

## Article

# How Do Comprehensive Territorial Plans Frame Resilience? A Content Analysis of Plans by Major Cities in China

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**Abstract:** Planning is considered one of the most important policy instruments for building resilience in urban systems. As an emerging trend, cities in China are starting to incorporate urban resilience-related statements into the new versions of their all-in-one spatial plans, known commonly as territorial plans. This research used a content analysis approach to examine resilience visions and actions in up-to-date comprehensive territorial plans prepared by major Chinese cities. The study results show that while different cities understand the concept of urban resilience in different ways, most cities devise resilience actions that fit into four categories, in descending order as follows: infrastructure and facilities, safety and security, protection and mitigation, and governance and management. This paper further argues that territorial plans in China tend to view resilience more as a synonym for structural soundness and recovery efficiency than as a prospect of broader urban change leading to overall social and economic betterment. The research contributes to explaining ongoing international resilience planning practices and helping planners make more thoughtful plans.

**Keywords:** urban resilience; territorial plan; planning vision; planning action



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## 1. Introduction

Urban resilience, defined as a city's integrated ability to deal with both acute shocks and slow burns of an uncertain nature [1,2], has gained attention in recent decades in the field of public policy across the globe. A variety of cities have developed their own resilience strategic plans, and numerous organizations and networks, including the United Nations Office for Disaster Risk Reduction, the International Council for Local Environmental Initiatives, and the Rockefeller Foundation, have pioneered international resilience-building efforts by setting standards and agendas and launching programs. Urban resilience is becoming increasingly popular as a result of the initiative-taking value orientation adopted by city administrators and leaders to cope with the increasingly interconnected and ever-changing environment. The concept's strong malleability allows it to encompass aspirational goals surrounding a variety of contemporary challenges, such as disaster preparedness, infrastructure and utilities, housing, and education, which further contributes to its wide adoption [3]. In line with the international trend, the idea of resilience has also become widely accepted in China as an approach to dealing with growing urban environmental changes and urban risks.

Spatial planning is an important policy instrument for achieving urban resilience [4]. Since 2018, China's new spatial planning system, better known as territorial planning, has been gradually established by integrating the originally fragmented departmental spatial planning systems. Territorial plans are made at different geographic levels to serve as a basis for overall sustainable territorial development. Since the 14th National Five-Year Plan, China's paramount development plan, emphasized the importance of urban resilience, most of the newly prepared territorial plans have included resilience-building content. Examining how resilience is framed in territorial plans provides insight into how and to what extent resilience is being incorporated into the new spatial planning system in China.

The need to incorporate the idea of resilience into spatial planning has been relatively clear, but as this round of plan-making is still ongoing, few studies to date have been conducted to assess planning documents' responses to urban resilience in reality. To fill this knowledge gap between need and reality, this paper attempts to offer a timely scan and critical analysis of resilience thinking in the comprehensive territorial plans of Chinese cities to illuminate unrecognized patterns. It also compares how the international academic community theorizes resilience in spatial planning with the Chinese spatial planning reality, in the hope of sparking more thoughtful discussions. Our inquiry has two particular parts. First, how are plan visions interpreting and framing the urban resilience concept? Second, how are resilience actions provided and structured by different cities? To do this, we used NVivo software to examine the plan documents for 26 major Chinese cities.

The structure of this paper is as follows. Section 2 provides a brief review of the literature on the pursuit of resilience in planning theory and practice, highlighting critical debates on urban resilience planning and China's recent spatial planning efforts towards resilience building. Section 3 presents our research design, methodology, and materials. Section 4 reports and discusses our findings from the vision analysis and action analysis. Section 5 summarizes key patterns reflecting a broader understanding of urban resilience planning and provides policy implications.

## 2. Literature Review

### 2.1. Planning for Urban Resilience

Holling [5] developed the concept of resilience in systems ecology and it was subsequently introduced to the study of social systems, urban systems, and urban planning [6]. Today, planning is one of the most important domains in which the resilience concept is used. Planning offers a realistic setting wherein the self-worth principle can be realized [7], and, in turn, resilience thinking offers a fresh approach to addressing the uncertain urban risks and complicated development challenges that different cities face. Three interpretations of the concept—engineering, ecological, and evolutionary resilience—have been put forth since its inception [8]. These three interpretations adopt varying viewpoints on system dynamics and courses of action. Engineering resilience is essentially a system's capacity to return to its pre-disturbance state [5]. Ecological resilience emphasizes an urban system's ability to absorb the effects of unforeseen events and elegantly arrive at a new state without losing its fundamental structure or function [9,10]. The most recent perspective, evolutionary/transformational resilience, or the non-equilibrium model of resilience [11], acknowledges the variety of ways in which cities can evolve and views the urban environment as a venue for constant change, adaptation, and transformation [12]. Overall, while the engineering perspective views resilience as recovery and the ecological perspective views resilience as compatibility or adaptability capacity, the evolutionary/transformational perspective considers resilience to be a more positive transformation [13] and a bounce-forth process [14,15]. Planning responses supporting different interpretations of resilience can vary significantly in their value propositions and approaches to implementation [16]. Beyond conventional risk-proof structural measures and adaptive ecological solutions, transformational resilience embraces the adoption of reflexive governance, establishment of interdisciplinary platforms, enhancement of local capitals and capacities, co-creation of knowledge, and the inclusion of innovative and bottom-up approaches [11,17].

