Global Disaster Preparedness Center

Executive Summary

Inclusivity and actionability of volcanic hazard Early Warning System in Indonesia: Perspectives of persons with disabilities

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Background

Early Warning Systems (EWS) and preparedness measures have saved tens of thousands of lives and are repeatedly reported to increase the likelihood of persons with disabilities capacity to cope with disasters. Findings from UNDRR Global Survey on Persons with Disabilities and Disasters indicate sufficient early warning can allow persons with disabilities to evacuate independently with fewer difficulties. Although

it is widely acknowledged that EWS should be accessible to all, comprehensive strategies and studies on effectively communicating with individuals with disabilities are lacking. Scholars have attempted to assess the extent to which EWS have been inclusive and responsive to the specific needs of persons with disabilities. Some studies have focused on particular hazards, such as floods and tsunami, while others have concentrated on specific impairment categories. However, the inclusion of persons with disabilities in volcanic hazard EWS is rarely explored in academic literature.

Considering EWS as social processes this research draws learning from two local communities in Indonesia at risk of volcanic eruptions. We aim to examine the inclusivity and actionability of EWS, focusing on the factors that affect the effectiveness of early warnings from the viewpoints of persons with disabilities. The research specifically seeks to assess the resource implications of the early actions taken by persons with disabilities in response to early warning messages. The study addresses the following research questions:

1. What factors affect the comprehension and inclusivity of early warnings from the perspective of persons with disabilities in two volcanic eruption-prone villages in Yogyakarta, Indonesia?
2. What influences the actionability of early warnings among persons with disabilities in these communities?
3. Additionally, what could be the potential resource implications of early actions taken by persons with disabilities in response to these warnings?

Methodology

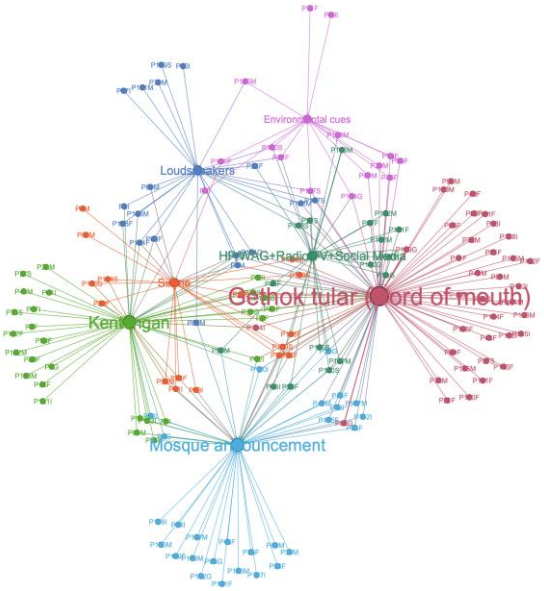
The research utilized a participatory mixed-method design inspired by Sendall et al. (2018), adapting the UNDRR's Inclusive Early Warning and Early Action Checklist to fit the local Indonesian context through meticulous translation and expert review. It was structured into two main components addressing governance aspects and specific needs and experiences of persons with disabilities. To promote inclusivity, persons with disabilities were actively involved as data collectors, working alongside local disaster volunteers, and were supported through extensive training and a quasi-mentoring approach to ensure accurate and meaningful data collection.

The data collection process employed multiple methods, including an accessibility review, household surveys, and photo elicitation, involving over 200 participants. These surveys assessed participants' interactions with EWS and their accessibility, complemented by geotagging to accurately map their locations. Additionally, focus group discussions with representatives from local disability organizations provided deeper insights. For analysis, the study combined thematic analysis, GIS-based spatial mapping to visualize the distribution of persons with disabilities in relation to EWS locations, and Social Network Analysis to investigate the flow of information within social networks. Finally, a joint display approach was used to integrate these diverse

data sources, resulting in a comprehensive evaluation of the inclusivity and effectiveness of the Early Warning Systems in the region.

