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Local Wisdom as an Instrument of Disaster Risk Management: Reconstructing Local Government Roles in the Governance of Local Knowledge

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Abstract:
This study examines local wisdom as an instrument of disaster risk management and reconstructs the role of local government in the governance of local knowledge. The study is grounded in the argument that community-based knowledge, indigenous practices, oral histories, ecological observations, customary norms, and social memory are often crucial in helping communities understand hazards, interpret risk, and organize collective preparedness. However, such knowledge frequently remains outside formal disaster governance systems, which tend to prioritize scientific data, technological warning systems, administrative procedures, and sectoral coordination. Using a qualitative case study approach, this research analyzes how local wisdom is recognized, documented, validated, and integrated into formal disaster risk reduction mechanisms. Data were collected through in-depth interviews, field observations, and document analysis involving local government actors, disaster management agencies, traditional leaders, community representatives, and disaster volunteers. The findings show that local wisdom functions as an early recognition system, a behavioral guide, and a social coordination mechanism in disaster risk management. Nevertheless, its institutional integration remains limited due to weak documentation, fragmented coordination, and the absence of clear policy mechanisms for local knowledge governance. This study contributes to disaster governance literature by proposing a reconstructed role for local government as a knowledge broker, facilitator, regulator, and institutional integrator. The novelty of this study lies in bridging local, indigenous, and traditional knowledge with formal governmental systems so that disaster risk reduction becomes more participatory, culturally grounded, and institutionally sustainable.

Keywords: local wisdom; disaster risk management; local government; local knowledge governance; disaster risk reduction; community resilience

1. Introduction

Indonesia's exposure to multiple hazards has made disaster risk reduction a permanent concern in public governance. Earthquakes, tsunamis, volcanic eruptions, floods, landslides, coastal abrasion, and climate-related hazards repeatedly affect local communities whose everyday lives are closely connected to fragile ecological systems. In this context, disaster risk is not merely a technical problem of hazard monitoring, emergency response, or infrastructure provision. It is also a governance problem that involves how risk is understood, communicated, remembered, and managed across different knowledge systems. Recent disaster studies increasingly show that communities do not respond to hazards as passive recipients of state intervention; they rely on experience, oral history, customary rules, ecological observation, collective memory, and locally embedded social institutions to interpret danger and organize preparedness (Hadlos et al., 2022; Firdaus et al., 2023; Hirono & Nurdin, 2024).

Local wisdom is particularly relevant in Indonesia because many communities have developed culturally rooted mechanisms for living with recurring hazards. These mechanisms may include reading natural signs, regulating settlement patterns, preserving sacred or protected spaces, maintaining mutual aid practices, transmitting disaster stories across generations, and using traditional communication tools for early warning. Studies on the Mentawai Islands, Anak Krakatau, Tiworo, Serang, and other Indonesian contexts indicate that local knowledge often functions as a practical instrument of preparedness, adaptation, and post-disaster recovery (Firdaus et al., 2023; Marhadi et al., 2024; Markolinda et al., 2025; Pujiyono et

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al., 2025). Such knowledge is not static folklore. It is a living and adaptive knowledge system shaped by repeated interaction between communities, hazards, landscapes, and social institutions.

The main problem is that local wisdom has not been fully positioned as an integral part of formal disaster risk governance. Government-led disaster management systems tend to prioritize scientific data, administrative procedures, technological warning systems, and institutional coordination, while community knowledge is often treated as complementary, informal, or culturally symbolic. This separation creates a governance gap. Local knowledge may be socially trusted but weakly documented, while formal government systems may be administratively legitimate but less sensitive to cultural meanings, local risk perception, and community-based decision-making. When these two systems operate separately, disaster risk reduction becomes less contextual, less participatory, and less capable of mobilizing community resilience (Cuaton & Su, 2020; Hadlos et al., 2022; Hirono & Nurdin, 2024).

