Institutional Textual Analysis of Resilient City Development in Hubei Province Using Nvivo Software

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Abstract: Against the backdrop of frequent extreme weather and escalating urban safety risks, advancing resilient city construction has become a core initiative for improving urban safety governance and achieving high-quality development. Located in the middle reaches of the Yangtze River, Hubei Province features intricate river networks and mountainous terrain, making it vulnerable to compound natural disasters including flooding and landslides, which underscores the urgent need for resilient city development. This study selects 98 institutional documents concerning resilient cities issued by Hubei provincial authorities and its 12 prefecture-level cities. Grounded in the Rothwell-Zegveld three-dimensional institutional tool theory, a two-dimensional analytical framework consisting of institutional tools and planning contents is established. Using Nvivo software, this paper conducts word frequency mining, hierarchical coding, and data statistics. Integrating quantitative coding with qualitative interpretation, systematic analysis is carried out from four dimensions: institutional tool structure, planning content layout, inter-city differences, and tool-content coupling. Results indicate that Hubei's resilient city institutions exhibit prominent structural problems. Environmental tools are overused, supply-side tools are internally unbalanced, and demand-side tools are nearly absent. Planning contents excessively focus on infrastructure resilience, while social governance and industrial-economic resilience remain inadequate. Affected by location, disaster types, and economic levels, institutional differentiation across cities is significant, with notable mismatch between tools and contents. Based on empirical findings, this paper proposes optimization approaches including balancing institutional tools, addressing planning shortcomings, coordinating regional development, and strengthening tool-content coupling, to improve Hubei's institutional system and provide references for other central provinces facing similar disaster risks.

Keywords: Resilient City; Textual Analysis; Nvivo; Hubei Province

1. Introduction

Against the backdrop of global climate change, extreme meteorological disasters have become increasingly frequent. Compound safety risks such as urban waterlogging, mountain geological hazards, and damage to municipal infrastructure have taken on normalized characteristics. The traditional passive disaster prevention system, which primarily focuses on post-event response, has become inadequate for addressing the complex demands of modern urban comprehensive safety governance. In this context, resilient city theory has gradually emerged as a core research direction and practical pathway in the field of urban safety governance [1]. In 2024, a national-level policy document was issued to coordinate the development of new urban infrastructure and enhance urban resilience, explicitly articulating core implementation requirements for full-cycle risk prevention and multi-stakeholder collaborative governance [2]. With the comprehensive implementation of the national territory spatial planning system, resilience-related concepts have continued to permeate spatial planning at various administrative levels, serving as an important operational tool for integrating territorial space management with urban safety risk prevention efforts [3].

Hubei Province is situated in the core hinterland of the Yangtze River Economic Belt and exhibits significant regional differentiation in

natural geographical conditions. The Jianghan Plain features dense river and lake networks with prominent flood disaster risks, while the mountainous and hilly areas in western and eastern Hubei have complex geological structures prone to landslides and collapses. The province simultaneously faces multiple safety hazards including floods, geological disasters, and aging municipal facility failures, placing considerable pressure on comprehensive disaster prevention and safety management. Following the issuance of national-level resilience policy guidelines, the Hubei provincial government, in conjunction with multiple functional departments including the Department of Housing and Urban-Rural Development, the Department of Emergency Management, and the Department of Natural Resources, has released provincial-level implementation documents. Meanwhile, 12 prefecture-level cities including Wuhan, Xiangyang, and Yichang have successively issued special plans, implementation rules, and work programs based on their local disaster profiles, urban development scales, and construction conditions. A total of 98 valid policy texts have been accumulated, establishing a two-tier provincial-city resilient city governance framework. Although the provincial policy system has been essentially established, numerous practical shortcomings remain in top-down policy transmission, grassroots implementation, and cross-regional collaborative prevention, necessitating quantitative policy text analysis to identify underlying causes.

