

Village Government Strategies for Landslide Disaster Mitigation and Community Preparedness in Disaster-Prone Areas

Insan¹, Muhammad Lutfi*¹, Sumardi¹

¹Department of Government Studies, Universitas Muhammadiyah Sinjai, Indonesia

*Email Co-Authors: lutfigov@gmail.com

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Abstract: This study aims to examine the strategies employed by the Village Government of Gantarang in mitigating landslide disasters and enhancing community preparedness within disaster-prone areas. This study adopts a qualitative approach with a phenomenological design. Data were collected through in-depth interviews, observations, and document analysis involving village officials, community leaders, and relevant stakeholders. The findings indicate that the village government implements a hybrid mitigation strategy combining structural measures (retaining walls, evacuation routes, early warning systems) and non-structural approaches (community training and participatory planning). However, the results show that implementation remains uneven due to financial constraints, limited infrastructure, and inconsistent community engagement, reflecting a gap between policy design and local execution. This study is limited to a single case study, which may affect generalizability. Nevertheless, it provides contextual insights into local disaster governance in rural settings. The findings suggest that strengthening local capacity, improving funding flexibility, and institutionalizing disaster education are essential for enhancing village-level resilience. The study highlights the importance of community participation in fostering adaptive capacity and reducing disaster vulnerability. This research contributes to the understanding of local disaster governance by demonstrating how global frameworks are operationalized at the village level in a resource-constrained context.

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INTRODUCTION

Disasters are increasingly recognized as complex disruptions that affect not only physical environments but also social, economic, and governance systems at multiple scales (Balch et al., 2020; Broadhurst & Gray, 2022; Chen et al., 2024; Schipper et al., 2021; Woodall et al., 2024). Globally, the frequency and intensity of hydro-meteorological hazards such as floods, landslides, and extreme weather have risen significantly in recent years, driven in part by climate variability and environmental degradation (Araújo et al., 2022; de Souza et al., 2024; Picarelli et al., 2021). These disasters disproportionately affect vulnerable communities, particularly those in rural and geographically isolated areas, where limited infrastructure and institutional capacity constrain effective response and recovery. As a result, disaster risk reduction (DRR) has shifted from a reactive, response-oriented paradigm toward a proactive approach emphasizing preparedness, mitigation, and resilience at the local level.

Within this global context (Shrestha et al., 2021; Syed et al., 2021; Zhang et al., 2020), a critical challenge that continues to hinder effective disaster management is the phenomenon widely referred to as the “Last Mile Challenge.” This concept highlights the persistent gap between national or international disaster policies and their actual implementation at the community level (Haque & Uddin, 2023; Uddin et al., 2021). While global frameworks such as the Sendai Framework for Disaster Risk Reduction advocate for inclusive, community-based approaches, many local governments particularly in developing countries struggle to operationalize these strategies due to limited resources, weak institutional coordination, and infrastructural constraints (Imperiale & Vanclay, 2021; Quader et al., 2023; Seddiky et al., 2020). This gap underscores the importance of strengthening governance capacity at the lowest administrative units, where disaster impacts are first experienced and immediate responses are initiated.

The challenges faced by the Village Government of Gantarang in Sinjai Regency, Indonesia, exemplify this global phenomenon (Sirimorok et al., 2023). As a disaster-prone rural area characterized by mountainous terrain and limited accessibility, Gantarang reflects broader patterns of rural vulnerability observed in many parts of the world (Tahir et al., 2022). Geographic isolation exacerbates what is often termed “access poverty,” where restricted transportation networks hinder the timely delivery of emergency assistance, particularly within the critical 24–72 hours following a disaster (Sirimorok et al., 2023; Tahir et al., 2022). This condition is further compounded by the village’s dependence on external funding sources, such as district-level disaster management agencies, which may not always provide timely or flexible financial support for localized emergency needs.

