The Practical Dilemmas and Countermeasures for Enhancing Grassroots Emergency Response Capabilities: Based on the "Authority-Responsibility-Resources-Technology-Coordination" Analytical Framework

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Abstract: *In the process of modernizing national governance, grassroots emergency management serves as the foundational component of the national emergency response system, and the capacity building in this area directly impacts the overall effectiveness of emergency governance. This paper constructs a four-dimensional analytical framework of "Authority-Responsibility-Resources-Technology-Coordination" to systematically analyze the practical dilemmas currently faced in building grassroots emergency response capabilities and proposes targeted enhancement pathways. During the process of improving grassroots emergency response capabilities, structural dilemmas persist, including imbalanced allocation of authority and responsibility, impeded resource flow, insufficient technological empowerment, and loose coordination networks. To effectively enhance grassroots emergency response capabilities, it is essential to promote the transformation of grassroots emergency management from passive response to proactive governance through balanced allocation of authority and responsibility, optimization of resource integration, systematic technological empowerment, and innovation in coordination mechanisms, thereby solidifying the grassroots defense line of the national emergency governance system.*

Keywords: *grassroots governance; emergency response capabilities; technological empowerment; collaborative governance*

Introduction

In the modernization of the national governance system, the transformation toward modern emergency management holds a pivotal position. Currently, risk patterns are becoming increasingly complex, and emergency incidents exhibit cross-regional and compound characteristics, placing higher demands on the efficiency and precision of emergency response. As the frontline and foundational component of emergency management, the capacity of the grassroots level directly influences the overall effectiveness of emergency governance and determines whether the "last mile" of response can be effectively implemented. However, the current capacity-building efforts at the grassroots level face multiple challenges. On one hand, grassroots units rely heavily on resource allocation and unified directives from higher authorities, lacking autonomy in emergency decision-making and operations. On the other hand, mobilization of external forces tends to be temporary and compensatory rather than grounded in long-term, stable cooperative mechanisms. Consequently, grassroots units are caught in a practical paradox: they are often "able to see but not manage" risks in prevention and "able to step up but not sustain" in emergency response, which significantly constrains the overall efficacy of the national emergency management system.

Against this backdrop, this paper seeks to construct a four-dimensional analytical framework of "Authority-Responsibility-Resources-Technology-Coordination" to thoroughly examine the practical dilemmas faced by grassroots emergency capabilities in terms of institutional supply, resource flow, technological empowerment, and collaborative networks. Building on this analysis, targeted and actionable pathways for improvement are proposed. The aim is to provide theoretical insights and practical guidance for advancing the modernization of grassroots emergency governance systems and strengthening the grassroots line of defense for national security and social stability.

1. Analytical Framework: A Four-Dimensional Construction of "Authority-Responsibility-Resources-Technology-Coordination"

Confronted with the new landscape of increasingly complex and compounded risk patterns, advancing the transformation of grassroots emergency management from traditional passive response to modern proactive adaptation has become an urgent imperative for enhancing the overall efficacy of the national emergency governance system. Within this transformation process, "resilience governance" offers significant insights for understanding the construction of grassroots emergency response capabilities. It emphasizes that, when faced with pressure and shocks from the external environment, governance entities implement a series of measures or approaches in terms of objectives, capacities, and processes to address various risk incidents. From this perspective, a successful transition in grassroots emergency management does not hinge on breakthroughs in a single element but relies on the organic synergy of four core components: the enhancement of governance entities' capabilities, the establishment of mechanisms for multi-stakeholder participation, the strengthening of social capital, and the extensive application of digital technologies and big data. This study refines and restructures these insights: it focuses the "entity" dimension on "authority-responsibility," highlighting the fundamental role of authority-responsibility allocation in activating agency; it deepens the "mechanism" dimension into "coordination" to clarify the goal orientation of diversified participation mechanisms; it retains "resources" as the material foundation for emergency management, and it positions "technology" as the core driver empowering the modernization of governance. Ultimately, this culminates in the formation of a four-dimensional analytical framework: "authority-responsibility-resources-technology-coordination."