Current domestic academic research has developed a mature paradigm for qualitative-quantitative policy text analysis using Nvivo software combined with three-dimensional policy tool models, which has been widely applied in territorial spatial planning, rural grassroots governance, and urban emergency management [4]. Reviewing existing resilience-related literature reveals that most empirical studies select economically developed eastern cities or single cities as case studies, while large-sample quantitative analyses covering multiple cities in central high-risk provinces remain relatively scarce [5]. Focusing on Hubei Province, existing studies have predominantly concentrated on engineering disaster prevention technologies and regional disaster risk assessments, lacking systematic review and quantitative evaluation of multi-level resilient city policy texts. To address these practical policy gaps and academic research deficiencies, this paper adopts the established analytical framework used in territorial spatial and urban governance policy studies, conducting coding and quantitative analysis on 98 provincial resilience policy texts. This approach can fill the research gap in comprehensive resilience policy analysis for central provinces while providing empirical evidence and theoretical support for subsequent optimization of resilience policies in Hubei.

2. Literature Review and Research Framework

2.1 Theoretical Significance

This study applies the classical Rothwell-Zegveld policy tool model to the resilient city policy context of a central province, extending the theoretical application boundary in the field of urban safety governance [6]. Using 98 provincial and municipal policy texts as samples, combined with Nvivo software for full-process coding analysis, this research enriches the case library of qualitative software applications in regional policy studies. By comparing policy differences among cities with varying disaster types and development levels, this paper summarizes the common patterns and regional characteristics of resilience policies in central China, providing analytical paradigms and theoretical references for subsequent regional policy comparison studies [7].

2.2 Practical Significance

Based on coding data, this paper accurately identifies practical problems in Hubei's resilience policies regarding tool selection, content layout, and regional coordination. The research conclusions can provide quantitative evidence for provincial and municipal governments to revise policies, adjust financial investment, and optimize project layouts. Furthermore, this study helps cities avoid policy homogenization and implementation disconnection, optimize local regulations based on regional disaster characteristics, comprehensively improve the effectiveness of resilient city construction across the province, and strengthen regional safety defenses.

2.3 International Research Status

Rothwell and Zegveld's three-dimensional

classification of supply-side, demand-side, and environmental policy tools represents a mainstream framework in international public policy analysis and has been extensively applied in urban disaster prevention and resilience governance [8]. International resilience policies generally emphasize the application of demand-side tools, actively guiding social organizations, market capital, and public participation in governance to establish a diversified collaborative framework. In terms of planning content, international scholarship has developed five mature classification systems covering engineering, spatial, social, economic, and governance dimensions, with policies balancing hardware infrastructure and soft services to achieve more balanced content distribution [9].

2.4 Domestic Research Status

Since the introduction of the resilient city concept in China, related research has diverged into three main directions: practical investigation, evaluation systems, and policy text analysis. Scholars such as Huang Cui pioneered the combination of Nvivo with policy tools for quantitative text analysis, which has now become a common method in planning policy research [1]. Zhu Xinru et al., analyzing village planning policies across 31 provinces, further confirmed these characteristics and found significant regional differences in policy content [3]. Focusing on the resilience domain, Lin Xue, through discourse analysis, identified a general tendency in domestic resilience policies toward "emphasizing engineering while neglecting comprehensive governance" [5].In addition, the systematic research on content analysis methodology conducted by Qiu and Zou provides theoretical support for the methodological choices of this paper [10]. Currently, large-sample quantitative research on resilience policies covering multiple cities across Hubei Province remains limited; this paper effectively addresses this research gap.

2.5 Research Content and Approach

2.5.1 Research Content

This paper takes 98 resilient city policy texts from Hubei Province and 12 prefecture-level cities as research objects. The core content is divided into four parts. First, a two-dimensional analytical framework of policy tools and resilience planning content is constructed, defining coding categories at all levels. Second, Nvivo software is employed for text preprocessing, word frequency analysis, hierarchical coding, and data statistics. Third, based on coding data, four major characteristics are sequentially analyzed: policy tools, planning content, inter-city differences, and tool-content coupling. Fourth, existing problems are summarized and targeted optimization pathways are proposed.

2.5.2 Research Approach

First, 98 policy texts are screened and organized according to principles of authority, validity, and relevance. Second, a two-dimensional coding framework is constructed based on classical theories. Third, Nvivo is used for coding, statistics, and matrix analysis. Finally, comprehensive analysis is conducted by integrating quantitative data with textual content to identify problems and propose countermeasures. A coding example Table 1 is provided below to illustrate the specific coding process.

