important. In this outbreak incidents, crisis management unusual management measures should be taken. The governments at all levels should take advantage of administrative means and legal means to establish a unified and efficient platform for the emergency information, build a capable and practical professional emergency rescue team, improve the public participation and their self-help ability, implement the whole linkage of event early warning, social mobilization, rapid respond and emergency disposal. It can be said that epidemic prevention and control is a comprehensive, systematic and complex process, which requires the collaborative governance of the government, social organizations and individuals to bring into play the synergistic effect of multiple actors. The government should emphasize improving the efficiency of the transmission of specific instructions in different fields during the special period, so as to better play the role of the government in the special period, provide necessary

public services for the economy and society, accelerate the transformation of the public service-oriented government, and create a fair and just business environment for enterprises. Under the circumstance of the failure of some medical supplies and some commodity market allocation mechanism in the current abnormal period of major epidemic, it is necessary to overcome the epidemic as soon as possible under the constraint of limited resources, which requires the rapid and effective transmission and implementation of administrative orders under the coordination and governance mechanism led by the government. Firstly, based on the characteristics of the epidemic, the vertical hierarchy should be reduced. It is necessary to build an abnormal rapid transmission system of information and data from the center to the local and then to the grass-roots level among government agencies at all levels, and strive for the transmission of information and data directly to the grid community. At the same time, to ensure the timely and accurate transmission of epidemic information and assist governments at all levels and medical units to make decisions quickly and scientifically is significant. Secondly, the collaborative governance mechanism during the epidemic period is multi-subject cross-regional cooperation. Various departments need to introduce a combination of policies in line with the real-time situation to promote the barrier-free and rapid concentration, deployment and use of important material resources across departments and regions and stimulate the enterprise to produce materials related to epidemic prevention and control and the basic living, so as to obtain the sustainable resources to fight the epidemic.

***2.2.3 Make Efforts from the Aspects of Legislation, Law Enforcement, Judiciary and Law-abiding to Comprehensively Improve the Effectiveness of Law-based Prevention and Control and Law-based Governance, so as to Provide a Strong Legal Guarantee for Epidemic Prevention and Control***

The priority task of the current epidemic prevention and control is to reduce the crisis and protect lives. As far as the current situation of epidemic impact is concerned, it is impossible to talk about risk aversion at this stage. It is imperative to comprehensively prevent epidemic, protect the safety and health of the people, and take measures to effectively reduce the crisis to the greatest extent. Since the outbreak of the epidemic, the CPC central committee has attached great importance to it, and general secretary Xi Jinping has personally deployed and directed it. He has stressed that the prevention and control of the epidemic is the most important work at present. The key to the prevention and control of the current epidemic is to take all measures to protect the lives and health of the people, make efforts in legislation, law enforcement, judiciary and law-abiding, to comprehensively improve the effectiveness of the prevention and control of the epidemic in accordance with the law, and provide a strong rule of law guarantee for the prevention and control of the epidemic. By taking concrete actions to protect the safety of the people's lives and their health, the government fully embodies the deep and profound feelings of the people. Our government should be a government that put people first, serve society and be efficient.

***2.2.4 Handle the Relationship between Epidemic Prevention and Control,***

***Recovery of Production and Guarantee of Life, and Ensure Sustainable Economic and Social Development. Social governance system is a complex open system***

Epidemic prevention and control is a whole system, which is composed of multiple subsystems, and each subsystem is nested with multiple secondary elements, presenting its internal nonlinear characteristics. Currently, a lot of information about COVID-19 prevention and control are still not grasped by the scientific community and the medical profession. Although there has been a marked slowdown in the development of the epidemic, and the epidemic prevention and control has been made effective achievements, it is still necessary to make preparations for a long time to fight against the epidemic. In the unknown period, it is necessary to ensure that medical resources (medical staff and protective materials) are sufficient at all times, and that the people, especially the people in hubei province, have sufficient ammunition for basic living and production materials. This requires comprehensive coordination among governments, further increasing financial support, introducing preferential tax policies, coming into play the function of “blood transfusion” of various types of banks, reducing tax, burden, rent, pressure for the majority of enterprises, especially small and medium-sized enterprises. We will increase the stock of basic living materials put on the market and reduce people's living costs.

