

Disaster-Resilient Village Governance: A Public Administration Perspective on Social-Ecological Resilience

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ABSTRAK

Distrupsi akibat bencana alam menyebabkan ancaman keamanan pada masyarakat. Sistem sosial-ekologis berfungsi untuk mengatur diri sendiri untuk merespons gangguan yang bersifat dinamis. Upaya untuk membangun konsepsi mendalam tentang konsep ketahanan sosial-ekologis belum dilakukan secara memadai. Ketahanan sosial-ekologis lebih banyak dilakukan pada daerah perkotaan, dan perlu adanya penelitian yang mempertimbangkan kondisi lokal. Penelitian ini bertujuan untuk mengetahui ketahanan masyarakat desa dari prespektif ketahanan sosial-ekologis. Sistem sosial-ekologis memiliki empat siklus yaitu sebelum, saat, setelah, dan pembelajaran bencana alam. Penelitian ini menggunakan metode kualitatif dengan teknik wawancara dan *focus group discussion* di Desa Kutamendala, Kabupaten Brebes. Penelitian ini menemukan bahwa kesiapsiagaan dan pembelajaran yang terstruktur sangat penting dalam membangun ketangguhan masyarakat di desa tangguh bencana. Masyarakat memiliki pemahaman yang baik terkait sensitivitas dan kerentanan bencana alam, sehingga masyarakat tidak lagi hanya menjadi korban yang menunggu bantuan, melainkan juga berperan sebagai aktor utama dalam pengurangan risiko bencana. Temuan penelitian menunjukkan koordinasi desentralisasi dalam penanggulangan bencana alam di Desa Kutamendala dilakukan untuk merespons penanganan bencana secara efektif. Pada proses pemulihan pascabencana ditemukan adanya partisipasi masyarakat dan kolaborasi lintas sektor untuk perbaikan infrastruktur dan pelayanan dasar. Selain itu, pembelajaran inklusif dan berkelanjutan dilakukan masyarakat untuk memperkuat kesiapsiagaan masyarakat.

Kata kunci: Bencana Alam, Desa, Ketahanan Sosial-Ekologis

ABSTRACT

Society faces significant threats from external disruptions, particularly natural disasters, which impact both people and ecosystems. These disturbances require social-ecological systems to self-regulate and adapt to changing conditions. However, efforts to develop a comprehensive understanding of social-ecological resilience remain insufficient. To effectively grasp the dynamics and capacity of resilience, empirical studies are essential. Most research on this topic focuses on urban areas, often neglecting the unique conditions of rural communities. This study aims to assess rural resilience through the lens of social-ecological systems. Natural disasters progress through four key stages: pre-disaster preparedness, crisis management, post-disaster recovery, and learning for future resilience. Using qualitative methods, including interviews and focus group discussions, this research was conducted in Kutamendala Village, Brebes Regency. Findings reveal that resilience in disaster-prone villages can be strengthened through structured preparedness and continuous learning. The community demonstrated awareness of disaster risks and actively participated in risk reduction efforts rather than relying solely on external aid. Decentralized coordination allowed for effective disaster response, while post-disaster recovery efforts involved collaboration across sectors, improving infrastructure and essential services. Additionally, inclusive and sustainable learning initiatives were implemented, reinforcing long-term preparedness and strengthening the village's ability to withstand future disasters.

Keywords: Natural Disasters, Villages, Socio-Ecological Resilience

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1. INTRODUCTION

Resilience is a concept that has been developed in a variety of disciplines and is becoming more widely used in the analysis of social-ecological systems worldwide (Li et al., 2020). The application of resilience in integrated social-ecological systems have

encouraged the development of resilience that recognizes adaptation and transformation to be more active (Oliveira et al., 2022). The definition of social-ecological systems encompasses a complex and integrated system in which humans are a part of nature (Petrosillo et al., 2019). In addition, the socio-

ecological system is influenced by disaster risk strategies that concentrate more on disaster management that is more oriented towards disaster response (Seddiky et al., 2020).