In addition, the increasing occurrence of landslides in the Sinjai region is closely linked to broader patterns of climate change, particularly rising rainfall intensity and unpredictable weather conditions (Ash-Shidiqqi et al., 2023; Busthan et al., 2024). These hydro-meteorological hazards not only threaten human lives but also disrupt critical infrastructure, including transportation networks and public services, thereby amplifying socio-economic vulnerabilities. The situation in Gantarang thus reflects a localized manifestation of global climate-related risks, where traditional infrastructure systems are often inadequate to cope with emerging environmental pressures. Consequently, enhancing local adaptive capacity has become a central priority in both policy and academic discourse on disaster resilience.

Efforts to address these challenges are aligned with global development agendas, particularly the Sustainable Development Goals (SDGs), specifically Goal 11 (Kumar & Sharifi, 2024; Nabiyeva et al., 2023), which emphasizes the creation of “resilient cities and communities.” This goal recognizes that national resilience is fundamentally determined by the preparedness and capacity of its smallest governance units, including villages. Similarly, the Sendai Framework underscores the importance of strengthening local institutions, promoting community engagement, and reducing disaster risks through integrated and inclusive approaches (Uchiyama et al., 2021; Wolff, 2021). However, despite these global commitments, significant gaps remain in translating these frameworks into effective local action, particularly in rural and disaster-prone regions such as Gantarang.

Empirical evidence from the Gantarang Village and the broader Sinjai Regency further illustrates the severity and frequency of disaster events, as well as their socio-economic impacts. The following table presents quantitative data on disaster occurrences between 2024 and mid-2025, highlighting the dominance of hydro-meteorological hazards and their consequences at both village and regional levels.

Table 1. Disaster Data for Gantarang Village and Sinjai Regency (2024–2025)

Coverage Area	Time Period	Number of Events	Dominant Type	Damage/Impact
Gantarang Village	March 2024	2	Landslides	Provincial road (Sinjai–Malino) nearly collapsed
Sinjai Tengah District	Throughout 2024	11	Landslides (7), Wind (3), Abrasion (1)	Damage to inter-village roads and settlements
Sinjai Regency	Jan–Dec 2024	>40	Landslides (34)	Increased disaster frequency compared to 2023
Sinjai Regency	Jan–June 2025	56	Extreme weather & landslides	Dozens of houses severely damaged
Sinjai Regency	July 2025 (Peak)	9 districts	Floods & landslides	Hundreds of houses, public facilities, and electricity networks damaged

Source: Processed from multiple data sources

Table 1 confirms several critical global patterns. First, the dominance of hydro-meteorological disasters in Sinjai mirrors global trends of increasing extreme weather events. Second, the economic losses experienced at the local level manifested in damaged infrastructure and disrupted livelihoods reflect broader global issues of uninsured disaster losses, which disproportionately affect low-income communities. Third, the disruption of transportation access, such as the collapse of a 60-meter road segment in Gantarang, highlights the persistent challenges of accessibility and logistics in remote disaster-prone areas. These findings reinforce the urgency of strengthening local preparedness and mitigation strategies as essential components of disaster resilience.

Despite the growing recognition of community-based disaster risk management, there remains a significant gap between policy frameworks and their practical implementation at the village level. Existing studies have emphasized the importance of local participation, institutional capacity, and adaptive strategies in enhancing resilience; however, limited research has specifically examined how village governments operationalize these strategies in geographically isolated and resource-constrained settings. In particular, the role of village governance in integrating mitigation measures, coordinating stakeholders, and fostering community preparedness remains underexplored, especially in the Indonesian context.

Based on these considerations, this study aims to analyze the strategies employed by the Village Government of Gantarang in mitigating landslide disasters and enhancing community preparedness in a disaster-prone environment. By focusing on local governance dynamics, this research seeks to contribute to the broader discourse on bridging the gap between global disaster frameworks and local implementation practices.

Accordingly, the study is guided by the following research questions:

RQ1. How does the Village Government of Gantarang design and implement strategies for landslide disaster mitigation in disaster-prone areas?