Previous studies have provided important foundations for understanding the relationship between local wisdom and disaster risk reduction. Hadlos et al. (2022), through a systematic literature review, demonstrated that local and indigenous knowledge has become increasingly significant in DRR scholarship, particularly in relation to preparedness, early warning, adaptation, and the Sendai Framework agenda. Cuaton and Su (2020) examined local-indigenous knowledge among the Mamanwa people in the Philippines and showed that community knowledge can shape disaster interpretation after major hazard events. In Indonesia, Firdaus et al. (2023) found that the integration of scientific knowledge and local wisdom around Anak Krakatau strengthens disaster resilience, especially in preparedness and recovery processes. Markolinda et al. (2025) explored Mentawai indigenous knowledge and showed that natural signs, traditional rituals, and local communication instruments contribute to mitigation and climate adaptation. Marhadi et al. (2024) examined local wisdom in Tiworo and emphasized that disaster mitigation is embedded in specific community knowledge and cultural practices.

Other studies have broadened the discussion by focusing on education, communication, social resilience, and institutional challenges. Suarmika et al. (2022) highlighted the role of indigenous disaster mitigation knowledge in reconstructing disaster education for Indonesian elementary schools. Syamsidik et al. (2021) reviewed long-term tsunami mitigation and preparedness in Aceh and showed that recovery requires continuous learning, institutional commitment, and community engagement. Sullivan and Sagala (2020) examined the long-term impacts of Mount Sinabung eruptions and revealed that inequality, relocation, and social status influence disaster recovery. Samson and Warganegara (2021) discussed post-tsunami disaster response in Indonesia and emphasized the interaction between religion, social meaning, and disaster governance. Dede et al. (2024) synthesized the relationship between disaster, environment, and local indigenous knowledge in Indonesian society, while Pujiyono et al. (2025) demonstrated that modern tsunami early warning systems can be strengthened when technological instruments are connected with local wisdom. These studies collectively confirm that local wisdom has practical value for disaster mitigation, education, communication, and resilience.

The existing literature, however, still leaves an important gap. Most studies have focused on identifying forms of local wisdom, describing community practices, or demonstrating their contribution to preparedness and resilience. Far less attention has been given to how local governments can reconstruct their institutional role so that local wisdom becomes part of formal risk governance, rather than remaining outside administrative planning, policy design, and inter-agency coordination. This study addresses that gap by positioning local wisdom as an instrument of disaster risk management and by examining the role of local governments in governing, validating, documenting, institutionalizing, and integrating community knowledge into formal DRR systems. The novelty of this study lies in its attempt to bridge local, indigenous, and traditional knowledge with the formal governmental system of disaster risk reduction. Accordingly, this study aims to analyze how local wisdom can be reconstructed as a governance instrument in disaster risk management and how local governments can build a more inclusive, culturally grounded, and knowledge-based model of disaster risk governance.

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2. Methodology

This study employed a **qualitative research method** with a **case study approach**. The qualitative method was selected because the study seeks to understand how local wisdom is interpreted, institutionalized, and integrated into formal disaster risk management by local governments. The focus of this study is not to measure disaster risk statistically, but to examine governance processes, institutional roles, community knowledge systems, and the relationship between formal government mechanisms and locally embedded disaster knowledge. Through this approach, the study is able to capture meanings, practices, institutional dynamics, and contextual factors that cannot be adequately explained through quantitative measurement alone.

The case study approach was used because the integration of local wisdom into disaster risk governance is highly contextual and closely related to specific social, cultural, institutional, and ecological settings. This study positions local government as the central unit of analysis, particularly in its role as a formal authority responsible for disaster risk reduction, community empowerment, knowledge documentation, policy coordination, and the incorporation of local knowledge into disaster planning. The case study focuses on local communities that possess disaster-related local wisdom and interact with local government institutions in disaster mitigation, preparedness, response, and recovery. This approach enables the research to examine how community-based knowledge is recognized, translated, and governed within formal administrative systems.

