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Opinion

Early Warning Alone Is Not Enough: Rethinking Disaster Preparedness Through Resource Mobilization

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ABSTRACT

The effectiveness of disaster preparedness cannot be measured solely from the existence of an early warning system (EWS). Warnings without prompt and coordinated action risk losing their significance in saving lives. In practice, many regions face challenges when warning signals are received, but response and resource mobilization are slow. This demonstrates that preparedness does not stop at detection systems, but rather relies on institutional, social, and technical capacity to act promptly. This opinion piece examines the limitations of EWS implementation in Indonesia from three dimensions: technical (limited reach and data interoperability), social (low risk literacy and community engagement), and institutional (unintegrated command, logistics, and anticipatory financing). This condition is exacerbated by weak coordination at the local level, including in the activation of volunteers and social networks, so that vulnerable groups are often not reached by warnings or early assistance. Based on lessons learned from case studies in Indonesia and international literature on anticipatory action, this paper emphasizes the need to review preparedness indicators by including aspects of resource mobilization as a main component. Policy recommendations include strengthening the capacity of Disaster Resilient Villages in the dissemination of warnings (last-mile warning), the application of the mechanism trigger and anticipatory financing, as well as the integration of preparedness with health services, education, logistics, search and rescue, and refugee readiness. This new approach positions preparedness not simply as the ability to receive warnings, but as an integrated system capable of translating warnings into concrete, life-saving actions.

Keywords: Disaster preparedness; resource mobilization; early warning systems

1. INTRODUCTION

Indonesia faces multi-hazard threats (earthquakes, tsunamis, floods, landslides, eruptions), so disaster preparedness is a public health and public safety priority. However, field experience shows that the existence of an early warning system does not automatically result in protective action at the community level: without the ability to mobilize emergency command structures, logistics, anticipatory funding, volunteers, and social networks, warnings often stop at information and do not prevent significant loss of life or public health impacts.(1)

Global commitments such as the Sendai Framework and initiatives, Early Warnings for All, targeting universal access to life-saving warnings, but national and regional evaluations reveal implementation gaps. National disaster data

places Indonesia among the countries with a high frequency of disasters; the 2023 National Disaster Management Agency (BNPB), disaster data publication details thousands of incidents and tens of thousands of affected households each year.[2] In East Java, provincial disaster data recapitulations record dozens, even hundreds of floods, landslides, and earthquakes at the district/city level each year, with examples of floods and landslides hitting Banyuwangi, Malang, and Jember in recent years (Regional Disaster Management Agency East Java recaps).[3] Evaluation of the Disaster Resilient Village (*Destana*) program shows that while the program helps raise awareness, constraints on funding, outreach coverage, and inclusion of vulnerable groups still hinder the effectiveness of last-mile warning and local response.

In disaster risk reduction literature, preparedness is not only the technical ability to detect threats but also the institutional and community capacity to respond. Turn warnings into quick action; model anticipatory action emphasize clear triggers and forecast-based financing so that actions can be taken before the peak impact occurs. Evaluation and practice in Indonesia show that the implementation of anticipatory action has begun through pilots and partnerships (e.g., Indonesian Red Cross/PMI, Non-Governmental Organizations/NGOs), but the scale is not yet evenly distributed across vulnerable areas.[4] Therefore, preparedness indicators need to be expanded to include resource mobilization metrics (command activation time, logistics readiness, rapid access to funds), not just EWS coverage.[5]

Addressing this gap requires strengthening last-mile warning through the capacity of Disaster Resilient Villages supported by budgets and anticipatory financial trigger mechanisms, as well as the integration of preparedness into the health, education, logistics, search and rescue (SAR), and refugee camp sectors. The novelty of the proposed approach is the measurement of preparedness that places resource mobilization as a core indicator and combines EWS with anticipatory financing mechanisms and proven local activation procedures. This approach aligns with the modern disaster management paradigm that prioritizes early action, inclusion of vulnerable groups, and cross-sector collaboration to maximize the warning function as a trigger for life-saving action.[1]

Based on evidence from local case studies and field implementation experiences, this opinion emphasizes that national policies and subnational programs need to seriously examine the effectiveness of early warning systems (EWS) and local mobilization capabilities. Without a thorough understanding of the local context and community capacity, early warnings risk becoming merely passive information that fails to stimulate concrete action. Therefore, integration between central policies and local dynamics is key to ensuring warnings truly serve as concrete protection, particularly for communities in vulnerable areas such as East Java and districts/cities repeatedly affected by disasters. This approach is not simply about technology or protocols, but also about fairness and alignment with those most in need, especially vulnerable groups and people with disabilities.

