GNDR

Global Network of
Civil Society Organisations
for Disaster Reduction

Localising Early Warning Systems & Anticipatory Actions through CSOs

GLOBAL SURVEY ANALYSIS REPORT

GNDR: 1,965 CIVIL SOCIETY ORGANISATIONS | 131 COUNTRIES | SUPPORTING MILLIONS OF THE WORLD'S MOST MARGINALISED PEOPLE

The Global Network of Civil Society Organisations for Disaster Reduction (GNDR) is a network of 1,965 civil society organisations across 131 countries working together to strengthen the resilience of communities most at risk of disasters, and prevent hazards from becoming disasters.

Our work is anchored on strengthening the collaboration, solidarity and mobilisation of civil society organisations; championing a localisation movement; and striving for development which is risk-informed. We listen to communities that are most at risk, strengthen the capacity of civil society organisations, and advocate for risk-informed development and localisation.

Under our Foreign, Commonwealth and Development Office (FCDO), British Red Cross (BRC) and Risk-Informed Early Action Partnership (REAP) initiative, funded by FCDO, *Localising Early Warning Systems and Anticipatory Action Through CSOs*, GNDR is looking to achieve the outcome of "*Enhanced CSO participation and engagement in the localisation of Early Warning Systems (EWS).*"

This material has been funded by UK International Development from the UK government; however, the views expressed do not necessarily reflect the UK government's official policies.

As a first step toward achieving this, we conducted a survey to identify the existing barriers, challenges, and best practices related to Early Warning Systems (EWS).

This report presents key findings from the collected data, which will inform the development of a strategic roadmap for localising EWS.

LITERATURE REVIEW ON EARLY WARNING SYSTEMS AND ANTICIPATORY ACTIONS

Over the years, EWS have emerged as indispensable tools for enhancing resilience among communities at the frontline of risk. Moreover, they have become crucial in mitigating the impacts of climate-related disasters due to hazards - such as floods, droughts,cyclones, landslides, and volcanoes - through the provision of timely alerts and actionable information. EWS save lives, protect livelihoods, and preserve critical assets – thereby contributing significantly to risk-informed development[1].

As International Federation of Red Cross Crescent (IFRC) Secretary General, Jagan Chapagain, emphasises, "*early warning systems are considered the most effective and dignified way to prevent an extreme weather event from creating a humanitarian crisis" particularly for vulnerable and remote populations who bear the brunt of it*"[2].

In March 2022, United Nations Secretary-General, António Guterres called, for new action to ensure every person on Earth is protected by EWS by the end of 2027.[3] The 2024 World Meteorological Organisation's Global Status of Multi-Hazard Early Warning Systems (MHEWS) Report[4] shows that more than half the countries in the world have MHEWS but significant gaps remain.

The number of countries reporting the existence of MHEWS continues to grow, showing a slow but steady improvement year-on-year since 2022. In 2024, at least half of the countries in all but the Americas and Caribbean region are now reporting the existence of MHEWS.

1 WMO Global Status of Multi-Hazard Early Warning Systems Report, 2024
2 https://www.undrr.org/news/early-warnings-all-initiative-scaled-action-ground#:~:text=Early%20warning%20systems%20are%20the,IFRC%20Secretary-General%20Jagan%20Chapagain
3 https://www.undrr.org/media/91954/download?startDownload=20250129
4 https://library.wmo.int/records/item/69085-global-status-of-multi-hazard-early-warning-systems-2024

However, despite these advancements, many developing countries still face significant gaps in operationalising EWS due to limited funding, technical capacity, and standardised guidelines.

Additionally, social and cultural barriers often hinder the effective dissemination, comprehension, and response to early warnings. Addressing these challenges through increased investments, enhanced inter-agency coordination, advanced technology integration, and inclusive, community-based engagement is essential to transform disaster response from reactive to proactive through effective early warning systems and life-saving strategies for all.

METHODOLOGY

We launched a global survey from November 2024 to January 2025, distributing it via internal communication channels such as our Community Platform and through our social media accounts. The survey, available in English, Spanish, and French, was a semi-structured questionnaire designed to gather data from GNDR members and other stakeholders involved in EWS.

It comprised six sections:

1) General Information – collecting data about the respondent and their organisation, including age and gender;

2) Current Early Warning Systems – assessing the status of EWS in their country and the respondent's role;

3) Community Engagement and Awareness – exploring the communities' understanding of EWS and their involvement;

4) Anticipatory Actions – gathering information on the organisation's role and challenges in implementing anticipatory actions (AA);

5) Recommendations and Insights – soliciting best practices and suggestions for improving EWS; and

6) Additional Information – allowing respondents to share any further comments.

The data collected through this survey is being analysed and the following report elaborates on the key findings and recommendations.

This analysis report will be shared with the members globally through the webinar, followed by an in depth workshop at the national level. The survey tool is annexed.

SECTION 1: EXECUTIVE SUMMARY

OVERVIEW OF THE PURPOSE, SCOPE AND KEY FINDINGS

The survey sought to understand, from the perspective of key stakeholders, the challenges, barriers and best practices vis-a-vis EWS and anticipatory actions.

The respondents from 88 countries shared their understanding on the current status of EWS, the degree of involvement and the role of the local communities and CSOs in EWS and AA, and the insights that they have to enhance EWS and AAs at the local level.

The key findings of the survey are as follows:

1) Limited inclusion and participation in EWS communication

2) Challenges in communication, accessibility, and comprehension

3) Variability in EWS effectiveness across countries

4) Strengthening community engagement and localised EWS

5) Addressing the funding crisis with forecast-based financing (FbF)

6) Need for stronger infrastructure, data systems, and communication networks

7) Enhancing policies, institutional coordination, and multi-stakeholder collaboration

KEY TRENDS, CHALLENGES, AND ACTIONABLE RECOMMENDATIONS

The global survey data states that strengthening EWS and AA requires a localised, inclusive, and technology-driven approach. While there is growing recognition of the importance of community-led EWS, significant challenges persist, including limited participation of marginalised groups, inconsistent communication, funding constraints, weak infrastructure, and fragmented policy coordination.

To address these, governments, CSOs, and stakeholders must prioritise local leadership, ensure accessible and timely communication, and invest in Forecast-Based Financing (FbF) to sustain proactive disaster preparedness. Strengthening Multi-Hazard Early Warning Systems (MHEWS), integrating indigenous/local knowledge with modern technologies, and embedding EWS into national disaster risk reduction policies will enhance resilience.

Improved coordination between governments, CSOs, NGOs, and private sector actors is essential for expanding real-time data integration, securing sustainable financing, and ensuring that early warnings translate into effective community action.

By adopting these measures, EWS and AA can be more effective, inclusive, actionable, understandable, interpretable and sustainable, thereby preventing hazards becoming disasters and reducing the impact on the lives and livelihoods of the communities most at risk.

VALIDATION OF THE GLOBAL FINDINGS

The data survey and findings were further disseminated amongst our members with the purpose of validating the survey results. More than 150 GNDR members across Africa, Asia and Latin America and the Caribbean participated in webinars where we shared the findings. The report is annexed.

KEY TERMS

TERM	EXPLANATION
Early Warning	Information provided in advance of a specific hazardous event, disaster or conflict to enable stakeholders to take timely action to reduce disaster risks.
Early Action	A set of actions to prevent or reduce the impacts of a hazardous event before they fully unfold, predicated on a forecast or credible risk analysis of when and where a hazardous event will occur.
Early Warning System (EWS)	An integrated system of hazard monitoring, forecasting and prediction, disaster risk assessment, communication and preparedness activities systems and processes that enables individuals, communities, governments, businesses, and others to take timely action to reduce disaster risks in advance of hazardous events.
Multi-Hazard Early Warning Systems (MHEWS)	Multi-hazard early warning systems address several hazards and/or impacts of similar or different types in contexts where hazardous events may occur alone, simultaneously, cascading or cumulatively over time, and take into account the potential interrelated effects. A multi-hazard early warning system with the ability to warn of one or more hazards increases the efficiency and consistency of warnings through coordinated and compatible mechanisms and capacities, involving multiple disciplines for updated and accurate hazards identification and monitoring for multiple hazards.
Community-Based Early Warning System (CBEWS)	Community Based Early Warning Systems (CREWS) are designed and operated by communities, integrating indigenous knowledge and ensuring direct participation in risk data collection, communication, and response. These systems are developed, managed, and maintained with the full engagement of the community, empowering individuals and groups at risk to take timely and appropriate action to reduce the likelihood of injury, loss of life, damage to property and the environment, and disruption of livelihoods.
Anticipatory Action (AA)	AA refers to actions taken to reduce (prevent or mitigate) the impacts of a specific, imminent, forecasted hazard before it occurs, or, before its most acute impacts are felt. The actions are carried out in anticipation of a hazard's predicted impacts and based on a forecast (or early warning) of when, where and how the event will unfold.

