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Building Resilience in Rural China: Governance and Policy Lessons from Flood-Prone Henan Province

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Abstract

In an era marked by intensifying climate disasters, strengthening rural resilience has become a critical policy imperative for ensuring food security and sustainable agricultural development, as emphasized in China's national strategic documents. This study examines the governance challenges of building disaster resilience through an in-depth case analysis of Gangxi Village in Henan Province, which experienced a rapid transition from drought to flooding in 2024. By applying a process-oriented resilience framework, we identify two core mechanisms—resilience depletion and mobilization efficacy—that shape adaptive outcomes. Our analysis reveals systemic vulnerabilities across material, organizational, and cultural dimensions and traces how pre-existing risk perception, coordination capacity during response, and post-disaster network relations critically influence resilience pathways. The study concludes with targeted policy recommendations aimed at improving multi-level governance and strengthening institutional capacity for disaster management in rural communities.

Keywords

Disaster Resilience, Rural Governance, Policy Mechanisms, Social Mobilization

1. Introduction

Despite repeated emphasis in Chinese central policy documents on enhancing grassroots capabilities for disaster prevention and reduction, and the establishment of an integrated system that equally prioritizes physical, technological, and

human dimensions, rural communities continue to frequently experience systemic response failures when confronting extreme climate events. This discrepancy between policy expectations and real-world outcomes reveals a critical disconnect between top-down resource allocation and bottom-up mobilization effectiveness. The "Zhengzhou 720 Incident" in 2021 underscored the dangers of climate-related disasters, resulting in significant casualties, extensive property damage, and widespread public concern (Huang & Guo, 2022). As an agricultural powerhouse, China faces significant threats to the safety of its agricultural production due to the potential hazards posed by climate disasters. As the saying goes, "To build a strong nation, it is imperative to first strengthen agriculture; only with robust agricultural development can the nation achieve comprehensive prosperity." The 2024 National Document No. 1 clearly states that efforts should be made to enhance short-term meteorological disaster warnings and to establish a long-term mechanism for disaster prevention, mitigation, and relief in agriculture. This is a crucial measure to ensure China's food security. In recent years, rural resilience has become an important area of research, with related studies first emerging in 2011. Since 2017, these studies have entered a phase of rapid growth, particularly focusing on disaster resistance and resilience in rural regions.

In recent years, rural security has attracted significant attention. A central practical and theoretical debate in China's current rural disaster prevention and reduction policy concerns whether resources should continue to prioritize "hard" investments in physical infrastructure and engineering defenses or be strategically reallocated toward enhancing "soft" capabilities such as organizational coordination, community participation, and cultural awareness. Although equal emphasis on the "physical, technological, and human dimensions" has been widely cited (Wang & Li, 2020), the attention and priority given to rural disaster prevention planning by relevant authorities and society at large remain noticeably lower compared to urban areas (Shao, 2022). Meanwhile, as the most vulnerable link in disaster prevention, reduction, and relief efforts, rural regions—being disaster-prone—exhibit weak grassroots disaster response capabilities and low levels of preparedness against natural hazards, making the improvement of rural disaster governance efficacy an urgent issue. However, there is still a lack of in-depth analysis regarding how static "resilience dimensions" can be transformed into dynamic "mobilization processes"—specifically, the internal mechanisms through which resilience is depleted, activated, and enhanced throughout the disaster cycle. This gap results in structural deficiencies in rural disaster governance when addressing compound disasters: an excessive reliance on top-down government mobilization, a singular governance actor, and a failure to effectively activate community endogenous motivation and collaborative networks, ultimately leaving the agricultural sector vulnerable and Although resilience theory offers a new perspective for addressing rural governance challenges, existing studies predominantly focus on static descriptions of resilience as a "state", failing to adequately reveal how multiple actors interact with systemic resilience within the dynamic processes of "mobilization

and collaboration".

Based on resilience theory, this study innovatively proposes a dynamic coupling analysis framework for "mobilization synergy-system resilience" and demonstrates its application through a case study of Gangxi Village in Henan Province, which experienced a rapid transition from drought to flood. This paper aims to address the following questions: 1) How do the roles and interaction patterns among multiple actors—including government, communities, and civil society organizations-dynamically adjust across different phases of the disaster cycle to meet the demands of systemic resilience? 2) In what ways do changes in the level of systemic resilience, in turn, reshape the collaborative structures and power relationships among these actors? 3) What institutional designs and policy tools can effectively bridge the gap between "hard" investments and "soft" mobilization, thereby establishing a positive feedback loop?

2. Literature Review

2.1. Resilience Theory

Rural resilience refers to the capacity of rural communities to achieve sustainable development when confronted with external shocks arising from a vulnerable society. This concept also addresses the challenge of promoting high-quality development in rural regions. As complex adaptive systems, rural areas are influenced by a multitude of factors that affect production and daily life activities. The incorporation of resilience theory provides a fresh perspective on rural development (Holland & Hidden, 2000).

The term was first coined by Alexander and originally referred to the ability to bounce back to the initial state (Liu, Xu, Li, & Wang, 2022). Resilience theory originated in physics. In 1982, management scholar Meyer introduced the concept of resilience into organizational management, coining the term "organizational resilience". As a multidisciplinary concept, resilience theory encompasses a wide range of definitions and applications. In the 1990s, ongoing exploration and application by Western scholars led to the gradual expansion of resilience theory into the social sciences. As research on resilience continued to evolve, its meanings became increasingly nuanced. From a human perspective, resilience emphasizes the interplay of "recovery" "growth" and "benefit", reflecting a positive adaptation process. Protective factors, both internal and external, influence an individual's response capabilities, ultimately affecting their resilience (Zhang et al., 2024). The core elements of resilience theory primarily include resilience, growth potential, and benefit potential. Specifically, resilience refers to an individual's (or organization's) ability to swiftly return to their original state under adverse conditions; growth potential denotes the capacity to learn from adversity and enhance one's capabilities; and benefit potential signifies the ability to transform challenges into opportunities, thereby reaping long-term advantages. In existing research, the concept of resilience has gradually emerged within social systems, economic systems, and urbanization, with terms such as "social resilience, economic resilience,

and urban resilience". Since the 21st century, resilience theory has been increasingly applied in disaster response and urban planning, becoming a crucial guiding principle for enhancing cities' disaster resistance capabilities. Consequently, "urban resilience" has become a widely recognized term (Shi, Wang, & Chen, 2024; Wang & Song, 2025; Wu, 2025). The heavy rainstorm in Zhengzhou on July 20, 2021, and Typhoon Doksuri in 2023 both caused substantial financial losses, underscoring the importance of urban resilience in disaster preparedness and mitigation efforts (Ge et al., 2022). However, there has been comparatively less research focused on strategies for disaster resilience in rural areas.

