

Strategies and practices for urban public safety crisis management: a case study of typhoons

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Abstract. Global warming and frequent typhoons pose a serious threat to urban public safety. With the acceleration of urbanization and the increase of population density, urban public safety has become one of the priorities of urban management. Taking typhoon as an example, this study explores the management of urban public safety crisis, and uses case analysis and literature review to analyze the strategies and practices that the government should implement when a city encounters a public safety crisis. The study found that there were problems in early warning, emergency response, and post-disaster reconstruction, and put forward corresponding optimization strategies. The conclusion of the study shows that it is necessary to improve monitoring and early warning and strengthen departmental coordination to improve the ability of cities to cope with typhoon disasters and ensure urban safety and stability.

Keywords: urban public safety, typhoons, crisis management, case analysis, literature re-view, strategies and practices.

1. Introduction

With the acceleration of urbanization and the increase of population density, urban public safety has become one of the priorities of urban management. Public safety is an important foundation for the normal operation and sustainable development of the economy and society, and it is also an important embodiment of the competitiveness and image of the city (Kang, Du & Cao, 2018). Urban security is a state of dynamic stability and coordination maintained by cities in terms of politics, economy, society, culture, ecological environment, human health, and resource supply, as well as a kind of resistance to natural disasters and social and economic abnormalities or emergencies (Zhang & Xia, 2013).

China is the country with the most typhoon landfall and the most severe disaster in the world, with an average of about 7~8 typhoons making landfall in China every year. In the South China Sea, Chinese mainland has a coastline of more than 5,800 km, and coastal areas including Guangdong, Guangxi, Hainan and Taiwan are the hardest hit by storm surges (Yin et al., 2019). Super Typhoon "Capricorn" No. 11 in 2024 has made landfall in Wenchang City, Hainan Province, and Xuwen County, Guangdong Province, causing serious disasters, disrupting power and communication for a large number of users, and damaging some houses. As of 12:00 on the 7th, the disaster has affected 1.227 million people to varying degrees in Hainan, Guangdong, and Guangxi, resulting in 3 deaths and 95 injuries (China Fire Protection, 2024). The typhoon disaster crisis refers to the threat and damage that typhoon disasters pose to the public and government interests. Information regarding typhoon disasters is very scarce, and the development of typhoon disasters is highly uncertain, while also requiring the government to make rapid decisions in adverse situations. Typhoon disasters not only pose a threat to the lives and property safety of the public, but also can trigger chain reactions such as social instability if the government fails to effectively resolve the crisis (Chen & Shen, 2010). Therefore, from the perspective of government management, it is an inevitable requirement to study and summarize the strategies of urban public security crisis management, apply them to practice, and strengthen urban public security crisis management. Therefore, the study of the strategy and practice of typhoon crisis management has broad prospects and far-reaching significance. Through case analysis and extensive collection of domestic and foreign literature related to urban crisis management, this paper systematically summarizes, summarizes and analyzes the content of crisis intervention under the natural disaster of typhoon. The research results of this paper can provide reference for city managers to improve their disaster prevention and mitigation capabilities.

2. Current status of typhoon crisis management response measures in coastal cities in China

2.1. Fujian Province

Fujian Province has built a three-dimensional meteorological monitoring network, which is coordinated by meteorological satellites, radars, and ground observation stations to achieve full-time tracking of typhoons. The early warning was issued quickly, with the help of television, radio, text messages and new media platforms, covering a wide range of urban and rural areas in the province. The emergency response mechanism is mature, and after the emergency response is initiated, multiple departments work together, such as the transportation department suspending passenger transportation in high-risk areas in advance; The water conservancy department monitors reservoirs and rivers in real time, and scientifically regulates and controls water conservancy facilities; The emergency management department organizes professional rescue teams and equips them with sufficient relief materials. In terms of publicity and education, government workers have carried out regular disaster prevention and mitigation science popularization activities in communities and schools, distributed brochures, and held knowledge lectures. In terms of infrastructure construction, government workers will continue to strengthen coastal seawalls, improve the standards of urban drainage systems, and enhance the city's overall anti-typhoon capacity. Wu Daorong (2007) proposed that the meteorological forecasting and early warning of geological disasters should be strengthened, and the prevention and control of regional geological disasters should be guided at the macro level, so as to reduce the loss of people's lives and property.

