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Urban Safety Risk Assessment Technology Based on Risk Correction

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Abstract

In order to effectively manage and control risks and improve the accuracy of urban safety risk assessment, a revised model of urban safety risk based on inherent risk screening is proposed, risk screening standards and industry risk coefficients for different industries are formulated, and a three-level urban safety risk assessment process is established, in which risk assessment subjects, industry management departments and governments (regions) are linked. Risk assessment is carried out through the bottom-up model of "point line surface", overlapping to form industrial and regional risks. Taking A district of a city in the south of China as a sample, the safety risk assessment of accident disaster cities is carried out in a "point line plane" mode. It is clear that the assessment object is the risk point hazard sources of production and business units and public safety areas under the jurisdiction. The results show that this method can systematically and comprehensively find out the key points of urban risk management and control, effectively evaluate the regional risk level, and provide decision-making basis for the hierarchical management and control of urban security risks.

Keywords

Risk correction, Urban safety risk assessment, Risk warning

1. Introduction

With the acceleration of urbanization in China, urban population is expanding rapidly, urban functions are increasing, and urban security risks are also increasing. In recent years, the problem that China's urban safety risk management and control ability lags behind the speed of urban development has been exposed. Carrying out urban safety risk assessment is an important means to improve the ability of urban safety risk management and control [1]. "In recent years, relevant documents on urban safety development in China have emphasized that urban safety risks should be systematically identified and comprehensively assessed, and a hierarchical management and control mechanism for urban safety risks should be established. Based on this, this paper proposes that the basic principles of urban safety risk assessment in China should be summarized, and based on" point industry region " The method of carrying out urban safety risk assessment layer by layer at three levels. It provides theoretical support for China to comprehensively carry out urban safety risk assessment practice and achieve hierarchical management and control of urban safety risks.

2. Assessment process

The core of risk assessment is risk identification and evaluation. All production and operation units and public area entities are responsible for risk assessment. Adhering to the bottom-up model of "point line area", and following the principle of full coverage, integration of departments, and highlighting inherent risks, through a comprehensive and systematic security risk assessment, we can identify the security risks of various industries in the urban area, and define the key areas and industry areas for government safety control according to the risk level. This paper proposes a risk assessment process based on risk assessment subjects (enterprises, public area subjects), risk screening assessment filling, industry supervision department verification, government coordination and promotion, as well as information

technology means, as shown in Figure 1.

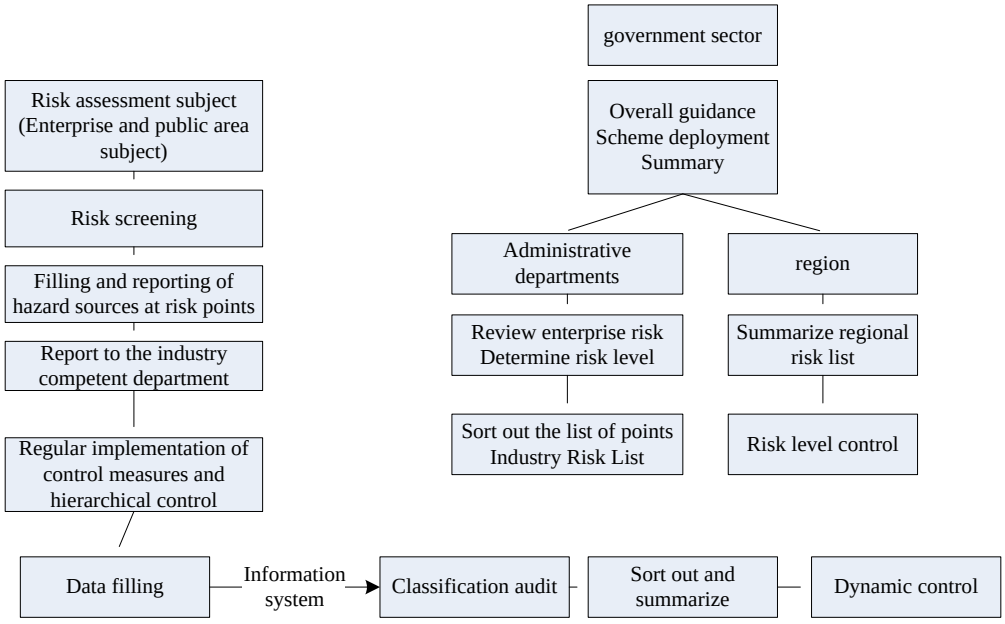

Figure 1. Urban Safety Risk Assessment Process.

3. Evaluation method

3.1 Point safety risk assessment

Point risk is the basic unit of urban risk. Risk screening, identification and assessment standards of various industries and fields should be refined as much as possible to achieve full coverage of urban risk assessment. At the same time, subjective factors should be reduced as much as possible, and a preliminary screening table should be prepared based on objective risk factors such as people, machinery, materials, and environment, and the corresponding weights. All production and operation units and public area responsibility subjects shall select appropriate risk screening standards for screening [2]. At the same time, the risk screening link is introduced. If the risk screening score is lower than 30 points, it will be deemed as an acceptable risk and will not be included in the scope of risk hierarchical control; If the risk screening score is higher than 30, the risk point and hazard source identification shall be completed to determine the risk level. The actual risk level is assessed according to the principle of "full implementation of measures, risk reduction by one level" by checking the status of control measures at three levels of "engineering technical measures," "management system measures," and "protection and emergency measures" for specific risk point hazard sources [3].