RQ2. What are the key challenges faced by the village government in enhancing community preparedness and resilience?

RQ3. To what extent do existing local strategies align with global frameworks such as the Sendai Framework and SDG 11?

RESEARCH METHOD

Research Design and Approach

This study adopts a qualitative research design with a phenomenological approach to explore and understand the lived experiences and strategic practices of the Village Government of Gantarang in landslide disaster mitigation. Qualitative research emphasizes meaning, process, and contextual understanding of social phenomena as experienced by research participants in real-life settings (Creswell, 2014; Moleong, 2019). The phenomenological approach is particularly relevant as it enables the study to capture the perceptions, interpretations, and experiences of individuals and groups directly involved in disaster mitigation efforts (Nasir et al., 2023). Accordingly, this approach allows for an in-depth examination of how local actors interpret risks, formulate strategies, and respond to disaster threats within their socio-institutional context.

Study Site and Data Sources

The study was conducted in Gantarang Village, Sinjai Tengah District, a disaster-prone area characterized by frequent landslides and limited accessibility. The selection of this site is based on its vulnerability to hydro-meteorological hazards and its relevance to the research objective of examining local governance strategies in disaster mitigation (Agliata et al., 2021). This study integrates multiple qualitative data sources, including primary data obtained through fieldwork and secondary data derived from relevant documents and reports. Such a multi-source approach enables a comprehensive understanding of both policy frameworks and their practical implementation at the village level.

Data Collection Techniques

Data were collected through in-depth interviews, observations, and document analysis (Deterding & Waters, 2021; Natow, 2020). In-depth interviews were conducted with purposively selected informants who possess direct knowledge and involvement in disaster mitigation activities, including the village head, village officials, community leaders, and relevant local government representatives. Observations were carried out to examine ongoing and past mitigation-related activities, including meetings, community initiatives, and public engagement processes. In addition, documentation techniques were employed to review official reports, policy documents, and media publications related to disaster mitigation in Gantarang Village. This combination of methods ensures data richness and supports triangulation across different sources.

Data Analysis and Validation

The data were analyzed using the interactive model proposed by Miles et al., (2014), which involves three key steps: data reduction, data display, and conclusion drawing. Data reduction was conducted by selecting and organizing relevant information into thematic categories aligned with the research objectives. The findings were then

presented in a narrative and analytical form to highlight patterns, relationships, and key insights. Conclusions were drawn based on empirical findings and continuously verified through source triangulation and follow-up clarification with informants. This process ensures the credibility, consistency, and scientific rigor of the study, while allowing for a grounded interpretation of local disaster mitigation strategies.

RESULTS AND DISCUSSION

Village Government Strategies for Landslide Disaster Mitigation

This section presents the key findings derived from the analysis of village-level disaster mitigation practices in Gantarang. The findings reveal that the village government has developed a dual strategy combining structural and non-structural mitigation measures. The analysis indicates that structural interventions, such as the construction of retaining walls, evacuation routes, and temporary shelters, are prioritized in response to the geographical vulnerability of the area. This indicates a strong reliance on physical infrastructure as the primary mechanism for reducing landslide risk (Kamal et al., 2023; Mendonca & Gullo, 2020). As shown in Figure 1, evacuation route signage has been systematically installed in visible and accessible locations. This suggests that spatial preparedness has been institutionalized to some extent within the village governance system, enabling faster evacuation during disaster events.



Figure 1. Evacuation route signs

The findings further show that the provision of evacuation shelters in public facilities reflects an embedded approach to disaster response within existing community infrastructure. It is evident that the village government utilizes mosques, schools, and village offices as temporary shelters, which indicates an efficient use of available resources (Sheikhi et al., 2021; Vivita et al., 2023). However, this also suggests a limitation in terms of dedicated disaster infrastructure, as the reliance on multi-purpose facilities may reduce effectiveness during large-scale emergencies. Moreover, the implementation of early warning systems, as illustrated in Figure 2, demonstrates an effort to integrate technological solutions into local disaster management. This indicates that external collaboration, particularly with academic institutions, plays a critical role in enhancing local capacity.

