

Strengthening Community Preparedness through Disaster Risk Mapping and Environmental Education in Sindangheula Village

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ARTICLE INFO

Keywords:

Disaster mitigation; risk mapping; environmental education.

ABSTRACT

Rural areas characterized by hilly geographical conditions have a higher vulnerability to natural disasters, particularly landslides. Sindangheula Village, as one of the areas with such topographical characteristics, still faces limited availability of spatial information that can serve as a basis for improving community preparedness toward disaster risks. In addition, public awareness regarding environmental management needs to be enhanced as part of community-based mitigation efforts. This community service activity aimed to improve community preparedness through the provision of spatial information in the form of disaster risk maps and to increase environmental awareness through waste management education. The method applied in this activity was a participatory approach consisting of several stages, including observation of local conditions, problem identification, program planning, implementation through the development of landslide-prone area maps and village administrative maps, as well as waste management education for the community and elementary school students. The results of the activity indicate that the community gained a better understanding of the geographical conditions of their area through map-based information displayed as a public information medium. Furthermore, environmental education activities improved awareness among the community and students regarding the importance of waste sorting and management as part of environmental sustainability efforts. This activity demonstrates that the integration of disaster risk mapping and environmental education can serve as an effective approach to improving



Introduction

Indonesia is one of the countries with a relatively high level of disaster vulnerability due to its diverse geographical, geological, and climatological conditions. One of the disasters frequently occurring in various regions is landslides, particularly in areas characterized by hilly landscapes and certain slope conditions. Disaster risks are not only influenced by natural factors but are also related to the level of community preparedness in understanding regional conditions and their ability to implement disaster risk reduction efforts (Zid et al., 2022).

Sindangheula Village is one of the areas located in Banjarharjo District, Brebes Regency, Central Java Province, with geographical characteristics consisting of hilly areas. These characteristics provide opportunities for land utilization as agricultural areas, plantations, and community forests; however, they also increase vulnerability to landslide disasters. Based on the identification of local conditions and information obtained from the community, Sindangheula Village is considered an area with potential landslide risks due to its hilly topography. This condition highlights the importance of disaster mitigation efforts that can provide information and improve community awareness regarding areas potentially affected by disasters.

One of the identified problems is the limited availability of spatial information that can be used by the community as a source of knowledge regarding village conditions. Information regarding administrative boundaries and disaster-prone areas plays an important role in supporting community preparedness because it helps residents understand the characteristics of their living environment and determine appropriate preventive measures. Regional mapping is one approach that can be applied in disaster mitigation because it is able to present geographical information visually and in an easily understandable manner (Sinarta et al., 2024).

In addition to regional information, disaster risk reduction also needs to be supported by community awareness regarding environmental management. A well-maintained environment can become one of the supporting factors in building community resilience against various risks. Therefore, environmental education through waste management is part of an effort to increase public awareness of surrounding environmental conditions. Proper waste management is not only related to cleanliness but also supports the creation of a more sustainable environment (Ngindana et al., 2026).

Based on these conditions, this community service activity focuses on strengthening community preparedness through disaster risk mapping and environmental education in Sindangheula Village. The activity was conducted through the development of landslide-prone area maps, village administrative maps, and waste management education for the community and elementary school students. The selection of Sindangheula Village as the location for this community service program was based on the community's need for regional information and increased environmental awareness as part of community-based disaster mitigation efforts.

This community service program aims to improve community understanding of geographical conditions and potential disaster risks in their area, while encouraging community involvement in environmental preservation. The expected social changes include the development of new awareness regarding the importance of disaster preparedness, increased community capacity in identifying environmental risks, and the availability of information media that can be sustainably utilized to support disaster risk reduction efforts in Sindangheula Village.

Method

This community service activity employed a participatory approach involving the community as the main subject in the processes of problem identification, activity implementation, and utilization of program outcomes. This approach was selected because community-based disaster mitigation requires direct community involvement in understanding environmental conditions and improving their capacity to respond to potential disaster risks (Pranajati, 2022).