TERM	EXPLANATION
Locally-led Anticipatory Action (LLAA)	A process driven and led by communities and actors, at the local level to create an enabling environment for anticipatory action by: empowering communities and local actors to implement their own early actions; identifying and communicating gaps and weaknesses in early warning systems and planning and coordinating mechanisms; and advocating for flexible or pre-agreed financing for autonomous locally-led early action ahead of the peak impact of forecastable or predictable hazardous events, or shocks, to reduce their impact.
Localisation	Localisation means ensuring communities, organisations and local authorities have the capacities and resources to decide how to strengthen their own resilience. A process of shifting power, resources, and decision-making closer to affected communities, promoting local leadership in humanitarian and disaster risk management efforts.
Forecast-Based Financing	An anticipatory action approach that releases pre-agreed finance for pre-agreed activities to prevent or mitigate the impact of an imminent hazardous event or shock when forecast triggers are reached. The terms forecast-based finance and forecast-based action are often used interchangeably.
Risk-Informed Development	Actions that prioritises the risks faced by communities living in the most vulnerable situations. This works through the perspective of people most at risk themselves. Communities most at risk come up with development solutions that mitigate their risks and build resilience.
Views from the Frontline (VFL)	Views from the Frontline (VFL) is GNDR's flagship participatory risk assessment and monitoring tool. Since 2009, it has served as an ongoing research and learning programme that collects data from local communities to identify the underlying drivers of risk and existing resilience capacities. VFL gathers and amplifies the perspectives of grassroots organisations and individuals engaged in local-level disaster risk reduction across the world.
Indigenous/Local knowledge	Indigenous knowledge is the knowledge that people in a given community have developed over time, and continue to develop. It is based on experience; often tested over centuries of use; adapted to the local culture and environment; embedded in community practices, institutions, relationships and rituals; held by individuals or communities; and dynamic and changing.

TERM	EXPLANATION
Community Engagement	A strategic process to directly involve local populations in all aspects of decision-making and implementation to strengthen local capacities, community structures and local ownership as well as to improve transparency, accountability and optimal resource allocations across diverse settings.
Capacity Building	It is defined as the process of developing and strengthening the skills, instincts, abilities, processes and resources that organisations and communities need to survive, adapt, and thrive in a fast-changing world. An essential ingredient in capacity-building is transformation that is generated and sustained over time from within; transformation of this kind goes beyond performing tasks to changing mindsets and attitudes.
Inclusive Communication	Inclusive communication adapts communication practices to promote equality, challenge stereotypes, and reflect diversity. It ensures all individuals feel represented and recognised, serving as a tool for social change by amplifying underrepresented and marginalised voices.
Feedback Mechanisms	A feedback mechanism is a structured process that enables crisis-affected populations to share their experiences of humanitarian aid. It supports accountability and informs decision-making by providing data for corrective actions and improvements in response efforts.
Last Mile Connectivity	The "last mile" refers to the final link in the information delivery chain, ensuring early warning messages reach those most at risk – particularly in remote, underserved, or marginalised areas. It goes beyond reaching the poorest to include people, places, and small enterprises often excluded from development efforts due to factors such as gender, age, disability, ethnicity, or geographic isolation. Last mile connectivity focuses on bridging these gaps to ensure no one is left behind in disaster preparedness and response.

SECTION 2: GENERAL INFORMATION

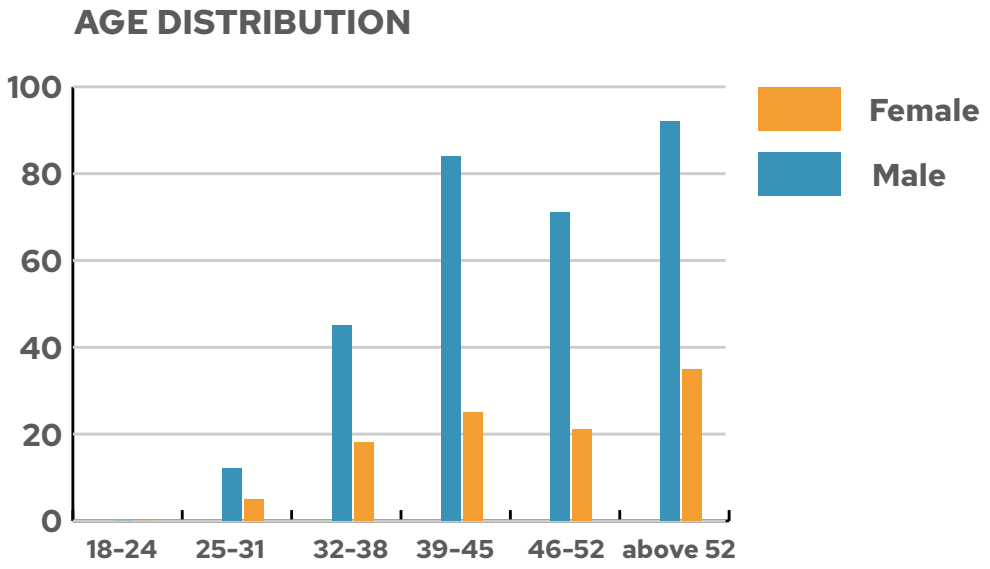
DEMOGRAPHIC PROFILE OF SURVEY RESPONDENTS

Countries participation by region:

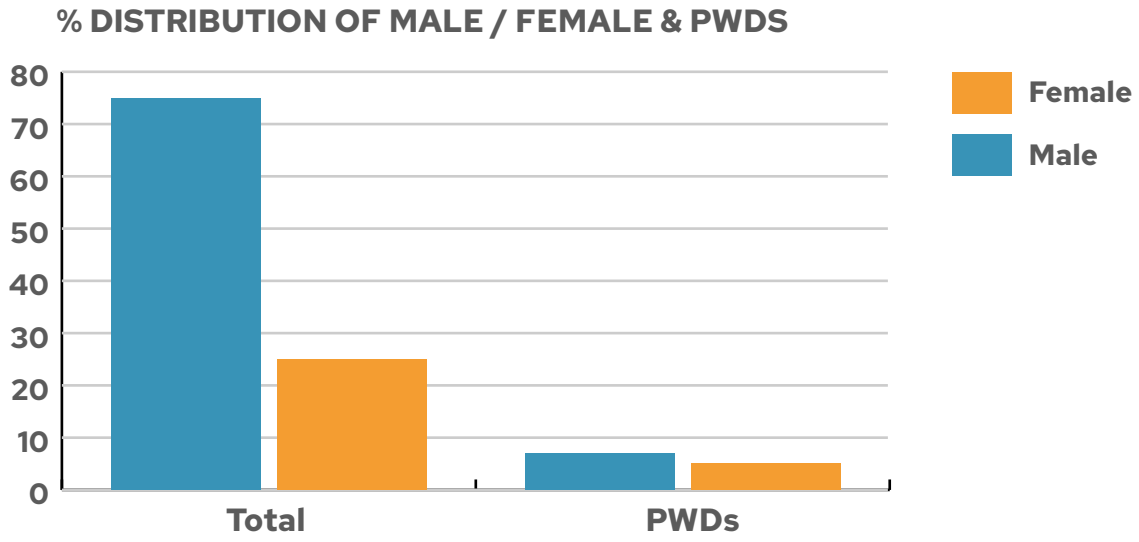
REGION	COUNTRIES
Asia Pacific	Azerbaijan, Bangladesh, Cambodia, Fiji, India, Indonesia, Kiribati, Kyrgyzstan, Maldives, Myanmar, Nepal, Pakistan, Philippines, Sri Lanka, Solomon Islands, Tajikistan.
Africa	Benin, Burundi, Burkina Faso, Cameroon, Chad, Republic of the Congo, Côte D'Ivoire, Democratic Republic of Congo, Eswatini, Ethiopia, Gabon, Gambia, Ghana, Kenya, Lesotho, Liberia, Madagascar, Malawi, Mali, Mauritania, Mozambique, Morocco, Namibia, Niger, Nigeria, Republic of Guinea, Rwanda, Somalia, Sierra Leone, South Africa, South Sudan, Senegal, Sudan, Tanzania, Togo, Tunisia, Uganda, Zambia, Zimbabwe
Middle East	Egypt, Iraq, Jordan, Kuwait, Lebanon, Palestine, Yemen
Europe	Georgia, Germany, Italy, Poland, Switzerland, Turkey
Americas and Caribbean	Antigua & Barbuda, Argentina, Bolivia, Brazil, Chile, Colombia, Costa Rica, Cuba, Dominican Republic, Ecuador, El Salvador, Guatemala, Haití, Honduras, Jamaica, Mexico, Peru, United States of America, Uruguay, Venezuela

Of the 408 respondents, nearly 92% were GNDR members, with non-members comprising the remaining 8% – including representatives from UN agencies (1%), national and local governments (2%), academia (3%), and the private sector (2%).