Disruption is an external event that affects and damages a system, leading to a change in the availability of resources and new opportunities to construct new ecosystem structures and functions (Weiskopf et al., 2020). Social-ecological systems are capable of self-regulation and response to various disturbances, as they are dynamic in both space and time (Binder et al., 2013). Ecological resilience evolves and is reflected in social resilience (Bousquet et al., 2021).

Evolution is a way of responding to new information, but it can also be a means of responding to extreme events (Danugroho et al., 2020; Soetanto et al., 2020). Change is crucial because it allows governments to adapt to meet the community's needs and desires (Fullerton & Weible, 2023). Effective governance structures assist in the formation and implementation of measures that contribute to reducing vulnerability to disasters (Nowell et al., 2018).

Natural disasters' ongoing challenges are highlighted by the disasters that have occurred in different nations (Hanif et al., 2023; Wirawan Zakariah, 2018). Natural disasters pose security threats to society (Yaghmaei, 2020). In the long run, it can influence the lives of individuals (Shah et al., 2020) and natural ecosystems (Serra-Llobet et al., 2022). The current adaptation strategies are focused on enhancing community preparedness (Purwitaningsih & Asano, 2024). Through community empowerment, disaster resilience can be increased through the use of local resources and disaster preparedness education (Hanif et al., 2023). Disaster mitigation requires community empowerment, not only involving local communities in the decision-making process, but also equipping them with the knowledge, skills, and resources to take responsibility for their own development and resilience (Insani et al., 2024).

Disaster Resilient Village Governance from a public administration position on environmental management integrates institutional capacity, community participation, and collaborative governance (Arifin et al., 2021). The institutional capacity of village governments plays an important part in strengthening environmental resilience (Nurmala et al., 2023). Disaster mitigation can be achieved through the Disaster Resilient Village Program (Desa Tangguh Bencana/Destana) by boosting community participation, government capacity, and stakeholder cooperation through an organized collaborative governance process (Hariani et al., 2022).

The National Disaster Management Agency (2023) has identified Brebes Regency as the Regency with the highest Disaster Risk Index in Central Java. This study focuses on the socio-ecological system of natural

disasters in Kutamendala Disaster Resilient Village. This location was chosen because this region often experiences flooding and landslides caused by large amounts of illegal logging and land use conversion (Sulaksana et al., 2014).

The interaction between humans and ecological components in social-ecological systems is complex and dynamic, and they emphasize resilience and vulnerability in the face of disturbances (Vázquez-González et al., 2021). This framework encourages stakeholder participation and engagement which is critical in addressing sustainability challenges (Manyani et al., 2024). The mapping of social-ecological systems enables researchers to identify specific human-environment interactions and sustainability challenges, resulting in targeted solutions (Yang et al., 2023).

According to Vázquez-González et al (2021) socio-ecological resilience is divided into 4 cycles, including:

1. Before a disaster occurs. Disasters can be prevented and reduced by the interaction between resilience and vulnerability during this phase. This phase includes: (a) sensitivity, which is the sensitivity to the potential for natural disasters caused by nature and humans; (b) vulnerability, which is the community's understanding of the dangers of natural disasters; (c) external response capacity, which is the action taken to prevent and/or prepare for damage. At this stage, resilience as a system attribute determines the capacity of the community.
2. During a disaster. Resilience-vulnerability interactions can reduce or mitigate damage. This phase is absorptive capacity is local community knowledge, social capital, organization, and cooperation during a disaster. Communities will have more internal response capacity to deal with disasters. This will reduce damage to the community.
3. Post disaster recovery. This relates to the recovery time after a disaster occurs. Capacity allows a community to recover. Recovery conditions do not have to be exactly the same as before. Restoration of basic services and facilities for the affected community so that they can bounce back.
4. Learning. During this phase, socio-ecological resilience is an outcome that depends on adaptive capacity and external response capacity. Adaptive capacity depends on learning after disaster experiences and the acquisition of knowledge about the natural environment. Resilience is also determined by external factors, such as reconstruction and new or improved preventive measures.

