NJCOM
Community Service Journal
E ISSN: 3090 - 0255 | P ISSN: 3090-5087
Vol. 2, No. 2 July 2026. Pages. 108-113

Community-Based Flood Monitoring and Mitigation Education through the Implementation of Biopore Systems in Cangkuang Kulon Village

Rd. Rohmat Saedudin[1]✉, Cindy Muhdiantini[2], Mega Fitri Yani[3]
rdrohmat@telkomuniversity.ac.id[1], cindymuhdiantinicm@telkomuniversity.ac.id[2]
megafy@telkomuniversity.ac.id[3]
[1] Information Systems, Faculty of Industrial Engineering, Telkom University, Indonesia
[2] Information Systems, Faculty of Industrial Engineering, Telkom University, Indonesia
[3] Information Systems, Faculty of Industrial Engineering, Telkom University, Indonesia

Keywords: Biopore System, Community Participation, Disaster Education, Flood Mitigation, Flood Monitoring

Submitted: 02/07/2026
Revised: -
Accepted: 28/07/2026

Abstract

Floods are among the most common hydrometeorological disasters in Indonesia and have significant impacts on the social and economic well-being of communities. Cangkuang Kulon Village, Bandung Regency, is one of the areas vulnerable to flooding, highlighting the need to strengthen community capacity in disaster mitigation. This community service program aimed to enhance public understanding of community-based flood monitoring and mitigation through the implementation of biopore systems and the provision of supporting facilities. The activity involved village officials and local community members. The implementation methods included educational sessions, interactive discussions, and the handover of biopore construction equipment. The results indicated an improvement in community understanding of environmental monitoring, the application of biopore systems as a flood mitigation measure, and the importance of community participation in building sustainable disaster preparedness.

Author Correspondent:
Cindy Muhdiantini
Information Systems, Faculty of Industrial Engineering, Telkom University, Indonesia
Jl. Telekomunikasi, Terusan Buahbatu, Sukapura, Dayeuhkolot, Bandung, Jawa Barat, 40257
Email: cindymuhdiantinicm@telkomuniversity.ac.id

INTRODUCTION

Floods are among the most frequent hydrometeorological disasters in Indonesia and have significant impacts on community life. High rainfall intensity, land-use changes, the reduction of water infiltration areas, and inadequate drainage systems are some of the factors contributing to the increasing flood risk in many regions (Zhang et al., 2026). The impacts of flooding extend beyond economic losses to include disruptions to social activities, public health, and infrastructure, ultimately affecting the sustainability of daily community life (Merz et al., 2021; Nooni et al., 2026; Sauer et al., 2024).

In the context of disaster risk reduction, mitigation efforts cannot rely solely on government intervention but require the active involvement of communities as the frontline actors when disasters occur (Fekete et al., 2021; Pasamonte, 2025). Communities are the first to experience the impacts of flooding and play a crucial role in implementing local disaster management measures. Therefore, strengthening community capacity is an essential aspect of enhancing regional resilience to disaster threats (Evans et al., 2026; Imperiale & Vanclay, 2021).

Community-based mitigation has emerged as an effective strategy because it utilizes local knowledge and community experiences in dealing with flood events within their environment (Moktan et al., 2026; Šakić Trogrlić et al., 2021). Through active participation, community members act not only as recipients of information but also as key actors in environmental monitoring, information dissemination, risk identification, and the implementation of sustainable mitigation measures. This approach is expected to foster collective awareness and strengthen social cooperation in responding to potential disasters.

One simple and sustainable flood mitigation measure that can be implemented by communities is the application of biopore systems. Biopore infiltration holes function by increasing the soil's capacity to absorb rainwater, thereby reducing waterlogging and surface runoff that may lead to flooding (Fathurrahman et al., 2026). In addition to improving soil infiltration, biopores can also be used for managing household organic waste by converting it into compost, providing broader environmental benefits (Ruslinda et al., 2021). The successful implementation of biopore systems largely depends on active community participation in their construction, maintenance, and sustainable utilization.

Cangkuang Kulon Village, Bandung Regency, is one of the areas vulnerable to flooding, particularly during the rainy season with high precipitation intensity. The geographical and environmental conditions of the area require communities to possess adequate preparedness to minimize the impacts of flood events. Therefore, enhancing community capacity in environmental monitoring, flood mitigation measures, and the implementation of biopore systems has become an important requirement for supporting disaster risk reduction efforts at the village level.

Based on these conditions, this community service program was conducted through educational activities on community-based flood monitoring and mitigation, emphasizing the implementation of biopore systems as one of the strategies for reducing flood risks. The program also included the distribution of equipment required for biopore construction to support community implementation efforts. Through these activities, it is expected that community knowledge, awareness, and participation in environmental management will increase, thereby fostering a more effective, adaptive, and sustainable disaster mitigation system for addressing flood risks in Cangkuang Kulon Village.