Regionally, 20% of responses came from Asia Pacific, 45% from Africa, 8% from the Middle East, 21% from the Americas and Caribbean, and 6% from Europe. In terms of gender, almost 75% of respondents were male and 25% were female, with 8% identifying as persons with disabilities. Age-wise, almost 31% of respondents were over 52 years old, with no respondents below 24 years old.



Pic 1: Graphical representation of age distribution of the respondents



Pic 2: Gender Distribution and % of People with Disabilities desegregated by Gender

INSIGHTS: ANALYSE PATTERNS SUCH AS DIVERSITY IN REPRESENTATION AND GAPS IN INCLUSION

The analysis of the data reveals significant diversity gaps and communication barriers within EWS. Key findings include:

1. Representation of persons with disabilities: Out of all respondents, 34 identified as persons with disabilities (20 male and 14 female). Notably, only 40% of male and 42.85% of female respondents with disabilities actively participate in the EWS communication process, indicating that this group predominantly functions as passive recipients.

2. Gender disparities: Among female respondents, 58% are merely recipients of early warnings, while only 42% engage actively in the communication process.

3. Language and comprehension issues: Although 69% of respondents reported receiving early warning messages in local languages, only 75% of those confirmed that their communities understood these messages – compared to a global comprehension rate of 51%.

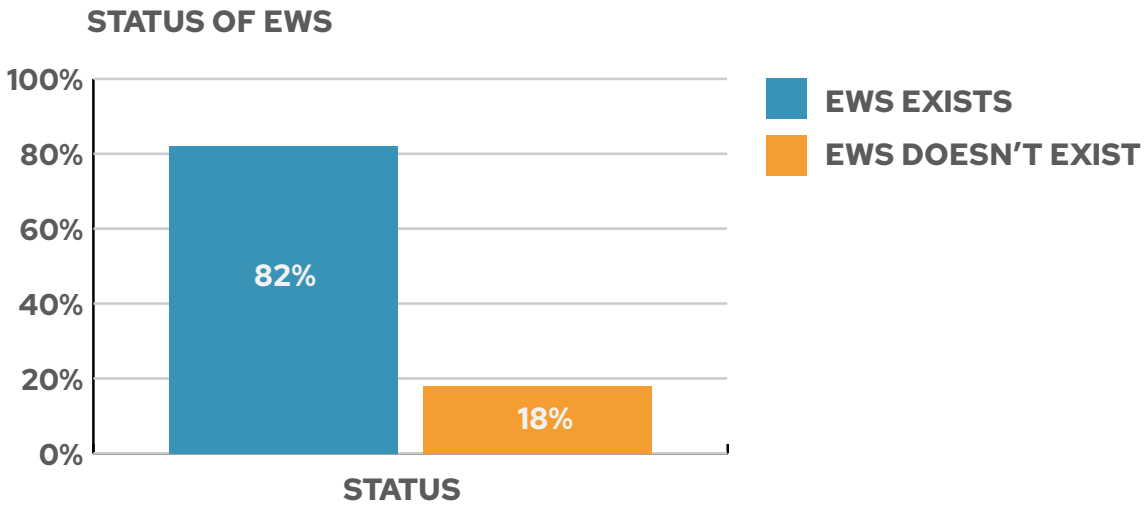
These key findings underscore the urgent need to address critical communication barriers and to develop more inclusive strategies that enhance active participation, particularly among persons with disabilities and female stakeholders.

SECTION 3: DATA ANALYSIS FROM SURVEY RESULTS

CURRENT EARLY WARNING SYSTEMS AS DIVERSITY IN REPRESENTATION

Effective EWS must be inclusive, understandable, interpretable,and actionable – they must not be overly complex, but should deliver clear, timely information to those who need it most.

In our survey, 84 out of 88 countries (82% of respondents) confirmed the existence of an EWS in their nations, with 75% of these reporting that their systems are Multi-Hazard Early Warning Systems (MHEWS). However, nearly 20% stated that while an EWS is in place, it is not multi-hazard. Overall, 62% of respondents confirmed having both EWS and MHEWS.



Pic 3: Status of Early Warning Systems

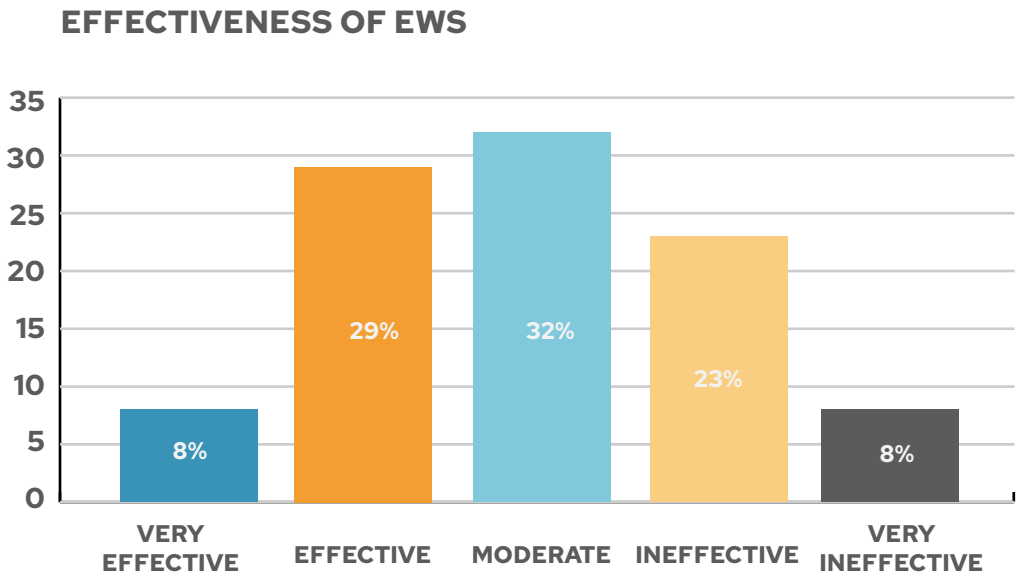
The primary threats identified include extreme weather events, floods, cyclones, landslides, and droughts, with systems tailored to each country's disaster risk profile.

For example, Ethiopia's EWS addresses floods, droughts, landslides, extreme weather, locust outbreaks, and famine-related food insecurity, while India's comprehensive system, supported by the India Meteorological Department (IMD) and the National Disaster Management Authority (NDMA), covers floods, landslides, cyclones, tsunamis, heatwaves, cold waves, droughts, and other extreme weather events.

Although real-time earthquake prediction is not possible, India employs seismic monitoring to assess risks. These integrated systems, which combine advanced technology, robust forecasting models, and community awareness programs, are crucial for minimising the impacts of natural hazards. On a scale of 1-5, the effectiveness of the EWS was measured.

Following are the results of the survey. Out of 254 respondents who stated that in their country MHEWS was established, almost 37% stated that it was either effective or very effective. While 32% of the respondents stated that the effectiveness was moderate. 31% of these respondents still felt that the MHEWS was ineffective or very ineffective.

Based on the responses received, perceptions of MHEWS vary significantly by country. Respondents from Bangladesh, Chile, Egypt, Ghana, India, Liberia, Switzerland, Uganda, and the USA rated their MHEWS as very effective. In contrast, those from Chad, Colombia, Kenya, the DRC, and Tanzania described their systems as very ineffective. Notably, the feedback from respondents in Haiti, Mauritania, and Pakistan was mixed, indicating a divided opinion on the effectiveness of MHEWS in those countries.