***2.2.1 Improve the Global Coordination Mechanism of Risk Management***

In the stage of risk society, the characteristics of cross-border of risk require more governance bodies to appear and form a cooperative relationship. Risks are always universal, and with the continuous development of globalization, the characteristics of all kinds of risks facing the whole mankind will become more and more obvious. The government needs to effectively strengthen the international cooperation among all parties and at all levels through the existing international cooperation platform, so as to publicize, collect, analyze and warn all kinds of potential risks. Many members of the international community offered sincere help and support to China during the China's most difficult time in fighting the COVID-19 epidemic. China has always remembered and cherished this friendship. In the face of the global spread of the epidemic, China has taken the initiative to cooperate with the international community, sharing its experience in fighting the epidemic with the World Health Organization and the international community without any reservation, rapidly providing material assistance to many countries and regions and sending teams of medical experts to many countries. In this global effort to combat the epidemic, China has not only given the world precious time for epidemic prevention and timely material assistance, but also the spirit of solidarity and cooperation in fighting the epidemic and overcoming difficulties.

***2.2.2 Take Zhuhai, Guangdong Province as an Example to Explain the Crisis Management of “during the Event” City***

- 1) COVID-19 Emergency in Zhuhai

The first three cases in Zhuhai were closely related to the mass migration of the population during the Spring Festival. The three cases came from one family: father (79 years old), mother (76 years old) and daughter (49 years old). The parents took the high-speed train from Wuhan to Zhuhai for a family reunion on January 11, 2020. The center for disease control and prevention (CDC) in Zhuhai investigated the three cases and their liquid samples and sent them to the National Health Commission. Combining epidemic investigation, clinical symptoms and laboratory tests, the three cases of COVID-19 were clearly diagnosed by the experts of National Health Commission. After 13 days of treatment, the daughter left hospital on January 30, 2020. The mother was classified as critically ill COVID-19 patient and left hospital on February 5, 2020. She was the first critically ill COVID-19 patient to be cured in Zhuhai.

### 2) COVID-19 Crisis Management Measures in Zhuhai

Infectious diseases pose a challenge to public health managers because they have threatened human security and economic development. Given the limited time available to respond, a decision had to be taken immediately to begin comprehensive emergency management. The Zhuhai government cancelled all religious activities. As a hot tourist attraction, Zhuhai closed all scenic spots, including beaches and community parks. Public transport was reduced by half on January 26, 2020, and by less than 5% on February 7, 2020. Once the close contacts are detected, they are quarantined for medical monitoring or treatment. On January 26, 2020, 10 clearly diagnosed patients in Zhuhai were forced to be hospitalized, Zhuhai residents were required to wear masks in any public place, and violators were punished by the police for violating the law of the People's Republic of China on epidemic prevention. The term has been postponed and all the students have been having online classes at home. All the residential areas are under closed management, requiring all residents returning to Zhuhai to be quarantined at home for 14 days. The Zhuhai government has developed a series of measures and policies to support many small and medium-sized enterprises during this long period of business termination, including labor subsidies, research input, loan discounts and tax breaks. The Zhuhai center for disease control and prevention has set up 10 emergency sites for epidemiological investigation, case reporting, specimen collection, epidemic site disinfection, close contacts management, emergency monitoring, health education, risk assessment and technical guidance. The fever clinic in Zhuhai was open 24 hours a day. Medical staff were sent to bus stations, docks, railway stations and airports to check for suspicious cases.

### 3) COVID-19 Crisis Management Experience in Zhuhai

In consideration of the high infectivity of COVID-19, policymakers must be highly alert to this emergency. Decisions should be made on the basis of resource integration, social mobilization and financial input for drug supply, vaccine development and international cooperation. Science and technology should also be fully utilized to mitigate complex emergencies of infectious diseases, which is a process that requires constant learning.

### ***2.3 After the Event -- Establish the Performance Evaluation System of Urban Crisis Management Based on Ahp-Fce Method***

#### ***2.3.1 Overview***

As the last link of the new epidemic emergency management organization system, performance evaluation is an important guarantee for the encouragement and restraint of the government emergency management organization. The performance evaluation of urban crisis management refers to the effect evaluation on the occupation, use, management and allocation of various resources of government organizations for emergency management. Based on the evaluation results, problems are found in time, which helps the government to improve the operation management and improve the operation efficiency. Therefore, the establishment of a reasonable emergency management performance evaluation system is an important part of improving the urban emergency management organization system.

#### ***2.3.2 Introduction to Ahp -- Multi-Level Fuzzy Comprehensive Evaluation Method***

Fuzzy comprehensive evaluation (FCE) is a method to transform qualitative evaluation into quantitative evaluation according to fuzzy mathematical membership theory. It has the characteristics of clear results and strong systematicness, and it can solve fuzzy and difficult quantified problems well, suitable for solving various non-deterministic problems.