1.1 The Authority-Responsibility Dimension: The Institutional Prerequisite

The Authority-Responsibility Dimension corresponds to "governance entity capacity development" and focuses on the allocation of power and the definition of responsibility within emergency management. The unleashing of an entity's capabilities is rooted in a clear authority-responsibility structure. Ambiguity in authority and responsibility undermines information flow and decision-making efficiency. Only through institutional empowerment and a clear delineation of duties can the capacity for proactive assessment and on-site decision-making be enhanced. This ensures the efficient transmission of emergency directives and the orderly advancement of fundamental tasks, thereby enabling grassroots entities to transform from passive executors into active agents equipped with on-site judgment and preliminary response capabilities. This transformation lays the institutional foundation for the operation of the emergency response system.

1.2 The Resource Dimension: The Material Foundation

The Resource Dimension corresponds to the "strengthening of social capital," focusing on the allocation, stockpiling, and flow efficiency of emergency resources such as funding, supplies, and personnel. Resources constitute the material foundation for the operation of the emergency response system, and their allocation efficiency directly impacts capabilities for risk prevention and control as well as disaster recovery. Strengthening resource integration capabilities can solidify the responsibility of leaders, clarify organizational task structures, and thereby enhance the effectiveness of grassroots emergency management. Grassroots governments need to integrate multiple channels, including fiscal investment, social donations, and volunteer mobilization, to ensure the efficient flow of resources across all stages: risk early warning, rescue and response, and recovery and reconstruction.

1.3 The Technology Dimension: The Empowerment Engine

The Technology Dimension corresponds to the "application of big data and new technologies," emphasizing the core driving role of digital technology in enhancing risk predictability, improving response precision, and optimizing service accessibility. Confronted with increasingly complex risk environments and frequent emergency incidents, traditional governance systems characterized by experience-driven and linearly operated approaches struggle to meet the dynamic and precise demands of modern governance. Consequently, there is an urgent need for grassroots emergency management models to transition from experience-based to intelligence-driven approaches. The advancement of digital governance at the grassroots level enables technologies such as big data, artificial intelligence, and the Internet of Things to play an increasingly vital role in disaster monitoring, emergency dispatch, and public opinion management. Technology has thus become a crucial empowerment tool for

enhancing the effectiveness of grassroots emergency governance.

1.4 The Coordination Dimension: The Integrative Nexus

The Coordination Dimension corresponds to the "construction of diversified participation mechanisms," focusing on breaking down barriers among multiple actors such as the government, the market, and society to establish an emergency response community characterized by "joint prevention and control as well as mass participation." Collaborative governance refers to the process in which various stakeholders, under the overall coordination of the government, form a synergistic governance force based on the nature and intensity of an incident. This process can effectively enhance emergency management efficacy and integrate multi-party resources[1]. Interaction among multiple actors represents both the ideal model and an inevitable choice for public crisis governance. Effectively responding to emergencies requires the establishment, under government leadership, of a network structure involving "social organizations – enterprises – the public." This is achieved by connecting diverse actors through institutional design and technological platforms to facilitate information sharing and resource complementarity.

The aforementioned four dimensions do not simply exist in parallel; rather, they constitute an organically interconnected and mutually reinforcing system. Clearly defined authority and responsibility serve as the prerequisite for targeted resource allocation, effective technology application, and orderly coordination. Ample resources provide the guarantee for fulfilling authority and responsibility, operating technology, and achieving coordination. Technology empowerment acts as the tool for optimizing the execution of authority and responsibility, accelerating resource flow, and enhancing coordination effectiveness. The coordination network, in turn, functions as the nexus that integrates the entities holding authority and responsibility, interconnects resource elements, and amplifies the benefits of technology. This framework provides an effective analytical tool for systematically diagnosing the dilemmas in grassroots emergency management and for strategically planning pathways for improvement.