As global climate change intensifies and natural disasters become more frequent, disaster resilience in rural areas is attracting increasing attention from academia, with resilience theory emerging as a key focus in rural development research. Under the rural revitalization strategy, rural resilience builds upon urban studies by concentrating on two main aspects: first, the survival and recovery capabilities of rural areas when faced with sudden natural disasters; and second, the driving forces that promote sustainable rural development. Both aspects center on rural areas as the primary subjects of study. When comparing research on rural resilience between China and the West, both regions generally adopt a bottom-up approach to enhance system resilience. However, due to differing national contexts, Western studies emphasize the exploration of and response to risks by local entities, while Chinese scholars focus more on government-led initiatives to promote resilience, with grassroots governance methods widely implemented. The term "resilience" has a dual nature regarding internal and external "disturbances" in rural development: it can either lead to irreversible decline or enable rural areas to achieve new dynamic balances and self-renewal. In risk science, the United Nations International Strategy for Disaster Reduction defines resilience as "the ability of a system, community, or society exposed to hazards to withstand, absorb, mitigate, and recover from the effects of those hazards". To some extent, rural resilience represents a continuous evolution of urban resilience research, shifting from the concept of "communities being able to help themselves when facing disaster risks" to communities exhibiting robust response capabilities, rapid recovery, and flexible adaptation when confronted with risk challenges, among other comprehensive resilience traits. Resilience theory provides a foundational analytical framework for understanding systemic disaster resistance, focusing on the adaptive capabilities of rural systems throughout the disaster cycle. It emphasizes the dynamic process ranging from disturbances to recovery. The resilience analysis presented in this article primarily revolves around three core perspectives: material-technical resilience, community-institutional resilience, and cultural-cognitive resilience.

2.2. Social Mobilization

The theory of social mobilization originated from the concept of "basic democratization", proposed by German scholars in the 1940s, and primarily focuses on

social movement research. Western scholars assert that social mobilization possesses strong guiding characteristics and is an inevitable outcome of political development during specific periods. In its early stages, social mobilization emphasized the government's role in encouraging public participation through promises, particularly in response to tense social structures. The resource mobilization theory emerged in the 1960s (Han, 2012). Resource mobilization lies at the heart of the action process. The success of collective action is intrinsically linked to the integration of resources, organizational collaboration, and the establishment of consensus. An organization's ability to mobilize resources depends on the decisions made by its leaders and the activation of relational networks within the organization. Social mobilization, an essential method for engaging the public and utilizing resources (Yang, 2018), has been a primary focus of research since the 1970s, mainly centered on public political participation. Changes in the political environment have fostered conditions conducive to mobilization, with organization and cognition serving as critical prerequisites for its transformation. At the same time, inadequate social mobilization can result in the interruption or distortion of social movements. Currently, academic research on the theoretical application of mobilization often emphasizes bureaucratic contexts, where government mobilization of society is frequently overlooked, reflecting a reality in grassroots governance (Wang & Yang, 2018).

Grassroots social mobilization is the primary form of Chinese-style social mobilization. Rooted in Western theories of social mobilization, it emphasizes a high degree of consistency in objectives (Gan & Lou, 2011). This mobilization is categorized into several stages based on the historical phases of localized research practices: the New Democratic Revolution period, the early years following the establishment of New China, the period of social subject construction, the Reform and Opening-up period, and the current era of socialist innovation and development. The types of mobilization (Xu, 2007) have evolved from early political mobilization to administrative mobilization and party-government integration mobilization. Since the 21st century, the complexity of grassroots social issues has made grassroots social mobilization an essential tool for local governments to engage citizens in policy implementation. To foster social cohesion and stability, developing community systems has become a vital strategy for addressing challenges in grassroots governance. The essence of mobilization theory lies in the dynamic expansion of the mobilization process from within, emphasizing interactive relationships among participants. The conventional "state-society" dichotomy fails to adequately explain the Chinese context, particularly in the context of rural revitalization. As an analytical framework for dynamic processes, social mobilization theory is crucial for the effective implementation of various rural policies.

Current domestic research primarily regards mobilization-style governance as a supplementary approach to routine grassroots governance, with multi-stakeholder interaction being a defining feature of contemporary social mobilization. Unlike community governance, disaster governance is marked by significant un-

certainty and unpredictability. Given the inherent complexity of rural communities, there is an urgent need to apply social mobilization theory in the governance process to revitalize rural resources and achieve effective disaster response outcomes. The mobilization process emphasizes the interactive dynamics among the government, market, and society in disaster response. This interaction encompasses both the rational choices made by actors and the knowledge related to their capacity to act. Mobilization within villages often highlights farmers' awareness of their actions and the role of capable individuals in facilitating this mobilization (Cao & Zhao, 2023). Under the combined influence of these factors, the emotional logic of collective action within the village (Guo, 2006) can be summarized, forming a relational network that creates favorable conditions for mobilization. From this, we can uncover the power dynamics and pathways of resource flow. In the disaster response process in Gangxi Village, I divided the mobilization process into several key stages: risk perception → resource integration → action coordination → effect feedback, and conducted a phased analysis.

3. Research Methods

3.1. Study Area

Considering the issues identified in previous studies, this paper examines the disaster resilience process of Gangxi Village in Henan Province in 2024, which is currently experiencing an unusual climate event characterized by sudden shifts from drought to flooding. Food security is the foundation of national stability. As a country with a substantial global population, China faces both internal and external risks that heighten concerns about domestic food security. For instance, on April 7, 2025, the "Plan for Accelerating the Construction of an Agricultural Powerhouse (2024-2035) issued by the Central Committee of the Communist Party of China and the State Council explicitly states, path of agricultural modernization must focus on food security and scientific innovation." The document highlights risk factors related to food security, particularly the growing issue of decreased agricultural production due to natural disasters. In regions with limited rural resources, the challenge of mitigating disaster impacts and minimizing losses is becoming increasingly significant.