Despite these efforts, the analysis indicates that the distribution of early warning systems remains uneven across high-risk areas. This suggests that financial constraints significantly affect the scalability and sustainability of mitigation strategies (Friess et al., 2022). The findings reveal that while innovation is present, its impact is limited by budget dependency and resource allocation challenges. In line with prior studies on community-

based disaster risk management, this indicates that local governments often operate within constrained fiscal environments that hinder comprehensive implementation. This suggests that the effectiveness of mitigation strategies is not solely determined by policy design but also by the availability of financial and technical resources.



Figure 2. Map of the Disaster Early Warning System

From a non-structural perspective, the findings reveal that the village government has implemented various initiatives, including disaster awareness programs, preparedness training, and integration of disaster risk reduction into development planning. This indicates an alignment with the principles of community-based disaster risk management, which emphasize participation and local empowerment (Ruszczuk et al., 2020). However, it is evident that these initiatives are not consistently implemented. The intermittent nature of training programs suggests that disaster education has not yet become institutionalized within the village governance framework. This suggests a gap between strategic planning and operational execution, where programs exist but lack continuity and long-term impact (Al-Dhaafri & Alosani, 2020).

Challenges in Enhancing Community Preparedness and Resilience

The findings indicate that the implementation of disaster mitigation strategies in Gantarang is constrained by multiple interrelated challenges. Financial limitation emerges as a dominant factor affecting both structural and non-structural mitigation efforts (Yildirim et al., 2023). The analysis indicates that the village government relies heavily on external funding from district-level agencies, which creates delays and limits flexibility in responding to urgent needs. This suggests that fiscal dependency reduces local autonomy and weakens the capacity for rapid disaster response (Friess et al., 2022). It is evident that such dependency reflects a broader global issue commonly referred to as the “localization gap,” where local governments lack sufficient resources to implement nationally mandated disaster policies.

In addition to financial constraints, infrastructural challenges significantly affect disaster preparedness. The findings reveal that the mountainous terrain and limited road connectivity in Gantarang create substantial barriers to evacuation and emergency response. This indicates the presence of the “last mile challenge,” where accessibility

issues delay the delivery of aid and increase vulnerability during disaster events. It is evident that the disruption of critical road infrastructure, particularly during landslides, further isolates affected communities. This suggests that mitigation strategies must not only focus on hazard reduction but also on improving connectivity and accessibility as integral components of disaster resilience.

The study also identifies socio-cultural challenges that influence community preparedness. The findings indicate that while some community members actively participate in mitigation activities, others show limited engagement, particularly in disaster training programs. This suggests that disaster awareness and literacy remain uneven across the population (Genc et al., 2022). It is evident that the lack of continuous education contributes to a fragmented understanding of disaster risks, which ultimately weakens collective preparedness. In line with existing literature, this suggests that sustained community engagement is essential to transform disaster preparedness from a reactive practice into a proactive culture (Appleby-Arnold et al., 2021; Sutley & Lyles, 2023).

Institutional coordination represents another critical challenge. The findings indicate that collaboration between the village government and external stakeholders, such as regional disaster management agencies, is present but not fully optimized. This suggests that communication gaps and bureaucratic inefficiencies may hinder effective coordination (Lovari & Bowen, 2020; Sarı & Özer, 2024). It is evident that while support mechanisms exist, they are not always timely or responsive to local needs. This indicates that improving institutional synergy is crucial for enhancing the overall effectiveness of disaster management strategies. Without strong coordination, even well-designed policies may fail to achieve their intended outcomes.