2.2. Guangdong Province

Guangdong Province uses advanced monitoring technology to accurately capture key information such as typhoon path and intensity, push early warning information in diversified forms, and use intelligent terminals to achieve personalized early warning. The emergency response is efficient and orderly, all departments act quickly according to the detailed plan, and the material allocation relies on big data to achieve scientific and accurate information to ensure that the materials in key areas are sufficient. There are rich forms of public education, and the awareness of disaster prevention is enhanced through knowledge competitions, online science popularization, community drills and so on. Urban planning focuses on disaster prevention and mitigation, buildings are built in strict accordance with high wind resistance standards, lifeline engineering protection such as power and communications is strengthened, and urban drainage pipe networks are optimized to improve drainage capacity. Pan Anding (2002) analyzed typhoons in Guangdong, and proposed to strengthen emergency evacuation work when disasters occur, prepare for disasters, quickly formulate scientific disaster relief and treatment plans, and resume production and post-disaster reconstruction as soon as possible. What is more important is to cut off the main link in the disaster chain as early as possible before the disaster strikes, so as to reduce the losses of successive disasters.

2.3. Hainan Province

Hainan Province has strengthened the exclusive monitoring and early warning of coastal and fishery areas in combination with the geographical characteristics of the islands, and used equipment such as fishing vessel positioning and marine weather stations to transmit typhoon information to marine operators in a timely manner. The emergency response focused on tourism and fishery safety, evacuating tourists in scenic spots in advance and recalling fishing boats that went to sea. Integrate local cultural elements into publicity and education, and disseminate knowledge of Taiwan defense through characteristic theatrical performances and folk activities. Infrastructure construction focuses on strengthening the island's transportation arteries and port facilities, improving the island's resilience to typhoon disasters, and ensuring the rapid recovery of basic livelihood and economic activities. Battle (2019) proposed that the linkage and coordination mechanism between government functional departments should be comprehensively promoted for the prevention and control of

typhoons in Hainan Province, the working mechanism of flood prevention and typhoon prevention with efficient linkage of multiple departments should be initially realized, the internal deepening of the new model should be strengthened, and the operation mechanism of flood prevention and typhoon prevention within the Hainan Provincial Emergency Management Department should be further clarified, so as to form a positive work cycle and closed-loop operation of the whole process.

2.4. Summary of typhoon crisis management in coastal cities in China

Meteorological monitoring and early warning systems have been established in China's coastal cities to disseminate information through a variety of channels, but there is still room for improvement in the coverage and reception of early warnings in some remote areas. The emergency response mechanism has been gradually improved, and multiple departments have collaborated and cooperated, but there are differences in the efficiency of coordination and the accuracy of material allocation. Public education is promoted through platforms such as schools and communities, but the depth and duration of publicity are uneven. The infrastructure construction has been continuously strengthened, the seawall and drainage system have been upgraded, and the wind resistance standards of buildings have been gradually improved, but there are gaps in the construction level of different cities due to different economic strength and different degrees of attention. Overall, coastal cities have made progress in typhoon crisis management, but they need to continue to improve in terms of technology integration, collaborative optimization, and deepening public participation. On the basis of fully implementing the national requirements, each city has its own focus and characteristics in the construction of emergency response mechanisms according to the different characteristics of their own cities (Wang, 2006).

3. Difficulties in typhoon crisis management

3.1. Geographically difficult

3.1.1. Variable typhoon path and wide range of influence

The path of typhoon is affected by a variety of geographical and meteorological factors, such as atmospheric circulation, topography, and so on, which makes the movement path and impact range of typhoon uncertain. This uncertainty makes typhoon defense difficult, as it is difficult to predict exactly when and where the typhoon will make landfall and how much impact it will have.

3.1.2. Low-lying coastal areas

The coastal areas of southeast China are relatively low-lying and vulnerable to storm surges and heavy rains brought by typhoons, resulting in severe flooding. This geographical condition limits the construction effect of the drainage system, which makes it difficult to effectively solve the problem of waterlogging.

3.1.3. Complex terrain

Some coastal areas in China have complex topography, such as mountains and hills, which increases the risk of secondary disasters caused by typhoons, such as landslides and mudslides. These disasters not only threaten the safety of people's lives and property, but also make rescue and reconstruction more difficult.

3.2. Difficulty of investing in construction funds

Significant demand for infrastructure investment: In order to improve the typhoon prevention capacity of coastal areas, a large amount of money needs to be invested in infrastructure construction, such as strengthening flood control levees, building drainage systems, and improving urban flood control and drainage capacity. These investments are in high demand and require long-term sustained investment.

How to ensure that funds can be accurately put where they are most needed, and how to avoid waste and misappropriation of funds, and so on, need to establish a sound regulatory mechanism. Some regions may face economic pressures or financial constraints, which limits funding for typhoon management. In this case, it is necessary to seek diversified funding sources, such as government grants, social donations, and so on.