2. Practical Dilemmas in Enhancing Grassroots Emergency Response Capabilities

2.1 Imbalanced Allocation of Authority and Responsibility

The key to effective risk governance lies in the timeliness of response, the precision of handling, and the adaptability of the system. However, in practical operation, the upward concentration of power inhibits empowerment at the frontline, while the downward assignment of responsibility lacks corresponding support mechanisms. This leads to systemic erosion of governance efficacy, manifested specifically in the following critical contradictions:

First, the elevation of power. Although the current system emphasizes shifting the focus of governance downward, critical decision-making authority remains highly concentrated within superior departments. For instance, during emergency response, the grassroots level lacks the statutory authorization for on-site command and the capacity to allocate resources. Rescue operations require approval through multiple administrative levels, resulting in broken response chains and missed critical windows for intervention. This not only weakens the timeliness of emergency response but also suppresses the endogenous motivation for grassroots innovation in risk management models.

Second, the precipitation of responsibility. Under the rigid constraints of the territorial management principle, responsibilities for areas such as workplace safety and disaster prevention and mitigation continuously accumulate at the grassroots level. However, the chain of accountability for incidents often terminates at the grassroots execution level, failing to trace back to upstream institutional deficiencies in areas like resource allocation and standard-setting. This one-way transmission of accountability pressure fosters "escalating risk aversion" behaviors at the grassroots level. It forces limited resources to be excessively invested in "traceability management," crowding out substantive investment in addressing the root causes of risks. Ultimately, this creates a counterproductive cycle where the intensity of accountability increases while the effectiveness of prevention and control gradually diminishes.

2.2 Impeded Resource Flow

The current grassroots emergency response system faces severe challenges in terms of fund

operation, material allocation, and personnel support. These intertwined dilemmas continuously reinforce grassroots dependency on higher-level resources, thereby hindering the development of autonomous emergency response capabilities.

First, there is a shortage of funds and restrictive usage. The allocation of financial resources exhibits an "inverted pyramid" structure, with most grassroots units experiencing tight emergency budgets that are insufficient to support the construction of basic disaster prevention infrastructure. Furthermore, complex approval processes and strict categorical restrictions prevent grassroots units from flexibly deploying resources during emergencies.

Second, material reserves are fragmented and their allocation is inefficient. The distribution of supplies poorly matches regional risk profiles, creating a structural contradiction where high-risk areas suffer from insufficient reserves while low-risk areas experience resource underutilization. Additionally, cross-regional and cross-level allocation of materials is hindered by information barriers, ambiguous authority and responsibility, and inconsistent standards, making it difficult for resources to be promptly deployed to the frontline.

Third, there is a shortage of professional personnel and instability within response teams. Grassroots agencies generally lack dedicated emergency positions, with existing staff often holding multiple roles. Emergency work is frequently treated as an additional duty rather than a core responsibility, leading to inadequate professional investment and a significant gap between functional positioning and actual needs.

2.3 Insufficient Technological Empowerment

The application of technology has failed to be effectively translated into practical emergency response capabilities at the grassroots level, facing the prominent issue of "emphasizing construction while neglecting application."

First, there is a misalignment between technological supply and actual needs. Technology solutions primarily led by higher-level authorities often prioritize macro-level control efficiency, overlooking the complex and variable risk scenarios and limited operational capabilities at the grassroots level. Coupled with inadequate operational funding and technical support, some smart devices and digital platforms lie idle or become obsolete, resulting in diminished effectiveness. Their operational complexity may even increase the burden on grassroots units.

Second, data silos impede information sharing. Vertically, data sharing from higher-level platforms to lower levels is restricted. Horizontally, data standards are inconsistent and interfaces remain closed across departments such as public security, transportation, and healthcare. This "information silo" situation forces grassroots units to expend significant effort on repetitive data collection and reporting to multiple systems, thereby weakening functions like integrated data analysis and real-time situational assessment.