Henan Province is located in the middle and lower reaches of the Yellow River and is characterized by its flat terrain, making it one of China's key grain-producing regions. As of 2023, Henan had a cultivated land area of 7.5796 million hectares, accounting for approximately half of the province's total land area. The proportion of land dedicated to grain cultivation reached an impressive 64.53%, making Henan the only province in the country where this figure exceeds 60%. The primary types of cultivated land include irrigated fields, dry land, and paddy fields, while the climate is marked by variability. In 2024, several regions in Henan experienced large-scale extreme weather events, resulting in significant losses to agricultural production, as shown in **Table 1**.

Table 1. The top ten weather and climate events in Henan in 2024[1].

Number	Time	Event Name
1	2024	The average annual temperature is rising
2	January-February	Low temperature rain, snow and ice continued
3	Late April to late June	It is rare to have a phased period at the end of spring and beginning of summer
4	May 14 - 15	Record-breaking winds have been recorded in many places
5	June 8 - 15	Extensively high temperatures continue
6	June 28-End of July	There was a sharp shift between drought and flood
7	July 9 - 12	The first flood of the Huai he River in 2024
8	July 14 - 20	"24·7" heavy rain in Henan province
9	August 4 - 6	Frost and hail weather occurred frequently
10	September 17 - 19	Typhoon Bibiji affected eastern Henan province

3.2. Units

Regarding this issue, the research site, Gangxi Village is located in central-eastern Henan Province, a region traditionally known for agricultural cultivation, where wheat, rice, and corn are the primary crops. Gangxi Village consists of three natural villages: X Village, Z Village and L Village. The overall terrain of the village is relatively low, with farmland distributed along rivers and rural roads, characterized by higher elevations in the north and lower elevations in the south. In recent years, the village's economic development has lagged, with agricultural production primarily focused on food crops. Over time, villagers have increasingly relied on their accumulated farming experience, considering dependence on weather patterns to be common sense. Additionally, the outflow of labor has diminished the village's vitality, resulting in a relationship between villagers and the collective that is primarily driven by self-interest, fostering a laissez-faire attitude. Furthermore, crop cultivation, as the main agricultural activity in the village, is emphasized in China's No. 1 Document, which aims to strengthen long-term mechanisms for disaster prevention, mitigation, and relief in agriculture. To support the national food security strategy and address the production and living needs of residents, it is essential to place greater emphasis on enhancing the resilience of rural areas against disasters.

The data sources for this study primarily include the following: first, primary materials obtained from multiple field surveys conducted by the author in Gangxi Village, where five village officials and thirty villagers were interviewed; second, meteorological information published on the government's official website and related sections; and third, supplementary materials from news reports to provide

[1]Source: Dahe Daily. https://baijiahao.baidu.com/s?id=1821934237641136506&wfr=spider&for=pc.

additional context and ensure completeness. The researchers established long-term relationships with the local community to facilitate in-depth interviews and data collection, ensuring the authenticity and richness of the data. This paper's analysis focuses mainly on Gangxi Village's response to sudden shifts between drought and flood, presenting the case through both dynamic and static analytical approaches. It examines the interactions among the actors involved in this scenario, taking into account the unique circumstances surrounding the events in Gangxi Village. The discussion is divided into three parts.

3.3. Methods

Existing research primarily explains disaster resilience and behavioral themes through multidisciplinary theoretical frameworks and empirical analyses. Studies demonstrate how individual behaviors shape resilience and, conversely, how resilience influences individuals' behavioral choices. In increasingly complex adaptive survival environments, disaster resistance systems emerge from dynamic interactions among multiple actors, with resilience arising from individuals' adaptive behaviors in response to both internal and external factors. Resilience is defined as a system's ability to absorb disturbances and reorganize itself. In the specific context of Gangxi village, risk perception, social norms, and collective action drive individual behaviors, while weak overall resilience mainly manifests as a free-rider problem (Wen, 2022). This study employs multiple data sources—including semi-structured interviews, policy document analysis, meteorological data, and news reports—to achieve triangulation and ensure validation.

To address the aforementioned policy paradox, this paper develops a "dynamic-static coupling" analytical framework to examine resilience performance and the underlying causes of behaviors in village-level disaster response (see **Figure 1**). The static resilience foundation explains the intrinsic vulnerability of rural systems. Drawing on three static dimensions "material-technical, cultural-cognitive and community-institutional resilience" this study characterizes the disaster resilience of Gangxi Village, providing capacity support for the "prevention-response-recovery" process and establishing the foundational capacity for disaster resistance. The dynamic mobilization process, in turn, reveals how this vulnerability is either amplified or mitigated throughout the disaster cycle. Through a dynamic analysis of rural community organizations, this paper explores the causes of behavioral patterns among actors in a phased developmental manner and their impact on overall resilience. Social mobilization generates kinetic energy for action through interactions among multiple actors, further facilitating the implementation of measures. The interaction between the static and dynamic pathways forms an assistive coupling interface, representing a critical arena for policy intervention. These two pathways mutually influence each other through "material foundation-institutional trust-behavioral iteration". When the static resilience foundation and the kinetic energy of mobilization are effectively coupled, the region demonstrates strong resilience in disaster response. Conversely, if weaknesses ex-

ist in various links of the static pathway, the resilience foundation cannot provide adequate support, and mobilization within organizations is hindered. When the kinetic energy of mobilization is insufficiently activated across different phases, mobilization fails to coordinate actors and utilize resources within relational networks, ultimately preventing the resilience foundation from functioning systematically to cope with disasters.

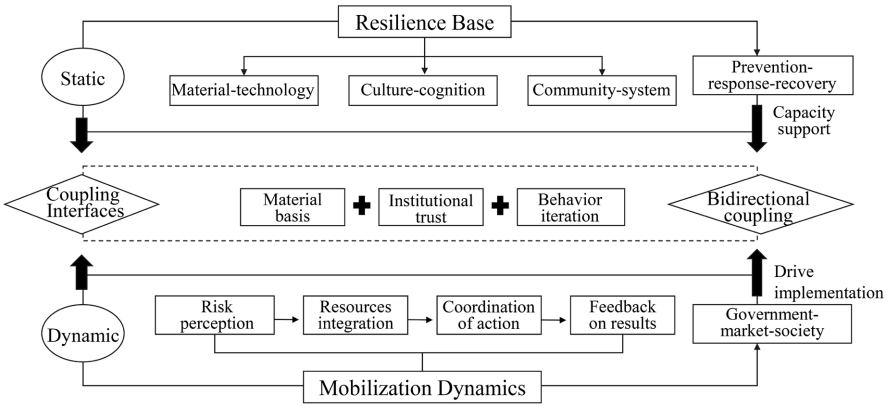

Figure 1. Analysis framework of rural disaster resistance resilience based on resilience theory.