Pic 4: Effectiveness of Early Warning Systems (EWS)

The following statements from the respondents provide insights on the effectiveness of the EWS:

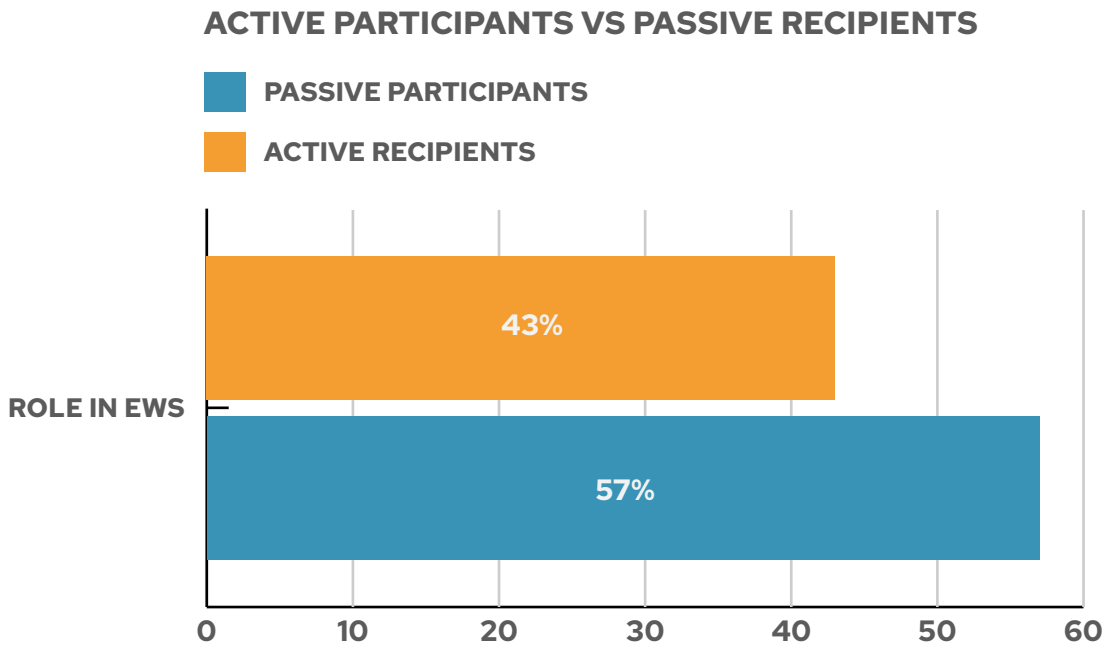
"The effectiveness of early warning systems (EWS) in Morocco is moderate and varies according to risks. Although systems such as Météo-Maroc and the CNRST for earthquakes are operational, they lack integration and coverage, particularly in rural areas. The absence of a centralised multi-risk system and the limited use of modern technologies (SMS, applications) reduce their impact. To improve their effectiveness, it is necessary to create an integrated platform, expand geographical coverage and increase awareness among the population" - **Moroccan Association of Green Economy for the Environment and Climate Justice**

"In Iraq, it is "Very Ineffective" because Iraq lacks a comprehensive and integrated Early Warning System (EWS) for natural hazards. Existing efforts are limited to specific areas and individual hazards, such as isolated flood warnings, but there is no multi-hazard system that can address the diverse risks Iraq faces, including droughts, dust storms, and extreme temperatures. The system's coverage is inconsistent, and communication channels for reaching vulnerable populations are underdeveloped, making it difficult to deliver timely alerts or guidance. Additionally, limited public awareness and a lack of coordinated response mechanisms hinder the effectiveness of the EWS, reducing its ability to protect communities and mitigate impacts. Overall, the current EWS framework is insufficient, highlighting a critical need for improvement and investment in a more reliable and inclusive system" - **Aran for the Development of Civic Culture**

"Kenya's Early Warning Systems (EWS) have improved considerably in recent years but not to the desired level. Since an EWS is only as good as the actions they catalyse, the existing systems have not helped communities prepare for and respond to climate-related hazards like droughts, and floods. More work is still needed to make EWS more effective in terms of accuracy and response coordination" - **Community-Led Solutions CBO Kenya**

Effective action is as critical as the outcomes achieved through EWS. Robust and effective communication is a cornerstone of disaster risk reduction, equipping institutions and communities with timely, actionable warnings that enable proactive mitigation measures.

Our data indicate that only about 43% of respondents actively participate in the EWS communication process, while approximately 57% remain passive recipients of the information.



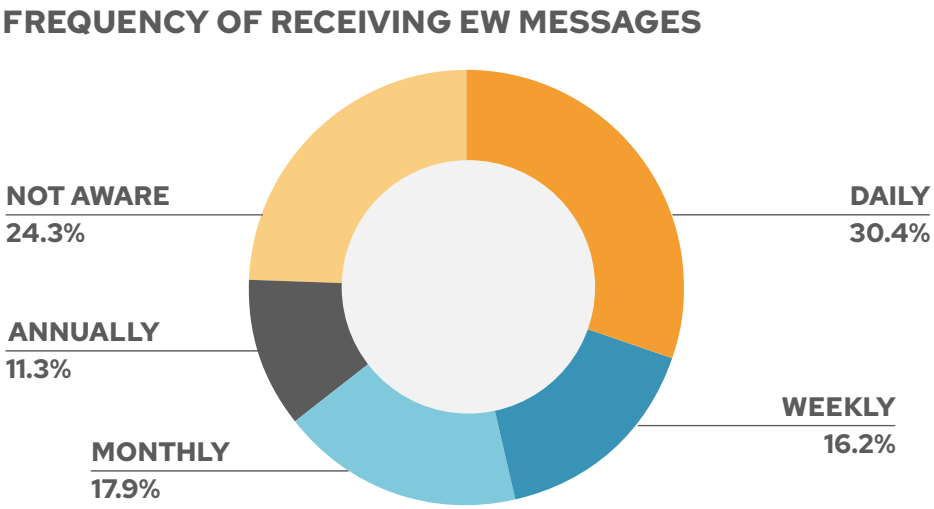
Pic 5: Role of CSOs in EWS processes

Most of those who said they were just the 'recipients' of the EWS information revealed that their major source of such information are weather bulletins from meteorological services departments, media and local government departments.

The respondents who stated that they were "part of the communication process" generated information from sources such as satellite imagery/data, indigenous/local knowledge, local observations, historical data and weather bulletins from meteorological departments.

However, it should be noted that none of these respondents mentioned receiving such information from the local government.

Almost 124 respondents stated that the warnings are updated on a daily basis. These respondents represent almost 50% from the total of 88 countries. 66 respondents representing 30 countries said that the warnings were updated on a weekly basis. 73 respondents representing 31 countries stated that the early warnings were updated monthly. 46 respondents representing 26 countries stated that early warnings were updated on an annual basis.



Pic 6: Frequency of receiving Early Warning Messages

KEY FINDINGS ON THE CURRENT STATUS OF EARLY WARNING SYSTEMS:

1) Variable existence and effectiveness of EWS

A significant majority (82% of respondents) confirmed the existence of EWS in their countries, with 75% of these reporting that they have MHEWS.

However, nearly 20% indicated that while an EWS exists, it is not multi-hazard.

Effectiveness ratings vary widely: countries like Bangladesh, Chile, Egypt, Ghana, India, Liberia, Switzerland, Uganda, and the USA are seen as having very effective systems, whereas Chad, Colombia, Kenya, the DRC, and Tanzania are rated as very ineffective.

Mixed opinions from Haiti, Mauritania, and Pakistan further highlight inconsistencies in system performance.

2) Gaps in stakeholder engagement and communication

Only about 43% of respondents actively participate in the EWS communication process, while 57% remain passive recipients. Active participants derive their information from advanced sources such as satellite imagery, indigenous/local knowledge, local observations, and historical data, whereas passive recipients largely rely on weather bulletins, media, and local government notifications.

Notably, local governments are rarely cited as proactive sources, pointing to a need for better integration and engagement of all stakeholders.

3) Inconsistent frequency of warning updates

The survey reveals substantial variation in how often early warning messages are received. Approximately 50% of respondents reported receiving daily updates, 30% on a weekly basis, 31% monthly, and 26 countries indicated annual updates.

This heterogeneity in update frequency likely impacts the timeliness and effectiveness of community responses, emphasising the need for standardised, regular communication protocols to ensure all vulnerable populations receive actionable alerts promptly.