The research data were collected from both **primary and secondary sources**. Primary data were obtained through in-depth interviews with relevant actors, including officials from local disaster management agencies, village or sub-district government representatives, community leaders, traditional leaders, disaster volunteers, and residents who possess knowledge of local disaster practices. These interviews were designed to explore perceptions of local wisdom, the role of government in recognizing and managing local knowledge, institutional barriers to integration, and opportunities for strengthening local knowledge governance in disaster risk management. In addition, field observations were conducted to understand community practices, social interactions, local mitigation mechanisms, and the ways in which local knowledge is transmitted and applied in everyday disaster preparedness.

Secondary data were collected through document analysis. The documents examined included regional disaster management plans, disaster risk reduction policies, contingency plans, local regulations, village-level planning documents, reports from disaster management agencies, academic publications, and other relevant institutional documents. These documents were used to assess how far local wisdom has been formally acknowledged, documented, and integrated into disaster risk governance. The combination of interviews, observations, and document analysis allowed the study to obtain a more comprehensive understanding of the relationship between local knowledge and formal disaster management institutions.

The informants were selected using a **purposive sampling technique**. This technique was considered appropriate because the study required information from actors who have direct experience, authority, or knowledge regarding disaster management and local wisdom. The selection of informants was based on their involvement in disaster risk reduction activities, their understanding of community-based knowledge, and their institutional or social role in connecting local communities with government programs. Snowball sampling was also used when necessary, particularly to identify traditional leaders, community elders, or local actors who were recognized by the community as knowledge holders.

Data analysis was conducted using an **interactive qualitative analysis model**, consisting of data condensation, data display, and conclusion drawing. Data condensation was carried out by selecting, simplifying, and categorizing information obtained from interviews, observations, and documents. The data were then organized into thematic categories, including forms of local wisdom, local government roles, institutional integration, knowledge documentation, policy recognition, and challenges in local knowledge governance. The displayed data were interpreted to identify patterns, relationships, and governance gaps between community knowledge systems and formal disaster risk management mechanisms. Conclusions were drawn through continuous comparison between empirical findings, theoretical concepts, and previous studies.

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To ensure data validity, this study applied **source triangulation and method triangulation**. Source triangulation was conducted by comparing information from government officials, community leaders, traditional knowledge holders, volunteers, and local residents. Method triangulation was carried out by comparing data from interviews, field observations, and policy documents. This process was important to reduce bias and strengthen the credibility of the findings. Ethical considerations were also maintained by ensuring that informants participated voluntarily, that their views were represented accurately, and that local knowledge was treated respectfully as a community-based intellectual and cultural resource.

3. Results and Discussions

1) Local Wisdom as a Community-Based Instrument for Understanding Disaster Risk

The findings indicate that local wisdom functions as a community-based instrument for understanding disaster risk. In the studied context, disaster knowledge is not only produced through formal scientific mechanisms, but also through collective experience, oral narratives, ecological observation, customary norms, and intergenerational learning. Community members identify disaster signs by observing changes in natural surroundings, including river flow, rainfall intensity, soil movement, animal behavior, sea conditions, wind direction, and other environmental indicators. These forms of knowledge are developed through long-term interaction between local communities and their hazard-prone environment. As a result, local wisdom becomes a practical knowledge system that helps communities recognize danger, interpret risk, and determine appropriate actions before formal warnings or government instructions are issued.

The research also found that local wisdom is closely connected with social memory. Communities that have repeatedly experienced floods, landslides, tsunamis, volcanic eruptions, or other hazards tend to preserve disaster memories through stories, customary advice, place names, rituals, and collective norms. These memories shape how people understand safe areas, dangerous zones, evacuation routes, settlement patterns, and proper behavior during emergency situations. This finding is consistent with Firdaus et al. (2023), who argue that local wisdom around Anak Krakatau contributes to community resilience by combining social memory, environmental knowledge, and collective preparedness. It also supports Markolinda et al. (2025), who show that indigenous knowledge in Mentawai communities is transmitted through natural signs, traditional communication, and cultural practices that strengthen disaster preparedness.

