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Enhancing Community Resilience in Facing Landslide Hazards through Education and Mitigation in Pasirmunjul Village, Sukatani District, Purwakarta

Abstract

Pasirmunjul Village, located in Sukatani District, Purwakarta Regency, is categorized as a landslide-prone area due to its hilly topography and high rainfall. The limited public understanding of disaster risks and lack of preparedness represent serious challenges in disaster risk reduction. This community engagement initiative aimed to improve local resilience through educational and mitigation-based approaches. The activities included public awareness campaigns, emergency response training, evacuation simulations, and environmental conservation education to help prevent future ground movement. The results showed a significant improvement in residents' understanding of landslide risks, readiness for emergencies, and active participation in protecting the surrounding environment. This program is expected to strengthen the community's capacity to independently and sustainably anticipate and manage landslide disasters.

Keywords: community resilience, landslide hazard, education, mitigation

1. Introduction

Indonesia is among the countries with a high vulnerability to natural disasters, one of which is landslides or ground movement. These disasters typically occur in areas with steep terrain, unstable soil structures, and high rainfall levels. One such high-risk area is Pasirmunjul Village in Sukatani District, Purwakarta Regency, West Java. This village frequently experiences ground movement, particularly during the rainy season, resulting in environmental damage, economic losses, and risks to human safety. National Disaster Management Agency (BNPB). (2024).

Despite the high potential for landslide disasters in the region, community awareness and preparedness remain relatively low. This condition is largely due to the limited knowledge of the causes and impacts of landslides, as well as a lack of training and information on self-managed mitigation strategies. Moreover, community involvement in environmental preservation efforts, such as planting soil-retaining vegetation, is still minimal.

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Figure 1. Top View of a Destroyed House
(Source: *Tirto.id*)

In response to this, strategic and systematic efforts are urgently needed to enhance community resilience through educational and mitigation-based approaches. Disaster education plays a crucial role in providing comprehensive knowledge about the causes, early warning signs, and appropriate responses to landslide hazards. At the same time, community-based mitigation encourages active citizen participation in creating a safer and more resilient living environment in the face of disaster risks. Geological Agency. (2024).



Figure 2. Damaged Road in Pasirmunjul Village
(Source: *Dompét Dhuafa*)

Through this community engagement program, residents of Pasirmunjul Village are expected not only to recognize the potential and risks associated with landslide disasters but also to develop the skills and preparedness necessary to respond effectively in emergency situations. By fostering collaboration among academics, village authorities, and local residents,

this initiative aims to build a village that is more resilient, self-reliant, and sustainable in facing natural disasters, particularly ground movement hazards. Chambers, R. (2024).

2. Theoretical Framework

2.1. Community Resilience in Disaster Response

Community resilience refers to a community's capacity to anticipate, respond to, and recover from disaster impacts swiftly and effectively. According to Indonesia's National Disaster Management Agency (BNPB, 2012), a resilient community possesses the knowledge, awareness, and capacity to manage disaster risks independently by leveraging local resources and indigenous wisdom. Key elements of resilience include the ability to understand potential risks, implement mitigation measures, and maintain strong social networks to support emergency response. Therefore, strengthening resilience is not solely dependent on physical infrastructure but also relies heavily on social, cultural, and educational factors. International Federation of Red Cross and Red Crescent Societies (IFRC). (2024).