Third, emergency response teams lack sufficient digital literacy. Decision-makers often lack capabilities in data analysis and intelligent situational assessment. Frontline personnel are unfamiliar with operating complex equipment, making it difficult to utilize advanced functions such as predictive warning and scenario simulation. Furthermore, some grassroots units exhibit a distorted understanding of technology. This manifests either as a blind faith in systems like "integrated command maps" or "smart brains," neglecting necessary localization adjustments and risk-specific modifications; or as a narrow view of technological tools merely as auxiliary means for emergency response, leading to superficial application of data analysis rather than embedding it as a supportive element throughout the entire cycle of risk prevention, preparedness, and response.

2.4 Loose Coordination Network

The cross-regional and compound nature of risk patterns necessitates highly efficient coordinated responses. However, the grassroots emergency coordination network still suffers from shortcomings in institutionalization and routinization.

First, cross-regional coordination lacks institutional arrangements. Responses to regional emergencies often rely on temporary coordination by higher-level authorities, lacking regular joint drills, unified command protocols, and resource-sharing mechanisms. Differences in contingency plans, reserve systems, and command structures among various localities lead to ineffective transmission of

coordination directives, often resulting in phenomena like "operating in silos" and "duplicate investments." Some regions still engage in resource hoarding and passive cooperation, further undermining the continuity of the overall response.

Second, the institutional integration of social forces is insufficient. Social organizations, enterprises, and volunteer groups possess unique advantages in terms of expertise and flexibility. In reality, however, they lack stable institutional channels and resource support, causing their contributions to be fragmented and short-term. Some grassroots officials still perceive these forces primarily in an auxiliary role, failing to fully harness their potential.

3. Pathways for Enhancing Grassroots Emergency Response Capabilities

3.1 Restructuring Authority and Responsibility: Institutional Empowerment and Flexible Accountability

A fundamental enhancement of grassroots emergency response capabilities requires genuinely activating the agency and initiative of grassroots units through institutional empowerment and structural reform.

First, establish a baseline authority list and a mechanism for dynamic authorization. Develop a categorized and tiered "Emergency Authorization List" based on incident type, severity, and scope of impact. Legally empower townships (sub-districts) and communities (villages) with authority for preliminary assessment, decision-making, resource dispatch, and social mobilization in the early stages of emergencies. Baseline authority should cover routine tasks such as risk screening, warning dissemination, and handling minor incidents, enabling grassroots units to make autonomous decisions and act swiftly for routine risks. Dynamic authorization should delegate corresponding emergency response powers according to the incident level, requiring only procedural reporting afterward to ensure immediate response and preliminary action during major disasters.

Second, establish a tiered responsibility and flexible accountability mechanism. For general emergencies, primary accountability for response should rest with the grassroots units themselves, focusing on timeliness and procedural compliance. For significant or major emergencies, scrutiny should extend upward, strengthening the responsibility of higher-level departments in decision support and resource coordination to prevent accountability from being unilaterally pushed downward. Clarify the applicable scenarios and recognition procedures for "exemption based on due diligence" through institutional means. This would exempt officials who, despite fulfilling their duties diligently, fail to achieve expected outcomes due to objective constraints, while providing positive incentives for those who employ innovative measures to effectively control risks and reduce losses. This approach aims to break the passive mentality of "more work leads to more mistakes, less work leads to fewer mistakes."

3.2 Resource Integration: Optimization of Materials and Team Development

The solution to breaking the impasse in resource flow lies in promoting the systematic integration of the resource framework, achieving efficient synergy and precise allocation of funds, materials, and personnel.