Local wisdom further operates as a mechanism of social mobilization. In many communities, disaster preparedness is not separated from everyday social relations. Mutual assistance, community meetings, religious gatherings, customary leadership, and neighborhood networks become informal channels for disseminating risk information and mobilizing collective action. The findings show that local actors such as traditional leaders, village elders, religious figures, community volunteers, and youth groups often play a strategic role in translating disaster information into language and practices that are more easily understood by residents. This confirms Hadlos et al. (2022), who explain that local, indigenous, and traditional knowledge can strengthen disaster risk reduction when it is embedded in community institutions and local decision-making processes.

The study reveals that local wisdom has three important functions in disaster risk management. First, it functions as an early recognition system because communities can identify hazard signs based on repeated experience and environmental observation. Second, it functions as a behavioral guide because local norms influence how people respond to danger, protect vulnerable groups, and organize evacuation. Third, it functions as a social coordination mechanism because trusted local actors can mobilize community participation more effectively than purely bureaucratic instructions. These functions demonstrate that local wisdom should not be reduced to cultural heritage alone. It is also a practical governance resource that can support preparedness, mitigation, emergency response, and recovery.

This finding is in line with the Sendai Framework for Disaster Risk Reduction 2015–2030, which emphasizes the need to use traditional, indigenous, and local knowledge, where appropriate, to complement scientific knowledge in disaster risk assessment and policy implementation. Recent UNDRR reports also underline that local, indigenous, and traditional knowledge is important for strengthening risk understanding, community participation, and culturally relevant disaster governance. In this study, the value

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of local wisdom lies not only in its cultural meaning, but also in its capacity to connect risk information with community trust, local behavior, and everyday decision-making.

2) Institutional Challenges in Integrating Local Wisdom into Formal Disaster Governance

Although local wisdom has strong practical value, the findings show that its integration into formal disaster governance remains limited. Local government institutions generally recognize the importance of community participation, yet local wisdom is often treated as informal knowledge that has not been systematically documented, validated, or incorporated into official disaster planning. Disaster management documents tend to emphasize hazard maps, contingency plans, institutional responsibilities, evacuation infrastructure, logistics, and emergency procedures. These instruments are essential, but they often do not sufficiently capture community-based knowledge, local narratives, customary rules, or informal mitigation practices that already exist within society.

The main institutional challenge lies in the separation between formal bureaucratic knowledge and community-based knowledge. Government agencies usually depend on scientific data, administrative reporting, and sectoral regulations, while local communities rely on experience-based knowledge and socially trusted actors. This difference creates a translation problem. Community knowledge may be meaningful and practical at the local level, but it is not always written, standardized, or compatible with government planning formats. At the same time, government programs may be technically accurate but less effective when they do not reflect local risk perception, cultural values, and community communication patterns. Cuaton and Su (2020) similarly found that indigenous knowledge can shape disaster interpretation, but its contribution is often weakened when formal institutions fail to recognize its epistemic value.

The findings also indicate that local government has not yet developed a clear mechanism for governing local knowledge. There are limited procedures for identifying local knowledge holders, documenting community-based disaster practices, validating local wisdom without eliminating its cultural meaning, and incorporating it into regional disaster management plans. In some cases, local wisdom is mentioned in policy narratives, but it is not translated into operational programs, budget allocations, training modules, or institutional coordination mechanisms. This condition shows that recognition alone is insufficient. Local wisdom must be governed through systematic procedures that connect community knowledge with planning, implementation, monitoring, and evaluation.

Another challenge concerns inter-agency coordination. Disaster risk reduction involves multiple institutions, including local disaster management agencies, village governments, social affairs offices, public works agencies, health offices, education offices, customary institutions, civil society organizations, and community volunteers. The findings suggest that these actors often work with different mandates, data systems, and program priorities. As a result, local wisdom is difficult to integrate because there is no shared institutional platform for managing knowledge across sectors. This is consistent with Syamsidik et al. (2021), who emphasize that long-term disaster preparedness in Aceh requires continuous institutional learning and sustained coordination, not only emergency response capacity.