Table 1. Examples of Policy Coding

Coding Content	Source Text	Coding Sub-Node	Specific Type
Article 72: Cultivate three major industrial clusters – metallurgical new materials, advanced steel, advanced copper-based materials, aluminum alloys, and new building materials	Huangshi Territorial Spatial Master Plan	Industrial Carrier Supply	Supply-Side
Ecological environment governance – air pollution prevention and control, water environment governance, pollutant emission control, full sewage network coverage, elimination of urban black-odor water bodies, and waste sorting management	Jingmen Urban Quality Improvement Action Plan (2022–2025)	Ecological Resource Supply	Supply-Side
Improve public service facilities – education, elderly care, convenience stores, markets; 15-minute neighborhood centers; sports and cultural facilities; 500m green space coverage; medical and emergency services with 10-minute / 12-minute emergency response circles	Wuhan High-Standard Planning System Work Plan	Infrastructure Support System	Planning Content
Article 12: Green development strategy – ecological priority, green transition; territorial pattern optimization; land use structure adjustment; water and energy consumption control	Xiangyang Territorial Spatial Master Plan (2021–2035)	Ecological Restoration & Comprehensive Territorial Improvement	Planning Content

2.6 Research Methods

Content analysis method: Following standard content analysis procedures, using sentences as the basic analytical unit, qualitative text is converted into quantitative data to objectively

describe policy structure and orientation [11].

Qualitative research method (Nvivo software analysis): Using the software for word frequency analysis, node construction, text coding, and matrix analysis to achieve integration of qualitative interpretation and quantitative statistics [12].

Comparative research method: Horizontally comparing policy differences among 12 prefecture-level cities, vertically comparing provincial-municipal policy articulation characteristics, and analyzing differentiated causes in combination with location and disaster types.

3. Research Design

3.1 Research Objects and Data Sources

This study's sample includes provincial-level policies from Hubei and resilient city policy texts from 12 prefecture-level cities including Wuhan, Xiangyang, Yichang, Jingzhou, Huanggang, Xiaogan, Ezhou, Huangshi, Shiyan, Jingmen, Xianning, and Suizhou, totaling 98 documents. The sample covers various city types including riverine plains, western mountainous areas, and eastern industrial-mining regions, providing sufficient regional representativeness. Text selection follows four principles. The issuing bodies are provincial and municipal governments along with competent departments such as housing and urban-rural development, emergency management, and water resources. The content relates to resilient cities, disaster prevention and reduction, flood control and drainage, and emergency management. Currently valid documents are selected, excluding draft versions, meeting minutes, and other informal texts. The documents encompass plans, programs, guidelines, and assessment methods. All texts were downloaded from Hubei provincial and municipal government affairs disclosure platforms and departmental websites, retrieved and deduplicated using keywords including "resilient city," "urban disaster prevention," and "flood control and drainage," ensuring reliable data sources.

3.2 Two-Dimensional Analytical Framework Construction

This paper combines the Rothwell-Zegveld policy tool theory with domestic general classifications for resilience planning to establish a two-dimensional coding framework serving as the core basis for Nvivo coding.

3.2.1 X-Dimension: Three-Dimensional Policy Tools

Environmental policy tools: Indirect guidance tools, including target planning, regulatory control, strategic measures, organizational leadership, and monitoring and assessment, creating policy implementation environments through institutional and regulatory frameworks.

Supply-side policy tools: Direct promotion tools, including financial investment, talent cultivation, infrastructure, information technology, public services, and personnel-material support, supporting construction through resource inputs.

Demand-side policy tools: External pull tools, including social participation, exchange and cooperation, pilot demonstrations, and service outsourcing, activating the participation vitality of diverse stakeholders.

3.2.2 Y-Dimension: Five Resilience Planning Content Categories

Based on Hubei's disaster characteristics, planning content is divided into five categories. Engineering facility resilience covers lifeline engineering, flood control and drainage, and emergency shelter facilities. Spatial-ecological resilience includes blue-green spaces, ecological buffer zones, and disaster prevention reserved areas. Social governance resilience focuses on community emergency response, disaster prevention education, and social organization cultivation. Economic-industrial resilience involves industrial disaster prevention, disaster relief, and disaster prevention industry support. Risk management resilience includes risk investigation, monitoring and early warning, emergency plans, and post-disaster reconstruction.