The study of socio-economic resilience has largely centered around its definition and characteristics (Pelling & Manuel-Navarrete, 2011). Efforts to construct an in-depth conception of the core concept of socio-ecological resilience have not been adequately undertaken (Sievers-Glotzbach & Tschersich, 2019). Empirical research is necessary to

understand socio-ecological resilience, dynamic mechanisms, and the built capacities (Li et al., 2020). Socio-ecological resilience is more frequently implemented in urban areas (Botequilha-Leitão & Díaz-Varela, 2020; Evans et al., 2022; Mngumi, 2021) and there is a need for research to utilize a socio-ecological resilience approach that considers local (Liu et al., 2023). Effectively responding to sustainability challenges is crucial. The aim of this study is to determine the resilience of rural communities based on socio-ecological factors.

2. METHODS

This study uses a qualitative method with a descriptive analysis approach. Qualitative research is used to explore and deepen a social environmental phenomenon that cannot be quantified (Ugwu & Val, 2023). This study uses data sourced from primary data. This study uses interview techniques and Focus Group Discussion (FGD). The informants selected in this study used purposive sampling techniques, namely Kutamendala Village employees, the Kutamendala Disaster Risk Reduction Forum, and the Kutamendala Village emergency response volunteer team. Data triangulation techniques are used to validate data by checking data from various sources. Researchers also conducted participatory observations by collecting data through direct observation, feeling and being in observation activities and the lives of observation objects.

This research employs narrative analysis, a qualitative research method that examines how individuals construct, organize, and interpret their personal experiences through storytelling. This approach enables researchers to gain deeper insights, not only into what is being conveyed but also into the underlying reasons and structures behind the way these stories are told.

The interview was conducted on July 10-12, 2024. The informants in this interview included, (1) Wasirun and Bayu Galih Permadi as the chairman and secretary of the Disaster Risk Reduction Forum (FPRB); (2) Rahmat Galyudi as the head of the volunteer team; (3) Sintia Purnama Desi as the Village Secretary in the Kutamandala Disaster Resilient Village, Brebes Regency.

3. RESULTS AND DISCUSSION

Communities living in disaster-prone regions have long faced the challenge of adapting to environmental threats, both natural and anthropogenic. This research explores the preparedness, response, and recovery mechanisms within disaster-resilient villages, highlighting the significance of community engagement, institutional support, and knowledge-sharing in mitigating risks. From the interviews conducted, the following data were obtained, which provided valuable insights into the research. Participants shared their experiences, perspectives, and observations, which were carefully analyzed to identify informants' awareness related to natural disasters. The responses revealed key findings that contributed to a deeper understanding of the research topic.

3.1. Before Disaster

Villages that are classified as disaster-resilient villages have unique challenges that must be faced daily. The community not only deals with daily life but must also be prepared to face natural disasters that can come at any time (Ma et al., 2023). Natural disasters such as flash floods, landslides and droughts are nothing new for rural communities, but how these communities understand and prepare themselves to face these potential threats is something that needs to be studied more deeply (Su et al., 2024).

Tabel 1. Research Interview Instrument

Research Instruments
Before the Disaster What is the level of understanding of the community in disaster-resilient villages regarding the potential threats of natural and anthropogenic disasters? What factors influence the understanding of village communities regarding potential disasters? What prevention measures have been taken to reduce vulnerability in village communities?
During Disaster What elements support community capacity during natural disasters? What is the role of local organizations and community cooperation in responding to disasters in disaster-resilient villages? What mechanisms are implemented to coordinate disaster response?
Post Disaster Recovery What steps are taken by the village to restore basic services and facilities during a disaster? Do you think the current capacity of the community is adaptive in recovering after a disaster?
Learning How can disaster-related knowledge be received by the village community? Is there socialization carried out by BPBD or are there other parties involved in providing community understanding regarding potential disasters? How is knowledge about changes in the natural environment used in the learning process and village adaptation to disasters?