COMMUNITY SERVICE METHODS

The implementation method employed a participatory and educational approach, positioning the community as the primary subject in the learning process and in strengthening disaster mitigation capacity. This approach enabled participants not only to receive theoretical knowledge but also to share their experiences and local knowledge regarding previous flood events in their area. The program was carried out in several stages. The first stage involved coordination with the village government to identify community needs and determine educational materials appropriate to local environmental conditions. The second stage consisted of educational sessions on community-based flood monitoring, covering the identification of flood indicators, environmental monitoring, and collective information reporting mechanisms. The following stage focused on flood disaster mitigation education, including preparedness measures before flooding, actions to be taken during flood events, and post-disaster recovery efforts. The activity continued with interactive discussions to encourage participants to identify problems and propose

mitigation solutions that were relevant to local conditions. As part of ensuring program sustainability, the activity also included the handover of equipment needed for constructing biopores to support flood mitigation efforts. The equipment is expected to help the community enhance disaster preparedness and strengthen their capacity for independent disaster management.

RESULTS AND DISCUSSION

Community-Based Flood Mitigation Education through Biopore Systems

One of the main outcomes of this community service program was the increased public understanding of the importance of community-based flood mitigation. Through educational activities, participants were introduced to several indicators that can be used to monitor potential flooding, such as rising water levels, rainfall intensity, and drainage conditions. In addition, the community gained a better understanding of the importance of communication and coordination among residents in disseminating information related to potential disasters so that preventive measures can be implemented more quickly and effectively.

The program also emphasized the importance of implementing biopore systems as an environmentally friendly flood mitigation alternative that can be carried out independently by the community. Participants were introduced to the function of biopore infiltration holes in enhancing the soil's capacity to absorb rainwater, thereby reducing waterlogging and surface runoff. Furthermore, the community learned about the additional benefits of biopores in managing household organic waste, which can be processed into compost, contributing positively to environmental cleanliness and quality.

Figure 1. Educational Session on Flood Mitigation

As shown in Figure 1, the educational sessions were delivered interactively to enable participants to relate the mitigation concepts to the conditions and experiences within their local environment. The discussions revealed that community members possessed substantial local knowledge regarding flood-prone areas and environmental indicators that often signal the onset of flooding. This local knowledge serves as an important foundation for developing a more effective community-based mitigation system that is aligned with local conditions.

Through this activity, participants gained an understanding that disaster mitigation should not only be carried out during flood events but also requires continuous planning, environmental management, and community collaboration. Community members were encouraged to strengthen coordination among residents, actively monitor environmental conditions, and participate in the construction and maintenance of biopores as a preventive measure to reduce flood risks.

Participant involvement throughout the program indicated an increased awareness of the importance of community roles in reducing disaster risks through collective preventive actions. The participation of village officials further strengthened coordination between the community and the local government, supporting the integration of biopore systems as part of a sustainable flood mitigation strategy in Cangkuang Kulon Village. Overall, the participatory approach adopted in this program not only enhanced community understanding of disaster management but also strengthened community preparedness and resilience in facing potential flood hazards in the future.

Strengthening Disaster Preparedness through Biopore Facilities and Community Participation

This community service program focused not only on providing education on flood monitoring and mitigation but also on distributing equipment required for constructing biopores within the community. The provision of these facilities represents a tangible contribution from higher education institutions in supporting local communities to strengthen environmentally based disaster mitigation capacity. The availability of such equipment is expected to facilitate the independent and sustainable implementation of biopore systems as an effort to enhance soil infiltration capacity and reduce the potential for waterlogging during the rainy season. In addition to providing direct benefits, this initiative also strengthened the synergy among universities, village authorities, and community members in fostering a participatory culture of disaster preparedness, thereby enabling flood risk reduction efforts to be carried out more effectively and sustainably.

The availability of supporting equipment is expected to help the community implement biopore systems more easily as a means of increasing soil absorption capacity and reducing the potential for flooding during periods of heavy rainfall. Beyond its immediate benefits, the provision of these facilities also reflects the collaboration among universities, village officials, and local communities in building long-term resilience against flood hazards. The community responded positively to the assistance provided and expressed hope for future programs that could further support the implementation of biopore systems in Cangkuang Kulon Village.

The success of this community service activity was also closely related to the active involvement of community members and village officials throughout the implementation process, as shown in Figure 2. All participants attended the program enthusiastically and actively engaged in discussions, sharing their experiences of previous flood events in their neighborhood. The participatory approach adopted in this activity facilitated knowledge exchange between the community service team and local residents, allowing participants' local experiences to be utilized in identifying problems and developing mitigation strategies that are appropriate to local conditions.

Figure 2. Community Participation in Cangkuang Kulon Village

Overall, this program demonstrates that community participation is a crucial factor in enhancing the effectiveness of disaster mitigation efforts. Active community involvement not only improves public understanding of disaster management but also strengthens the sense of ownership toward collective disaster risk reduction initiatives. The combination of educational activities, support for biopore implementation, and community participation provides an important foundation for developing a more adaptive and sustainable flood mitigation system at the village level.