Key Findings

The study emphasizes that EWS must be understood as more than just technical tools; they operate within the social and cultural contexts of the communities they serve, particularly in areas with significant populations of persons with disabilities. Social networks, including caregivers, family members, neighbours, and community leaders, are identified as essential sources of support for early action during volcanic eruptions. Organizations of Persons with Disabilities (OPDs), who also serve as disaster volunteers, play a vital role in helping communities integrate EWS into disaster education and preparedness measures (Figure 1). The discussion focuses on three key themes: the coexistence of technology with indigenous knowledge, EWS as social processes, and the inclusivity and actionability of EWS for persons with disabilities.



Co-existence of Technology and Indigenous Knowledge and Practices

A critical finding is the coexistence of technology-based EWS with indigenous knowledge and social networks. While modern technologies like sirens and CCTVs form the backbone of formal EWS infrastructure, their effectiveness is often limited by various barriers, such as the restricted reach of auditory warnings, particularly for individuals with hearing impairments. Indigenous knowledge systems, however, offer better coverage and are more contextually relevant and accessible. For instance, communities rely on environmental cues, such as changes in weather patterns or volcanic activity, to signal impending danger. **Traditional practices, such as the use of Kentongan (bamboo slit drum) and mosque announcements, provide effective and low-cost early warning tools**, particularly in rural areas where technological infrastructure is limited. These methods, deeply rooted in local culture, complement modern EWS and extend the reach of warnings, ensuring broader community coverage.

EWS as a Social Process and the Role of Social Networks

Understanding EWS as social processes, rather than purely technical systems, is crucial for improving their effectiveness. The study highlights that EWS are most

effective when integrated into the everyday lives of the communities they serve, supported by ongoing education, training, and preparedness activities that build resilience and reduce vulnerabilities. **Social networks, including local leaders, volunteers, and community organizations, play a pivotal role in bridging the gap between government-installed EWS and persons with disabilities**. The involvement of community leaders, like the Dukuh (head of the sub-village), in disseminating early warnings through direct interaction underscores the importance of local social structures in disaster preparedness. Additionally, the participation of OPDs in disaster preparedness efforts enhances inclusivity, allowing persons with disabilities to actively engage in disaster response. However, challenges remain, particularly in ensuring that social networks are fully inclusive and that persons with disabilities are not marginalized in disaster risk reduction efforts.

Inclusivity and Actionability of EWS for Persons with Disabilities

The study identifies significant challenges in the inclusivity and actionability of EWS, particularly for persons with disabilities. While formal EWS are in place, they often fail to adequately consider the specific needs of persons with disabilities, resulting in limited accessibility and understanding of early warning messages. The disconnect between receiving early warnings and taking effective early action is a critical issue that undermines the potential benefits of EWS. This disconnect is due to several factors, including the **lack of accessible communication formats, difficulties in comprehension, and limited resources for taking immediate action**. Sociocultural factors, such as reliance on traditional knowledge systems and fear of discrimination in evacuation shelters, further exacerbate these challenges. Supporting early action for persons with disabilities during volcanic eruptions requires urgent improvements in transportation, evacuation infrastructure, and shelter facilities, as current resources are insufficient. There is also a critical need for better community-based support systems and government assistance, particularly in social protection and cash aid.

Conclusion

The study reveals that despite existing infrastructure like sirens and CCTVs, these systems often fail to meet the needs of persons with disabilities, resulting in delayed responses during disasters. There is a pressing need to integrate modern technologies with indigenous knowledge and social networks, enhance the role of OPDs in integration of EWS in disaster preparedness, and improve transportation, evacuation facilities, and assistive devices. The study emphasizes the importance of developing inclusive EWS policies, formalizing the role of local leaders and community organizations, and investing in education and capacity-building initiatives tailored to persons with disabilities to promote long-term resilience and effective early action.

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