Source processed by researchers

Tabel 2. Research Result

Dimension	Indicators	Findings	Informant Quotes
Before the Disaster	What is the level of understanding of the community in disaster-resilient villages regarding the potential threats of natural and anthropogenic disasters?	The community is increasingly aware of disaster risks due to past experiences, particularly the 2021 flash flood. Training and disaster simulations by BPBD and NGOs have enhanced preparedness.	<i>"We now understand the risks of floods and landslides. Every household knows what to do when warnings come."</i>
	What factors influence the understanding of village communities regarding potential disasters?	Experience with past disasters, government and NGO training, and socialization efforts from village leaders significantly shape community awareness.	<i>"Learning from past floods, we realized the importance of preparation. Training from BPBD helped a lot."</i>
	What prevention measures have been taken to reduce vulnerability in village communities?	Reforestation, improved drainage systems, and community-based disaster preparedness programs have been implemented. The village also conducts emergency drills.	<i>"We planted trees on slopes to prevent landslides and built better drainage to reduce flood risks."</i>
During Disaster	What elements support community capacity during natural disasters?	Decentralized coordination, trained volunteers, and early warning systems enhance the community's response capability. Social capital plays a key role.	<i>"The volunteers and the early warning system helped us evacuate quickly and minimize losses."</i>
	What is the role of local organizations and community cooperation in responding to disasters in disaster-resilient villages?	Local organizations coordinate with BPBD and PMI to mobilize emergency response teams and distribute aid. Community members actively participate in disaster management.	<i>"The village disaster response team worked with BPBD and local organizations to evacuate people safely."</i>
	What mechanisms are implemented to coordinate disaster response?	WhatsApp groups, local disaster forums, and radio communication are used to relay emergency information. Volunteers work in shifts to assist affected families.	<i>"Through WhatsApp and local radio, we could quickly spread information and coordinate help."</i>
Post-Disaster Recovery	What steps are taken by the village to restore basic services and facilities during a disaster?	Priority is given to restoring roads, water supply, and health services. Community-based efforts, supported by NGOs, help rebuild damaged infrastructure.	<i>"We repaired roads and cleared debris together. NGOs helped with water and food supplies."</i>
	Do you think the current capacity of the community is adaptive in recovering after a disaster?	The community has shown adaptability, but funding limitations and dependency on external aid remain challenges.	<i>"We are getting better at recovery, but we still need more resources and financial support."</i>
Learning	How can disaster-related knowledge be received by the village community?	Disaster education is integrated into local religious and cultural activities. Schools also include disaster preparedness in lessons.	<i>"We discuss disaster preparedness in religious gatherings, making it easier for everyone to understand."</i>
	Is there socialization carried out by BPBD or are there other parties involved in providing community understanding regarding potential disasters?	BPBD, NGOs, and village officials conduct regular socialization programs, ensuring widespread awareness.	<i>"BPBD and volunteers often visit to educate us about disaster preparedness."</i>
	How is knowledge about changes in the natural environment used in the learning process and village adaptation to disasters?	The community observes environmental changes (e.g., river water levels, soil movement) and adapts accordingly. Traditional knowledge is also passed down through generations.	<i>"We monitor the river and hills closely. If the water rises too fast, we know to evacuate early."</i>

Kutamendala Village is a disaster-resilient village in Brebes Regency (Badan Penanggulangan Bencana Daerah Kabupaten Brebes, 2024). The study found that the level of community understanding of the threat of natural and anthropogenic disasters is quite high. This is due to the experience of facing the flash flood disaster in 2021 which was a turning point for the community in realizing the importance of disaster preparedness and mitigation. Through training and socialization facilitated by the Regional Disaster Management Agency (BPBD), as well as support from various local communities and organizations, the community began to be more active in understanding the disaster risks around them. This understanding does not only come from theory, but also from direct experience and active involvement in disaster management in their own villages. Direct experience and active involvement in disaster management in the village can effectively improve disaster preparedness (Sunarto et al., 2024).