3.3 Nvivo Coding Implementation Process

The first step is text preprocessing, unifying formats and importing into Nvivo, cleaning invalid content, and using word frequency functions to extract core keywords. The second step is hierarchical node construction, setting primary and secondary nodes according to the two-dimensional framework to form a standardized coding directory. The third step is item-by-item coding, using minimal sentence units for multiple coding to ensure complete information. The fourth step summarizes all coding data and conducts matrix cross-analysis. The fifth step adopts a dual-person coding review mode to validate data and correct

deviations, ensuring coding reliability [13].

4. Policy Foundation Analysis Based on Coding Data

Full coding was completed for 98 policy texts. Multi-dimensional analysis was conducted based on total coding volume, internal structure, and regional distribution to systematically review the overall characteristics of Hubei's resilient city policies.

Using Nvivo word frequency statistics, all policy texts were analyzed with word clouds generated. Results show that high-frequency words concentrate on city, construction, protection, implementation, governance, infrastructure, emergency, risk, ecology, and planning. These high-frequency terms reflect that Hubei's resilience policies focus on urban development as the carrier, ecological protection and environmental governance as the foundation, infrastructure improvement, risk prevention, and emergency capacity building as key priorities, and various planning documents as the means to comprehensively promote resilience enhancement, closely aligning with resilience's core connotations of risk resistance, comprehensive support, and long-term governance.

4.1 Overall Policy Tool Dimension Analysis

As shown by the overall coding data in Table 2, the proportions of the three types of institutional tools used in Hubei's resilient city institutions are severely imbalanced, which is consistent with the general characteristics of domestic planning institutions [10]. Environmental policy tools dominate in coding volume, followed by supply-side tools, with demand-side tools having the fewest codes. This indicates that Hubei's resilience construction relies mainly on indirect government administrative forces, with insufficient resource support and limited market and social pull effects.

4.1.1 Internal Characteristics of Environmental Policy Tools

Environmental tools exhibit significant internal differences, with strategic measures having the most codes, indicating that provincial and municipal policies primarily consist of various implementation plans and macro-level deployments. Texts tend toward directional guidance, lacking detailed implementation rules and practical operational methods, which may lead to inconsistent enforcement standards and excessive flexibility [7]. Regulatory control and monitoring-assessment codes are at moderate levels, reflecting attention to rule-building and implementation supervision through institutional constraints. Target planning content is concentrated in provincial documents, with most cities directly adopting provincial targets and fewer developing personalized phased objectives based on local risks. Organizational leadership has the fewest codes, with cross-departmental authority allocation and collaborative mechanism provisions being scarce, potentially causing implementation fragmentation

Table 2. Coding of Policy Tools

Policy Tool Category	Coding Count	Total	Percentage
Environmental		1020	61.78%
Infrastructure & Hardware Resources	518		
Factors, Capital & Investment-Financing	233		
Public Facilities & Public Services	192		
Coordinated Management	77		
Supply-Side		584	35.37%
Regulatory Control	136		
Monitoring & Assessment	103		
Target Planning	218		
Strategic Measures	250		
Fiscal & Tax Incentives	76		
Demand-Side		47	2.85%
Exchange & Cooperation	15		
Procurement	20		
Service Outsourcing	8		
Demonstration Projects	8		

4.1.2 Internal Characteristics of Supply-Side Policy Tools

Supply-side tools have relatively low overall usage frequency, showing a structural problem of "emphasizing hardware while neglecting software." Infrastructure-related codes are most numerous, consistent with Hubei's flood and geological disaster risks, with policies prioritizing engineering facilities such as pipe networks, embankments, and emergency shelters. Information technology and public service codes decrease sequentially, with smart disaster prevention concentrated in central cities and uneven coverage across prefecture-level cities. Financial investment provisions remain general, lacking detailed special fiscal and investment-financing mechanisms. Personnel-material support lacks differentiated allocation plans. Talent cultivation has the lowest supply-side codes, with severe

deficiencies in policies for attracting, developing, and incentivizing professionals in disaster prevention technology, emergency management, and resilience planning, representing a long-term development weakness [14].