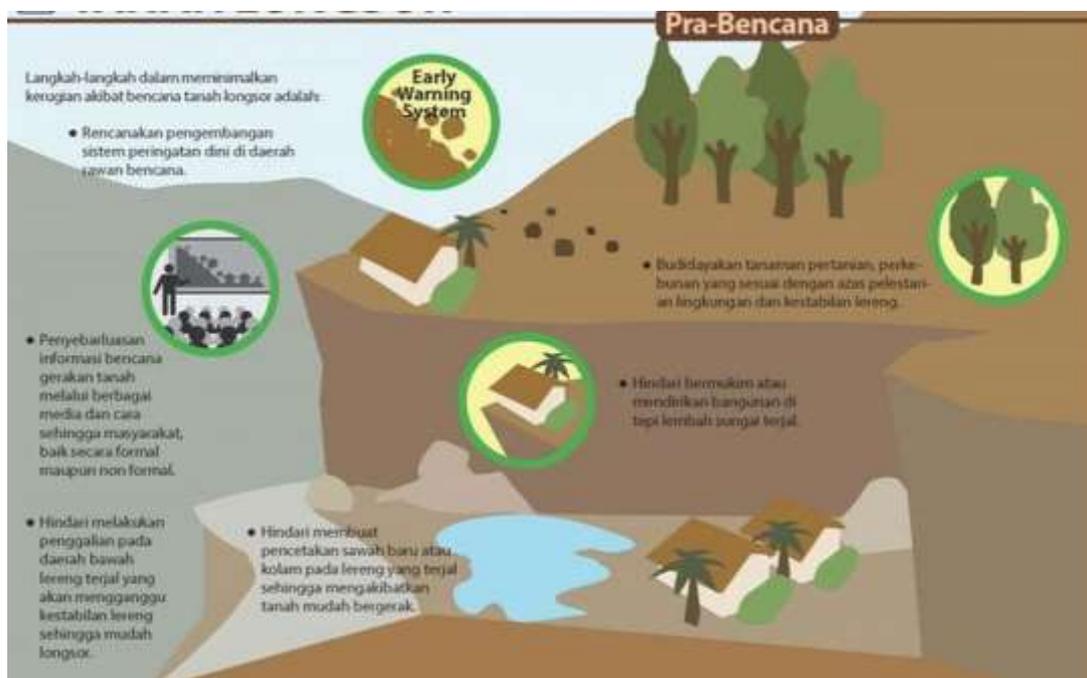


Figure 3. Pre-Disaster Landslide Sketch

(Source: Kompasiana.com)

2.2. Landslide Hazards (Ground Movement)

Landslides, or ground movements, are geological disasters caused by the downward movement of soil and rock masses along a slope. According to the Geological Agency (2020), landslides are triggered by several factors, including geological conditions, heavy rainfall, steep slope gradients, and human activities that degrade vegetation cover. In hilly areas such as Pasirmunjul Village, landslides pose a serious threat, particularly during the rainy season. Therefore, educational and preventive efforts are critical to reducing both the risks and impacts of such disasters. Permana, R., & Lestari, D. (2024).

2.3. Disaster Education

Disaster education involves the process of equipping communities with knowledge, skills, and awareness about various potential hazards, their impacts, and appropriate response and self-rescue strategies. This education can be delivered through various methods, such as community outreach, training, simulations, and strengthening local capacities. According to Indonesian Law No. 24 of 2007 on Disaster Management, community education is an essential part of disaster risk reduction that must be implemented in a planned, structured, and sustainable manner. Carter, W. N. (2024).

2.4. Community-Based Mitigation

Mitigation refers to systematic efforts to reduce or eliminate the adverse effects of disasters. Community-Based Disaster Risk Reduction (CBDRR) emphasizes the involvement of local communities as the primary agents in designing, implementing, and evaluating mitigation efforts. Carter (2008) notes that the success of mitigation efforts heavily relies on active community participation, the use of local knowledge, and integration with village development programs. Examples of mitigation activities include vegetation planting, drainage construction, risk mapping, and the establishment of early warning systems.

2.5. Community Empowerment in Disaster Risk Reduction

Community empowerment is the process of enhancing individuals' and groups' capacities to take control over their lives and address problems, including disaster preparedness. Chambers (1995) argues that empowerment should place communities as subjects, not objects, of development. In the context of disaster risk reduction, empowerment involves raising awareness, providing access to information and training, and supporting the formation of local volunteer groups and disaster preparedness forums. UNDRR. (2024).

2.6. Theoretical Summary

Based on the above theoretical concepts, it can be concluded that strengthening community resilience to landslide hazards must be approached through educational and participatory strategies. Disaster education and community-based mitigation are essential in building awareness, preparedness, and adaptive capacity in high-risk areas such as Pasirmunjul Village, Sukatani, Purwakarta.