Planning practices with a resilience mindset can guide more prudent actions against uncertain circumstances and enhance both the physical environment and social networks of cities [18,19]. Due to this, resilience has evolved into one of the guiding principles of urban future development [18]. It was initially intended to be used to outline grand planning visions before it became a more sophisticated and place-specific framework [20]. The development of independent resilience/adaptation/mitigation plans [3] and the integration of resilience thinking into already-existing hazard mitigation, emergency management, and land use plans [21] are the two principal approaches to urban resilience planning. Planning for resilience demonstrates four key features. First, as many cities concentrate

on looking into practical solutions to possible crises including natural disasters, terrorism, economic decline, and environmental degradation, resilience plans are typically problem-oriented [22]. Second, comprehensive evaluations of urban risks and assets are typically required when planning for resilience [23]. Third, to address the interdependency and interaction of various urban subsystems as well as the collaboration of relevant stakeholders, resilience planning calls for a systematic approach [20,24,25]. Fourth, because the urban system and its subsystems are challenged by continuous uncertain disturbances, resilience planning is shaped by constant learning, growth, and adaptation, often without an ultimate end state [23].

## 2.2. Debates on Urban Resilience Planning: Definition, Operationalization, and Solutions

As urban resilience-building activities have continued to gain widespread popularity and become highly localized in recent years, academics are delving deeper into the content, planning process, and implementation of plans to evaluate their effects on urban socioecological systems and create more general lessons for better resilience planning. The following questions are of particular interest to them. First, what is the scope of urban resilience planning? Next, how is resilience planning operationalized? And finally, for whom are resilience plans and solutions intended?

Concerning its definition and scope, a range of insightful research findings have been derived from analysis of urban systems, discussions with planning professionals, and textual examination of planning documents. Urban resilience is increasingly understood on a deeper and broader scale. Sharifi and Yamagata [26] outlined major themes of urban resilience research, including infrastructure, security, environment, economy, institutions, and society. Water, energy, spatial configuration, transportation, green infrastructure, defensive structures, sheltering, building and design, technology, and information are further components of infrastructure. The City Resilience Framework (CRF) better captures the rounded dimensions of urban resilience, encompassing leadership and strategy, infrastructure and environment, economy and society, and health and wellbeing [27]. In recent years, there has been a substantial shift toward problems of social equity and participation in the content of resilience plans, as opposed to earlier resilience plans that focused more on physical elements [3]. In comparison to other plans, resilience plans usually propose broader visions, stronger goals, wider participation, and more all-encompassing solutions to reduce urban vulnerability and prepare for hazards [28,29]. More current plans exhibit an ecological-to-evolutionary interpretation, whereas earlier ones maintained an engineering-to-ecological perspective.

In terms of its operationalization, resilience is understood as a crucial organizing principle throughout the process of plan-making and plan implementation [20]. Effective planning incorporates resilience thinking throughout all stages of comprehensive urban risk management, including prevention, preparedness, response, and recovery, in addition to the plan's content [22]. According to Jabareen [30], a complete framework for resilient planning is made up of four interconnected parts: vulnerability assessments, governance, prevention, and planning for uncertainty. Good resilience governance relies on factors including clear vision and objective, well-defined responsibilities, innovative learning and feedback, systems approach, knowledge co-production and trust, and multi-scale governance [31]. The fundamental issue in executing resilience planning is to match the needs of different stakeholders in different circumstances, which are usually in contradiction [16,32]. Its solution depends on an increased focus on collaboration among stakeholders and the incorporation of various thematic planning components relevant to resilience building [32,33]. Different tools have been developed and used to guide resilience building, including but not limited to City Resilience Profiling Tool, Resilience Matrix [34], City Resilience Framework [27], and Plan Integration for Resilience Scorecard [33].

More recently, academics have called for the inclusion of equity and social justice issues in resilience research due to their observations of the imbalances in power and capabilities among different social groups coping with urban risks [35,36]. According

to Jon and Purcell [37], for instance, to ensure that resilience plans reflect the benefits of the general public rather than the elite class, the public should be more informed and involved in agenda shaping. Ensor et al. [38] define equitable resilience as a form of human-environmental resilience that considers social vulnerability and differentiated access to power, knowledge, and resources. They also propose that the lived experience of diverse social groups be associated when developing resilience policies. By concentrating on the case of displacement in the Mekong Delta, Miller [39] proposes paying more attention to people's connection to place, each other, and familiar ways of life to render resilience more morally just and rational. These justifications set a higher standard for achieving urban resilience and add to the difficulty of resilience planning.

Researchers are now reflecting more critically on existing plans due to the recent resilience boom, and conventional plans are being developed in more resilient ways. Scholars are keen to find out whether the current planning regime provides enough resilience signals [21] and whether specific plans identify new approaches for reducing vulnerability and strengthening resilience building [23,40]. Such inquiries can be found on different subjects including hazard mitigation [29,41], emergency management [40], post-disaster recovery [42,43], climate sustainability [44], transportation [45], energy [46], economic development [47], and spatial planning [48].

### 2.3. A Resilience Transition in China's Spatial Planning

China has ambitious goals for strengthening the resilience of its cities. For example, two Chinese cities—Huangshi in Hubei Province and Deyang in Sichuan Province—joined the 100 Resilient Cities program in 2014 and immediately began exploring resilience measures for addressing their respective physical, social, and economic challenges. China introduced the Sponge City Initiative in 2015 to reduce the impact of urban flooding and increase the use of rainwater [49]. Beijing became the first municipality in China to adopt the resilience principle and include particular measures in its city comprehensive plan in 2017 [50]. The inclusion of the expression “constructing more resilient cities” in China's 14th Five-Year Plan (2021–2025), the key policy framework for medium-term social and economic growth, marked a significant milestone in March 2021 [51]. This suggests that a top-level design is being employed nationwide to enhance urban resilience.