4. Research Results and Discussion

4.1. Resilience Characterization Analysis

The systematic development of rural resilience requires key measures that align with environmental risks and sustainable development (Liu, Liu, & Du, 2025). Resilience research demands a fresh perspective from a systemic viewpoint; the principle that "adaptability creates complexity" serves as the foundation for exploring the generation and evolution of resilience in rural contexts. During the drought-flood emergency in Gangxi Village, significant deficiencies in disaster resilience were observed. Material resilience, organizational resilience, and cultural resilience were identified as the three critical dimensions analyzed in the village's disaster resilience assessment. Based on the survey findings, the analysis of insufficient disaster resilience in Gangxi Village is as follows:

1) Material resilience, often referred to as disaster hard power, The most significant challenge facing the village is the inadequate availability of material support. This issue primarily manifests in two ways. First, there is a deficiency in agricultural infrastructure components. When disasters occur, the ability of rural communities to withstand and recover depends heavily on physical support systems, such as flood embankments and drainage facilities. These structures can directly mitigate the physical impact of disasters on farmland and reduce the extent of damage. Unfortunately, agricultural development in Gangxi Village has not yet reached the standards necessary for high-quality farmland, making it difficult to meet practical needs for drought irrigation and flood drainage. As the "capillaries" of farmland, ditches are often clogged and difficult to access. The construction of

"three-sided smooth" ditches has been delayed but remains included in the agricultural construction plans issued by the township government (see Table 2 for specific infrastructure indicators). Additionally, there is a challenge in connecting material resources. During disaster events, grassroots township governments allocate resources to address extreme weather conditions, but these efforts primarily focus on drainage within suburban communities and flood prevention for government facilities. Rural communities are often overlooked in this resource distribution and may even be designated as flood discharge zones during severe waterlogging, effectively depriving them of agency in practical operations. This reflects a policy mismatch between infrastructure investment for disaster prevention and the actual needs at the grassroots level. Faced with such misallocation of external disaster response resources, community self-rescue becomes the only viable option.

Table 2. Basic construction indicators of farmland in Gangxi Village.

Number	Metric	Numeric value	Unit
1	Piped irrigation channels	8	Twig
2	Standard roads in farmland	3	Twig
3	The water outlet	16	Number
4	Electricity box	8	Number
5	Facility maintenance rate	30	%
6	Machine yield	95	%

2) Organizational resilience refers to the ability of rural communities to effectively respond to, adapt to, and recover from disasters. In the case of Gangxi Village's sudden transition from drought to flood, the analysis primarily focuses on community collective action and institutional factors. On one hand, community collective action emphasizes spontaneity, which includes the organization of villagers, their collaborative capabilities, and resource mobilization, with multi-level core mobilization networks serving as the primary manifestation. The village committee, as the main coordinator of daily activities within rural communities and the liaison with grassroots governments, plays a "leading role" during sudden disasters, which is crucial for subsequent steps in community collective action. Due to the inaction of the Gangxi Village Committee members, the three-tier linkage system of "Party members-village group leaders-local notables" lost its practical authority, resulting in the failure of collective action driven by blind resistance to disaster. Additionally, the severe lack of institutional support significantly contributed to the tragedy. The township government's risk avoidance and lack of commitment during disasters led to a deficiency in unified leadership in Gangxi Village's disaster response efforts and hindered timely communication with neighboring communities. Existing regulations proved ineffective in disaster situations, and due to resource limitations, emergency mechanisms could not be

implemented.

Cultural resilience plays a crucial role, primarily through traditional knowledge and risk perception (Tu & Wei, 2023). As a traditional farming region, Gangxi Village boasts extensive agricultural experience, with farming serving as the primary livelihood for its residents. However, this advantage has become a significant challenge in the face of recent disasters. In Henan, there is a saying that "nine out of ten years are dry", and the persistent high temperatures in May have further reinforced the villagers' belief in the likelihood of summer droughts, prompting them to prioritize corn selection as a direct response (details of the high temperatures are illustrated in **Figure 2**). The occurrence of prolonged heavy precipitation can transform a singular drought disaster into a more detrimental combination of drought and flooding, profoundly impacting agricultural production (refer to **Table 3** for details on changes in precipitation). Traditional farming practices heavily depend on natural conditions, a perspective that continues to prevail in contemporary society. Compared to the blind rescue efforts during disasters, the "indifference" displayed in post-disaster relief efforts starkly underscores the inadequacies in villagers' risk awareness. Achieving disaster resilience in villages cannot rely solely on hard power measures, such as irrigation and drainage systems. The essence of cultural resilience lies in the creative transformation of risk perception, which fundamentally involves cultivating risk awareness. This process necessitates an open system for knowledge updates to support agricultural production activities. Enhancing rural disaster warning systems and building risk resilience continue to pose significant challenges (Zhang & Sun, 2020).

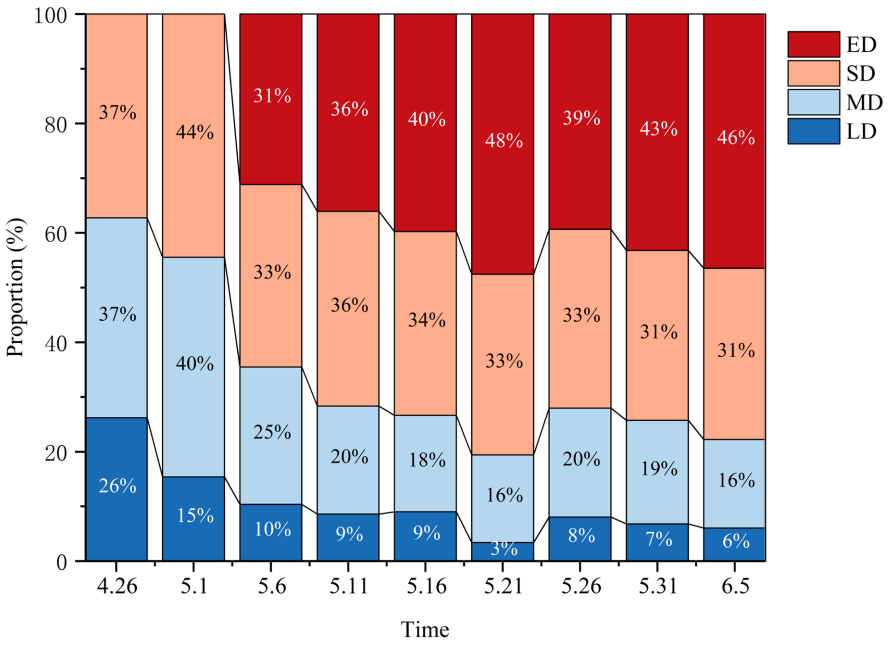

Figure 2. Percentage of drought in May[2].