4.1.3 Internal Characteristics of Demand-Side Policy Tools

Demand-side tools are generally marginalized, with all four subcategories at very low levels, reflecting that Hubei's resilience construction remains government-led. Social participation has relatively more codes but is limited to basic planning disclosure and public consultation, with few policies for deep public involvement in emergency drills and community disaster prevention. Exchange and cooperation mainly involve departmental and regional joint prevention, with minimal government-enterprise collaboration content. Pilot demonstrations and service outsourcing have extremely low code volumes, with nearly no supporting policies for resilience pilots or market-based operations and maintenance, making it difficult to leverage market forces to share government burdens and resulting in poor construction model sustainability.

4.2 Overall Planning Content Dimension Analysis

Five planning content categories show clear hierarchical differentiation in Table 3, with overall characteristics of "emphasizing hardware engineering while neglecting soft governance." Engineering facility resilience codes lead significantly, risk management resilience and spatial-ecological resilience are at moderate levels, while social governance resilience and economic-industrial resilience are substantially lower, representing policy weaknesses.

Table 3. Coding of Planning Content

Planning Content Category	Coding Count	Percentage
Development & Protection Pattern	286	18.30%
Resource Element Protection & Utilization	363	23.24%
Infrastructure Support System	352	22.54%
Ecological Restoration & Territorial Improvement	243	15.56%
Regional Coordination & Planning Transmission	318	20.36%

Engineering facility resilience is the policy core province-wide. Riverine cities focus on flood control, drainage, and river management; mountainous cities emphasize slope support and road disaster prevention; central cities promote aging pipeline and fire facility renovation. Content is detailed, though some cities show project homogenization. Risk management resilience ranks second, with provincial-level unified risk survey and emergency plan frameworks supplemented by city-specific early warning content, but forward-looking elements such as dynamic disaster assessment and scenario simulation are insufficient. Spatial-ecological resilience shows significant regional variation, with riverine cities emphasizing ecological regulatory spaces such as Yangtze shorelines and wetlands, while smaller inland cities only implement provincial minimum requirements with limited innovative content including disaster prevention reserved spaces and dual-use facilities [3].

Social governance resilience has fewer codes, with existing content limited to community stations and basic education, lacking detailed provisions for social organization cultivation and regular training, resulting in weak grassroots disaster prevention capacity. Economic-industrial resilience has the fewest codes among the five categories, only sporadically addressing industrial park safety management, with nearly no policies for small-medium enterprise relief, agricultural protection, or disaster prevention industry chains. As a major industrial and agricultural province, Hubei's industrial risk resistance lacks institutional safeguards, creating vulnerabilities in the comprehensive safety system.

4.3 Differentiated Analysis of 12 Prefecture-Level City Policies

Based on the total coding volume, tool structure, and content emphasis in Table 4, the 12 cities can be divided into three categories with distinct regional characteristics. The first category includes the three central cities of Wuhan, Xiangyang, and Yichang, with large policy text and coding volumes, relatively balanced tool ratios, significantly more supply-side codes for funding, technology, and talent than other cities, full coverage of all five planning content categories with differentiated emphases aligned with city positioning, and the highest policy sophistication.

The second category includes riverine plain cities such as Jingzhou, Huanggang, and Xiaogan, primarily facing flood disasters. These policies heavily depend on environmental tools

and infrastructure-related supply tools, with demand-side tools essentially absent. Planning content concentrates on engineering facilities and spatial-ecological resilience, with social and industrial content largely omitted, resulting in strong targeted focus but narrow coverage.

Table 4. Resilient City Construction Priorities in Hubei Province and Its 12 Prefecture-Level Cities