3. Implementation Method

This community service project was carried out using participatory and educational approaches, placing the local community at the center of efforts to enhance resilience to landslides. The implementation method included the following stages:

3.1. Risk Identification and Field Observation

The initial stage involved identifying landslide-prone areas in Pasirmunjul Village. The team conducted field observations, interviews with community leaders, and coordination with village officials to map hazard zones and understand the local socio-economic context. Republic of Indonesia Law No. 24 of 2007 on Disaster Management. (2024).

3.2. Community Outreach and Disaster Education

Educational sessions were held through focus group discussions (FGDs) with residents, aimed at increasing awareness of:

- a. Causes and warning signs of ground movement
- b. Disaster impacts on local communities
- c. Preventive and mitigation strategies
- d. Community roles and rights in disaster management

Interactive media such as posters, videos, and simple simulations were used to make the information accessible to all age groups, including children and the elderly. Yuliana, S., & Prasetyo, A. (2024).

3.3. Emergency Response Training and Simulation

Residents participated in basic training covering:

- a. Evacuation procedures during a landslide
- b. Basic first aid techniques
- c. Formation and training of a village disaster response team

Evacuation drills were conducted to enhance emergency preparedness and test the effectiveness of evacuation routes and assembly points. Handayani, T., & Saputra, A. R. (2023).

3.4. Structural and Non-Structural Mitigation

Mitigation efforts included:

- a. Planting vegetation (trees and shrubs) on vulnerable slopes
- b. Constructing simple drainage systems to manage rainwater
- c. Participatory risk mapping with community involvement
- d. Establishing community disaster awareness groups

3.5. Monitoring and Evaluation

A participatory evaluation was conducted to assess changes in knowledge and preparedness. Changes in community behavior and attitudes toward disaster risks were also measured. Ongoing monitoring was coordinated with village authorities and local volunteer teams. Nugroho, H. (2023).

3.6. Time and Location of Activities

The program was implemented over the course of one month in Pasirmunjul Village, Sukatani District, Purwakarta Regency. It involved various stakeholders, including village officials, community leaders, women's groups, youth, and students. Putri, S. M., & Wibowo, D. P. (2023).

4. Findings

The community service activities in Pasirmunjul Village yielded several key findings, demonstrating a measurable increase in community resilience to landslide hazards:

4.1. Increased Knowledge and Awareness

Following the disaster education sessions, 85% of participants demonstrated improved understanding of:

- a. The causes of landslides
- b. Early warning signs of ground movement
- c. The social and economic impacts of disasters
- d. Independent mitigation efforts

This was verified through pre- and post-training tests.



Figure 4. Handover of Aid to the Head of Pasirmunjul Village

(Source: Document)

4.2. Active Participation in Emergency Training and Simulations

More than 60 residents from various age groups took part in evacuation drills and emergency preparedness training. Observations showed:

- a. Residents were able to follow evacuation procedures effectively
- b. Participants recognized the importance of evacuation routes and safe gathering points
- c. A structured village-level disaster volunteer group was formed

4.3. Implementation of Community-Based Mitigation

Structural and non-structural mitigation actions involved community participation in:

- a. Planting vegetation across approximately 150 meters of landslide-prone slopes
- b. Installing basic drainage systems at two flood-prone points
- c. Developing community-based risk maps using local knowledge

These efforts reflect a shift in community attitudes toward environmental stewardship and disaster risk reduction. Nugroho, H. (2023).

4.4. Emergence of Collective Awareness and Social Responsibility

The program fostered positive social outcomes, including:

- a. Increased solidarity among residents in facing disaster risks
- b. Improved communication between community members and local authorities
- c. Growing community initiative in proposing follow-up disaster preparedness programs

4.5. Community Recommendations

Residents expressed their hope for annual disaster education and mitigation programs. They also suggested additional training such as:

- a. First aid response training
- b. Development of local early warning systems
- c. Inter-village collaboration to strengthen disaster preparedness networks

These findings confirm that education and community-based mitigation significantly contribute to building community resilience in Pasirmunjul Village. Active public participation was the key to the program's success and serves as a strong foundation for long-term sustainability. UNDRR. (2023).

5. Discussion

The community service program implemented in Pasirmunjul Village demonstrates that disaster education and community-based mitigation efforts significantly enhance local resilience against landslide hazards. This resilience is reflected in improved knowledge, shifts in attitudes, and active public participation in mitigation and preparedness activities.