COMMUNITY ENGAGEMENT AND AWARENESS

22 respondents (almost 5%) stated that the communities are "Very Informed" about EWS. This is attributed to the access of information from the media, the ability of communities to observe change in weather patterns, and through local CSOs who work with these communities.

115 respondents (30%) stated that the communities were "Informed". Communities receive early warning information from a wide range of sources. National meteorological services provide official warnings, forecasts, and alerts, which are disseminated through mass media channels such as television, radio, and newspapers, as well as through digital platforms and social media.

In Argentina for instance, local governments and CSOs, often in collaboration with community-based initiatives like the SAT system installed in the Bermejo River basin, play a crucial role by sharing alerts via SMS, WhatsApp, community radio, and public announcements. In many regions, traditional and indigenous knowledge further supplements these methods, ensuring that even marginalised or remote communities are reached.

93 respondents (23%) remained moderately informed. Community awareness of early warning systems (EWS) is inconsistent and often limited. While some communities – particularly those in urban areas or well-targeted regions – receive EWS messages through media, local initiatives, and indigenous practices, many remote or marginalised groups remain underinformed.

Barriers such as difficult terrain, limited outreach, language and literacy challenges, and insufficient follow-up mean that, despite multiple communication channels (radio, TV, SMS, social media, and community meetings), the level of understanding and preparedness varies significantly. 123 respondents (30%) stated that the communities were "uninformed".

The reflection from the survey stated that - many communities – especially those in remote, rural, or marginalised areas – remain minimally informed about EWS because of a lack of structured, institutionalised approaches, limited funding, and communication barriers.

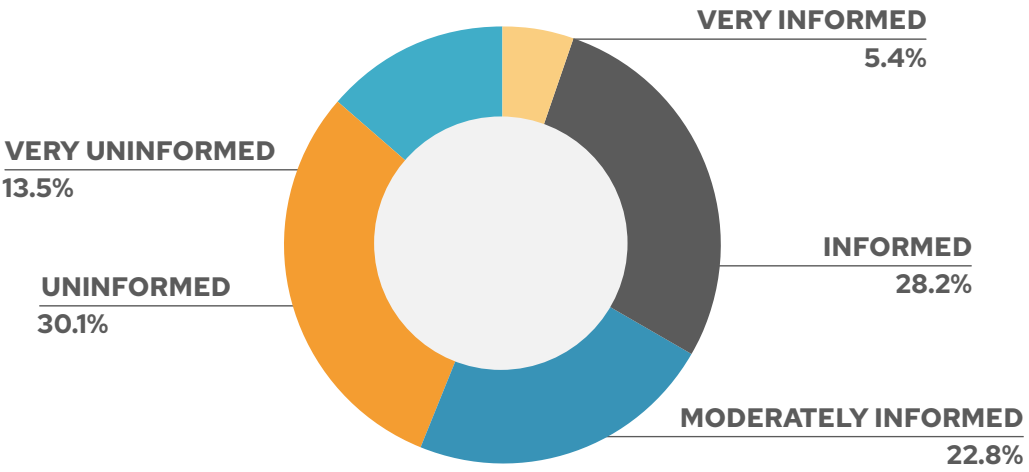
These communities often rely on indigenous/local knowledge and sporadic media reports rather than systematic, culturally and linguistically appropriate outreach, leaving them unprepared for disasters. Efforts by local governments, NGOs/CSOs, and international organisations have improved awareness in some regions, yet significant gaps persist, particularly among indigenous populations and those with limited access to digital or modern communication channels.

55 respondents (12%) said that the communities were "very uninformed". Under this category the respondents stated that the current dissemination of early warning information is sporadic and insufficient – communities often only receive alerts after disasters occur, followed by prolonged silence.

In urban areas, media and technological alerts provide some coverage, but in rural and isolated regions, access is limited, and there is a significant lack of training and coordinated communication channels. Consequently, both local authorities and civil society organisations struggle to inform vulnerable populations, highlighting an urgent need for improved, regular, and community-centered early warning strategies.

These results clearly indicate that more needs to be done to ensure multi-hazard early warning for all is established.

LEVEL OF AWARENESS OF COMMUNITIES ON EARLY WARNINGS



Pic 7: Level of awareness amongst the communities

The primary channels used for disseminating EWS include SMS alerts, social media platforms, radio and television broadcasts, and community meetings or local announcements.

These methods are often combined to maximise reach and ensure that diverse community members, both in urban and rural settings, receive timely and accessible information.

Almost 282 (69%) of the respondents said that the early warning messages are translated into local language, while 126 (31%) of the respondents stated that the early warning messages are still not translated into local language.

From the 69% above who received messages in the local language, only 74% of these communities were able to easily understand the message. However 31% from the total respondents also stated that even if the messages were not translated in the local language, it was easily understandable by the local communities.

Also, from 31% of the respondents who stated that the messages were not translated into the local languages, at least 75% of those respondents mentioned that the early warning message was not fully understood by communities.

The following insights are shared by the CSOs working closely with frontline communities:

"Coastal communities in Bangladesh possess a deep-rooted understanding of natural hazards, particularly cyclones and floods. They rely on a combination of traditional knowledge and modern technology to respond effectively to early warning systems. Local leaders, volunteers, and community organisations play a crucial role in disseminating warnings and mobilising communities. However, challenges like illiteracy, poverty, and limited access to information can hinder the effectiveness of these systems. To overcome these challenges, it is essential to strengthen community-based early warning systems, improve the dissemination of timely and accurate information, and enhance the capacity of local communities to respond to disasters" - **An Organization for Socio-Economic Development (AOSED)**

"In Bolivia, communities are often uninformed, especially in rural and remote areas. The involvement of organisations such as the Bolivian Red Cross, local governments and NGOs has improved awareness, but gaps in access to information persist, especially in areas far from the main communication centres. However, the availability of EWS focused on specific risks such as flooding in prone areas and community-based early warning systems have helped raise awareness" - **Practical Action**

"The communication system does not allow the populations to be well-informed of the opinions. It must be improved by setting up local groups at the base in each district, village, canton, commune, prefecture, region and finally national. This system will have the advantage of having leaders trained in each sphere of the population and the information will circulate faster and reach the base" - **Nouvelles Alternatives pour un Développement Durable en Afrique (NADDAF) Togo**

Effective EWS requires active and inclusive community engagement to be truly transformative. A people-centred approach ensures that communities are not merely passive recipients of alerts, but active contributors in the design, data collection, and dissemination processes.

Communities participate by sharing indigenous/local knowledge, developing locally relevant evacuation plans, and leading awareness campaigns, which all contribute to tailoring early warning information to their specific contexts.

This collaborative involvement fosters stronger partnerships between traditional leaders, civil society organisations, government agencies, and local opinion groups, thereby enhancing the overall resilience of at-risk populations. Community engagement can be conceptualised as a range of possible approaches to inform, consult, involve, collaborate with and empower communities and their members.[5]

As noted by IFRC Secretary General, Jagan Chapagain, community-based EWS are among the most effective tools for preventing humanitarian crises (IFRC, 2023). Similarly, the World Meteorological Organization (WMO) emphasises that integrated, community-driven EWS are crucial for ensuring timely, actionable warnings that can significantly mitigate disaster impacts (WMO, 2024).

5 https://openknowledge.fao.org/server/api/core/bitstreams/13d617dc-1df2-4b74-8bf5-4bbac49d9ddc/content

Communities are seen to be involved in different ways, based on their contexts, socio-cultural backgrounds, risk exposure and their general awareness of EWS. Data respondents shared the following examples to exemplify communities' involvement in the process:

"Communities have an active role in the EWS, from observing weather conditions, pest behavior, epiphytes and epizootics, to collecting rainfall data in pluviometric networks, observing phenomena such as landslides and cracks, and reporting the perceptibility of seismic events" - **Sociedad Cubana de Geología, Cuba**

"Communities are involved in the implementation of EWS through awareness raising, training and participation in simulation exercises. They also play a role in collecting local data and transmitting alerts, especially in isolated areas. In addition, after each event, they participate in evaluations to improve the system. This involvement strengthens the preparedness and responsiveness of populations to risks" - **Association marocaine de l'économie verte pour l'environnement et la justice climatique, Morocco**

"Community involvement in EWS implementation is often limited but evolving in some areas. In many cases, communities participate through local disaster management committees, where they help identify vulnerabilities and risks. NGOs and government agencies occasionally engage community members in awareness campaigns, simulation exercises, and capacity-building workshops to enhance their preparedness and response capabilities. In certain areas, local volunteers assist in disseminating warnings and mobilising resources during emergencies. However, the level of involvement is not uniform, and there is a need to institutionalise community participation by integrating local knowledge, encouraging inclusive decision-making, and fostering ownership of EWS processes to make them more effective and sustainable" - **Sangtani Women Rural Development Organization (SWRDO), Pakistan**

EWS are only effective if they support local communities in taking action.