No.	City	Core Positioning	Core Construction Directions	Period
1	Hubei Province	Full-dimensional resilient system integrating urban renewal, infrastructure, climate response, territorial governance, and beautiful city development	Underground infrastructure; urbanization and human settlements; urban renewal; climate resilience; infrastructure lifecycle management; equipment upgrading; territorial spatial resilience; beautiful city development	2021.4–2026.4
2	Wuhan	Post-pandemic mega-city resilience system with dual-use facilities, full-cycle governance, and multi-dimensional resilience	Post-pandemic recovery; territorial spatial resilience; smart governance center; natural disaster relief; dual-use infrastructure; sponge city development; urban renewal regulations; long-term resilience planning	2020.9–2026.4
3	Huangshi	Resource-based city transition resilient system centered on housing-urban development, geological disaster prevention, and sponge city construction	Housing-urban development planning; urban renewal management; geological disaster prevention; sponge city regulations; territorial spatial planning; infrastructure lifecycle management	2022.1–2026.5
4	Shiyan	Mountain-water city resilient system centered on water security, new urbanization, and urban governance	Water security planning; regional coordination and new urbanization; urban governance planning; ecological and comprehensive resilience development	2022.1–2025.12
5	Yichang	Yangtze Economic Belt resilient system centered on full-chain sponge city development, emergency supplies, and urban renewal	Sponge city full-process control; equipment upgrading for infrastructure safety; tiered emergency material reserve; long-term resilience planning	2020.11–2026.5
6	Xiangyang	Hanjiang River basin central city resilient system centered on emergency system, sponge city, urban renewal, and meteorological disaster prevention	Emergency system planning; sponge city development; sponge city regulations; urban renewal and housing; natural disaster and meteorological defense; territorial spatial planning; long-term resilience planning	2022.3–2026.5
7	Ezhou	Wuhan metropolitan area resilient system centered on emergency management, underground infrastructure, and watershed governance	Emergency response plans and system; underground infrastructure; water security and gas pipeline upgrading; watershed governance; territorial spatial planning	2021.12–2025.9
8	Jingmen	Jianghan Plain resilient system centered on urban quality improvement, territorial spatial planning, and long-term development	Urban quality improvement three-year action; territorial spatial planning; long-term resilience development layout	2022.1–2025.12
9	Xiaogan	Wuhan metropolitan area node city resilient system centered on digitalization, sponge city, emergency system, and urban renewal	Smart city planning; sponge city development; emergency system planning; new urbanization; sponge city regulations; old pipeline upgrading; territorial spatial planning; sponge city special planning	2021.9–2026.4
10	Jingzhou	Yangtze midstream node city resilient system centered on emergency system, human settlements, lifeline engineering, and urban renewal	Emergency system planning; human settlements development; new urbanization; water/gas pipeline upgrading; lifeline engineering; territorial spatial planning; urban renewal management	2022.6–2025.8
11	Huanggang	Dabie Mountains old revolutionary base resilient system centered on underground utility tunnels, urban renewal, emergency management, and territorial spatial planning	Underground utility tunnel management; urban renewal guidance; emergency management system planning; territorial spatial planning	2020.10–2025.3
12	Xianning	Wuhan metropolitan area eco-resilient system centered on new urbanization, emergency system, sponge city, and urban renewal	Regional coordination and new urbanization; emergency system planning; sponge city management; old community renovation and urban renewal; annual resilience implementation priorities	2022.7–2025.2
13	Suizhou	"Special Vehicle Capital" resilient system centered on lifeline engineering, smart monitoring, urban renewal, and infrastructure development	Lifeline engineering with smart monitoring (minute-level response); annual resilience implementation; infrastructure quality improvement; smart urban operation monitoring	2024.3–2026.1

The third category includes mountainous and hilly cities such as Shiyan and Jingmen, with generally low total coding volumes. Policies largely replicate provincial provisions with limited locally developed resource policies. Planning content focuses only on geological disaster control and small-scale emergency facilities, with other categories extremely weak. Constrained by fiscal and talent conditions, these policies exhibit prominent problems of generalization and homogenization with weak autonomous planning capacity.

4.4 Coupling Analysis of Policy Tools and Planning Content

Matrix coding results reveal insufficient coupling depth and matching mismatches between policy tools and planning content. Engineering facility resilience mainly relies on environmental strategies and infrastructure supply tools without incorporating market-oriented demand tools, making project investment and maintenance fully government-dependent and creating fiscal pressure. Risk management resilience primarily uses environmental monitoring and regulatory tools, with technology-related supply concentrated in central cities and grassroots risk

investigation lacking public participation.

Spatial-ecological resilience shows clear differentiation, with riverine cities combining ecological funding and environmental regulation, while mountainous cities rely only on restrictive policies with missing resource supply. Social governance and economic-industrial resilience, the two weak content areas, suffer from tool absence across all categories, lacking both specialized environmental strategies and funding, talent, social participation, and pilot tools, directly causing implementation difficulties. Overall, this presents a situation of "tool stacking for strong content and tool absence for weak content," indicating insufficient coupling effectiveness.