In this work, the factors that influence community understanding of sensitivity and vulnerability to natural disasters vary, ranging from empirical experience in facing disasters to active involvement in training and socialization activities carried out by BPBD and volunteer communities. The importance of strengthening village institutions and community-based preparedness is strongly emphasized, with the establishment of a village disaster management forum that serves as a center for coordination and rapid response to disaster threats. Communities are no longer just victims waiting for help but also play a role as the main actors in disaster risk reduction. Community preparedness and rapid action play a crucial role in saving lives (Chong et al., 2018).

Prevention efforts to reduce vulnerability have also been carried out consistently. The village government, together with various related parties, have attempted to initiate mitigation programs. These efforts focus on three key areas.

1) Disaster simulation training is conducted to help residents become familiar with proper safety procedures before, during, and after a crisis. These simulations provide hands-on experience in responding to different emergency scenarios, allowing people to practice evacuation routes, communication strategies, and first aid techniques. By reinforcing these skills, the community can react more effectively and minimize potential harm; 2) Increasing volunteer, crucial aspect of disaster preparedness is strengthening the role of local volunteers. Training sessions are provided to equip volunteers with essential skills such as basic medical aid, rescue operations, and emergency coordination. This proactive approach ensures that in the event of a disaster, there are trained individuals within the community who can provide immediate assistance while waiting for professional responders to arrive. A well-prepared volunteer network also fosters a sense of collective responsibility and resilience; 3) Disaster plan ensure a coordinated response to potential disasters, a comprehensive emergency management plan is being developed. This plan includes risk assessments, evacuation strategies, resource management, and communication protocols tailored to the village's specific needs. By involving experts and community leaders in its formulation, the plan provides a structured approach to disaster mitigation, ensuring that preventive and response measures are both practical and effective. All of this is done with the aim of increasing community preparedness, so that when a disaster occurs, the impacts felt can be minimized.

Disaster preparedness in disaster-resilient villages is not only about how ready they are to respond, but also about how they understand the threat, the factors that influence it, and the preventive measures they have taken. This understanding is important to ensure that village communities have the resilience and adaptive capacity to face disasters that can come at any time (Scott & Few, 2016; Shah et al., 2019).

3.2. During Disaster

When disasters, such as flash floods, landslides, or droughts occur in Kutamendala Village. The community is faced with real challenges that test their capacity and preparedness. In these critical moments, all elements of society (individuals, volunteer groups, village governments and local organizations) are required to move quickly and in a coordinated manner to save lives and reduce material losses. Our findings suggest that decentralized coordination is carried out in response to disaster management. When networks are less centralized, information can be transferred more easily across agencies, which increases shared awareness across component teams, and improves collaborative coordination (Abdeen et al., 2021).

Kutamendala Village experienced a major flash flood in 2021, elements that support community capacity during disasters involve synergy between local volunteers, disaster management forums, and

efficient early warning systems. The availability of trained volunteers quickly became the frontline in providing first aid, evacuating residents, and securing affected locations. The volunteers came from various backgrounds and organizations such as SAR, nature communities, and student groups, who had been trained to act quickly and appropriately in emergency situations.

Effective response depends not only on individuals, but also on cooperation between organizations and citizens. The functional structure allows for decentralized decision-making within operational areas, such as evacuation, while maintaining coordination across operational areas as the complexity of the disaster incident increases (Nowell et al., 2018). The role of local organizations such as the Regional Disaster Management Agency (BPBD), the Indonesian Red Cross (PMI), and village disaster management forums is crucial. They act as a liaison between the government, aid agencies, and communities, and facilitate the smooth flow of information. These forums enable good coordination through technology-based communication systems such as WhatsApp. The availability of up-to-date and reliable data allows authorities and emergency response organizations to quickly assess the situation, identify the most affected areas, and make informed decisions to protect the lives of people at risk (Peña-Cáceres et al., 2024).