By creating a more rational and interdependent territorial arrangement of different land uses, spatial planning serves as an essential policy tool for encouraging proactive development. It has traditionally aimed to support a range of urban development agendas, including fostering economic growth, protecting the natural environment, improving public health, and enhancing social justice. In an era featuring a shifting environment, it also plays an indispensable role in preventing natural hazards, mitigating and adapting to climate change impacts, and building the resilience of regions and cities [4,52]. Territorial planning (*guotu-kongjian guihua*), China's fundamental spatial planning system, was created as part of the 2018 administrative reform. Formerly dispersed and fragmented spatial planning regimes, such as primary functional zone planning, urban and rural planning, land use planning, marine functional area zoning, and eco-environmental protection planning, were integrated under the newly created system. To improve integration in planning administration and encourage interdepartmental coordination, the reform established a single spatial planning institution that is completely under the supervision of the Ministry of Natural Resources (MNR). Territorial plans, which include comprehensive, detailed, and special plans, can be created at the national, provincial, city, county, and township levels [53]. In this framework, the new territorial plans serve as the key strategic policy documents for future development within their respective jurisdictions instead of simply being land use plans. They function as the basis of all construction and conservation actions and provide critical tools for improving quality of life.

Specifically, a city-level comprehensive territorial plan, which replaces its predecessor city comprehensive plan, becomes the overall framework for the protection, development, utilization, and restoration of territories within the administrative boundary of the

metropolitan city. Following the corresponding requirements in the 14th Five-Year Plan, the Guidance of Composing City-level Territorial Plans calls for a systematic approach to “raising the resilience level of territorial space”. In particular, the guidance suggests that (1) disaster risk assessment be implemented and coping mechanisms developed to better prepare for climate change, natural disasters, and public health events, and (2) the spatial structure be optimized toward urban safety by detailing resilience bottom lines through attentive assessments, achieving the networked distribution of city infrastructures, encouraging the construction of sponge cities, and providing community-level disaster shelter spaces and facilities [54]. Different cities now have a good opportunity to integrate resilience thinking into their spatial plans thanks to the establishment of the Chinese territorial planning system and the beginning of a new round of territorial plan making. It also offers a good chance to examine how resilience is understood and employed in the Chinese planning culture.

### 3. Research Design and Methodology

This study investigated the content of comprehensive territorial plans of major cities in mainland China using NVivo. NVivo is a qualitative analysis software that uses grounded theory to inductively analyze unstructured text data by sorting and coding raw data, discovering relationships among data, defining categories and themes for data, and visualizing results [55]. The software is widely used by urban policy researchers to reveal the implicit patterns and links among a myriad of policy texts and plan documents [56–58]. Our steps are described in detail below.

#### 3.1. Collecting Plans of Targeted Cities

In this paper, a major city is one that has a significant political and economic impact. The city may be a directly administered municipality, a provincial or autonomous region’s capital, or a city with a 2020 gross domestic product (GDP) of more than 600 billion yuan. A total of 55 major cities were scanned, including 24 economically developed cities, 27 provincial/autonomous region capitals, and 4 directly administered municipalities (Beijing, Shanghai, Tianjin, and Chongqing). By the end of 2021, 26 cities, or 47.27% of them, had made their most recent comprehensive territorial plans available to the public (Figure 1). Twenty-four cities had created their plans as per the MNR’s requirements. The plans of Beijing and Shanghai were still named “city comprehensive plans” because they were prepared and approved before the administrative reform, but we still considered these city comprehensive plans due to the cities’ prominence in the country (Table 1).

**Table 1.** Cities for which comprehensive territorial plans were surveyed.

	City	Area (in Ten Thousand km <sup>2</sup> )	2020 Census Population (in Ten Thousand)	Province	Region	Release Date
1	Chongqing	8.24	3205	-	Southwest	May 2021
2	Shanghai	0.63	2487	-	East	January 2018
3	Beijing	1.64	2189	-	North	September 2017
4	Chengdu	1.43	2094	Sichuan	Southwest	July 2021
5	Guangzhou	0.74	1868	Guangdong	South	June 2019
6	Shenzhen	0.20	1756	Guangdong	South	June 2021
7	Tianjin	1.20	1387	-	North	September 2021
8	Suzhou	0.87	1275	Jiangsu	East	September 2021
9	Wuhan	0.86	1233	Hubei	Central	July 2021
10	Hangzhou	1.69	1194	Zhejiang	East	May 2021
11	Qingdao	1.13	1007	Shandong	East	July 2021
12	Changsha	1.18	1005	Hunan	Central	December 2021
13	Harbin	5.31	1001	Heilongjiang	Northeast	July 2021

Table 1. Cont.

	City	Area (in Ten Thousand km <sup>2</sup> )	2020 Census Population (in Ten Thousand)	Province	Region	Release Date
14	Shenyang	1.29	920	Liaoning	Northeast	August 2021
15	Xuzhou	1.13	908	Jiangsu	East	January 2021
16	Quanzhou	1.10	878	Fujian	East	December 2021
17	Nanning	2.21	874	Guangxi	South	November 2021
18	Fuzhou	1.20	829	Fujian	East	August 2021
19	Nantong	0.80	773	Jiangsu	East	November 2021
20	Wuxi	0.46	746	Jiangsu	East	January 2021
21	Dalian	1.25	745	Liaoning	Northeast	September 2021
22	Yantai	1.39	710	Shandong	East	September 2021
23	Changzhou	0.44	528	Jiangsu	East	May 2021
24	Xiamen	0.17	516	Fujian	East	November 2021
25	Haikou	0.31	287	Hainan	South	January 2021
26	Xining	0.76	247	Qinghai	Northwest	July 2021



**Figure 1.** Targeted major cities in China for which comprehensive territorial plans were released by the end of 2021 (in red).