2. CHALLENGES OF IMPLEMENTING EARLY WARNING SYSTEMS

Ideally, early warning systems combine risk monitoring, trigger analysis, actionable message dissemination, and end-user response capacity. However, several obstacles hinder this function, including:

1. Technical constraints: limited sensor networks, weak data interoperability, and fragile communication infrastructure in disaster scenarios.
2. Non-actionable communication: messages are technical or do not contain clear instructions ("what to do, when, and where"), so that people are confused.
3. Institutional coordination: overlapping mandates between institutions (Meteorology, Climatology and Geophysics Agency (BMKG), Center for Volcanology and Geological Hazard Mitigation, National Disaster Management Agency (BNPB), Regional Disaster Management Agency (BPBD), Geospatial Information Agency, Early Warning and Response System, including the role of other Ministries/Institutions) as well as non-standard activation procedures result in delayed responses.
4. Unequal dependence on technology: the portion of the population without access to telecommunications or digital literacy is the last group to receive warnings.
5. Technical advances in early warning systems, as confirmed by various international literature and global reports, will not have a real impact without a substantial investment in institutional capacity and strengthening social networks at the local level. An alarm is merely information if it is not acted upon by responsive institutions and organized communities. Without institutional structures ready to act and

communities capable of mobilizing together, even the most sophisticated technology will lose its meaning. Therefore, building preparedness is not just about sophisticated devices, but about establishing a resilient and threat-responsive social ecosystem.[6]

3. THE ROLE OF DISASTER RESILIENCE VILLAGE CAPACITY IN THE SOCIALIZATION AND DISSEMINATION OF EARLY WARNING SYSTEMS

Disaster Resilient Villages (*Destana*), are designed to spearhead community-level preparedness, with a primary mandate of building residents' capacity to recognize, respond to, and recover from disaster threats. Through disaster training, risk mapping, volunteer formation, and strengthening local communication mechanisms, *Destana* serves as a key node in disaster preparedness. Last-mile warning to ensure that technical warnings from national agencies can be translated into instructions that are relevant, easy to understand, and immediately implemented by the public.

Destana's concrete role is seen in organizing evacuation simulations, holding periodic socializations, creating evacuation routes, managing assembly points, and maintaining communication facilities such as loudspeakers, posts, bulletin boards, and WhatsApp groups for citizens. This activity makes *Destana* not just a recipient of information, but a key driver in transforming warnings into collective action. When connected to the national Early Warning System, *Destana* acts as a local translator, bridging data-driven hazard signals with rapid decisions at the household and neighbourhood levels.

However, the reality on the ground shows that *Destana*'s capabilities are not evenly distributed. Many villages still have the status of primary. Due to limited budgets, community participation, and technical and logistical support from local governments, some lack reliable emergency communication systems, don't regularly conduct evacuation drills, or still rely on informal warnings from residents.[7] This often means that early warning messages from the central government don't lead to prompt action, especially in remote and high-risk areas.

So that *Destana* really functions as a reinforcement, last-mile warning, a sustained financial commitment, cross-sector technical support, and formal recognition of the village's role in the emergency response chain are needed. Strengthening local capacity is not just a one-time training, but a long-term investment to ensure every village has the communication systems, evacuation procedures, and basic resources to act independently in the crucial minutes before aid arrives. Integrating *Destana* into the national anticipatory financing mechanism will be a strategic step to ensure the early warning system truly leads to life-saving action.