Alignment with Global Frameworks: Sendai Framework and SDG 11

This section examines the extent to which local disaster mitigation strategies in Gantarang align with global frameworks such as the Sendai Framework for Disaster Risk Reduction and Sustainable Development Goal 11. The findings indicate that there is a conceptual alignment between local practices and global principles, particularly in terms of community participation and risk-informed planning. The implementation of evacuation routes, early warning systems, and community-based training programs suggests that the village government recognizes the importance of proactive disaster management (Sufri et al., 2020). This indicates that global frameworks have influenced local policy orientation, even at the village level.

However, the analysis reveals that this alignment is largely normative rather than operational. It is evident that while policies reflect the principles of the Sendai Framework, their implementation remains inconsistent and limited in scope. This suggests that the translation of global frameworks into local practice is constrained by resource limitations and institutional capacity (Bang, 2021; Uchiyama et al., 2021). For instance, the uneven distribution of early warning systems and the lack of regular training programs indicate that local strategies are not yet fully aligned with the comprehensive approach advocated by global frameworks.

Furthermore, the findings indicate that the integration of disaster risk reduction into village development planning reflects an effort to align with SDG 11, which

emphasizes resilient communities. This suggests that local governance is moving toward a more integrated approach to development and disaster management (Sandoval et al., 2023). However, it is evident that monitoring and evaluation mechanisms are still underdeveloped. This indicates that the village government lacks the tools to systematically assess the effectiveness of its strategies and ensure continuous improvement.

The discussion further suggests that local strategies are still in a transitional phase toward full alignment with global standards. While foundational elements such as community participation and infrastructure development are present, gaps remain in terms of sustainability, scalability, and institutionalization. This indicates that achieving full alignment requires not only policy adoption but also sustained investment in capacity building, governance strengthening, and community engagement (Swaris et al., 2024). These findings suggest that bridging the gap between global frameworks and local implementation remains a critical challenge, requiring coordinated efforts across multiple levels of governance.

CONCLUSION

This study investigated the strategies of the Village Government of Gantarang in mitigating landslide disasters and enhancing community preparedness within the broader context of local disaster governance and global resilience frameworks. By focusing on a disaster-prone rural setting, the study examined how structural and non-structural approaches are designed and implemented in response to increasing hydro-meteorological risks. The findings collectively demonstrate that the village government has adopted a hybrid mitigation strategy that integrates infrastructure development, community participation, and institutional collaboration. This indicates that local governance plays a critical role as the frontline actor in disaster risk reduction, particularly in geographically vulnerable and resource-constrained areas. At the same time, the results suggest that the effectiveness of these strategies is shaped by financial capacity, institutional coordination, and the consistency of community engagement, highlighting the complex interplay between policy intent and operational realities.

These results advance the theoretical understanding of community-based disaster risk management by illustrating how global frameworks such as the Sendai Framework and SDG 11 are interpreted and operationalized at the village level. The findings suggest that while conceptual alignment with global principles is evident, practical implementation remains partial and uneven. This contributes to the broader discourse on the “last mile challenge,” where local governments are expected to deliver resilience outcomes despite limited resources and structural constraints. By emphasizing the role of local institutions, social participation, and adaptive strategies, this study provides empirical insight into how resilience is constructed in practice rather than assumed in policy. It is evident that disaster mitigation at the village level is not merely a technical process but a socio-institutional endeavor that requires continuous learning, collaboration, and contextual adaptation.

For public agencies, the insights suggest that strengthening local disaster governance requires a more decentralized and flexible approach to funding, capacity

building, and policy implementation. It is evident that empowering village governments through sustained financial support, technical assistance, and institutional integration is essential to achieving effective and inclusive disaster resilience. However, the study is limited by its focus on a single case study, which may influence the generalizability of the findings to other regions with different socio-geographical conditions. In addition, the reliance on qualitative data may limit the ability to quantify the effectiveness of specific mitigation strategies. Further research should explore comparative multi-case studies and incorporate mixed-method approaches to deepen understanding of how local governance systems can bridge the gap between global disaster frameworks and localized implementation practices.

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