### 3.2. Extracting the Resilience Content

The textual plan materials used in our study were collected from open internet sources, such as local governments' websites and official WeChat accounts run by their planning/natural resource agencies. We examined the comprehensive plans of all targeted cities and kept track of any revisions or modifications made by the end of 2021. Taking Shenzhen as an example, we conducted searches using "comprehensive territorial plan" as the keywords and downloaded original planning documents from the Shenzhen People's Government Online Portal and the Shenzhen Bureau of Planning and Natural Resources websites. We took those chapters from the comprehensive plans that concentrated on building urban resilience and prepared them for use in NVivo analysis. For instance, Chapter 9 of Shenzhen's comprehensive territorial plan comprised 1100 Chinese characters related to resilience. The resilience content was further divided into the resilience vision content and the resilience action content. The resilience vision material comprised chapter headings and urban resilience vision statements, which are descriptions of how different cities perceive urban resilience and portray the future resilience state of their cities [3]. Resilience action material was made up of the remaining text in related chapters.

### 3.3. Conducting Content Analysis with NVivo

The textual content analysis aimed to expose hidden significant patterns in resilience-related visions and actions. Two main NVivo features, word frequency analysis and encoding statistics, were utilized (Figure 2).

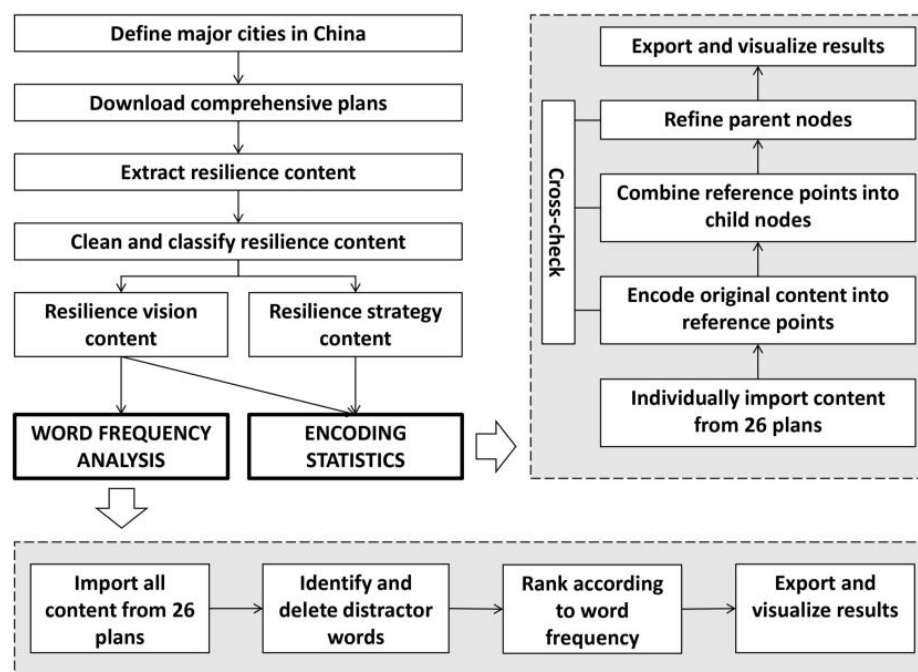


Figure 2. Procedure of NVivo-enabled plan content analysis.

Word frequency analysis enabled us to quickly extract the most important information from the resilience content, including crucial elements that made up the resilience blueprints and areas where cities are most willing to invest their resources. We ranked nouns like “infrastructure” and “transportation” and adjectives like “green” and “smart” according to their frequency using the word cloud function to create a general representation of resilience visions. Distracting words were ignored since there was not enough information being delivered. Common collocations like “city”, “block”, and “region”, as well as verbs like “forge”, “enhance”, and “strengthen” were among these words.

Using three rounds of bottom-up coding, the resilience action content was analyzed. The first round was to encode source materials into reference points. Resilience action corpora were selected after a pre-read of all plan documents and were then carefully read, sentence by sentence. Each resilience action was recorded as a reference point. If a sentence contained multiple actions, it was marked with the corresponding number of occurrences. This step produced a total of 332 reference points. The second step was to generate child nodes. We obtained 43 initial sub-nodes by grouping reference points with comparable meanings. A further 23 child nodes emerged from sorting these sub-nodes based on the categories and connotations they communicated. The third step was to summarize parent nodes. After carefully examining the logical connections between different child nodes, more meaningful parent nodes were refined. To make sure that no key codes were missed and that all codes were covered by their parent nodes, a rigorous double-check reading was performed. After this step, there are four parent nodes left.

Three experienced coders with planning backgrounds worked separately throughout the whole coding process to ensure a fair assessment of the contents. Researchers and coders debated any disagreements they have and decided on the categorizations together.

## 4. Findings and Discussions

### 4.1. Resilience Visions

Resilience visions are essential since they not only lead the entire plans by displaying long-term grand designs, but also reflect varying understandings of the urban resilience notion held by different cities. This study focused largely on three aspects of resilience visions: positioning, connotations and collocations, and responses made by cities to different resilience visions.

#### 4.1.1. Positioning

Where the term resilience first appears in the plan document is a fair indicator of the relative priority different cities devote to resilience building. In deciding the overarching goals of their territorial comprehensive plans, 5 out of the 26 targeted cities—Shanghai, Wuhan, Dalian, Harbin, and Quanzhou—explicitly adopted a resilience statement. Shanghai, for instance, wants to create “an ecological city with higher adaptability and resilience”, and Wuhan suggests “creating a safe and resilient metropolis”. This indicates that these cities are more proactive than their peers in fostering resilience. The remaining 21 cities did not offer substantial credit to resilience in their overall objectives; instead, they either regarded resilience as the subject theme of plan chapters or referenced resilience in a more inconsequential location.