One of the preconditions of FCE calculation is to determine the weight of each evaluation index, that is, the weight vector, which is generally directly specified by the decision maker. However, for complex problems, such as many evaluation indicators and they have influence on each other, it is difficult to directly give the weight of each evaluation index, which is what AHP is good at.

In AHP, the complex problem is divided into several sub-problems through the decomposition of the problem and the decision data is given in the form of pairwise comparison and the ranking weight of the alternative is finally given. If the evaluation index is taken as an alternative to AHP, AHP can be used to model the problem hierarchically and calculate according to the decision data of the experts of this model and then the ranking weight of the alternative, that is, the ranking weight of each evaluation index, can be obtained. This solves the problem of determining the weight of complex evaluation index in FCE.

#### ***2.3.3 Modeling (Using the Software Yaahp )***

The following is the establishment of the performance evaluation system model of urban crisis management based on AHP-FCE and yaahp:

##### **1) Build Hierarchy Model**

Firstly, the performance evaluation of urban crisis management is analyzed and the hierarchical model of this problem is built, as shown in the following figure: (P.S.: The program layer elements are the evaluation indexes of the fuzzy



comprehensive evaluation)

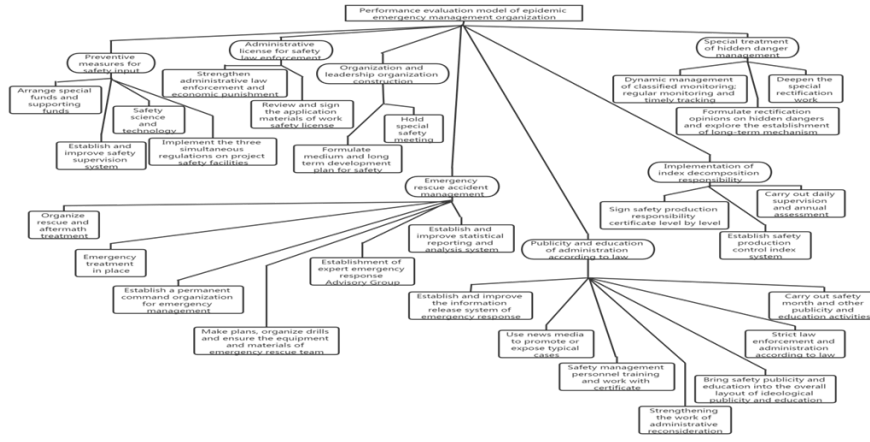


Fig.2 Analytic hierarchy process model

2) Collect Experts' Data to Calculate the Sort Weight

The AHP questionnaires are generated and distributed to the experts. After the experts complete the questionnaire, the questionnaires are collected and imported into yaahp. After calculation, the ranking weight of each evaluation index was as follows:

Table 1 Ranking of evaluation index weight

Alternative	weight
Establish a safety regulator led by the main responsibility of law enforcement	0.243
Arrange special funds and supporting funds	0.0978
Establish and improve the safety supervision system	0.0978
Convene security conferences	0.0719
Formulate plans, organize drills, and ensure the equipment and materials of emergency rescue teams	0.0558
Implement emergencies fully	0.0558
Carry out daily supervision and annual assessment	0.0476
Formulate rectification opinions on potential dangers and explore the establishment of a long-term mechanism	0.0451
Formulate medium - and long-term development plans for safety	0.0421
Implement the safety facilities of the project at the same	0.0245

time	
Security science and technology research	0.0245
Establish safety production control index system	0.0196
To examine the application materials for work safety license	0.0163
Increase administrative law enforcement and economic penalties	0.0163
Classify monitoring dynamic management; Monitor and track on a regular basis	0.015
Deepen special rectification work and effectively organize and implement	0.015
Establish and improve the statistical reporting and analysis system	0.0139
Establish a permanent command organization for emergency management	0.0139
Organize rescue and post-treatment	0.0139
Establish an expert emergency response advisory group	0.0139
Include safety publicity and education in the overall layout of ideological publicity and education	0.0102
Use the news media to promote or expose typical cases	0.0102
Establish and improve the information release system for emergency handling	0.0102
Safety management personnel training and work with the certificate	0.0089
Sign the certificate of responsibility for production safety step by step	0.008
Carry out activities of safety month and other publicity and education	0.0035
Strictly enforce law and administer according to law	0.0026
Strengthen the work of administrative review	0.0026

3) Generate Evaluation Questionnaires

After obtaining the ranking weight of city crisis management performance evaluation, the evaluation table is generated in yaahp.

