

Local Wisdom in Flood and Earthquake Disaster Mitigation Strategies: A Study of the Perspective of Social Resilience Theory

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ABSTRACT: Ambulu District in Jember Regency is highly exposed to flood and earthquake hazards due to its lowland geomorphology, sedimentary soil characteristics, and proximity to an active subduction zone. Despite these vulnerabilities, local communities across seven villages exhibit a notable capacity for resilience through the sustained practice of local wisdom embedded in daily social life. This study aims to examine the role of local wisdom in disaster mitigation strategies and its contribution to strengthening social resilience from a theoretical perspective of social resilience. Employing a qualitative case study design, data were collected through in-depth interviews, participatory field observations, and document analysis. The findings reveal that local wisdom plays a strategic role in disaster mitigation by mobilizing social capital, promoting environmentally adaptive practices, and reinforcing psychosocial resilience grounded in cultural and religious norms. These mechanisms enhance collective preparedness, response, and post-disaster recovery capacities. The study concludes that integrating local wisdom into formal disaster risk reduction frameworks is essential for fostering sustainable, community-based resilience in disaster-prone areas.

KEYWORDS: Adaptive capacity, Community-Based Disaster Risk Reduction (CBDRR), Earthquake, Flood, Indigenous Knowledge, Jember Regency

I. INTRODUCTION

Indonesia is one of the most disaster-prone countries in the world due to its complex geological setting and tropical climate, which expose large parts of the archipelago to earthquakes, tsunamis, floods, and landslides. In recent years, the increasing frequency and impact of disasters have highlighted the limitations of disaster mitigation strategies that predominantly rely on technical and structural approaches. These approaches often overlook the social and cultural dimensions of vulnerability and resilience, despite the fact that local communities are the primary actors affected by and responding to disasters. Consequently, there is a growing recognition of the need for disaster risk reduction strategies that are socially embedded and grounded in local contexts.

Within this broader national context, East Java Province, particularly Ambulu District in Jember Regency, represents an area with a high risk of both floods and earthquakes. Ambulu's lowland topography, river networks, and proximity to the southern Java subduction zone contribute to its multi-hazard exposure. While government-led mitigation efforts have been implemented, they remain largely top-down and insufficiently integrated with local social practices. Preliminary observations indicate that local communities in Ambulu continue to apply forms of local wisdom, such as adaptive housing practices, the use of natural signs as informal early warning systems, and communal work traditions (*gotong royong*) to reduce disaster risks. However, these practices are increasingly challenged by social change and declining intergenerational transmission, particularly among younger community members.

Previous studies have consistently emphasized the importance of local wisdom and community participation in non-structural disaster mitigation (e.g., Gaillard & Texier, 2010; Suparmini et al., 2015). These studies demonstrate how indigenous knowledge and cultural practices can enhance local preparedness and adaptive capacity. Nevertheless, while studies on local wisdom exist, few have examined its role in building social resilience against concurrent flood and earthquake risks in a rural Javanese coastal community such as Ambulu. Moreover, limited attention has been given to how local wisdom operates within the framework of social resilience, particularly in contexts where multiple hazards intersect with processes of modernization and socio-cultural change.

Addressing this research gap, this study seeks to analyze the role of local wisdom in disaster mitigation and its contribution to strengthening social resilience in Ambulu District from a social resilience perspective. Specifically, this study is guided by the following research questions: (1) What forms of local wisdom are practiced by communities in Ambulu in mitigating flood and

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earthquake risks? (2) How are these practices implemented in everyday social life and disaster-related contexts? (3) In what ways does local wisdom contribute to the strengthening of social resilience in a multi-hazard environment?

II. METHODS

This study uses a qualitative approach with a descriptive-exploratory design to gain an in-depth understanding of local wisdom practices in flood and earthquake disaster mitigation in Ambulu Subdistrict, Jember Regency. This approach was chosen because it allows for exploration of the meanings, values, norms, and social practices that have developed in the local context, as well as the empirical experiences of the community in dealing with disasters. The research was conducted over a period of six months, from June to December 2025, focusing on villages with high disaster vulnerability that still maintain local wisdom practices, namely Sabrang, Andongsari, and Pontang villages.

Research informants were determined using purposive sampling techniques with criteria of having knowledge, direct experience, and active involvement in community-based disaster mitigation practices. There were a total of 15 informants, consisting of 3 community leaders, 3 religious leaders, 3 village government officials, 4 residents who had been directly affected by floods or earthquakes, and 2 officials from the Jember Regency Disaster Management Agency (BPBD). The selection of informants was based on considerations of depth of information and diversity of perspectives in order to comprehensively capture social dynamics.