[2]Data source: real-time data from meteorological drought stations in Henan Province from 4.26 to 6.5.

Table 3. Comparison of rainfall in July 2024[3].

Time	Area	Average value	Rainfall	Leveling rate
Since 2024 (January-July)	Henan province	468.7	579.2	23.6%
	Kaifeng city	391.0	575.0	47.1%
Since July (1st-31st)	Henan province	179.8	356.8	98.4%
	Kaifeng city	171.5	408.0	137.9%

4.2. Deconstruction of Mobilization Process

Disaster prevention and mitigation construction has become a major focus nationwide over the past five years, attracting significant attention as a key policy area. Given the uncertain climate conditions and the diverse characteristics of various villages, a site-specific approach is essential for effective resilience analysis and development. Drawing on the theory of disaster management cycles, this article deconstructs the social mobilization process in response to disaster events in Gangxi Village through the three-stage response chain of "Prevention—Response—Recovery". It interprets the mobilization process as a complex, dynamic interaction among groups with differing perspectives and interests, with a primary focus on exploring the impact of social mobilization on disaster outcomes. An examination of mobilization practices in Gangxi Village reveals three distinct stages: early, mid, and late. The early stage centers on risk perception, while the late stage emphasizes feedback effects. Recognizing that disaster response is a multifaceted, dynamic process, the mid-stage highlights the implementation of resource integration and coordinated actions. This paper emphasizes how these stages operate during the rapid transition between drought and flood. It is important to note that the case of Gangxi Village is somewhat extreme, and its mobilization process and outcomes are shaped by the specific context of the event. Human actions play a crucial role in social mobilization, and analyzing this aspect underscores the practical significance of deconstructing the mobilization process in Gangxi Village.

4.2.1. Early Stage: Perceptual Misjudgment + Real Action Deviation

Meteorological disasters often involve uncertainty, and risk perception is a critical factor influencing disaster response actions. In Gangxi Village, traditional experiences and a lack of risk awareness have significantly hindered the mobilization process during the risk perception stage. Previous models of disaster risk perception frequently shape the action orientation of governments and organizations, especially when climate conditions are difficult to modify through human intervention. Constrained by limited resources, local governments and organizations often rely on conventional disaster response measures for preliminary risk prediction. Traditional methods of risk perception primarily include phenological observation (Zhang & Hao, 2023), intergenerational experience, and collective

[3]Data source: Henan Hydrology and Water Resources Forecasting Center, precipitation comparison data from January to July 2024.

memory (He, 2025). While these approaches can contribute to disaster prediction to some extent, their effectiveness is limited due to the complex and dynamic nature of disasters. Furthermore, traditional methods exhibit significant empirical lag when addressing non-periodic disasters (Zhou & Tong, 2024). The prefecture-level city where Gangxi Village is located has been disseminating meteorological information since early April 2024. Due to the strong cyclical nature of agricultural production, local village collectives and residents have become accustomed to early climate phenomena and have overlooked the predictability associated with the risk perception stage. The rare drought phase, caused by prolonged high temperatures, has not received adequate attention regarding its multifaceted impact on the medium-term response stage.

"We have always cultivated rice. However, due to the persistently high temperatures, the land has become severely arid. Farmers depend on the weather for their crops and are anxious about the lack of rainfall. Many villagers have transitioned to growing corn. Since planting the corn, we have already irrigated the fields twice. The seeds are on the ground, and everyone is proceeding cautiously, taking it one step at a time." (Interview Record: Z20240903)

4.2.2. Medium Stage: Resource Misalignment + Relationship Network Fracture

As an intermediate link in the disaster response process, the response phase often exhibits characteristics of both bridging and initiating, making it a critical component that influences the overall effectiveness of disaster relief efforts. In Gangxi Village, during the mid-response phase, resource misalignment and fractured social networks led to interruptions in mobilization. Some scholars emphasize the geographical location and social structure of rural areas, arguing that these regions are insular and traditional. This perspective has served as a foundation for many researchers conducting innovative studies on rural communities. With ongoing interactions and dynamic changes between rural areas and modern society, the distinctiveness and adaptability of the rural domain have garnered increasing attention from scholars (Xu, Wang, & Zhao, 2024). Under these changes, the emergence and evolution of organizational networks create a conducive environment for a range of interactive activities within the rural sector, aligning with the mobilization needs of the response phase (Jia & Zhang, 2025). The mobilization process encompasses various aspects, including collaborative cooperation, resource sharing, and information dissemination, collectively forming a dynamic evolutionary process (Du & Sun, 2024). The mid-stage response phase can be primarily summarized into two key components: resource integration and action coordination.

"The land south of my house was originally low-lying. When the early rainfall was insufficient, the family next door secretly dug a field ridge to divert water from their own fields into mine. What kind of trickery is this? The two families even argued with the village party secretary about it, and that family denied any wrongdoing. I was already frustrated by the corn in my field, and this incident made me

even more furious. How could this not be considered a natural disaster or human misfortune"? (Interview Record: Y20240905)

As a critical component in enhancing community resilience, resource integration becomes significantly more complex due to the unpredictable nature of disasters and the unique characteristics of rural areas. In communities characterized by close relationships, resource integration often faces dual pressures from both internal and external factors. In the case of Gangxi Village, this is evident in the inadequate efforts to secure external resources and the misallocation of internal resources. During a drought, when there was an urgent need to irrigate seedlings within the village, members of the village committee failed to gather and communicate the villagers' concerns. Consequently, government departments did not hear the farmers' voices, and the Yellow River tributary channel running through the farmland became little more than an ornament. To ensure the survival of the seedlings, residents resorted to groundwater irrigation; however, the supply from the wells was insufficient to meet the villagers' needs, sowing the seeds of conflict for future collaborative efforts. During the flood season, inadequate infrastructure, such as drainage channels, resulted in a severe lack of material resilience, preventing water from draining out of the fields and even causing backflow. The haphazard drainage measures taken by individuals further exacerbated these conflicts, leaving villagers without the necessary resources for cooperative action. In the absence of formal institutional coordination, informal social networks may transform from cooperative resources into sources of conflict—a typical manifestation of the negative feedback mechanism in "relational networks" within mobilization theory. Throughout these processes, the government and the community experienced a disconnect in coordination, stemming from the lack of complementarity between formal and informal institutions in rural areas.