Figure 5. Participants of PKM Indonesian Research Lecturer Association
(Source: Document)

5.1. Improved Knowledge and Preparedness

Based on pre-test and post-test results, the community showed a significant increase in understanding the risks, causes, and appropriate responses to landslides. This aligns with disaster education theory, which emphasizes that enhancing individual capacity begins with the provision of relevant and accurate information (BNPB, 2012). Such knowledge is a crucial foundation for building community resilience.

5.2. Effectiveness of Training and Simulation Activities

Evacuation drills and emergency response training raised community awareness of the importance of preparedness. Residents gained an understanding of self-rescue procedures and their individual roles in emergencies. This proves that participatory training approaches help cultivate practical experiences that reinforce collective resilience. In line with the Community-Based Disaster Risk Reduction (CBDRR) approach, direct community involvement in simulations fosters confidence and readiness in disaster situations.



Figure 5. Management Meeting of the Indonesian Research Lecturers Association
(Source: Document)

5.3. Environmental Mitigation as Preventive Action

Community involvement in both structural and non-structural mitigation—such as planting soil-retaining vegetation and building drainage systems—demonstrated behavioral changes and increased environmental awareness. These activities not only strengthen the area's physical resilience but also enhance social cohesion and collaboration. This reflects Chambers' (1995) view that empowering communities in disaster risk reduction is more effective when people feel a sense of ownership over their environment.

5.4. Social Transformation and Collective Responsibility

The program revealed that residents were not passive beneficiaries but active participants in planning and implementation. The formation of volunteer groups and the emergence of community-led initiatives indicate the development of social resilience and local autonomy. This supports the UNISDR (2009) concept of community resilience, which emphasizes the collective ability to act and recover in the face of disasters. Republic of Indonesia Law No. 24 of 2007 on Disaster Management. (2023).

5.5. Challenges and Sustainability Potential

Despite positive results, some challenges remain, such as limited resources, unequal access to information, and the need for ongoing program continuity. Therefore, sustained support from village authorities, academic institutions, and other stakeholders is necessary to ensure the longevity of education and mitigation programs. The development of localized early warning systems and continued capacity-building were among the key recommendations raised by the community. Yuliani, N., & Hidayat, R. (2023).

6. Conclusion

- a. **Increased Knowledge and Awareness:** Through disaster education and outreach, residents of Pasirmunjul Village gained significant understanding of the causes, early warning signs, and impacts of landslide disasters.
- b. **Preparedness and Collective Response:** Evacuation drills and emergency response training successfully led to the formation of a trained village disaster response team capable of executing evacuation procedures and providing basic first aid.
- c. **Environmental Mitigation Implementation:** Activities such as planting vegetation and constructing participatory drainage systems reflect positive behavioral change toward environmental preservation and physical risk reduction.
- d. **Emergence of Solidarity and Program Ownership:** Active participation across all activities fostered a strong sense of ownership and collective responsibility, which became the foundation for long-term program sustainability.

6.1. Implications

This discussion indicates that educational and participatory approaches are highly effective in fostering community resilience. The success of this program can serve as a model for other villages with similar disaster-prone characteristics. Strengthened cross-sector collaboration is essential to ensure that resilience-building efforts are sustainable and integrated into rural development plans.

6.2. Recommendations

- a. **Regular Disaster Education Programs:** Village authorities and volunteer groups should organize disaster preparedness training and awareness campaigns at least twice a year to maintain and enhance community readiness.
- b. **Development of Local Early Warning Systems:** Introduce simple tools or applications (e.g., moisture sensors, manual sirens) managed by the village disaster team to detect early signs and issue warnings.
- c. **Maintenance and Expansion of Structural Mitigation:** Continue and expand vegetation planting on critical slopes, and maintain drainage systems to ensure proper function during heavy rainfall.

- d. **Strengthening Inter-Village Networks:** Establish partnerships with neighboring villages through regular forums for knowledge-sharing, cross-training, and coordinated evacuation planning for large-scale disasters.
- e. **Continuous Monitoring and Participatory Evaluation:** Form a joint monitoring team (community members, academics, and village officials) to annually assess the effectiveness of mitigation and preparedness programs and improve them based on field findings.

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