Data collection was conducted through participatory observation, semi-structured in-depth interviews, and documentation studies. Participatory observation was used to observe local wisdom-based mitigation practices, such as community service for the environment and adaptive housing patterns. In-depth interviews focused on disaster experiences, forms of local wisdom that are still practiced, the role of social actors, and changes in practices due to modernization. Documentation included disaster archives, BPBD reports, village regulations, and researchers' field notes.

Data analysis was conducted inductively using Miles and Huberman's interactive analysis model, which was operationalized in stages. In the data reduction stage, interview transcripts and observation notes were coded openly to identify main themes, such as early warning signs, communal work, adaptive housing, informal leadership, and religious-based coping. The data presentation stage was carried out by compiling thematic matrices and analytical narratives to see the interrelationships between categories and emerging patterns of social resilience. Conclusions were drawn gradually and continuously verified throughout the analysis process. To ensure data validity, this study applied triangulation of sources and methods. Data from community leaders, village officials, residents, and BPBD were compared to ensure consistency of information, while interview results were verified with observation findings and official documents. This process was repeated until data saturation was achieved.

Ethical aspects of the research were strictly observed in accordance with qualitative research standards. All informants were given an explanation of the research objectives and were asked to provide informed consent before the interviews were conducted. The identities of the informants were kept confidential by using codes or initials to protect their anonymity and prevent potential social impacts. The data obtained was used solely for academic purposes and was stored securely by the researchers.

III. RESULTS AND DISCUSSION

A. Result

The results of the study show that the people of Ambulu Subdistrict have developed local wisdom in response to the vulnerability of the region to floods and earthquakes. This local wisdom is not only in the form of abstract cultural values, but is manifested in ecological knowledge, unwritten social rules, and adaptive practices that function as community-based mitigation strategies. This knowledge is passed down from generation to generation and serves as the main reference for the community in interpreting natural threats and determining collective actions before, during, and after a disaster occurs.

In practice, local wisdom is clearly evident in the physical and environmental adaptation efforts undertaken by the community. In flood-prone areas, residents build stilt houses or raise foundations as a form of adaptation to the seasonal flood cycle. In addition, there is a social agreement not to erect permanent buildings in areas that are collectively understood to be prone to flooding. This practice shows that communities have an awareness of risk that is formed from empirical experience in dealing with disasters, enabling them to independently develop non-structural mitigation mechanisms.

Local wisdom is also reflected in the use of natural signs as an informal early warning system, particularly for earthquakes. Changes in animal behavior, certain ground vibrations, and other environmental conditions are interpreted as natural signals that encourage community vigilance. Although not technically scientific, this local knowledge serves as a trigger for initial preparedness and accelerates collective response when a disaster threat occurs.

In addition to physical and ecological aspects, the results of the study reveal that local wisdom plays an important role in strengthening social resilience through the strengthening of social capital. The values of mutual cooperation, deliberation, and social solidarity form the basis for collective decision-making, especially in emergency situations. The role of community and religious leaders as informal leaders accelerates the mobilization of residents, distribution of aid, and coordination of actions, thereby reducing the social impact of disasters.

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Furthermore, local wisdom also contributes to strengthening the psychosocial resilience of the community. Religious activities, collective rituals, and post-disaster social gatherings serve as a means of emotional recovery and strengthening social bonds. These practices help communities manage trauma, foster hope, and accelerate the process of social recovery after a disaster. Thus, the resilience of the Ambulu community is built not only through material capacity, but also through the strength of social relations and shared cultural meaning.

However, this study also found challenges in the sustainability of local wisdom. Modernization and changes in lifestyle have caused some younger generations to begin to distance themselves from mitigative local practices and knowledge. This condition has the potential to weaken the process of passing on local wisdom if it is not balanced with efforts to integrate it into formal mitigation programs and disaster education.

Based on the above description, the research findings confirm that local wisdom in Ambulu Subdistrict serves as a strategic resource in building community social resilience to floods and earthquakes. Local wisdom works through interrelated adaptive practices, social capital strengthening, and psychosocial recovery. Therefore, integrating local wisdom into community-based disaster mitigation policies and strategies is an important step to improve the effectiveness and sustainability of disaster risk reduction efforts.

B. Discussion

The findings of this study indicate that the adaptation strategies of the Ambulu District community in dealing with floods and earthquakes have developed contextually through a long process of social learning due to repeated exposure to disasters. The practice of building stilt houses in flood-prone areas, routine community service to clean waterways, and the use of natural signs as an informal early warning system reflect forms of adaptation rooted in the empirical experiences of the community. These findings support the view of Berkes and Ross (2013), who emphasize that social resilience is formed through interactions between local experiences, collective learning, and the adaptive capacity of communities in responding to environmental changes.