4.2.3. Later Stage: Lack of Feedback + Hinder the Formation of Synergy

After the mid-term response phase, the mobilization process in Gangxi Village revealed significant conflicts among various stakeholders, including the government and the village community, the village committee and the villagers, as well as among the villagers themselves. As the disaster unfolded, the coordination of mobilization failed to effectively support the disaster response. Key elements involved in the mobilization process—such as systems, personnel, and facilities—were insufficient. There was a lack of clear and timely arrangements regarding multiple chains of command and divisions of responsibility during the three stages of disaster prevention, response, and recovery. Consequently, the villagers, as the primary actors, were placed in a passive role, which delayed the optimal timing for disaster relief. At this stage, disaster response had progressed into the later phases of mobilization, focusing on feedback from mobilization efforts to guide post-disaster recovery practices.

"I believe the flooding of the farmland this time is solely due to the weather; it rained excessively. Continuous heavy rainfall over several days makes it difficult

to protect anything. This land has been cultivated for decades, and we have always managed to survive. What can one do to prepare for a disaster? We cannot stop the rain, either". (Interview Record: X20240904)

"At that time, I asked the village secretary how to preserve our resources, but he replied that there was nothing he could do; even his family's grain had been flooded. When I discussed this issue with my neighbors, they were also unable to propose any solutions—the land was fixed in place and could not be relocated. The only decision I felt I could make was to choose to plant rice in the future, but there were still no concrete solutions for the drought period". (Interview Record: L20240906)

Contrary to theoretical assumptions, the members of Gangxi Village engaged minimally in post-disaster discussions. The villagers believed that disasters were inevitable and viewed their efforts as futile. Instead, they focused more on geographical conditions and material resilience. The disaster caused severe flooding in the fields. Due to the detrimental effects of both internal and external factors, disaster resistance in Gangxi Village exhibited a profound sense of powerlessness. The lack of involvement from key decision-makers was a critical factor undermining the effectiveness of disaster response and mobilization (The disaster situation in Gangxi Village is illustrated in Figure 3).

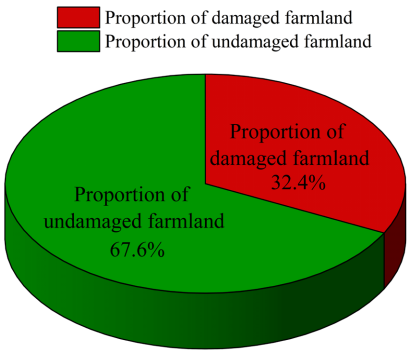

Figure 3. Disaster situation in Gangxi Village.

In the three stages of pre-disaster, mid-disaster and post-disaster, social mobilization does not progress linearly. Instead, it advances through four causal links "risk perception → resource integration → action coordination → feedback" in a spiraling process of progress, allowing each element to form a dynamic collective action system. However, when any link breaks, mobilization can produce negative effects, potentially leading to the failure of the overall effort. In the case of Gangxi Village, deviations in risk perception caused institutional delays in resource integration. This misallocation and shortage of resources further triggered conflicts of interest and organizational disorder during the action coordination stage. The failure of coordination obstructed effective feedback from post-disaster experiences, reinforcing the community's path dependence on traditional risk cognition. This causal chain analysis not only reveals the transmission mechanisms among

the various links but also provides precise entry points for subsequent policy interventions.

4.3. Key Mechanism Identification

Based on the overall performance of Gangxi Village during the drought and flood emergency, we observe that both pathways demonstrate a clear pattern through static resilience assessment and dynamic mobilization processes. This paper identifies two key mechanisms derived from the observed events.

The first mechanism is resilience loss, which refers to the decline in a rural system's ability to absorb disturbances and maintain stability during disaster response due to internal and external constraints. This decline causes the system to fall into a vulnerability trap. This paper will elaborate on the resilience loss mechanism from two perspectives: endogenous and exogenous factors. Endogenous vulnerability arises mainly from structural deficiencies within the resilience system. Key components of this structure include infrastructure, agricultural production models, community responses, and social capital. The system's inherent fragility and delays hinder communities' ability to withstand disasters independently when they occur. Exogenous factors, on the other hand, refer to external shocks beyond the community's control. In the case of Gangxi Village, these factors include the impacts of climate change—characterized by unpredictability—institutional blockages, and regional ecological security threats. Institutional blockages, exemplified by the disconnect between government and community coordination, also directly impede the proactive mobilization efforts of organizations. For easier understanding, the loss of resilience primarily involves the following aspects: 1) the material aspect, which includes drainage channels and pumping stations, as shown in **Table 2**; 2) the organizational level, where villagers reported in interviews that the village committee failed to respond promptly, and the three-tier linkage system within the village was unable to operate normally; and 3) the cultural aspect, referring to villagers' insufficient risk awareness, which led to inaccurate and delayed responses in practice.

The second mechanism is mobilization and efficiency, whereby multiple entities can achieve a dynamic improvement in collective disaster resistance efficiency. This is accomplished through activating relationship networks, effectively integrating resources, and coordinating cooperative actions throughout the disaster cycle. Mechanisms for mobilization and efficiency enhancement also exist in rural areas, where competition and cooperation coexist (Zhao, 2006). Multiple stakeholders often act to maximize their own interests during the mobilization process, and their interactions ar e dynamic within the network structure (Zhang & Zhang, 2022; Ding & Yang, 2008). Under ideal conditions, the organizational leader occupies a central position in the relational network, exerting significant influence over other entities, which leads to their recognition and acceptance of the leader's goals. When the objectives of the mobilization participants are closely aligned, the relational network enhances mobilization efficiency, enabling multi-

ple stakeholders to form more collaborative relationships, free from the constraints of their individual roles. The mobilization efficiency discussed in this paper is primarily characterized by the sudden disaster, Gangxi Village was not proactive in seeking external resources, and there was a breakdown in the sharing of water resources within the village—available in the early stages but lacking later on. Interviews also revealed that the village collective leadership was disorganized both before and after the disaster. Additionally, most villagers lacked trust in their leaders, which hindered effective information transmission throughout the event and impeded the activation of the village's mobilization and efficiency mechanisms.