3.3. Difficulty in communication and decision-making between departments

3.3.1. Obstacles to cross-departmental coordination and cooperation

Urban crisis management involves multiple departments such as meteorology, emergency response, transportation, and fire protection, and when the responsibilities of each department are different, and the coordination mechanism is not perfect, problems such as unclear responsibilities and inconsistent actions are prone to occur, which affects the overall effect of typhoon crisis management.

3.3.2. Inaccurate plans and risk assessments

Typhoon emergency plans in some cities lack pertinence, do not fully consider local geographical, demographic, industrial and other characteristics, and in actual implementation, in the face of complex and changeable typhoon conditions, the plans are not flexible enough to effectively respond. The risks that may be caused by typhoons are complex and diverse, and it is difficult to accurately assess the impact on infrastructure, ecological environment, and social economy, resulting in unreasonable resource allocation and inability to effectively prevent and respond to risks.

3.3.3. Imperfect laws and regulations

There are still some gaps and deficiencies in the current laws and regulations on typhoon crisis management, and there is a lack of clear provisions on the definition of responsibilities, resource allocation, and public behavior norms, which affect the legal development of management work. In the process of implementation, some policies related to typhoon crisis management are not implemented in place, and the supervision mechanism is not perfect, resulting in the failure of policies to play their due role and effectively ensure the safety of cities in typhoon crises.

4. Case study of typhoon safety crisis management

4.1. A brief description of the case

Super Typhoon Capricorn No. 11 in 2024 made landfall in Wenchang City, Hainan Province and Xuwen County, Guangdong Province at 16:20 and 22:20 on September 6, causing serious disasters, with a large number of users losing power and communications, and some houses being damaged. According to the Hainan Provincial Emergency Command for Typhoon "Capricorn", as of the 10th, Typhoon "Capricorn" caused a total of 4 deaths and 95 injuries in Hainan due to the disaster, more than 500,000 people in 19 cities and counties were affected, and direct economic losses of nearly 60 billion yuan in Haikou and Wenchang.

4.2. Analysis of specific measures

4.2.1. Implement various defensive measures in detail and transfer the masses in a timely manner

On September 1, when Typhoon "Capricorn" was still in tropical depression, the Hainan Provincial Party Committee and Provincial Government held a meeting to study and judge in advance, and requested that the mobilization and deployment be upgraded. On September 3, Hainan held a provincial video mobilization and deployment meeting. According to the plan, the Hainan Provincial Party Committee requires that each city and county be stationed by provincial-level leaders to guide the work of preventing typhoon "Capricorn", and party members and cadres at all levels in the province take the lead in going to the front line of anti-typhoon and going to the places where the

masses need it most. By the evening of September 5, Wenchang realized that the masses should turn around. As a typhoon that landed in the city and county, through the implementation of various defense measures and the timely evacuation of the masses, no one in the city died due to the disaster.

4.2.2. Rush to repair infrastructure, rebuild after the disaster, and restore normal production and life order at an early date

The majority of party members and cadres in Hainan led grassroots workers, grid workers, volunteers, fire rescue personnel, medical personnel, and sanitation workers to actively participate in this war and fight at the forefront of the war. Under the unified deployment of the State Council, other provinces have dispatched technical personnel and emergency communication equipment to support Hainan in repairing communication facilities.

In terms of water transportation, after stepping up the rush to open and repair, the transportation capacity of the Qiongzhou Strait was basically restored at 18 o'clock on September 9; In terms of land routes, at 15 o'clock on the 9th, the national and provincial trunk roads in Hainan Province have resumed two-way normal traffic, county and township roads have been rushed through, and rural roads have been basically unblocked; In terms of air transportation, Sanya Phoenix International Airport gradually resumed flight operations from 10 o'clock on September 7, and Haikou Meilan International Airport resumed flight operations in an orderly manner from 12 o'clock on September 8. In view of the areas where there is no water and electricity at present, the provincial public security and fire departments are organizing fire trucks to deliver water to the affected people.

4.2.3. Mobilize the whole of society to work together to mitigate the impact of disasters

People from all walks of life do their best to help each other. Deploy in advance, the whole society works together to fight the disaster, invest in post-disaster reconstruction in a short period of time, and minimize losses.

4.3. Summary

4.3.1. Merit

The government responded positively to the meteorological department of Typhoon "Capricorn", and the early warning and monitoring were relatively accurate, releasing the dynamic information of the typhoon a few days in advance and conducting continuous monitoring, so as to buy time for various departments to deploy defenses. The government has launched a high-level emergency response, and multiple departments have acted quickly. The transportation department suspended some routes and trains to ensure safety. The water conservancy department investigates the hidden dangers of reservoirs and dams. The civil affairs department prepares disaster relief materials. Promote typhoon preparedness knowledge through various channels such as television, radio, and new media to raise public awareness. After the disaster, the power and communications departments quickly repaired facilities and restored order to life. The Housing and Urban-Rural Development Department assesses the damage to the building and guides the repair and reconstruction to minimize the damage.