The disaster response coordination mechanism in Kutamendala Village has involved several stages that have been arranged and tested through regular training. This structured approach ensures that the community is well-prepared to handle emergencies effectively, 1) Early detection, where potential disaster risks are monitored closely. By identifying threats in advance, necessary precautions can be taken to minimize damage and ensure a swift response when needed; 2) In addition to early detection, the village has established a well-defined emergency response plan. This plan outlines the necessary actions to be taken in various disaster situations, such as issuing emergency alerts, organizing evacuations, and coordinating recovery efforts. To further enhance preparedness, community members and volunteers undergo regular training in essential skills, including evacuation procedures, basic medical assistance, and crisis management. These efforts help ensure that individuals within the village are equipped to provide immediate assistance before professional responders arrive; 3) Accurate and timely disaster reporting is another vital component of the response mechanism. The village follows standardized reporting procedures to ensure that all incidents are documented properly, allowing authorities to assess the situation and provide appropriate assistance; 4) Strong coordination between the village and district-level authorities helps facilitate a quick and efficient response, ensuring that aid reaches the affected areas without delay. Through these comprehensive measures, Kutamendala Village

has developed a reliable disaster management system that enhances community resilience and ensures a prompt and organized response to emergencies. The coordination mechanism helps track resources, make decisions, and increase accountability and transparency in disaster response efforts (Aldrich, 2019).

During the disaster, Kutamendala Village proved that preparedness measures influence increasing response and contributing significantly to rescue actions and minimizing damage during a disaster. In addition, this is influenced by the community's ability to work together, communicate effectively, and utilize every element available to reduce the impact of the disaster (Geddami & Raj Kiran, 2024).

3.3. Post Disaster Recovery

The post-disaster recovery process in disaster-resilient villages does not only focus on rebuilding damaged infrastructure, but also on strengthening the adaptive capacity and resilience of communities to face future disasters. This recovery includes various strategic steps involving village governments, local communities, non-governmental organizations, and the community itself. Community resilience and local government play an important role in recovery activities (Hidayati & Noviana, 2024).

The first recovery process is to ensure that basic services and public facilities that have been affected can function again. After the flash flood disaster that hit the village in 2021, recovery steps included the distribution of clean water, repair of damaged roads and bridges, rehabilitation of public buildings (schools, mosques, and health centers). The village government worked with volunteers and organizations such as BPBD and PMI to coordinate these recovery efforts.

The availability of trained volunteers and responsive local organizations facilitates the distribution of aid and the implementation of recovery programs. Volunteers play a role not only in emergency response operations but also in the recovery phase, such as helping to repair basic infrastructure and ensuring that aid is distributed to the right targets. Through village disaster management forums, communities are encouraged to be actively involved in the planning and decision-making process related to recovery.

The adaptive capacity of communities in dealing with and recovering from disasters is a key factor in accelerating the recovery process. Training conducted before a disaster, such as mitigation training, contingency planning, and emergency response simulations, is very helpful in coordinating recovery steps. Communities that have been equipped with knowledge and skills in disaster management are able to identify recovery needs more accurately and quickly. This can be seen from their ability to prepare structured disaster reports and convey assistance needs to the district level in 2021.

Kutamendala Village also utilized community independence mechanisms, such as donations from residents and assistance from third parties, to support the recovery process. Villagers independently organized fundraising and manpower to help rebuild their village. Initiatives like this demonstrate the high level of community awareness of the importance of cooperation in facing post-disaster challenges. Social capital plays an important role in the success and acceleration of post-disaster rehabilitation and reconstruction. (Kriswibowo & Rining Nawangsari, 2019).

Although recovery measures have been carried out well, there are several challenges faced by the village community. The main challenge is the limited village budget for disaster recovery activities. Village funds are often inadequate to cover all recovery needs. In addition, the lack of adequate facilities and equipment is also an obstacle in implementing recovery activities.

3.4. Learning

Learning is an important element in increasing community capacity in dealing with and managing disaster risks (Pamungkas et al., 2024). In Kutamendala Village, learning not only includes technical knowledge related to mitigation and emergency response, but also knowledge gained through direct experience and collaboration with various parties. The acceptance of disaster-related knowledge by the community is highly dependent on the effectiveness of communication and socialization carried out by various parties, including BPBD, local organizations, and volunteer communities. This knowledge is conveyed through various forms of activities such as socialization, training, disaster simulations, and religious studies. The socialization carried out not only targets adults but also involves various community groups, including women, children, and adolescents.