From the perspective of Adger's (2000) social resilience theory, the findings of this study show that the adaptive capacity of the Ambulu community is not only determined by material or infrastructure factors, but mainly by the social ability to organize a collective response. Interview data show that the decision not to build houses in vulnerable zones and the agreement to carry out community service arose from deliberations facilitated by community and religious leaders. This indicates that social norms and informal leadership function as risk regulation mechanisms, reinforcing Adger's argument that social resilience is rooted in social institutions and relationships that enable communities to collectively manage external pressures.

Findings regarding mutual aid practices and the role of social networks also reinforce the concept of social capital proposed by Aldrich (2012), who states that the strength of social relationships is more decisive in determining the success of post-disaster recovery than economic capacity alone. In Ambulu, the mobilization of aid, evacuation of residents, and distribution of emergency resources relied heavily on kinship networks and trust between residents, rather than solely on formal intervention. However, this study also expands on Aldrich's findings by showing that social capital is dynamic and vulnerable to social change. Interviews with community leaders revealed a declining trend in the participation of younger generations in mutual aid practices, partly influenced by modernization and increasing reliance on formal disaster information.

When compared to the research by Gaillard and Texier (2010), which emphasizes the importance of local knowledge in disaster mitigation in traditional communities, the findings in Ambulu show a relatively similar pattern, particularly in the use of local ecological knowledge as the basis for preparedness. However, unlike communities that are relatively closed and homogeneous, the Ambulu community exists in a more open social context and is exposed to modernization, so that local wisdom practices tend to undergo adaptation and selection. Meanwhile, compared to the Baduy community studied by Suparmini et al. (2015), where local wisdom is strictly maintained through strong customary rules, the Ambulu community shows greater flexibility but at the same time faces challenges in the sustainability of intergenerational inheritance of mitigative values.

Within the framework of Berkes and Ross (2013), the findings of this study indicate that the social resilience of the Ambulu community is formed through a combination of coping capacity and adaptive capacity. Coping capacity is evident in the rapid response based on social networks when disasters occur, while adaptive capacity is reflected in long-term behavioral changes, such as adjustments to housing patterns and environmental management. However, empirical evidence from field observations shows that transformative capacity is still limited, especially in terms of institutionalizing local wisdom into a sustainable formal mitigation system.

The theoretical implications of this study lie in the assertion that local wisdom is not merely a complement to structural mitigation, but rather a core component in the formation of social resilience in multi-hazard disaster-prone areas. This study enriches the theory of social resilience by showing that social capital and local knowledge are contextual, dynamic, and vulnerable to social change, and therefore need to be understood as an ongoing process rather than a static condition.

In practical terms, the findings of this study imply the need for disaster mitigation policies that systematically integrate local wisdom into formal planning. Disaster programs need to utilize existing community leaders and social practices as a bridge between technical

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approaches and local social realities. In addition, strengthening community-based disaster education is important to ensure the sustainability of local wisdom inheritance, especially to the younger generation. Thus, disaster mitigation is not only oriented towards reducing physical risks, but also towards strengthening social resilience and cultural sustainability of the community.

IV. CONCLUSIONS

This study demonstrates that local wisdom plays a central role in strengthening social resilience to flood and earthquake hazards in Ambulu District. The findings show that local wisdom is manifested through specific practices such as *gotong royong*, river patrols, communal rituals, and the interpretation of natural signs as informal early warning systems. These practices are embedded in everyday social life and function as adaptive mechanisms that enhance community preparedness, collective response, and post-disaster recovery. In this sense, local wisdom directly answers the first and second research questions by identifying both its concrete forms and modes of implementation in a multi-hazard context.

Furthermore, the study reveals that local wisdom contributes to social resilience by reinforcing social capital, facilitating collective decision-making, and enabling the integration of traditional practices with selected elements of modern disaster management, such as community-based disaster response teams and digital communication tools. This finding addresses the third research question and highlights the dynamic nature of social resilience as a process shaped by cultural values, social networks, and adaptive learning. The original contribution of this study lies in its empirical evidence on how local wisdom operates as a social resilience mechanism in a rural Javanese coastal community facing concurrent flood and earthquake risks—an area that has received limited attention in previous research.

Despite these contributions, this study has several limitations. The research was conducted in a single district, which may limit the generalizability of the findings to other socio-cultural and geographical contexts. In addition, the qualitative research design, while effective in capturing depth and meaning, does not allow for the measurement of the level or intensity of social resilience across communities.

Future research is therefore encouraged to adopt a longitudinal approach to examine changes in local wisdom and social resilience over time, particularly in the context of ongoing social transformation and climate change. Quantitative or mixed methods studies could also be conducted to develop measurable indicators of social resilience and assess the relationship between local wisdom and disaster preparedness across different regions.

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