4. COMMUNITY RESPONSE CHALLENGES AND INCLUSION GROUPS

Receiving early warnings is not always followed by concrete action. In many areas, distress signals delivered via text message, radio, or loudspeaker often fail to trigger action because people lose trust due to past experiences. False alarm or unsubstantiated warnings. Repetition of inaccurate information leads to risk fatigue (risk fatigue), making citizens apathetic about subsequent warnings. In this context, the effectiveness of an early warning system depends not only on technology but also on the social trust built between the message-delivering agency and the recipient community.[8]

In addition to trust issues, barriers to access to information and risk literacy also weaken community preparedness. Some residents in remote areas lack adequate communication access; weak signal, limited mobile phone ownership, or messages delivered in technical language often make instructions difficult to understand. This situation is exacerbated by the fact that around 12.15% of Indonesia's population are people with disabilities, who have physical or sensory challenges in receiving information, while more than 28 million people, or 10.6% of the population, are elderly, who have limited mobility and capacity for in responding to warnings, not because they are negligent, but because they lack the power and means to act quickly.[9]

Therefore, building an inclusive response requires designing an early warning system that truly takes into account the diverse capabilities and social conditions of the community. Warning messages must be delivered through various accessible channels, including community radio, loudspeakers, and image-based messages in local languages, so that they can be understood by all. Evacuation plans should involve

vulnerable groups from the planning stage, including ensuring access to transportation, safe assembly points, and basic health services in evacuation centers. These efforts will ensure that the early warning system is not only audible to everyone but also actionable by everyone, without exception.

However, inclusivity cannot be achieved solely through message design and community engagement; it also requires adequate resources, proactive financing mechanisms, and robust cross-sectoral coordination. The goal is to ensure that every level of society has the real capacity to act or respond when a warning arrives. Without such systemic support, early warning messages risk being ineffective, especially for vulnerable groups who are often marginalized in decision-making and aid distribution processes. Therefore, inclusivity must be understood not simply as a communication principle, but as a comprehensive commitment reflected in policies, budgets, and practices across institutions.

5. RESOURCE MOBILIZATION AS A PILLAR OF PREPAREDNESS

Disaster preparedness is measured not only by the existence of an early warning system, but also by how quickly communities and institutions can mobilize resources after receiving a warning. The mobilization of resources, such as financial, logistical, human, and social capital, serves as a bridge between hazard information and concrete action on the ground. Without the readiness of funds, equipment, and a solid social network, warning signals remain mere messages, powerless to prevent loss of life or property.

Approach anticipatory action offers a new paradigm in disaster risk reduction by linking financing and aid release to trigger early warning.[10] This mechanism allows funds and resources to be released before maximum impact occurs, not after the disaster has occurred. Evidence from many a number of countries, including trials of cash anticipatory programs by global humanitarian agencies, shows that early action can reduce economic losses and accelerate social recovery when the trigger and the activation mechanism have been clearly defined.

At the village level, resource mobilization includes the availability of local logistical reserves such as food and medical supplies, a network of trained volunteers, evacuation transportation, and readily accessible funds, either through village funds or the Regional Disaster Management Agency reserve fund. However, in reality, this flexibility is often hampered by rigid village budget regulations, limited administrative capacity, and accountability procedures that slow decision-making. As a result, when a warning comes, villages are often left waiting for bureaucratic direction, wasting valuable time.

A promising model for the Indonesian context is a hybrid scheme that combines national and regional funds that are released automatically based on a trigger. Technical resources, with local reserves managed directly by communities for early intervention. This approach allows for rapid action without compromising public accountability. Cross-sector collaboration also needs to be strengthened, particularly with the private sector in logistics, telecommunications, and financial services, to ensure supply chains, emergency communications, and aid distribution can be activated simultaneously. In this way, resource mobilization truly becomes a living pillar of preparedness, not just a concept on paper.