5. Major Existing Problems in Policies

Based on comprehensive coding data and textual analysis, Hubei's resilient city policies exhibit four core problems. First, policy tool structure is imbalanced, with excessive reliance on environmental macro-control, supply-side tools "emphasizing hardware while neglecting talent and funding," and near-absence of demand-side tools, with multi-stakeholder collaborative governance mechanisms yet to be established [10]. Second, planning content layout shows polarization, with engineering-oriented hard content dominating while soft content such as social and industrial aspects is neglected, creating vulnerabilities in the comprehensive resilience system. Third, regional development is unbalanced, with central cities having comprehensive policies, riverine cities having narrow content, and mountainous cities having generalized and lagging policies, with homogenization and replication problems coexisting. Fourth, tool-content matching is misaligned, with different construction content failing to match corresponding tools, resulting in low policy implementation conversion rates.

6. Optimization Pathways for Hubei's Resilient City Policies

Based on the empirical analysis of policy tools, planning content, regional differences, and tool-content coupling relationships, and considering Hubei's natural endowments, disaster characteristics, and local development realities, this paper proposes systematic and implementable optimization pathways from four dimensions: policy tools, planning content, regional coordination, and supply-demand coupling, to comprehensively improve the provincial resilience policy system.

6.1 Optimize the Allocation of Three Policy Tool Categories to Build a Diversified Collaborative Governance Pattern

Hubei's current resilience policies excessively rely on environmental tools, supply-side tools "emphasize hardware while neglecting soft resources," and demand-side tools are severely underutilized, with the single government-led model constraining construction effectiveness. Systematic adjustment and optimization of the three tool categories are urgently needed.

For environmental tools, while retaining reasonable content such as regulations and target planning, delete vague and repetitive macro statements, and focus on supplementing detailed implementation provisions. Specifically improve cross-departmental authority allocation, joint approval, and collaborative linkage system designs, refine tiered and classified supervision and assessment indicators to avoid one-size-fits-all assessment models, and resolve problems of implementation fragmentation and inconsistent standards.

For supply-side tools, while continuing to ensure investment in flood control pipe networks, embankments, emergency shelters, and other infrastructure, optimize resource allocation structures. Establish special resilience funds at the provincial level with clear rules for allocation, utilization, and supervision. Introduce policies for attracting, cultivating, and incentivizing professionals in disaster prevention, resilience planning, and smart operations and maintenance to address talent shortages. Simultaneously improve emergency material coordination mechanisms and grassroots public emergency service support systems to balance hardware and software resource supply.

For demand-side tools, increase development and application efforts to broaden participation channels for markets, social organizations, and the public. Improve whole-process public participation mechanisms from planning formulation to project construction and operations management. Introduce support policies for government-enterprise cooperation, project concessions, and operations service outsourcing to guide social capital participation in resilience projects. Establish provincial and municipal resilience pilot zones and demonstration projects in phases to drive

regional development through pilot experiences, fully activating diverse stakeholder vitality [14].

6.2 Address Planning Content Weaknesses to Build a Comprehensive Territorial Resilience System

Hubei's existing policies heavily favor engineering facility resilience while lagging in social governance and economic-industrial resilience, resulting in unbalanced development across the five planning content categories. While consolidating advantageous areas, targeted reinforcement of weak links is needed to achieve coordinated development of all resilience dimensions.

Continuously optimize the three advantageous content areas of engineering facilities, spatial ecology, and risk management. Update engineering construction standards for flood control, drainage, and geological disaster management based on local disaster characteristics. Deepen ecological space protection such as Yangtze shorelines and inland wetlands, and promote planning models including dual-use spaces and disaster prevention reserved land to enhance spatial flexibility and comprehensive disaster prevention capacity. Improve full-cycle risk investigation, dynamic monitoring, and emergency plan systems, strengthening disaster scenario simulation and forward-looking assessment.

Focus on strengthening the two weak areas of social governance resilience and economic-industrial resilience. The provincial level should lead the development of special guidelines for community resilience, specifying detailed requirements for community emergency stations, disaster prevention education, regular emergency drills, and social organization cultivation to consolidate grassroots disaster prevention foundations. Given Hubei's status as a major industrial and agricultural province, introduce policies for industrial disaster prevention and affected entity relief, improve disaster prevention facilities for industrial parks and agricultural areas, cultivate emerging disaster prevention industries, and enhance economic system risk resistance. Through multi-point efforts, build a comprehensive resilience system integrating engineering, ecological, risk, social, and economic dimensions.