Almost 66% of the respondents stated that the EWS provoked actions at the local level.

While 34% said that the local communities did not take any actions based on EWS.

151 respondents (37%) mentioned that feedback mechanisms exist.

These feedback mechanisms for EWS are implemented through multiple channels.

Regular community meetings, post-disaster evaluations, surveys, and focus group discussions enable stakeholders to assess the clarity and timeliness of warnings. Toll-free numbers, suggestion boxes at community hubs, and reports from local leaders and committees further capture first hand feedback.

This collected information is systematically analysed by government agencies, NGOs/CSOs, and technical partners to identify gaps and refine warning protocols, ensuring the system continuously improves to meet community needs.

257 respondents (63%) stated that no feedback mechanisms exist.

As per the respondents, there was a consensus that no robust feedback mechanism exists to measure the impact of early warning alerts on the ground. Surveys, such as the VFL conducted in Côte d'Ivoire at Grand-Bassam and surrounding areas, indicate that while some alerts are issued, they are not effectively translated into local languages or contextualised for vulnerable populations, leaving communities largely uninformed and unprepared.

Furthermore, groups responsible for managing alerts before, during, and after natural phenomena are overwhelmed, and formal evaluations – like post-crisis assessments and systematic community feedback – are either absent or poorly structured. This lack of structured, ongoing feedback hinders continuous improvement of EWS and their ability to meet local needs effectively.

Some of the key reflections on feedback mechanisms from the respondents:

"There is no strong feedback mechanism in Nepal. The lack of a proper feedback mechanism in Nepal's (EWS hinders the assessment of its effectiveness. Without systematic evaluation and community input, improvements cannot be identified, leading to persistent gaps in communication, response strategies, and overall disaster preparedness" - **Association for Rural Social Welfare Nepal (ARSOW Nepal)**

"In high-risk areas, volunteers and local leaders are often trained to relay warnings, mobilise resources, and organise evacuation routes. These local representatives also help distribute preparedness materials and organise mock drills to familiarise residents with EWS procedures. Community members in some areas are encouraged to participate in hazard-mapping activities, providing valuable insights into the specific vulnerabilities and needs of their region , However, EWS effectiveness still faces challenges, particularly in remote and rural areas where communication infrastructures may be limited. Here, ongoing community engagement and education are vital to improving local knowledge, responsiveness, and the system's overall reach and resilience" - **SHIFA Welfare Association (SHIFA), Pakistan**

"Tanzania's EWS utilises a multi-level feedback mechanism to assess its effectiveness. Following hazard events, the Tanzania Meteorological Authority (TMA) and the Disaster Management Department (DMD) collect feedback through community surveys, stakeholder meetings, and field assessments. Local leaders and community members provide insights on the timeliness, clarity, and accessibility of warnings. These evaluations highlight gaps in communication or preparedness, informing system improvements. Additionally, regular workshops and feedback sessions with NGOs, local government officials, and community representatives enable continuous adaptation. This iterative process ensures the EWS remains responsive to community needs and evolving environmental risks" - **Tanzania Agricultural Modernization Association (TAMA)**

COMMUNITY ENGAGEMENT AND AWARENESS KEY FINDINGS

Wide variability in community awareness

Only 5% of respondents indicated that their communities are "Very Informed" about EWS, while 30% reported being "Informed," 23% were "Moderately Informed," and a combined 42% were either "Uninformed" (30%) or "Very Uninformed" (12%). This variability highlights significant disparities in how effectively EWS information reaches communities – particularly those in remote or marginalised areas – even though multiple communication channels (SMS, radio, TV, social media, community meetings) are in use.

For instance, as noted by the Moroccan Association of Green Economy for the Environment and Climate Justice, effective dissemination in Morocco is hampered by limited integration and rural coverage.

Critical gap in feedback mechanisms

Only 37% of respondents confirmed the existence of feedback mechanisms for EWS, while 63% reported no such system is in place. This absence of systematic, structured feedback – through tools like community meetings, surveys, toll-free numbers, and suggestion boxes – impedes the ability to continuously refine and improve EWS.

Organisations such as ARSOW Nepal and the Tanzania Agricultural Modernization Association emphasise that robust feedback loops are essential for identifying communication gaps and enhancing preparedness.

Essential role of community engagement

Active community participation is key to effective EWS, as communities contribute through local data collection, indigenous knowledge sharing, and involvement in designing evacuation plans and awareness campaigns. However, many communities remain passive recipients of EWS information, with only about 43% actively engaging in the communication process.

This underlines a pressing need to foster greater community involvement – through capacity building and coordinated action with local leaders, NGOs, and government agencies – to ensure that EWS are not only disseminated but also understood and acted upon effectively, as highlighted by feedback from SHIFA Welfare Association and Sangtani Women Rural Development Organization in Pakistan.

ANTICIPATORY ACTIONS (AA)

Anticipatory action refers to actions taken to reduce, prevent or mitigate,the impacts of a specific, imminent, forecasted hazard before it occurs, or, before its most acute impacts are felt.[6]

For anticipatory action to be effective, it should be locally-led. For anticipatory action to be effective, it must be locally led. This requires that the planning clearly defines the roles of each stakeholder in the process as well as the responsibilities of the key actors and institutions.

The process should be inclusive and the mechanisms should be contextually appropriate. The forecasts used to anticipate hazards and the threshold levels that trigger action must be relevant, accessible, and trusted by the communities at risk. Equally important is the availability of pre-arranged financing, with clarity on both the amount and the source of funds, to ensure that actions can be implemented immediately once the thresholds are met.[7]

The survey data stated that almost 75% of the organisations used early warnings for undertaking anticipatory actions. For example, based on EWS, CSOs help communities anticipate threats by raising awareness about the harmful impacts of unsustainable practices on beaches – often through volunteer-led cleanups to prevent sea erosion – and by supporting early warning mechanisms.

They also implement anticipatory actions such as developing emergency plans, training locals in disaster preparedness, planning and reinforcing infrastructure. Additionally, sustainable practices like reforestation, water conservation, and climate-adaptive agriculture are promoted to build long-term resilience against both environmental and socio-economic risks.

The survey captures some of the practices carried out by CSOs as follows:

"We facilitate communities to identify the most hazards in their locality especially flood, heavy rains storms and bush fires. The communities are facilitated to out storm resistance building and planting of trees around their homes to prevent heavy storms. The community disaster volunteers are formed and continuously engage with their communities against any disaster occurrences. We also facilitate peace dialogues and engagements in communities. We pick early conflict information and timely engage key stakeholders and prevent conflicts" - **Independent Minds Association (IMA), Ghana**

"Yes, our organisation engages in Anticipatory Actions (AA) based on early warnings, particularly for hazards like floods and river erosion in Assam. We support communities by providing pre-emptive interventions such as distributing emergency relief kits, reinforcing shelters, and conducting evacuation drills before flood events. Additionally, we focus on enhancing community resilience through awareness programs, reinforcing embankments in vulnerable areas, and encouraging adaptive agricultural practices. These actions help reduce the immediate impacts of hazards and ensure that communities are better prepared to face these risks" - **North-East Affected Area Development Society (NEADS), India**

6 https://www.anticipation-hub.org/about/what-is-anticipatory-action
7 https://www.gndr.org/wp-content/uploads/2024/01/Anticipatory-Action-Guide_EN_Published.pdf

"[ARSOW Nepal] Actively engages in Anticipatory Actions (AA) by working closely with rural municipalities, such as Panchpokhari Thangpal, to implement disaster risk reduction (DRR) measures and respond effectively based on early warnings. This includes conducting awareness-raising campaigns within communities to educate residents about disaster preparedness, early warning signals, and evacuation procedures. Through these campaigns, ARSOW Nepal enhances community understanding of risks, promotes proactive actions, and encourages a culture of resilience. By strengthening local knowledge and preparedness, ARSOW Nepal's efforts help to mitigate disaster impacts and protect lives and livelihoods in vulnerable areas."- **Association for Rural Social Welfare Nepal (ARSOW Nepal)**

Despite the good progress in engaging and implementing anticipatory action by the respondents, challenges still persist. Some of the pertinent challenges revolve around the issue of funding for AA - which is inadequate.