*Fig.3 Generate evaluation questionnaire*

#### 4) Fill in and Import the Evaluation Questionnaires

The generated evaluation form is distributed to each evaluator, who opens the file with Excel to fill the evaluation data of the tested object into the evaluation form. After the evaluation forms are recovered, all the evaluation questionnaires are imported using the “import” function of fuzzy comprehensive evaluation.

#### 5) Fuzzy Comprehensive Evaluation Results

After importing data, FCE window will be opened to obtain the comprehensive evaluation score of each object under test.

#### 6) Modify the Evaluation Hierarchy Domain

In the calculation of fuzzy comprehensive evaluation, the last step is to eliminate fuzziness, so as to obtain the final evaluation score. In yaahp, it can be set in the table on the top right of FCE calculation results.

#### 7) Evaluation Level Domain Setting

After the modification of the evaluation level (excellent, good, medium, poor), the comprehensive evaluation results and detailed scores will be updated in real time.

### 2.3.4 Summary

The timely detection of problems according to the assessment results will help

the government to improve the operation management and improve the operation efficiency. Performance evaluation of urban crisis management is the last link of emergency management, which is to improve the emergency management system of public emergencies, improve the organization's emergency response ability and resilience to public emergencies, and prevent similar public emergencies from happening again. It is the important standard to judge the government public emergency management decision-making, planning, organizing, management level and evaluate work performance of the relevant government departments. It is not only an assessment of the government's existing emergency management awareness, ability and performance, but also an important condition for formulating future government emergency management policies, plans and evaluating the effectiveness of management.

### **3. Conclusions and Implications**

First, urban crisis risk management should be “risk-based”. Different risks have different characteristics, different losses of expected cost and different residual uncertain cost. For the same risk management cost, different risks will also show different degrees of response, thus bringing different risk costs and risk management effects. Since the founding of the People's Republic of China, we have had experience in fighting against natural disasters on many occasions, but we are clearly ill-prepared for major public health emergencies. The risk of new epidemic is quite different from that of natural catastrophe such as earthquake. Although the catastrophe risk of earthquake is caught off guard, its geographical scope is relatively limited. Although the risk of a new epidemic is not a full-blown epidemic overnight, it can spread across the country and around the world within a month, affecting a vast geographical area. Therefore, if the main risk control measure for the catastrophe risk of earthquake is “loss reduction”, then for the risk of new epidemic, the risk control measure should attach equal importance to “loss prevention” and “loss reduction” (such as early isolation, early treatment), and take the loss prevention, that is, preventing the spread of the epidemic as an extremely important work.

Second, urban crisis risk management in the epidemic should be “right crop for right time“. In the prevention and control of COVID-19, corresponding risk management measures should be taken according to the stage and situation of the epidemic development. In January, for example, early in the disease development (such as occurrence peak of Wuhan), although if start the significant level of risk control measures, such as a public health emergency response may bring some risk management costs (including certain public panic and social lockout cost), early epidemic loss cost and residual uncertainty is low, so the total cost will be relatively lower and the risk management effect will be better. If we further consider that the local “two sessions” were being held in Wuhan and Hubei at that time, and representatives were participating in the discussion of state affairs on behalf of the people, there was really no reason not to start the emergency response mechanism that obviously had better risk management effect. Of course,

after the strong intervention of the central government in late January, the situation of epidemic prevention and control finally began to turn a corner after a period of extremely hard fighting, but the total risk cost to the society and the tragic cost to life and health are sorrow.

Third, urban crisis risk management in the epidemic should be “adjust measures to local conditions“. In the prevention and control of COVID-19, differentiated risk management measures should be adopted by different regions and levels according to the development of local epidemics. “The economy and society is a dynamic circulatory system, which cannot be shut down for a long time.” the central government requires high-risk areas to continue to focus on epidemic prevention and control, medium-risk areas to return to work and production in an orderly manner in accordance with the prevention and control situation, and low-risk areas to fully restore production and living order while preventing foreign imports. The risk management thinking logic behind these seemingly zoning classification differentiation of risk management measures is consistent, namely to reduce the risk and cost of each type of region, minimize social total risk cost. Thus in a realistic risk society, the enhancement enterprise and social resilience try their best to achieve the maximization of total social welfare.

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