6.3 Coordinate Differentiated Regional Development to Narrow Inter-City Gaps

Based on coding analysis results, the three regional categories of central cities, riverine plain cities, and mountainous-hilly cities show significant differences in policy positioning and development foundations. Differentiated guidance and targeted measures are needed, balancing unified requirements with local characteristics to address policy homogenization and regional polarization.

For the three provincial central cities of Wuhan, Xiangyang, and Yichang, encourage pioneering and innovative breakthroughs, focusing on frontier areas including smart resilience, industrial resilience, and diversified governance to establish provincial resilience benchmarks and create replicable and scalable experience models.

For riverine plain cities including Jingzhou, Huanggang, and Xiaogan, based on their high flood disaster risk characteristics, expand beyond existing flood control and water ecology policies to incorporate social governance and industrial protection content, enriching policy dimensions and addressing the current narrow content scope.

For mountainous and hilly cities including Shiyan, Jingmen, and Suizhou, increase provincial fiscal transfer payments and talent pairing assistance to address resource and capacity shortcomings. Guide these cities to develop localized policy details based on geological disaster characteristics, avoiding simple replication of provincial documents.

Simultaneously establish a provincial resilience city experience exchange, case sharing, and on-site observation mechanism to disseminate advanced practices from leading cities to less developed areas, gradually narrowing regional development gaps and achieving balanced provincial resilience construction.

6.4 Promote Precise Tool-Content Coupling to Enhance Policy Implementation Effectiveness

Current Hubei policies exhibit obvious tool-content matching mismatches, with different construction areas lacking corresponding tool support, resulting in low policy conversion rates. Policy tools should be targeted and combined according to the construction attributes of different resilience content to achieve deep adaptation between tool

functions and construction needs.

For engineering facility resilience, change the pure government investment and operations model by introducing demand-side tools including service outsourcing and government-enterprise cooperation while retaining environmental regulation and infrastructure supply tools, reducing fiscal pressure and improving professional operations and maintenance.

For spatial-ecological resilience, rely on institutional constraints and financial support to guide market entities in participating in regular maintenance of ecological buffer zones and regulatory spaces.

For social governance resilience, based on financial support and public service supply tools, combine with public participation and social organization cultivation demand tools to achieve grassroots-level policy implementation.

For economic-industrial resilience, comprehensively apply environmental tools including fiscal incentives and industry regulations, combined with supply-side tools such as industry subsidies and project support, to provide comprehensive policy guarantees for industrial disaster prevention and transformation upgrading. Through precise tool combinations, strengthen coupling effectiveness and tangibly improve policy execution and implementation outcomes.

7. Conclusions and Prospects

7.1 Research Conclusions

Taking 98 resilient city policy texts from Hubei Province and 12 prefecture-level cities as samples, this paper completed coding analysis using Nvivo software and the Rothwell-Zegveld model. The research shows that Hubei's resilient city policy framework is basically established and closely aligns with local disaster characteristics focusing on engineering disaster prevention. However, four major weaknesses exist: structural imbalance in policy tools with multi-stakeholder collaborative mechanisms absent; uneven planning content distribution with insufficient comprehensive protection capacity; significant policy differentiation among cities with large regional development gaps; and tool-content matching mismatches with low implementation effectiveness. Subsequent systematic optimization is needed from the four dimensions of tools, content, regional coordination, and coupling.

7.2 Research Limitations

This study only conducts static analysis of publicly available policy texts without incorporating field investigation of project implementation outcomes and grassroots feedback. The research focuses on provincial and municipal levels without extending to district-county and subdistrict levels, failing to reflect policy characteristics at the grassroots level. Subsequent research could supplement field visits and expand research coverage to lower administrative levels.

7.3 Future Prospects

With the continued advancement of resilient city and smart city construction, Hubei's policies will enter a phase of dynamic revision. Subsequent research can conduct cross-year policy evolution analysis and carry out specialized policy studies based on different disaster types. At the same time, continue exploring application scenarios for demand-side tools to establish a diversified collaborative resilience governance model, comprehensively enhancing the safety protection capacity of the Yangtze River midstream urban agglomeration.

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