

EGU24-9073, updated on 13 Jul 2024

<https://doi.org/10.5194/egusphere-egu24-9073>

EGU General Assembly 2024

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Bridging gaps, saving lives: Integrating communities' voices in advancing flood early warning system in developing countries

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Safeguarding lives and properties during major disasters, such as floods, relies on timely and comprehensive communication and dissemination of early warning information. According to UNDRR, an effective Early Warning System (EWS) consists of four pillars: risk knowledge, monitoring and warning services, dissemination and communication and response capability. It is crucial to assess the operational status of EWS, particularly in vulnerable rural areas of developing countries, where technical EWS capacity as well as residents' awareness, understanding of messages, and taking appropriate actions may be hindered by multifaceted factors such as communication of complex forecast information and their pathways, lack of sufficient monitoring stations, low literacy, geographical challenges, and other socio-economic factors.□

The present study focuses on advancing knowledge on the challenges in implementing the four pillars of flood EWS from the perspective of vulnerable communities for planning necessary interventions to enhance flood resilience. We conducted community surveys, key informant interviews, and reviewed publicly available information in the flood prone West Rapti Basin of Nepal. Further, we applied statistical tests to analyze the community surveys and examined the key informant interviews through thematic analysis based on the four EWS pillars. Finally, we assessed the potential economic impacts across various flooding scenarios to integrate early actions in EWS for saving lives and properties.

Our study reveals that most of the local population face difficulties interpreting associated risks when they are communicated with risk maps. However, the understanding of early warning and reception of SMS alerts varies strongly among rural municipalities due to language, literacy status, and mobile network problems. The community's interest to participate in warning process and to help in warning others suggests the importance of a community-centric approach and feedback mechanism to the existing top-down approach of EWS. The study also highlights the potential of impact-based risk maps integrated with the findings of community surveys and key informant interviews to plan early actions for informed decision making.

The potential improvements of EWS include upgradation of warning information dissemination, participatory early warning process, development of protocols for early actions and response mechanism, warning production based on impact-based forecast, improving technical capabilities for monitoring hazards, and creating community-level database to record the post flood impacts

and community feedback to validate warning and impact-based forecasts. Our study contributes to strengthening EWS through impact-based quantitative risk analysis which is implementable worldwide. Future research is called for on how to develop the impact-based forecasting chain for different future scenarios and incorporate citizen science to improve this process.