First, optimize the supply and utilization mechanisms for emergency funds. Establish a fiscal guarantee mechanism linked to the risk levels at the grassroots level, precisely allocating funds by comprehensively considering factors such as disaster frequency and population density. Create a "green channel" for emergency funds, allowing flexible cross-category adjustments during emergencies to ensure grassroots units can swiftly conduct preliminary response actions.

Second, establish cross-regional material reserve and sharing platforms. Form material reserve alliances that transcend administrative boundaries, leveraging logistics enterprises to establish regional emergency supply centers that integrate physical reserves, contractual agreements, and production capacity reserves. Based on this, optimize reserve distribution by constructing central warehouses equipped with smart storage facilities in high-risk disaster areas and densely populated regions. Furthermore, develop a nationally unified smart material management platform that utilizes Internet of Things and big data technologies to achieve visualization and intelligence in material storage, allocation, and transportation.

Finally, build a stable, professional emergency response team at the grassroots level. Define

dedicated staffing positions for grassroots emergency management, and integrate diverse forces-including retired military personnel, introduced professionals, enterprise safety officers, militia and police officers, and volunteers-to construct a "specialized-permanent combined" emergency response team system.

3.3 Technology Empowerment: Data Integration and Capability Enhancement

Enhancing grassroots emergency capabilities necessitates systematic optimization of technology, driven by the dual engines of "policy and technology" to achieve multidimensional leaps in infrastructure, data application, and workforce proficiency.

First, accelerate the development of digital infrastructure at the grassroots level. Guide technological iteration through policy planning, and establish long-term operation and maintenance mechanisms via fiscal subsidies, service procurement, and public-private partnerships. This ensures that critical equipment remains "consistently operational during routine times and reliably functional during disasters."

Second, advance mechanisms for data sharing and information interoperability. Construct an emergency data-sharing platform that integrates vertical and horizontal systems, unifying data resource catalogs, collection standards, and quality specifications to break down data silos and eliminate information isolation. Leveraging technologies such as blockchain and privacy-preserving computation, prioritize the development of an "integrated command map" for grassroots emergency management. This map will consolidate multi-source data and intelligent models, facilitating an intelligent transformation in risk assessment, resource dispatch, and decision support.

Third, strengthen technical training and application for grassroots personnel. Implement tiered and categorized practical training in digital skills to enhance capabilities such as situational assessment and decision-making for commanders, equipment operation for technical staff, and risk inspection for grid-based personnel. Concurrently, introduce expert support and technical outreach services to provide grassroots units with ongoing technical guidance. This approach lowers the cognitive barriers and operational risks associated with technology adoption, enabling the synergistic advancement of both "technology empowerment" and "human empowerment."

3.4 Collaborative Innovation: Cross-Regional Cooperation and Social Participation

A systematic enhancement of grassroots emergency response capabilities urgently requires breakthroughs in collaborative mechanisms. This entails shifting emergency management from a model of "working in isolation" to one of "coordinated action," achieving the organic integration of government and societal forces for maximized effectiveness.

First, standardize cross-regional cooperation models. Designate emergency management departments from neighboring regions to take turns leading efforts, regularly convening coordination meetings to jointly assess regional risk landscapes. Develop unified regional emergency cooperation plans and coordinated response procedures, clearly defining collaboration workflows and resource allocation mechanisms for different types of emergencies. This helps to avoid responsibility gaps or duplicated efforts. Concurrently, conduct regular cross-regional practical drills to test the feasibility of cooperation plans, refine coordination procedures, and foster a collaborative framework of "joint construction during peacetime and shared utilization during emergencies."

Second, refine mechanisms for social force participation. Clearly define entry standards and codes of conduct for participating entities, such as professional rescue organizations and volunteer teams, providing institutional safeguards for their orderly involvement. Focus on improving the full-cycle management of emergency volunteer services, covering registration, training and assessment, service support, and incentive recognition. This ensures that volunteer services are standardized and sustainable. Particular emphasis should be placed on building community-based emergency volunteer teams to leverage their advantage as "first responders."

Fund Projects

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