#### 4.1.2. Connotations and Collocations

Urban resilience is multifaceted and highly adaptable in diverse socioeconomic circumstances. An examination of its connotations and collocations revealed the variety of ways the resilience idea was applied in plans and policies and identified the phrases that were frequently used in conjunction with resilience. We found through word frequency analysis that words like “safety” (59 times), “system” (31 times), “infrastructure” (30 times), and “security” (21 times) were closely related to resilience visions. They were followed by “green” (17 times), “transportation” (13 times), “municipal engineering” (12 times), “integrative” (11 times), “public” (10 times), “risk” (9 times), “smart” (8 times), “disaster prevention” (8 times), and “emergency response” (6 times). The relationship with words such as “space” (2 times), “cycle” (2 times), “sharing” (2 times), and “society” (2 times) was observable but not substantial (Figure 3).

This result shows that safety/security is the most important starting point for planning for resilience, and that strengthening infrastructure is the primary approach to achieving resilience in China. It also implies that visions for resilience frequently combine efforts for disaster management and environmentally friendly and intelligent development. In contrast, a smaller number of cities focus on robust spatial forms and connect social issues to the resilience agenda.

#### 4.1.3. Responses of Different Cities

All resilience vision corpora fell into eight areas, namely, safety and security, infrastructure support, transportation operation, space arrangement, green and low-carbon development, intelligent and smart development, emergency management, and social cohesion. We discovered a broad pattern of the attitudes held by different cities when crafting their resilience visions by matching the specific resilience visions with the eight vision types listed above (Table 2).



**Figure 3.** A cloud of keywords in resilience visions of territorial comprehensive plans.

**Table 2.** Responses to different resilience vision categories.

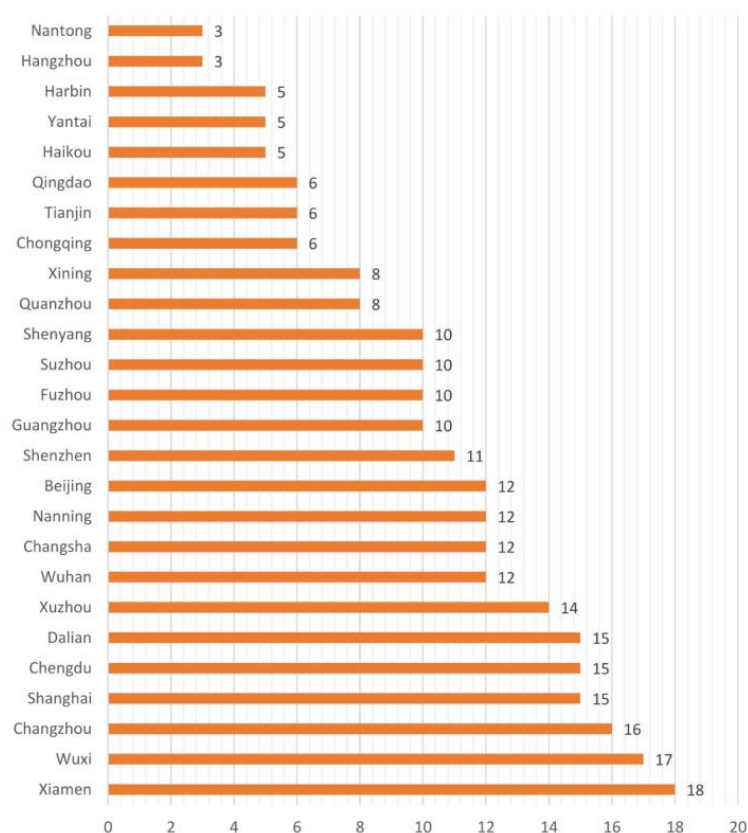
Resilience Vision Category	Number of Cities	Percentage
High safety level	23	88.46%
Robust infrastructure	20	76.92%
Convenient transportation	7	26.92%
Green and low-carbon development	6	23.07%
Smart and intelligent development	5	19.23%
Efficient emergency management	4	15.38%
Flexible spatial arrangement	1	3.85%
Strong social cohesion	1	3.85%

Three findings are noteworthy here. First, an overwhelming majority of 23 cities and 20 cities, respectively, acknowledged “high safety level” and “robust infrastructure”. This outcome shows the steadfast belief among Chinese planning administrators that improving the structural soundness and functionality of vital infrastructure could keep cities safe. Resilience planning is therefore viewed as a natural continuation of China’s traditional integrated disaster prevention and mitigation planning. Second, four to seven cities noted “efficient emergency management”, “smart and intelligent development”, “green and low-carbon development”, and “convenient transportation” in their resilience visions. These visions are presented as the response to the requirements of fine-grained urban planning and governance against the backdrop of the new urbanization stage in China. Including these agendas into a general framework of urban resilience building greatly expands the scope of resilience, which marks a shift away from old-fashioned thinking. Third, notwithstanding the progress made in the previous point, it is still uncommon for targeted plans to propose “flexible spatial arrangement” and “strong social cohesion”. Such concerns were only expressed in the plans of Xuzhou and Chengdu. The emerging scholarly debates on resilient urban forms and the social component of resilience have not influenced Chinese planning practice. It will take more time to operationalize the full spectrum of urban resilience.

#### 4.2. Resilience Actions

Resilience actions are specific strategies, goals, and measures that enable the fulfillment of resilience visions. An examination of resilience actions revealed how urban resilience is operationalized in territorial plans. We were especially interested in how these actions were distributed by city and by category.

A city was more likely to include more resilience actions in its comprehensive territorial plan when it gave urban resilience more attention. We located 264 resilience actions in all 26 plans, or 10.15 resilience actions per city. This result suggests a relatively high understanding of resilience in plan content. Changzhou (16 actions), Wuxi (17 actions), and Xiamen (18 actions) were the cities with the largest numbers of resilience actions, while Nantong (3 actions) and Hangzhou (3 actions) had the smallest numbers of resilience actions in their plans (Figure 4).