The subjects of this community service activity were the residents of Sindangheula Village, Banjarharjo District, Brebes Regency, as well as students of SDN Sindangheula 03 as the target participants of environmental education activities. The selection of the location was based on the geographical condition of Sindangheula Village, which is situated in a hilly area and has potential landslide risks. These conditions indicate the community's need for information regarding regional characteristics and efforts to improve preparedness against potential disasters.

The implementation of the activity began with field observations and identification of regional conditions to determine the geographical characteristics of the village, potential disaster risks, and community needs related to disaster information. The identification process was conducted through observation of environmental conditions and communication with local residents regarding issues related to disaster mitigation and environmental management. The results of this observation became the basis for determining activity strategies, namely the provision of spatial information through regional mapping and the improvement of community awareness through environmental education (Muflih et al., 2025).

The community service strategy was carried out through two main approaches: disaster risk mapping and environmental management education. The mapping activity involved developing landslide-prone area maps and administrative maps of Sindangheula Village as information media for the community. The mapping process aimed to provide an overview of regional conditions, locations with potential disaster impacts, and village administrative boundaries, allowing the community to understand the geographical characteristics of their living environment more easily.

In addition, environmental education activities were conducted by delivering materials on organic and inorganic waste sorting, introducing the utilization of inorganic waste through ecobrick production, and providing educational media regarding types of waste commonly found in the surrounding environment.

The community service activity was carried out through several stages, including preparation, implementation, and evaluation. During the preparation stage, information regarding regional conditions was collected and an activity plan was developed based on community needs. The implementation stage consisted of creating landslide-prone area maps, village administrative maps, and conducting waste management education for the community and elementary school students. Furthermore, the evaluation stage was conducted to determine community understanding of the information provided and to ensure that the outcomes of the activity could be utilized sustainably (Ariana, 2022).

The results of the mapping activity were then placed as village information media that could be used by the community to understand regional conditions and increase awareness of disaster risks. Meanwhile, waste management education was directed toward developing community habits in maintaining the surrounding environment. Through this method, the community service activity is expected to support improved community preparedness and encourage the development of environmental awareness as part of community-based disaster mitigation efforts.

Results and Discussion

The implementation of the community service activity in Sindangheula Village resulted in a series of activities divided into two main focuses: strengthening community preparedness through disaster risk mapping and increasing environmental awareness through waste management education. Both focuses were implemented as a response to the geographical conditions of the village, which is located in a hilly area, as well as the limited access to spatial information and the low level of environmental management awareness among the community.

The mentoring process began with the identification stage of regional conditions, which showed that Sindangheula Village has potential landslide risks. Based on these conditions, technical activities were carried out through the collection of simple spatial data obtained from field observations and identification

of village boundaries. The collected data were then processed into landslide-prone area maps and village administrative maps. This mapping activity served as a technical action aimed at providing visual information that could be easily understood by the community (Budhiana et al., 2023). The resulting maps were then installed in public village facilities as information media that could be accessed by the wider community.



Figure 1 and 2. Identification of regional conditions and spatial data collection in Sindangheula Village as the basis for developing disaster risk maps

During the implementation process, the mapping activity functioned not only as a technical output but also as a risk communication medium between the community service team and the residents. The community began to respond to the spatial information presented, particularly regarding areas with potential disaster vulnerability. This indicates that visual presentation of information plays an important role in improving community disaster literacy, as spatial information can strengthen public understanding of environmental risks in their surroundings.



Figure 3 and 4. The process of mapping disaster-prone areas as spatial disaster information media in Sindangheula Village

In addition to mapping activities, a program action in the form of waste management education was also conducted for the community and students of SDN Sindangheula 03. This activity included the separation of organic and inorganic waste, the introduction of environmental impacts caused by improper waste management, and the practice of making ecobricks as a form of inorganic waste utilization. The education activity was also complemented by visual media in the form of information boards displaying types of waste commonly found in the surrounding environment. This educational approach aimed to build awareness

from an early age regarding the importance of environmental preservation as part of disaster risk mitigation efforts (Haris et al., 2023).