4.4. Existing Problems and Challenges

Rural communities, especially grassroots units, serve multiple functions and responsibilities, acting as a vital link between national governance and local society. Grassroots governance in villages is often referred to as the "last mile" of policy implementation, particularly evident in the precise execution of policies. The outcomes of these implementations are often shaped by internal mobilization efforts. Based on an analysis of resilience indicators and the mobilization process, Gangxi Village faces the following primary challenges during disaster response events.

4.4.1. Resilience-Mobilization Coupling Failure

Table 4. Disaster resilience indicators.

Number	Primary indicators	Secondary indicators	Tertiary indicators
1	Material Resilience	Water conservancy facilities are perfect	Irrigation system coverage
2			Water storage and drainage regulation capacity
3		Agricultural adaptation and transformation	Crop variety planting ratio
4			Soil permeability
5		Emergency resource reserve	Number of drought-resistant pumps/drainage equipment
6			Number of groundwater Wells
7	Organizational Resilience	Disaster warning mechanism	Real-time data
8			Efficiency of warning information transmission
9		Multi-agent collaboration network	Insurance coverage for disaster insurance
10			Coverage of agricultural technology extension
11		Mechanism for safeguarding interests	Agricultural insurance penetration rate
12			Investment in maintenance of agricultural facilities

Continued

13	Cultural Resilience	Local knowledge	Mastering traditional technology
14			Crop variety retention
15		Disaster prevention and mitigation awareness	The level of risk perception
16			Disaster avoidance skill penetration rate
17		Community mutual aid culture	Number of neighborhood mutual aid after disaster
18			Participation rate in collective disaster relief activities

This paper focuses on the Gangxi Village case, examining the manifestations of material, organizational, and cultural resilience. It finds that Gangxi Village exhibits significant deficiencies in resilience during disaster response, with these shortcomings being more pronounced at the organizational and cultural levels. The indicators of resilience are presented in Table 4. Through analysis of these indicators, it is revealed that there is a lack of continuity in internal mobilization within community organizations, resulting in poor mobilization outcomes, particularly during the pre-disaster, mid-disaster, and post-disaster phases. Furthermore, as the primary leader in policy implementation for rural communities during disaster response, the grassroots township government often remains silent or even actively withdraws during disasters. This inaction further contributes to the failure of disaster relief efforts and hinders the community's ability to take proactive measures. In summary, a critical issue in Gangxi Village's disaster response is the failure of resilience-mobilization coupling. Specifically, the rigid mobilization led by the government fails to effectively coordinate with the flexible resilience of village self-organization, and the mobilization framework is not clearly defined, ultimately leading to failure.

4.4.2. System Blockage

The effective implementation of disaster relief efforts depends on clear and efficient execution channels. As the primary conduit for the flow of policy resources, institutional channels play a vital role in supporting agricultural production and improving farmers' livelihoods through collaborative policy frameworks, management systems, and technical resources. In early July 2024, Government K issued emergency updates for flood control, mandating strict adherence to the responsibilities of command leaders at the city, county, and township levels, ensuring that all materials and facilities are always prepared for activation. However, at the grassroots level, miscommunication from decision-makers led to misalignment and disruption in resource allocation, causing Government T (Township Government) to fail in effectively implementing specific measures within its jurisdiction. Additionally, the mobilization process was hindered by ineffective hierarchical coordination, and the relational network deteriorated due to both in-

ternal and external factors, preventing it from functioning as an effective intermediary. This situation can be summarized as the dissipation of policy resources at the grassroots level, resulting from the disruption of the relational network, which is a consequence of obstructed institutional channels.

4.4.3. Subject's Rights and Responsibilities Blurred, and Decision-Making Authority Suspended

The case of Gangxi Village highlights the structural problems arising from unclear boundaries of rights and responsibilities among various actors within the rural disaster governance system. During the crisis, key decision-making authority becomes township government, as the legal authority, remains invisible; the village committee, as the executive body, is ineffective; grassroots networks, including party members and group leaders, are fragmented; and individual farmers are forced to make decisions independently in this power vacuum. However, they become trapped in a prisoner's dilemma due to a lack of coordination. This suspension and misallocation of power not only initiate mobilization failure but also represent the core manifestation of institutional channel blockages.

5. Discussion

The article titled "Disaster Resilience" employs case studies to highlight the pronounced vulnerability of rural communities in the face of increasingly frequent extreme weather events. The abrupt transition from drought to flood—a compound disaster—reveals significant shortcomings in disaster resilience. Using the 2024 Kaifeng City drought-flood transition event as a representative case, the article examines the distinctive characteristics of compound disasters at the village level, focusing on the actual behaviors of communities and individuals during such crises. The coupling framework of "mobilization and coordination-system resilience" proposed in this paper posits that rural disaster resistance efficiency is determined not only by the "hard power" of material infrastructure or the "soft power" of social mobilization but also by the dynamic interaction between the two throughout the disaster cycle. The gap between disaster prevention awareness and the willingness to take action, highlighted in Section 4.1, represents a critical issue in this context. This disparity corresponds with the psychological distance between individuals and disaster risks, as discussed by scholar Shang Z.H. (2018), which also affects risk assessment outcomes and response behaviors. Meanwhile, Li's team et al., (2024) conducted a study in Jun County, Henan Province, revealing that despite a relatively adequate level of disaster prevention knowledge at the collective level, the lack of individual emergency plans significantly undermines disaster resilience and mobilization effectiveness. This finding highlights the institutional barriers present in the cognitive-action transformation process in Gangxi Village, characterized by hesitation and dependency. Regarding the relationship between authoritative recognition and community self-organization, this study aligns with existing consensus while also offering new insights that build upon previous research. Following heavy rainfall, the village's focus on disaster

recovery shifted toward post-disaster restoration, particularly addressing drainage issues in the fields. Due to varying degrees of damage, communities experience phased differences in resilience recovery. Unlike single disasters, drought-flood emergencies present unique recovery challenges, leading to cumulative agricultural losses. Traditional recovery methods are ineffective in addressing these compounded damages.