AA is largely dependent on early warning data - this data is insufficient among CSOs making it difficult to activate a trigger. At the level of policy, lack of, or sometimes weak, policy and regulatory frameworks on AA poses a challenge coupled with lack of technical capacities to implement AA.

The respondents also reflected on the effectiveness of anticipatory actions in reducing the impacts of disasters.

Around 73% of the respondents stated that anticipatory actions were either "very effective" or "effective".

Respondents reflected that AA based on early warnings are highly effective in reducing the impact of disasters.

By preparing in advance – through measures such as early evacuation plans, pre-positioning of supplies, infrastructure reinforcement, and community training – these proactive steps save lives, minimise economic losses, and build long-term resilience.

While challenges like limited resources and technical capacity can constrain their full potential, well-coordinated AA empower vulnerable groups to take timely precautions, ultimately minimising disaster-related losses and building long-term community resilience.

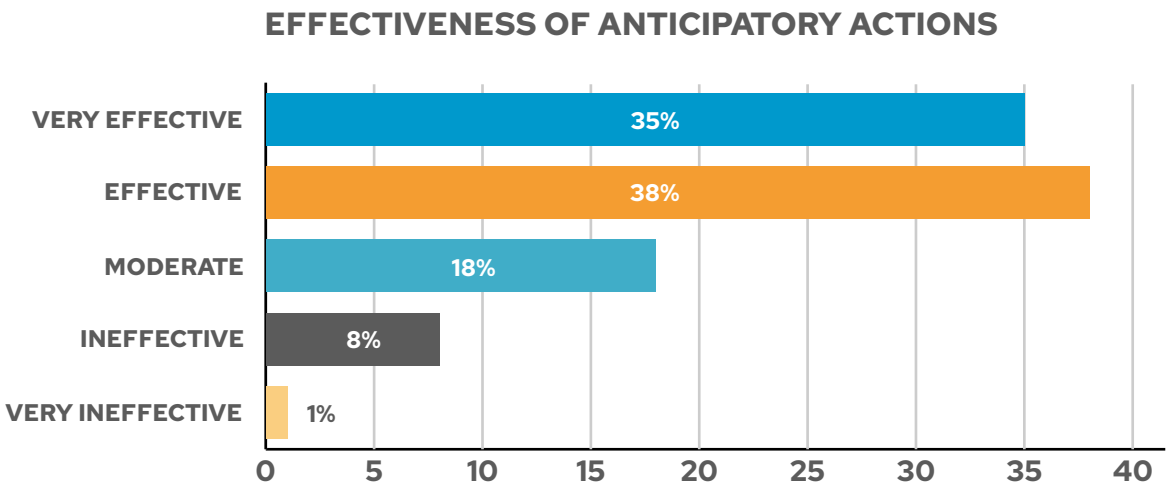
They also foster a culture of preparedness, ensuring communities can respond efficiently to hazards like floods, droughts, cyclones, and landslides, while reducing dependency on costly emergency responses.

Around 9% of the respondents mentioned that the anticipatory action was "ineffective" or "very ineffective".

The respondents stated that AA remains largely ineffective because of a critical lack of funding, coordination, and resources.

Without adequate financial support, essential tools like transport and communication technology, and proper engagement with local authorities, EWS and proactive preparedness measures are not implemented, leaving communities vulnerable and reliant on reactive responses.

The data results on the effectiveness of AA can be depicted as follows:



Pic 8: Perception of effectiveness of Anticipatory Actions by CSOs

Some of the reflections from the CSOs on making AA effective were as follows:

According to the Organisation for Socio-Economic Development (AOSED) in Bangladesh, reliable early warning systems accurately warn about the disasters such as floods, droughts, and hurricanes well in advance.

Providing such timely and clear warnings empowers vulnerable populations to take necessary precautions, while investments in resilient infrastructure, detailed emergency response plans, and essential supplies minimise damage and ensure efficient responses.

Moreover, educating communities about disaster risks, encouraging community-based initiatives, and establishing financial mechanisms like insurance or disaster funds further strengthen local resilience and facilitate rapid recovery.

Sociedad Amigos del Viento Meteorología Ambiente Desarrollo, Uruguay recommended the development of educational strategies and mechanisms to boost resilience by integrating inclusive risk reduction approaches into prevention programmes for severe weather events. In collaboration with local populations, identify and analyse climatic, hydrological, and atmospheric threats and risk factors.

Practical Action, Bolivia emphasises that while AA have effectively reduced the impacts of hydrometeorological hazards, there is still room for improvement.

Specifically, adequate financing, better coordination with local authorities, and enhanced community participation and technical capacity are essential to expand and sustain these benefits in future implementations.

While AA have been implemented effectively, some challenges persist that present opportunities for further improvement.

Enhancing year-round dissemination of climate forecasts, strengthening coordination between government and non-government stakeholders, and deepening local community engagement – especially among youth – could further optimise the delivery and impact of EWS information.

KEY FINDINGS FROM THE ANALYSIS OF THE DATA ON ANTICIPATORY ACTIONS

1. Local leadership is crucial: AA are most effective when they are locally-led, with community members actively engaged in risk identification, data collection, and response planning.

Organisations such as the North-East Affected Area Development Society (NEADS) in India and ARSOW Nepal demonstrate that integrating indigenous knowledge and community participation enhances the relevance and timeliness of early warnings.

2. Resource and coordination challenges persist: Although about 73% of respondents rated AA as effective or very effective, many organisations face significant challenges – primarily inadequate funding, weak coordination with local authorities, and limited technical capacities – that hinder the expansion and sustainability of these measures (Practical Action, Bolivia).

3. Proactive measures yield tangible benefits: When effectively implemented, AA – such as early evacuations, pre-positioning of supplies such as foodstocks, water etc, infrastructure reinforcement, and community training – substantially reduce disaster impacts by saving lives and minimising economic losses, thereby building long-term resilience against environmental and socio-economic risks.

SECTION 4: RECOMMENDATIONS AND INSIGHTS BY THE RESPONDENTS

STRATEGIES TO STRENGTHEN EWS

The respondents elaborated on the ways to ensure improvement of the existing EWS in their own countries:

1. Capacity building and training for GNDR member organisations

Strengthening the skills and knowledge of GNDR member organisations is crucial for effective EWS. Key actions include:

- **Technical training**: Equip GNDR members with skills in risk analysis, data interpretation, and forecasting models using advanced technologies like AI, GIS, and remote sensing.
- **Community-based training**: Conduct training for local leaders and communities on community mappings, disaster preparedness, response, and how to act upon warnings.
- **Simulation exercises:** Regularly organise drills and scenario-based training to test the effectiveness of alerts and ensure communities know how to respond.
- **Localised training materials**: Develop context-specific training guides, ensuring they are available in local languages and accessible to diverse populations.
- **Partnerships for capacity building**: Collaborate with meteorological agencies, universities, and NGOs to provide specialised training programmes to enhance the communities understanding on the overall phases of disaster risk management, role of EWS, AA and over all risk-informed development.
- **Integration of indigenous/local knowledge**: Train GNDR members to combine traditional early warning methods with modern technologies for a more trusted and effective EWS.

2. Addressing the Funding Crisis

To ensure sustainability and effectiveness, EWS requires stable and sufficient funding. Key steps to resolve funding challenges include:

- **Pooled funding mechanisms**: Establish joint funding initiatives with multiple donors, including international agencies, governments, and private sector partners.

- **Long-term budget allocation**: Advocate for EWS funding to be integrated into national disaster management budgets to ensure sustainability.

- **Grant mobilisation**: GNDR member organisations should actively seek grants from climate adaptation funds, humanitarian donors, and multilateral agencies. Public-private partnerships: Engage businesses in funding EWS through corporate social responsibility (CSR) initiatives and risk reduction investments.

- **Decentralised funding distribution**: Ensure resources are allocated down to the local level, enabling grassroots organisations and local governments to maintain and improve their EWS infrastructure. Pre-arranged finance for AA are easily and quickly made accessible directly to communities.

- **Financial transparency and advocacy**: Establish clear tracking of EWS funding and advocate for increased government commitment to disaster preparedness.

3. Strengthening EWS Infrastructure and Implementation

Beyond training and funding, improving the overall system requires:

- **Technology upgrades**: Investing in real-time data collection tools, automated weather stations, and mobile alert systems.