Figure 5 and 6. Waste management education for SDN Sindangheula 03 students to foster early environmental awareness

From the perspective of the mentoring process, the involvement of the community and students in educational activities demonstrated active participation in the learning process. The community was not merely a recipient of information but was also involved in discussions and direct practices. This reflects a community empowerment approach that emphasizes active participation as a key element in the process of social transformation. Such participation serves as an initial indicator of the emergence of new awareness regarding the importance of environmental management and disaster preparedness (Ilham et al., 2025).



Figure 7 and 8. Environmental awareness socialization for Sindangheula Village residents as an effort to mitigate disaster risks

The social changes resulting from this activity can be observed through increased community understanding of disaster risks and awareness of the importance of environmental preservation. The installation of maps at the village office has also begun to function as a new information institution that can be utilized by the community as a reference for understanding regional conditions. Furthermore, the involvement of village officials and community leaders during the mentoring process indicates the potential emergence of local leaders who can contribute to the sustainability of the program outcomes, particularly in disseminating disaster-related information to the wider community (Masruroh et al., 2024).



Figure 9 and 10. Participation of village officials and community leaders of Sindangheula Village in the community service activity as strengthening local roles in disaster mitigation

Theoretically, this activity aligns with the concept of community-based disaster risk reduction (CBDRR), which emphasizes the importance of community involvement throughout the disaster risk reduction process, from risk identification to the implementation of preventive actions (Nurcahyo et al., 2022). This approach emphasizes that communities are not merely objects receiving assistance but are the main actors in disaster risk management. In this context, disaster risk mapping functions as an instrument for improving community capacity in understanding the geographical characteristics of their area (Nakoe, 2021).

Furthermore, waste management education can also be understood within the framework of environmental behavior change theory, in which increased knowledge and awareness serve as the foundation for developing environmentally responsible behavior (Simanungkalit et al., 2021). According to behavioral change theory, transformation does not occur solely through information transfer but also through direct experiences and practical activities experienced by individuals (Dewi et al., 2020). This can be observed in the community service activity, which combined material delivery with ecobrick-making practices, enabling more effective internalization of environmental knowledge.

Thus, the results of this activity indicate that the integration of disaster risk mapping and environmental education can create a more comprehensive community service approach. The activity not only produced outputs in the form of maps and educational media but also encouraged the emergence of new awareness, initial behavioral changes, and strengthened community capacity to face disaster risks more independently and sustainably.

Conclusion

The community service activity conducted in Sindangheula Village demonstrates that a participatory approach through disaster risk mapping and environmental education can contribute significantly to enhancing community preparedness for potential disasters while strengthening environmental awareness. The results indicate that the provision of spatial information in the form of landslide-prone area maps and village administrative maps serves as an effective risk

communication medium, enabling residents to better understand the geographical characteristics of their area through visual and accessible information.

Furthermore, the waste management education program positively impacted the knowledge and awareness of both community members and elementary school students regarding the importance of environmental conservation. The integration of regional mapping and environmental education not only generated tangible outputs in the form of maps and educational media but also fostered new community awareness concerning the relationship between environmental conditions and disaster risks.

From a theoretical perspective, this activity reinforces the concept of community-based disaster risk reduction, which positions local communities as the primary actors in disaster risk management. Active community participation throughout the program serves as an initial indicator of empowerment and social transformation toward a more resilient and disaster-prepared society. In addition, the environmental education activities contributed to encouraging behavioral changes toward more sustainable environmental management practices.

Based on the outcomes of this activity, it is recommended that village authorities and community members continue utilizing the mapping products as disaster information media and further develop environmental education programs on a sustainable basis. Continued assistance in disaster mitigation and environmental management is also necessary to strengthen community capacity in addressing potential risks in the future.

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