**Figure 4.** Number of resilience actions by city.

Resilience actions were gathered into four categories: infrastructure/facilities, safety/security, protection/mitigation, and management/governance. The results show that planners are more likely to associate resilience actions with the former two categories, as 24 cities offered 166 resilience actions on infrastructure/facilities and 25 cities propose 99 resilience actions on safety/security. In contrast, only 38 and 29 resilience actions, respectively, were recommended by the 20 cities that valued protection/mitigation and the 12 cities that valued management/governance (Figure 5).



**Figure 5.** Number of resilience actions by category.

#### 4.2.1. Category of Infrastructure/Facilities

Actions in this category seek to build stronger infrastructure and public facilities that can withstand external shocks and be restored quickly after a disastrous impact. The findings demonstrate that resilience-related actions clustered around six themes, including lifeline systems, smart communications, shelter spaces, facility upgrades, underground spaces, and military facilities (Table 3).

**Table 3.** Resilience actions on infrastructure/facilities.

Theme		Number of Cities	Percentage of All Targeted Cities	Number of Actions	Percentage of All Actions in the Category
1	Lifeline systems	22	84.62%	120	72.28%
2	Smart communications	17	65.38%	28	16.87%
3	Shelter spaces and evacuation	8	30.77%	9	5.42%
4	Facility upgrades and integration	5	19.23%	5	3.01%
5	Underground spaces	1	3.85%	3	1.81%
6	Military facilities	1	3.85%	1	0.60%
Infrastructure/facilities total		24	92.31%	166	100.00%

The lifeline system is strongly related to the basic functioning of cities and the fulfillment of essential survival needs. As a result, it formed the basis of the vast majority of resilience actions, with 22 cities (or 84.62%) proposing 120 activities. With 17 cities and 28 actions, the next theme was smart communications, which reflects a growing national tendency to use novel tools like artificial intelligence and fifth-generation mobile communication technology to increase the reliability and interconnectedness of communications. Furthermore, 8 cities proposed 9 actions on improving shelters and evacuation facilities to better prepare for emergencies and disastrous events. Finally, 5 cities made a point of modernizing their aging and deteriorating infrastructure and integrating various facility systems.

We also found a few intriguing themes. For example, Xuzhou's plan was quite innovative in that it stressed the resilience of underground spaces. Given its significance in political standing and national defense, Beijing decided to incorporate the resilience principle into its military facilities in its comprehensive territorial plan.

When the main theme of lifeline systems was examined more closely, it could be further divided into five facets: energy systems, water supply and drainage systems, medical systems, transportation systems, and the integrated enhancement of different systems (Table 4). The results indicate that the energy system was the facet with which territorial plans were most concerned. A total of 42 specific actions, including securing gas

and electricity supplies and restructuring the energy mix, were proposed by 19 cities. By promoting the adoption of sustainable energy sources like wind, solar, and biomass energy, six cities—Chengdu, Guangzhou, Nantong, Xiamen, Shenzhen, and Wuhan—proposed enhancement of their energy security. The construction of an extensive, effective, and environmentally friendly drainage system, as well as increasing the capacity of sewage treatment facilities, were the main goals related to resilient water supply and drainage systems. Building resilient healthcare systems placed a strong emphasis on distributing medical resources equally among urban and rural areas and modernizing facilities to better handle public health emergencies. By sustaining the efficient movement of people and products to support urban functioning and by providing evacuation and rescue spaces in case of emergency, the transportation system also played a crucial role in plans to foster urban resilience. When developing resilience actions, a wide range of important topics were brought up, including road networks, railroads, logistics, aviation, parking, slow transportation modes, and transportation hubs. To increase the general effectiveness and service level of public transportation systems and to lower logistical costs, several cities emphasized the construction of comprehensive passenger transportation hubs and freight handling centers. Additionally, five cities proposed integrating and coordinating the operation of different lifeline systems.

**Table 4.** Resilience actions on lifeline systems.

Theme	Number of Cities	Percentage of All Targeted Cities	Number of Actions	Percentage of All Actions in the Category
1 Energy systems	19	73.08%	42	35.00%
2 Water supply and drainage systems	17	65.38%	26	21.67%
3 Medical systems	8	30.77%	8	6.67%
4 Transportation systems	8	30.77%	38	31.67%
5 Integration and coordination between different systems	5	19.23%	6	5.00%
Lifeline systems total	22	84.62%	120	100.00%

#### 4.2.2. Category of Safety/Security

Resilience actions within this category were developed in response to specific risks and disastrous events, including natural disasters caused by extreme weather and geological hazards, manmade disasters such as terrorist attacks, and sudden outbreaks such as fires, chemical leaks, and public health issues (Table 5). The most notable subject was how to respond to extreme weather, for which 18 cities proposed 35 resilience actions. A majority of city plans made considerable efforts to manage extreme rainfall and water-related hazards. Common practices included retaining rainwater runoff, mitigating flooding, enhancing drainage basin capacity, installing coastal protection measures, and building sponge cities. The theme of preventing integrated hazards and risks followed, as 14 cities suggested adopting systematic thinking and enhancing overall resilience against different disaster risks. Ten cities proposed resilience actions to deal with earthquakes and other geological disasters. Given the rising impact of epidemics in recent years, 10 cities put forward actions on public health events. In addition, several themes, including fire protection, civil air defense, management of hazardous chemicals, counterterrorism, and national defense, were less emphasized in territorial plans.