Scholars such as Su et al. (2024) found that the impact of government intervention and community self-organization varies across different stages of recovery in the Qinghai-Tibet Plateau community. The case of Gangxi Village illustrates this, demonstrating that significant fluctuations in trust toward authorities during sudden transitions from drought to flood greatly affect mobilization processes both within and outside the village community. Villagers' trust in the local government changes dynamically based on the effectiveness of emergency response measures. Unlike the post-disaster recovery phase examined by Su et al., this case reveals that compound disasters significantly compress the "golden window" for policy response, posing severe challenges to the current hierarchical system of disaster reporting and decision-making. Meanwhile, the time window for trust repair is extremely limited; once this critical period is missed, mobilization efficiency drops substantially. This phenomenon contrasts with the actions taken by relevant departments in the Yuwangtai area, which have to some extent, intensified villagers' suspicions.

6. Conclusions and Prospect

Climate change presents increasingly severe real-world challenges, and the consequences of meteorological disasters are profound and far-reaching (Tan et al., 2023). The proposal to establish a robust long-term mechanism for disaster prevention, mitigation, and relief in agriculture underscores the state's commitment to addressing meteorological disaster issues. Disasters cause varying degrees of damage during their pre-, mid-, and post-stages. Following the dissipation of a disaster, inadequate implementation of recovery measures can result in side effects that are even more detrimental. This article analyzes the shortcomings of disaster resistance in Gangxi Village and draws conclusions aimed at enhancing the existing body of knowledge in resilience research.

First, we must examine the systemic roots of insufficient resilience. The amplification of disaster losses primarily results from cumulative deficiencies in resilience. Analyzing the case of Gangxi Village from three dimensions—material, organizational, and cultural resilience—reveals a "vulnerability trap" (Li, 2013). This trap arises from the combined effects of fragmented infrastructure, disjointed policies and institutions, and weak community organizational capabilities, which significantly undermine the resilience of the village's agricultural production system against disturbances. Similar structural imbalances exist in urban resilience building, and rural areas face comparable challenges. Enhancing resilience presents a significant challenge in disaster response, and technological media can serve as an

effective tool to address this issue. To overcome institutional channel blockages, we propose promoting a streamlined emergency authorization mechanism for grassroots disaster prevention and reduction. This mechanism would enable village-level organizations to autonomously and rapidly deploy emergency resources within predefined budget ceilings upon issuance of early warnings. In this process, the village committee should actively assume the responsibility of interpreting information and mobilizing the community to ensure that risk awareness leads to effective preparatory actions.

Second, the paradoxical nature of social mobilization must be considered. Mobilization is a process involving multiple stakeholders collaborating and integrating various resources within organizations or systems to achieve greater efficiency through dynamic interactions. However, grassroots mobilization is often hindered by unique local conditions. In the critical chain of the mobilization process, Gangxi Village faces contradictions such as institutional barriers, imbalanced resource allocation, and the silence of decision-makers. This results in a scenario where "mobilization is possible, but implementation is difficult". While some households may spontaneously engage in disaster response, they often struggle to contribute positively to the relational network due to a lack of emotional identification and risk awareness. This situation can exacerbate conflicts and lead to an "alienation" phenomenon within the mobilization process. Finally, based on the theoretical breakthrough of "resilience-mobilization" bidirectional coupling, a dynamic coupling interface is constructed through three pathways: material foundation, institutional trust, and behavioral iteration. This interface establishes a linear complementary relationship aimed at breaking the "vulnerability lock". When all these elements are present, the relational networks and collective learning derived from the mobilization process will further enhance resilience building, leading to an adaptive upgrade in disaster resistance.

This case serves as a typical negative example. Based on resilience theory, the author constructs a framework to analyze specific issues in disaster resistance processes and integrates theoretical insights into practical knowledge transformation. However, there are limitations associated with studying a single negative case: 1) The article establishes a rural disaster resilience analysis framework grounded in resilience theory and applies it to Gangxi Village in Henan Province. Due to the constraints of case studies and the varying levels of rural development across regions, the framework's effectiveness in explaining the disaster resistance processes of other rural communities requires further validation within their specific contexts. 2) Given that the overall development capacity of Gangxi Village is relatively weak, there is a lack of comprehensive and clear statistical data following the disaster. The primary research materials obtained are limited; most studies on disaster resilience employ quantitative methods. The author anticipates improved data availability in the future to conduct further quantitative analyses that will support the conclusions. As a microcosm of China's rural areas, the distinctive research process on rural resilience to disasters in Gangxi Village offers new theoretical insights into understanding the resilience of contemporary Chinese rural agricul-

ture in the face of disasters.

Rural areas, like complex adaptive systems, involve the interplay of multiple influencing factors in their operational dynamics. This study, grounded in the "mobilization-resilience" coupling framework, aims to provide a universal analytical tool for understanding grassroots policy implementation failures in developing countries. As demonstrated, informal institutions play a crucial role in disaster resilience, exerting both positive and negative impacts. Clan relations, a significant aspect of social interactions within communities, influence the conduct and direction of various village activities and should not be overlooked. As a vital component of grassroots governance, effective mobilization requires a collaborative network among the government, society, and market sectors, where optimizing social mobilization enhances the effectiveness of grassroots governance. In addition to internal mobilization within villages, there exists a network of collaborative relationships between different villages. Under the requirements for high-standard farmland construction, inherent flaws in the vulnerability reproduction mechanism may lead village communities to intensify water rights disputes with upstream and downstream villages to protect their own interests. This behavior undermines the overall resilience of disaster resistance systems. Effectively addressing all influencing factors is essential for enhancing rural resilience. Globally, disasters exacerbated by climate change continue to impact various regions. In an era where coexistence with disasters has become the norm, disaster resistance has emerged as a universal consensus. Tailored research designs should be developed based on the specific conditions of rural areas in different countries and regions, focusing on innovation and improvement in multiple aspects, including disaster monitoring and early warning systems, rural infrastructure development, disaster prevention material storage and management, and community collaborative participation. Strengthening the disaster resilience of rural agricultural production requires the collective efforts of rural communities worldwide.

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Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

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