The study further found that formal disaster governance tends to prioritize technological and administrative instruments over socio-cultural instruments. Early warning systems, hazard maps, and emergency response procedures are often designed in a top-down manner. While these instruments are important, their effectiveness depends on whether communities understand, trust, and act upon them. Pujiyono et al. (2025) show that tsunami early warning systems can become more effective when modern technology is connected with local wisdom. This supports the finding of this study that technological systems should not replace local knowledge. Instead, technology and local wisdom should be integrated to produce a more socially accepted and culturally grounded disaster risk management system.

These findings demonstrate that the weakness of current disaster governance is not the absence of local wisdom, but the absence of institutional arrangements that can transform local wisdom into a recognized governance instrument. Local knowledge already exists within communities, but it remains underutilized because government institutions have not fully developed mechanisms for documentation, validation, policy integration, and collaborative implementation. This creates a gap between the community's capacity to understand risk and the government's capacity to institutionalize that knowledge within formal disaster risk reduction systems.

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3) Reconstructing the Role of Local Government in Local Knowledge Governance

The findings suggest that local government must be repositioned not only as a provider of disaster services, but also as a knowledge broker, facilitator, regulator, and institutional integrator. In the context of local wisdom-based disaster risk management, local government should not merely deliver programs to communities. It must create governance spaces where community knowledge can be identified, respected, documented, discussed, and connected with scientific and administrative systems. This reconstructed role is essential because local wisdom cannot enter formal disaster governance automatically. It requires institutional mediation so that community knowledge can inform planning, preparedness, mitigation, and recovery without being reduced to symbolic cultural discourse.

First, local government should act as a knowledge broker between scientific knowledge and local wisdom. This role requires government institutions to facilitate dialogue between disaster experts, local communities, customary leaders, universities, civil society organizations, and technical agencies. Through this process, local knowledge can be compared with scientific data, while scientific information can be translated into culturally understandable forms. The objective is not to subordinate local wisdom to scientific knowledge, but to create a complementary relationship between different knowledge systems. Hadlos et al. (2022) argue that the integration of local, indigenous, and traditional knowledge into DRR requires recognition of plural knowledge systems. The findings of this study support that argument by showing that local government has a strategic role in building bridges between technical risk assessment and community-based understanding.

Second, local government should function as a facilitator of documentation and knowledge preservation. Many forms of local wisdom are transmitted orally and are vulnerable to disappearance due to modernization, generational change, migration, environmental degradation, and weakening customary institutions. Local government can support participatory documentation through village disaster histories, community risk maps, oral history archives, local mitigation inventories, school-based learning materials, and community-based disaster education. This finding is related to Suarmika et al. (2022), who emphasize that indigenous disaster mitigation knowledge can be used to reconstruct disaster education. In this study, documentation is not only an archival activity. It is a governance strategy to ensure that local knowledge remains accessible, teachable, and usable for future disaster risk reduction.

Third, local government should act as a regulator that provides formal recognition for local wisdom in disaster planning. Recognition can be strengthened through regional regulations, village regulations, disaster management plans, contingency plans, local development planning documents, and community-based disaster risk reduction programs. The findings indicate that without formal recognition, local wisdom tends to remain dependent on individual leaders or informal community initiatives. Formalization is needed to ensure continuity, budget support, institutional responsibility, and policy accountability. At the same time, formalization must be conducted carefully so that local wisdom is not bureaucratized in a way that removes its cultural meaning or community ownership.

Fourth, local government should serve as an institutional integrator. This role requires coordination among local disaster management agencies, village governments, customary institutions, education institutions, health services, social protection agencies, and community organizations. Local wisdom should be integrated into hazard mapping, early warning dissemination, evacuation planning, disaster education, community training, and recovery programs. Such integration can improve the relevance and legitimacy of disaster governance. Sullivan and Sagala (2020) show that disaster recovery is strongly influenced by social status, relocation policies, and community conditions. This indicates that disaster governance cannot rely solely on technical procedures; it must also address social and cultural realities. The findings of this study strengthen that argument by showing that local wisdom provides important contextual knowledge for designing more socially responsive disaster policies.