CONCLUSIONS AND SUGGESTIONS

Conclusion

The community service program conducted in Cangkuang Kulon Village successfully enhanced community understanding of community-based flood monitoring and mitigation. Through educational activities, participants gained knowledge about the importance of environmental monitoring, coordination among residents, and active community participation in supporting local disaster risk reduction efforts.

The implementation of biopore systems as an environmentally based mitigation solution also provided new insights for the community regarding efforts to improve soil infiltration capacity and manage household organic waste. The provision of biopore construction equipment, together with the active involvement of village officials and community members, played an important role in strengthening disaster preparedness and ensuring the sustainability of flood mitigation programs in Cangkuang Kulon Village.

Suggestion

The sustainability of the program can be supported through continuous assistance in the implementation and maintenance of biopore systems so that their benefits can be fully realized by the community. Furthermore, sustained collaboration among higher education institutions, village governments, and local communities is needed to develop participatory disaster mitigation programs and enhance regional resilience to future flood hazards.

REFERENCE

Evans, G., Wickes, R., D'Arcy, Z., & Bos, J. J. (Annette). (2026). Enabling local action and reflection: The community disaster resilience capability framework. *International Journal of Disaster Risk Reduction*, *143*, 106212. https://doi.org/10.1016/j.ijdrr.2026.106212

Fathurrahman, Radam, I. F., Novitasari, N., & Rusdiansyah, R. (2026). A Laboratory-Scale Rainfall Simulation of the Surface Runoff Reduction Using Biopore Infiltration Holes. *Engineering, Technology & Applied Science Research*, *16*(3), 37132–37139. https://doi.org/10.48084/etasr.16584

Fekete, A., Aslam, A. B., de Brito, M. M., Dominguez, I., Fernando, N., Illing, C. J., KC, A. K., Mahdavian, F., Norf, C., Platt, S., Santi, P. A., & Tempels, B. (2021). Increasing flood risk awareness and warning readiness by participation – But who understands what under 'participation'? *International Journal of Disaster Risk Reduction*, *57*, 102157. https://doi.org/10.1016/j.ijdrr.2021.102157

Imperiale, A. J., & Vanclay, F. (2021). Conceptualizing community resilience and the social dimensions of risk to overcome barriers to disaster risk reduction and sustainable development. *Sustainable Development*, *29*(5), 891–905. https://doi.org/10.1002/sd.2182

Merz, B., Blöschl, G., Vorogushyn, S., Dottori, F., Aerts, J. C. J. H., Bates, P., Bertola, M., Kemter, M., Kreibich, H., Lall, U., & Macdonald, E. (2021). Causes, impacts and patterns of disastrous river floods. *Nature Reviews Earth & Environment*, *2*(9), 592–609. https://doi.org/10.1038/s43017-021-00195-3

Moktan, A., Banerjee, S., & Barua, A. (2026). Reconceptualizing community-based disaster risk management: From external-led projects to community-centered resilience building through a systematic review. *Progress in Disaster Science*, *30*, 100569. https://doi.org/10.1016/j.pdisas.2026.100569

Nooni, I. Kwesi., Sarpong, L., Kumi, N., Prempeh, N. A., Fianko, S. K., & Jin, Z. (2026). Human impacts of flood disasters: A global systematic review (1980–2025). *H2Open Journal*, *9*(3), 100019. https://doi.org/10.1016/j.htopen.2026.100019

Pasamonte, R. C. V. (2025). Strengthening Community Engagement in Local Disaster Management: The Northern Mindanao, Philippines Experience. *Jurnal Public Policy*, *11*(1), 1. https://doi.org/10.35308/jpp.v11i1.9270

Ruslinda, Y., Aziz, R., Arum, L. S., & Sari, N. (2021). The Effect of Activator Addition to the Compost with Biopore Infiltration Hole (BIH) Method. *Jurnal Ilmu Lingkungan*, *19*(1), 53–59. https://doi.org/10.14710/jil.19.1.53-59

Šakić Trogrlić, R., Duncan, M., Wright, G., van den Homberg, M., Adeloye, A., Mwale, F., & McQuistan, C. (2021). External stakeholders' attitudes towards and engagement with local knowledge in disaster risk reduction: are we only paying lip service? *International Journal of Disaster Risk Reduction*, *58*, 102196. https://doi.org/10.1016/j.ijdrr.2021.102196

Sauer, I. J., Mester, B., Frieler, K., Zimmermann, S., Schewe, J., & Otto, C. (2024). Limited progress in global reduction of vulnerability to flood impacts over the past two decades. *Communications Earth & Environment*, *5*(1), 239. https://doi.org/10.1038/s43247-024-01401-y

Zhang, J., Li, Z., Li, X., & Zhang, L. (2026). Influence of land use change on rainfall and waterlogging in Zhengzhou city. *Applied Water Science*, *16*(6), 182. https://doi.org/10.1007/s13201-026-02864-4