4.3.2. Shortcomings

Although the government has publicized and predicted the hazards of typhoons in advance through a variety of scientific and technological means, in terms of information coverage, some residents in remote areas, such as fishing villages and mountainous areas, have not received timely warnings due to limited signals and publicity channels, which has affected early preparedness. In addition, some elderly groups have low acceptance of new media methods, and there are many academic discourses in propaganda content, which is difficult to understand, which reduces the ability of actual hedging operations. Despite the positive response and coordination of various departments, there are still gaps. For example, in the allocation of relief materials, information communication is not smooth, resulting in repeated allocation of materials in some areas, but insufficient supply in some areas. For post-disaster reconstruction, it is more likely to be rebuilt with restoration facilities rather than in

conjunction with future disaster prevention needs, which may affect the ability to withstand typhoons in the long run.

5. Suggestions for optimizing the management of urban public safety crisis during typhoons

5.1. Monitoring and early warning

The government should increase investment in the research and development of meteorological monitoring technology, introduce advanced equipment and systems, improve the accuracy of predictions of typhoon paths and intensity, and extend the advance time of early warnings. The government should also broaden the channels for early warning, in addition to traditional media, make full use of social media, mobile phone text messages, community broadcasts and other diversified channels to ensure that early warning information reaches remote areas and vulnerable groups. Strengthening information construction, timely disclosure of disaster information, and providing reliable prevention knowledge through smooth channels play a very important role in eliminating unstable factors and reducing the harm caused by emergencies (He, 2009). The government can also establish an early warning feedback mechanism so that the public can give feedback on the reception of early warnings and questions, so that they can adjust and optimize early warning work in a timely manner.

5.2. Emergency response

First, the government should improve the emergency response plan, formulate a detailed and operable emergency plan, clarify the responsibilities and coordination processes of each department, and conduct regular drills to improve the ability to coordinate operations. Second, the government strengthens the management of material reserves, scientifically plans the type, quantity and layout of material reserves, establishes a material information management system, grasps the dynamics of materials in real time, and ensures reasonable allocation. The government can also improve the professional capacity of rescue teams, strengthen the professional training of rescue teams, improve rescue skills in complex and harsh conditions, and establish rescue cooperation mechanisms with surrounding areas.

5.3. Urban planning and infrastructure construction

The government should strengthen the construction of urban flood prevention and drainage facilities, increase investment in drainage systems, and regularly clean up and upgrade them, so as to improve the city's ability to cope with heavy rains and floods. The government also needs to improve the wind resistance standards of buildings, strictly enforce the design code for building wind resistance, strengthen the wind resistance of old buildings, and strengthen the supervision of new buildings. In urban planning, the corresponding government departments should give full consideration to natural disasters such as typhoons, avoid building important facilities and dense residential areas in areas with frequent typhoons, and increase urban green spaces and squares as safe havens.

6. Conclusion

This study focuses on urban public safety crisis management with typhoons as an example, and comprehensively uses case analysis and literature review to analyze its strategies and practices. From the perspective of monitoring and early warning, although the existing technology and multiple channels can transmit typhoon information in a timely manner, the coverage of remote areas and special groups is insufficient, which makes it difficult for some groups to receive early warnings in time. In terms of emergency response, although multi-departmental coordination has become the

main model, the delay in information communication and the vague definition of responsibilities have reduced the efficiency of emergency response. Public publicity and education have achieved certain results in popularizing typhoon prevention knowledge, but there is still room for improvement in the depth, sustainability and pertinence of educational content. Although progress has been made in infrastructure construction in terms of seawall reinforcement and drainage system upgrading, the level of construction varies among cities, and the ability of some cities to resist typhoon disasters still needs to be strengthened. In order to improve the city's ability to cope with typhoon disasters, it is necessary to further optimize the monitoring and early warning system to ensure comprehensive information coverage. Clarify the responsibilities of departments, improve the coordination mechanism, and improve the efficiency of emergency response. According to the characteristics of different audiences, enrich and deepen the content of public publicity and education; Increase investment in infrastructure construction, unify construction standards, enhance the overall resilience of cities to disasters, and ensure urban public safety in an all-round way. The results of this study provide some ideas and help for typhoon crisis response in high-frequency areas and areas with less experience, but there is a lack of specific measures on how to formulate emergency plans, and further research can be carried out in emergency response and urban planning in the future.

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