6. POLICY APPROACH AND CROSS-SECTOR COLLABORATION

Closing the gap between warning and action requires policies that not only address the technical aspects of early warning systems but also ensure institutional and financial readiness to respond. In the context of Indonesia facing multi-hazard threats, policies must include clear operational standards, starting with trigger warnings, activation protocols, and resource mobilization mechanisms that bind all actors across sectors, including the BMKG (Meteorology, Climatology, and Geophysics Agency), the BNPB (National Disaster Management Agency), health services, midwifery, education, and private partners and non-governmental organizations. Without an integrated policy framework, each agency will act independently and lose critical momentum when the warning comes.[11,12]

One of the important foundations is establishing a definition that triggers clear operational requirements, for example, based on extreme rainfall probability thresholds, tsunami wave heights, or landslide risk indices. Trigger this serves as the basis for automatically activating funds, logistics, and standard operating procedures (SOPs) for emergency response. This ensures that decisions about action are not dependent on lengthy bureaucracy but rather on scientific criteria mutually agreed upon by technical and funding agencies.

Policies should also provide legal recognition of the role of villages in the response activation chain, including the authority to access emergency funds or reserve funds when the trigger is fulfilled. Preparedness measurements should include concrete mobilization indicators such as the speed of fund activation, the availability of logistical supplies, and the number of trained volunteers, all incorporated into the regional performance evaluation system. Thus, preparedness is no longer measured by the frequency of simulations, but by how quickly communities can mobilize when a threat arises.[13]

Cross-sector integration is key to sustainability. Health services, especially obstetric facilities and emergency units, need to have operational continuity plans, essential drug stocks, and referral pathways that remain operational during disasters. Global initiatives such as Early Warnings for All, Anticipation Hub, and guide Forecast-based Financing. The IFRC (International Federation of Red Cross and Red Crescent Societies) encourages the institutionalization of an anticipatory approach as a permanent part of the national disaster risk management system. Indonesia can seize this momentum to strengthen cross-sectoral policies—making collaboration not just about joint response after a disaster, but also about shared preparedness before it occurs.

7. CONCLUSION

Early warning is a crucial element in a disaster preparedness system, but its presence does not automatically guarantee human safety. Without the ability to mobilize resources quickly and coordinate early warnings cease to be signals, not triggers for rescue actions. True preparedness is measured not only by the ability to detect risks, but by the actual response after a warning is issued—including the speed of activation, the availability of logistics, the readiness of personnel, and the effective functioning of communication and financing channels. Therefore, disaster preparedness needs to be understood as a dynamic system that requires synergy between early warning technology, institutional capacity, and community participation.

7.1 Policy Recommendations

To strengthen national preparedness, resource mobilization should be a key indicator in evaluating early warning systems. Central and regional governments should institute anticipatory finance with an automatic trigger mechanism that allows for the release of emergency response funds as soon as the risk threshold is reached. The capacity of Disaster Resilient Villages needs to be enhanced through budget support, ongoing training, and strengthening local logistics management to effectively carry out outreach and last-mile warning functions. Warning messages should be designed to be actionable and inclusive, taking into account local language, message visualization, and the needs of vulnerable groups. Integrating preparedness with health services is also crucial, particularly in ensuring continuity of services, drug supply chains, and referral mechanisms during disasters. Finally, integrated cross-sectoral exercises involving the government, disaster clusters, volunteers, the media, academics, the mass media, the business community, and communities need to be conducted regularly to test system readiness, address weaknesses, and strengthen collaboration across disaster clusters. With these steps, early warning systems can transform from mere alarms to triggers for rapid action that save lives and strengthen community resilience.

Ethical Approval

Ethical approval issued by the Health Research Ethics Commission of the Surabaya Ministry of Health Polytechnic, with reference number: EA/3177/KEPKPoltekkes_Sby/V/2025.

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Competing Interests

Although this research received funding from the Magetan Regency Disaster Risk Reduction Forum, East Java, Indonesia, the authors declare no conflict of interest with the forum. The findings of this study are expected to be used to improve disaster preparedness in various regions in Indonesia, particularly in converting early warning systems into concrete steps in the form of resource mobilization by stakeholders in affected areas.

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Underlying Data

Derivative data supporting the findings in this opinion piece are available from the corresponding author upon reasonable request.

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