(1) Analysis of accident possibility

Select the key characterization factors of the safety management capability of the point management unit (such as the coverage of equipment and facilities' intrinsic safety measures, the coverage of hazardous process monitoring and monitoring technology, the number of full-time safety management personnel, etc.) as the correction parameters for the possibility of accidents and develop the correction (upgrade or downgrade) conditions. Analyze the compliance of each correction parameter, and correct according to the following rules to obtain the actual accident probability level [4]: ① If this item does not meet the upgrade or downgrade conditions, it is considered that this factor does not affect the adjustment of the probability level; ② If one or more of the projects that meet the upgrade conditions meet the upgrade conditions, the possibility level will be upgraded to one level; ③ If all items meet the degradation conditions, the possibility level will be reduced by 1 level; ④ If the corrected actual accident probability level is greater than 5, 5 will be retained; if it is less than 1, 1 will be retained.

(2) Analysis of accident consequence severity

Assume the most serious accident scenario and estimate the maximum possible loss caused by the typical accident at the point according to the impact parameter data of the accident consequences, historical accident statistics and typical cases. See Table 1 for the rating criteria of the severity of the consequences of inherent accidents at the point [5]. The number of deaths, serious injuries and direct property losses in Table 1 are described by reference to the Regulations on Reporting, Investigation and Handling of Production Safety Accidents. If other industries (such as earthquake, typhoon and other natural disasters) have a clear classification of the severity of the consequences, a targeted rating standard for

the severity of accident consequences can be formulated according to relevant regulations. According to the standards in Table 1, judge the severity level of the consequences of the inherent accidents at the point.

3.2 Industry safety risk assessment

Industry risk is the embodiment of the overall risk of an industry. The competent department of the industry uses the analytic hierarchy process to determine the risk coefficient of the industry according to the inherent risk and accident statistics of the industry [6]. Unified analysis methods and evaluation criteria are adopted between different industries to ensure the comparability of industry risks. The local government determines the industries that need to strengthen control in key jurisdictions according to the industry risk assessment results.

3.3 Regional security risk assessment

The purpose of regional security risk assessment is to identify regions and industries with high risks in the city. By analyzing the risk level and number of hazard sources of enterprises in different industries, the proportion of different enterprises in the city's safety risk can be quantified, so as to find out the key controlled regions and industries through the risk superposition of different regions and industries [7]. It is suggested to use weighted algorithm to calculate regional risk. At the same time, the emergency rescue capability, regional management level and number of accidents shall be considered for correction.

4. Application examples

Taking A district of a city in the south of China as a sample, the safety risk assessment of accident disaster cities is carried out in a "point line plane" mode. It is clear that the assessment object is the risk point hazard sources of production and business units and public safety areas under the jurisdiction [8]. According to the layout characteristics of industry and trade industries and public areas in the urban area, 74 technical guidelines for safety risk assessment in different industries (including 37 production and business units and 37 public areas) were prepared by using objective indicators such as equipment and facilities, technological processes, and operating activities. Enterprises selected and graded the corresponding industry standards item by item. See Table 1 for examples of safety risk guidelines and safety risk screening standards in some key industries.

Table 1. Technical Guidelines for Safety Risks in Some Key Industries

type		Industry category	Industry risk coefficient
Production and operation units		Lithium ion battery	1.5
		Furniture manufacturing	1.2
		Production of dangerous chemicals	1.5
		Electroplating enterprises	1.3
Public area	Key places	hospital	1.1
			1.1
	Key parts	school	1.3
	Key equipment and facilities	Muck receiving yard	1.5
	Construction projects	Gas pipeline	1.5

All production and operation units and public area entities in the region calculate their own risk value by selecting appropriate industry safety risk screening standards and combining industry coefficients. The safety risk level of the enterprise is obtained by identifying the hazard sources at risk points and the implementation of control measures.

A total of 76,300 production and operation units and public area subjects were organized to carry out risk assessment in the area, of which 4875 units had a risk screening score higher than 30, and further carried out risk point hazard identification and assessment. 34 higher risks, 201 general risks and 4640 lower risks were assessed.

Through the analysis of the screening and evaluation, 9 electronic manufacturing enterprises, 5 gas stations and 5 metal products enterprises were found to be enterprises with higher risk level, and 67 electronic manufacturing enterprises and 22 metal products enterprises were found to be enterprises with general risk level, which is consistent with the concentration of manufacturing enterprises in the area and the statistics of the types of safety production accidents, which can identify the key risk management and control points at the regional level in the city.

5. Conclusion

To sum up, this paper takes scenario construction as the basic method, proposes the "risk parameter method" to assist the risk matrix method in point and industry risk analysis, and uses the weighted calculation method to link the industry risk assessment and regional risk assessment. The "point industry region" level by level urban security risk assessment method helps to identify the weak links of risk governance at different risk management levels, Then formulate targeted urban safety risk grading management and control countermeasures.

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