**Table 5.** Resilience actions on safety/security.

Theme	Number of Cities	Percentage of All Targeted Cities	Number of Actions	Percentage of All Actions in the Category
1 Extreme weather	18	69.23%	35	36.08%
2 Integrated hazards and risks	14	53.85%	17	17.53%
3 Earthquakes and geological disasters	10	38.46%	14	14.43%
4 Public health events	10	38.46%	10	10.31%
5 Fires	9	34.61%	10	10.31%
6 Air strikes	6	23.08%	6	6.19%
7 Chemical leaks	3	11.54%	3	3.09%
8 Terrorist attacks	1	3.85%	1	1.03%
9 National security threats	1	3.85%	1	1.03%
Safety/security total	25	96.15%	97	100.00%

The emphasis of resilience actions was typically placed on natural catastrophes as opposed to manmade ones, disasters with a track record as opposed to unexpected ones, and more frequent disasters as opposed to sporadic ones. The majority of resilience measures were suggested based on the city's experience of disasters. For instance, Chengdu's proximity to the Longmenshan fault zone puts it in danger of earthquakes and other geological hazards; therefore, the city's plan detailed pertinent resilience actions, such as raising the seismic performance of buildings and avoiding construction in locations with frequent geological hazards. Yantai, which has historically experienced multiple mega-storm surges, has taken specific measures like fortifying seawalls to protect coastal development and planting shelterbelt woods to stop coastal erosion.

#### 4.2.3. Category of Protection/Mitigation

Protection and mitigation have become a priority due to the rising awareness of global climate change. Cities are unable to function without consuming various forms of energy and producing pollutants, which imposes substantial pressure on the carrying capacity of their environs. Urban resilience is frequently utilized as tool in a policy discourse on challenges related to climate change in addition to dealing with natural disasters. Environmental protection is further connected to the idea of resilient city building given China's carbon peaking and carbon neutrality targets. A considerable number of cities have begun to integrate environmental protection and mitigation measures into their comprehensive territorial plans. Four themes particularly stood out in this category: improving sanitary conditions, strengthening solid waste disposal, achieving low-carbon development and a green transition, and protecting the natural and ecological environment (Table 6).

**Table 6.** Resilience actions on protection/mitigation.

Theme	Number of Cities	Percentage of All Targeted Cities	Number of Actions	Percentage of All Actions in the Category
1 Sanitation	9	34.62%	9	23.68%
2 Solid waste disposal	8	30.77%	8	21.05%
3 Green and low-carbon development	8	30.77%	10	26.32%
4 Natural conservation and ecological environment protection	6	23.08%	11	28.95%
Protection/mitigation total	20	76.92%	38	100.00%

Compared with themes in other categories, the themes in this category were more evenly distributed in terms of cities and actions. With eight cities proposing 10 actions, the theme of green and low-carbon development was given priority. Two distinct measures were used. To reduce greenhouse gas and pollutant emissions and promote a healthy urban lifestyle, plans first aimed to optimize the energy structure, encourage green travel

modes, and build public transportation systems. Plans also encouraged the reforestation of degraded mountains and restoration of grasslands and ecological systems to improve the overall effectiveness of natural carbon sinks. Eleven actions were suggested by six cities for the protection of the freshwater, marine, soil, and atmospheric environments. This theme placed the most emphasis on the freshwater environment. Specific measures included optimizing the structure of urban water usage, controlling total water usage, improving the connection of water channel networks, and enhancing the quality of water bodies. In addition, nine cities proposed nine actions to improve urban sanitation, and eight cities proposed eight actions on solid waste disposal. Detailed actions included advocating garbage sorting, building sanitation facilities, fostering the solid waste recycling economy, and promoting zero-waste cities.

#### 4.2.4. Category of Management/Governance

The category of management/governance was emerging in comprehensive territorial plans. Although a rising number of cities have acknowledged the significance of incorporating more social aspects in achieving urban resilience, most actions are typically administered top-down by local governments. This category contained four themes: emergency management, risk identification and disaster early warning, intersectoral and inter-territorial coordination, and long-term dynamic risk control (Table 7).

**Table 7.** Resilience actions on management/governance.

Theme	Number of Cities	Percentage of All Targeted Cities	Number of Actions	Percentage of All Actions in the Category
1 Emergency management	12	46.15%	20	68.97%
2 Risk identification and disaster early-warning	4	15.38%	5	17.24%
3 Intersectoral and inter-territorial coordination	3	11.54%	3	10.34%
4 Long-term dynamic risk control	1	3.85%	1	3.45%
Management/governance total	12	46.15%	29	100.00%

First, 12 cities (46.15%) put focus on enhancing governmental organizations' capabilities for emergency management and suggested 20 actions. These actions were mainly twofold. On the one hand, they stressed stockpiling emergency supplies, providing and maintaining refuge spaces, and optimizing contingency command systems. On the other hand, actions highlighted the creation of a full-coverage rescue management unit based on urban community grids, which is a component of a larger endeavor of building 15 min community life cycles. Second, four cities (15.38%) proposed five actions on risk identification and disaster early warning. Actions included strengthening risk monitoring and analysis, expanding channels of disaster warning, and preparing special urban public safety plans. Third, three cities brought up the topic of intersectoral and inter-territorial coordination, to reduce the silo effect and enhance the effectiveness of information sharing and the ability to take collaborative actions across various entities. Fourth, just one city—Chengdu—proposed giving long-term dynamic risk control more consideration in its plan. The city defines urban risks as ever-evolving phenomena and has developed dynamic solutions to address different stages of risks. Its territorial plan also specifies the duties of different departments and provides a more thorough analysis of urban risks resulting from both the natural and social environments.

## 5. Conclusions

### 5.1. Rationale for and Contribution of This Research

The agglomeration effect of urbanization fosters economies of scale and offers a wealth of amenities and jobs that draw people from distant locations. On the other hand, as cities expand, the complexity of urban systems and the connections between them increases,

making it more challenging to respond to sudden shocks and slow burns that pose a threat to the future of cities. Cities all over the world are becoming key locations for resilience building as a result of increased risks and their uncertain results. Building a resilient urban environment requires careful spatial planning [3,21,30].