Based on these findings, this study proposes that the reconstruction of local government roles should be directed toward a local knowledge governance model. This model consists of five interrelated stages: identification of local wisdom, participatory documentation, collaborative validation, policy integration, and community-based implementation. Identification involves mapping local knowledge holders, customary practices, disaster memories, and community mitigation mechanisms. Documentation transforms oral and

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practical knowledge into accessible institutional resources. Collaborative validation ensures that local wisdom is assessed through dialogue between communities, experts, and government institutions. Policy integration places local knowledge within formal planning and budgeting systems. Community-based implementation ensures that local wisdom remains owned, practiced, and evaluated by the community.

The proposed model offers a distinctive contribution to disaster risk management studies. Previous research has largely shown that local wisdom contributes to preparedness, early warning, education, and community resilience. This study extends that discussion by emphasizing the governmental dimension of local wisdom. The central issue is not only whether local wisdom exists or whether it is useful, but how local government can govern it as part of formal disaster risk reduction. By reconstructing the role of local government, local wisdom can be transformed from scattered community practices into an institutionalized, participatory, and culturally grounded instrument of disaster risk management.

4. Conclusion

This study concludes that local wisdom is not merely a cultural legacy, but a practical instrument of disaster risk management that helps communities understand hazards, interpret risk, mobilize collective action, and maintain preparedness through socially trusted mechanisms. The findings show that local knowledge is formed through long-term interaction between communities and their environment, transmitted through oral history, customary norms, ecological observation, social memory, and community institutions. In this sense, local wisdom contributes to disaster risk reduction by functioning as an early recognition system, a behavioral guide, and a social coordination mechanism.

The study also found that the main challenge does not lie in the absence of local wisdom, but in the weak institutional capacity of local governments to integrate such wisdom into formal disaster governance. Local knowledge often remains informal, fragmented, undocumented, and dependent on community leaders or customary institutions. Formal disaster management systems, on the other hand, tend to prioritize scientific data, administrative procedures, technological instruments, and sectoral coordination. This separation creates a gap between community-based risk understanding and government-led disaster management. As a result, local wisdom is frequently acknowledged in normative discourse but has not been systematically transformed into planning documents, policy instruments, budget programs, disaster education, early warning systems, or community-based mitigation strategies.

The contribution of this study lies in its reconstruction of the role of local government in local knowledge governance. Unlike previous studies that mainly describe the forms, meanings, and functions of local wisdom in disaster contexts, this study emphasizes how local government can act as a knowledge broker, facilitator, regulator, and institutional integrator. This perspective offers a novelty by positioning local wisdom as part of a formal governance process, rather than as an isolated community practice. The proposed governance orientation includes the identification of local wisdom, participatory documentation, collaborative validation, policy integration, and community-based implementation. Through this framework, local wisdom can be connected with scientific knowledge, administrative systems, and disaster risk reduction policies without eliminating its cultural roots and community ownership.

The findings imply that disaster risk governance in Indonesia needs to move beyond a purely technocratic approach. Scientific data, hazard maps, early warning systems, and emergency procedures remain essential, but their effectiveness depends on social trust, cultural relevance, and community acceptance. The integration of local wisdom can strengthen the legitimacy and responsiveness of disaster policies, particularly in areas where communities have long histories of living with recurring hazards. This study also contributes to previous research by showing that the value of local wisdom cannot be fully understood only from the perspective of community resilience. It must also be examined through the capacity of local government to institutionalize, coordinate, and sustain local knowledge within formal disaster management systems.

This study has limitations. Its qualitative case study design allows for an in-depth understanding of governance processes and local knowledge dynamics, but the findings cannot be generalized statistically to all disaster-prone regions in Indonesia. The study also focuses more strongly on the institutional role of local government, while the internal diversity of community actors, gendered knowledge, intergenerational

transmission, and power relations within local communities require further exploration. Future research should examine comparative cases across different hazard types and regions, develop measurable indicators for local knowledge governance, and analyze how local wisdom can be incorporated into digital disaster information systems, village planning, school-based disaster education, and regional disaster risk reduction policies. Further studies may also use mixed-method approaches to assess the effectiveness of local wisdom integration in improving preparedness, reducing vulnerability, and strengthening community resilience.

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