In this village, religious studies and cultural events are effective means of conveying information about disaster risks and ways to mitigate them. This approach is considered more easily accepted by the community because it combines cultural and religious elements that are already familiar to them. This also reflects the importance of an approach that is tailored to the local context to ensure that disaster information can be understood and internalized well by the community. Local knowledge, including shared knowledge related to natural disasters, is an understanding to build community sensitivity regarding their location which is a disaster-prone area (Kurnio et al., 2021).

Various parties play an important role in providing understanding to village communities about potential disasters. BPBD is one of the main actors that provides direct disaster training and simulations. The training conducted by BPBD not only improves the technical skills of the community but also strengthens their psychological readiness in facing disasters. In addition to BPBD, local organizations such as the Indonesian

Red Cross (PMI) and environmental volunteer communities also contribute to increasing community awareness and understanding. They often collaborate to carry out mitigation activities, such as planting trees in landslide-prone areas and managing waste to reduce the risk of flooding.

Knowledge of changes in the natural environment is used by disaster-resilient village communities as part of the learning and adaptation process. Communities are taught to understand natural signs that indicate potential disasters, such as changes in rainfall patterns that can trigger landslides or droughts. With this understanding, they can make better decisions regarding daily activities, such as when to evacuate or take other precautions. Tree planting in landslide-prone areas and waste management activities in this village are real examples of how knowledge of environmental changes is utilized in disaster mitigation activities. Through these activities, communities not only learn about the importance of protecting the environment, but also see firsthand its impact on disaster risk reduction. Disaster risk reduction in pre-disaster planning is driven by a social learning process to prevent loss of life and material loss (Ross et al., 2024).

Disaster learning in Kutamendala Village shows that a comprehensive and contextual approach is essential to improving community resilience. By integrating technical knowledge, practical experience, and local wisdom, communities can build stronger capacities to deal with future disaster risks. This study shows that effective learning emphasizes not only the development of technical skills, but also the development of collective awareness in managing disaster risks.

4. CONCLUSION

This study highlights the critical role of preparedness and structured learning in strengthening the resilience of disaster-prone village communities against both natural and human-made threats. Using a socio-ecological resilience approach, the Kutamendala Village community has demonstrated a strong understanding of disaster management throughout all stages—before, during, and after disasters. Prior experience with events like the 2021 flash flood has contributed significantly to their awareness of potential threats. This understanding is shaped by direct experiences, training sessions, socialization efforts by BPBD and local organizations, and community-based education that incorporates local wisdom. Preventive measures, such as the formation of disaster management forums, mitigation training, and environmentally sustainable community initiatives, play a crucial role in reducing vulnerability. Additionally, effective disaster response is influenced by the readiness of human resources, strong coordination among organizations, and efficient communication. The collaboration between volunteers, BPBD, PMI, and the use of information

technology for coordination has proven effective. The village disaster management forum serves as a crucial coordination hub, ensuring a well-organized response during crises.

Despite these successes, the study faces certain limitations. The findings are specific to Kutamendala Village, and their applicability to other regions with different disaster risks and resource availability may be limited. Furthermore, challenges such as financial constraints and infrastructure limitations impact the community's ability to fully implement disaster recovery and mitigation strategies. The recovery phase in disaster-resilient villages focuses on restoring essential services, improving adaptive capacity, and strengthening local institutions, often relying on community-driven initiatives and partnerships with NGOs to overcome resource shortages. Future research should explore disaster management in diverse communities, assess the long-term effectiveness of these strategies, and examine the role of technology in disaster mitigation. Strengthening local institutions, enhancing mitigation facilities, and fostering closer collaboration between governments, NGOs, and local communities will be essential in improving disaster preparedness and resilience at a broader scale.

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