In light of the drawbacks caused by decades of rapid and haphazard urban growth, China's 14th Five-Year Plan starts to accentuate the resilience theme and establishes crucial guidelines for creating fine-grained urban plans to enhance the overall resilience of cities. Taking the opportunity of the recent territorial planning system reform, China is attempting to integrate the resilience idea into the development of new territorial plans. Although resilience is frequently mentioned in spatial plans, different policymakers and planners understand it differently, which may cause confusion when these plans are delivered and compared [11]. This paper is innovative in that it presents one of the first studies to examine resilience thinking in the city-level comprehensive territorial plans to see how resilience is defined and operationalized in the new spatial planning system. Theoretically, it reviews the spatial planning approach to building urban resilience in works from the international academic community, highlighting an evolutionary perspective. It also contributes to the theorization of Chinese resilience understanding and efforts. Practically, it informs better planning for spatial resilience in China by identifying the gap between necessity and reality and comparing the merits and demerits of different plans.

## 5.2. Summary of Main Findings

The fact that all major cities with completed plans can address the issue of making their cities more resilient in some manner or another suggests that authorities and plan-makers have a positive mindset toward resilience. This is in sharp contrast to just a few years ago, when resilience-related expressions were rarely found in urban plans. In this study, both resilience visions and resilience measures were examined.

In terms of their visions, a valuable research finding is that the positioning of resilient cities in China is beginning to incorporate very diverse connotations and move beyond the traditional area of disaster prevention and risk mitigation. Dozens of cities are beginning to incorporate broader goals such as efficient transportation, green and low-carbon development, and smart cities into the grand resilient city blueprint in addition to maintaining their focus on urban safety and infrastructure support. This discovery demonstrates that Chinese urban administrators and planners view urban resilience as being highly malleable in response to contemporary societal changes. Furthermore, it shows that more Chinese cities are moving away from an engineering interpretation of resilience and toward an ecological perspective, which supports compatibility and adaptability for a better regime under the influence of unknown threats.

Resilience actions in city-level comprehensive territorial plans fell into four categories: infrastructure and facilities, safety and security, protection and mitigation, and management and governance. The former two categories received substantially more attention than the latter two. This demonstrates that engineering resilience thinking is pervasive in resilience building even as ecological resilience gains attention. This may be partially explained by the fact that in China, planners and technocrats with expertise in disaster prevention and risk mitigation have led the national resilience conversation. Additionally, a noteworthy trend is that an increasing number of Chinese cities are attempting to address contemporary global issues in their resilience discourses, such as meeting carbon emission targets and adapting to climate change. Current resilience planning actions are more willing to consider the impact of long-term pressure on urban development and take forestalling measures than previous efforts, which were primarily focused on preventing the occurrence or containing the impact of potential natural disasters on the urban environment.

There are some potential limitations to this study. Since a large number of city-level territorial plans are still in the process of development, our above findings and discussions are based on those cities that have already issued their territorial plans into the public domain. In addition, because we did not have access to complementary documents

and planning analysis documents, it was difficult for us to interpret reasons why these cities have preferred certain resilience visions and actions over others. Nevertheless, by interpreting the resilience concept in existing territorial plans of major cities, we can gain a glimpse of how resilience is understood in China's spatial planning system. In future research, we expect to focus on one or more case studies after obtaining detailed complementary documents and conduct semi-structured interviews with plan makers to fully investigate the motivations behind the resilience ideas in territorial plans.

### 5.3. Policy Implications

While the resilience agenda continues to gain prominence in comprehensive territorial plans, spatial planning in China can better foster resilience building by considering the following policy implications.

First, planners are recommended to explore operational procedures, planning techniques, and spatial resilience strategies within the framework of territorial planning. Although comprehensive plans give attention to resilience objectives and goals in their language, these contents are mostly crude and conceptual, lacking specifics on how territorial regulation, land use, building retrofitting, urban design, and urban renewal initiatives can strengthen urban spatial resilience. Moreover, the current resilience-oriented planning procedures, which usually include risk assessment, uncertainty-oriented planning, plan implementation, monitoring, and plan adjustment and amendment, are not sufficiently systematic and clear to inform practice. It is therefore recommended that detailed and specialized territorial plans clearly address these issues. The result could be the formulation of legally binding spatial resilience strategies for individual cities, absorbing the experience of successful precedents such as the Netherlands and Japan [52].

Second, planners are encouraged to examine broader issues of social and economic resilience in support of resilience provisions in spatial plans. The current understanding of resilience as seen from comprehensive territorial plans neglects broader and more far-reaching social and economic aspects, such as planning for more equitable resilience [38]. The resilience of social and economic constituents and linkages are integral parts of a complete resilience concept, apart from the much-emphasized infrastructure resilience. Judging from the examined plans, major cities in China still rule out the resilience of these intangible urban elements at this stage, while in many developed economies, social and economic resilience occupies an important place in preparing urban spatial plans [3]. Therefore, there is still much work to be done before planning in China recognizes full-spectrum resilience.

Third, it is recommended that the planning process encourages multi-stakeholder collaboration and grassroots participation. Resilience is portrayed as something that is managed and controlled rather than something that is negotiated and governed, as the achievement of resilience goals appears to be largely top-down from the perspective of plan makers. In forming the resilience content in spatial plans, bottom-up and participatory approaches can make greater contributions. Planners in China are therefore advised to make clever use of community knowledge and crowdsourcing of volunteered geographic information [15] and to combine pluralistic governance approaches when refining spatial resilience initiatives.

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