- **Multi-channel communication**: Using SMS, TV, radio, loudspeakers, social media, and local networks to ensure alerts reach vulnerable populations. This should be based on socio-cultural practices, languages and other contextual nuances.

- **Regular policy reviews**: Ensuring EWS policies at country level are up to date and responsive to emerging disaster risks and climate change impacts.

- **Enhanced community engagement**: Meaningful and regular involvement of local CSOs/CBOs, grassroots organisations, and disaster-prone communities in EWS design and implementation.

- **Data integration and coordination**: Establishing a centralised database that connects GNDR members, government agencies, and international partners.

Suggestions made by Aran Organization for the Development of Civic Culture, Iraq, to improve the EWS in their region:

"To improve the existing EWS in the Kurdistan Region, the following suggestions could be made:

1. Establish a centralised and integrated system: Develop a unified EWS that consolidates data from various agencies, including meteorological, geological, and hydrological institutions. This will ensure comprehensive monitoring of multiple hazards and provide timely, accurate warnings.

2. Improve data collection and information sharing: Strengthen data collection mechanisms and ensure that relevant hazard information (e.g. weather forecasts, flood risks, seismic activity) is shared across government agencies, local authorities, and communities in real-time.

3. Enhance communication channels: Expand and diversify the channels used for warning dissemination, including SMS, social media, local radio, and community-level announcements. Ensure that all groups, especially vulnerable populations, have access to early warnings.

4. Community engagement and education: Implement widespread education and awareness programmes to ensure that communities understand the purpose of EWS and how to respond effectively. Involve local leaders in training and dissemination activities to build trust and reach the most vulnerable groups.

5. Strengthen local capacity: Provide technical training to local authorities and community organisations to improve their ability to respond to early warnings. Equip them with the necessary tools and resources to act effectively.

6. Establish feedback mechanisms: Develop a structured process for evaluating the effectiveness of warnings and actions taken. This would include gathering feedback from communities, local responders, and authorities after each disaster event to improve future responses.

7. Policy and regulatory support: Advocate for the creation of national and regional policies that support the establishment and continuous improvement of an EWS, ensuring sustainable funding and legal frameworks for disaster preparedness and response.

8. Secure funding and resources: Mobilise funds from both governmental and international sources to improve the infrastructure, technology, and resources needed to strengthen the EWS. This includes upgrading early warning technology and establishing reliable communication networks".

SUPPORT FOR ANTICIPATORY ACTIONS

Based on the responses, the additional support required for AA falls into the following key areas:

1. Financial and technical support

- **Forecast-based financing (FbF)**: Implement pre-arranged financing mechanisms that release funds based on early warnings and risk forecasts, ensuring timely interventions before a disaster occurs.

- **Sustained funding**: Many respondents emphasise the need for adequate financial resources to support AA, including funding for infrastructure, training, and emergency preparedness.

- **Technical assistance**: There is a strong need for technical expertise in data analysis, disaster forecasting, and EWS implementation. This can be done by local CSOs, local government and experts.

- **Dedicated funds for nature-based solutions**: Some respondents highlight the need for targeted funding for solutions such as reforestation, watershed management, and sustainable agricultural practices.

2. Capacity building and training

- **Training of local authorities and CSOs**: Strengthening the skills of CSOs and local authorities is crucial for effective AA.

- **Community-based training**: Local communities require training on disaster preparedness, first aid, and how to act on early warnings.

- **Infrastructure and human capacity**: Both physical infrastructure and trained personnel are needed to support effective disaster response.

3. Improved communication and awareness

- **Simplifying technical data**: Information should be translated into accessible language for communities to interpret, understand and act upon.

- **Multi-channel alert systems**: Expanding communication channels to include SMS, social media, radio, and community loudspeakers.

- **Awareness campaigns**: Increasing public awareness through educational programs, school initiatives, and community meetings.

4. Strengthening data and technology integration

- **Investing in early warning technology**: Expanding the use of advanced forecasting tools such as AI, satellite monitoring, and Internet of Things (IoT)-based systems.

- **Real-time data sharing**: Establishing mechanisms for real-time data exchange between national agencies, local governments, and international partners.

- **Localised data collection**: Collecting and analyzing data at the village or community level to ensure warnings are accurate and context-specific.

5. Policy and institutional strengthening

- **Developing clear protocols and guidelines**: Establishing standardised procedures for anticipatory actions to ensure swift decision-making.

- **Mainstreaming AA into national policies**: Ensuring that anticipatory action is included in disaster risk reduction strategies at local, national, and regional levels.

- **Improving coordination among stakeholders**: Strengthening collaboration between governments, CSOs, international agencies, and the private sector to improve disaster response.

6. Strengthening partnerships and community engagement

- **Networking with local groups**: Building stronger partnerships between governments, NGOs, and community groups to implement effective AA. A trained network of volunteers should be established who are able to localise climate projections and take necessary actions.

- **Leveraging indigenous knowledge**: Integrating traditional knowledge with modern technology for a more holistic approach to disaster preparedness.

- **Empowering local governments and CSOs**: Providing direct support to community-led initiatives that enhance AA.

7. Regular testing and drills

- **Simulation exercises**: Conducting regular drills and community engagement activities to test the effectiveness of EWS.

- **Monitoring and evaluation**: Establishing feedback mechanisms to assess the impact of AA and refine strategies accordingly.

By addressing these key areas, AA can become more proactive, effective, and sustainable, reducing disaster impacts and building community resilience.

> *"To enhance AA, support is needed in building community capacity through training and EWS that directly reach at-risk areas. Investment in technology and resources for safe shelters will enable timely, organised responses. Partnerships with NGOs and financial mechanisms can further strengthen rapid, effective action."* - **Community Awareness Raising & Advocacy Ventures Around Needs (CARAVAN), Pakistan**

> *"There is a need for Forecast-Based Financing (FbF): Set up funding mechanisms that release resources based on early warnings, allowing communities to take preventive actions before a crisis. FbF enables organisations to act promptly on forecasts, reducing damage and response costs. In addition, contingency and emergency funds: Ensure flexible funding options that can be quickly accessed for AA, minimising delays and enabling rapid response when forecasts indicate an imminent hazard."*- **Abs Development Organization for Woman and Child, Yemen**

KEY FINDINGS FROM STRATEGIES TO STRENGTHEN EWS AND SUPPORT REQUIRED FOR EWS

Major findings on strengthening early warning systems (EWS) and anticipatory actions (AA)

1. Capacity building is critical for effective EWS and AA

A recurring theme across respondents is the urgent need for capacity building at multiple levels – government agencies, CSOs, local communities, and technical institutions. Strengthening skills in risk analysis, data interpretation, and forecasting using advanced technologies like AI, GIS, and remote sensing is essential.

Regular community-based training, simulation exercises, and localised training materials will ensure better preparedness and timely responses. Additionally, integrating indigenous/local knowledge with modern scientific EWS can enhance community trust and effectiveness.

2. Addressing the funding crisis and institutionalising forecast-based financing (FbF)

A major barrier to improving EWS and AA is inconsistent and insufficient funding.

There is a clear need for pooled funding mechanisms, long-term budget allocations, and grant mobilisation to sustain these systems. FbF, which enables the release of pre-arranged funds based on early warnings, was highlighted as a key solution for ensuring timely and proactive disaster response.

Public-private partnerships and decentralised funding distribution to grassroots organisations can further enhance financial sustainability.

3. Strengthening infrastructure, data systems, and communication networks

The effectiveness of EWS depends on robust data collection, integration, and sharing mechanisms. Respondents emphasised the need for a centralised and integrated system to consolidate meteorological, geological, and hydrological data for better monitoring and early warning.

Expanding real-time data collection through AI, IoT sensors, and satellite monitoring will significantly improve prediction accuracy. Additionally, multi-channel communication systems – including SMS, social media, radio, and loudspeakers – must be expanded to ensure that early warnings reach even the most remote and vulnerable populations.

4. Strengthening community engagement and localised EWS

Effective EWS and AA must be community-centred. Training local disaster committees and equipping community-based early warning champions will ensure faster dissemination of alerts and organised evacuations. Indigenous/local knowledge should be integrated into modern EWS, and risk-based warning systems tailored to specific hazards must be developed at the local level.

Trust-building measures, including consistent awareness campaigns, educational initiatives, and participatory decision-making, are vital to ensuring communities understand, trust, and act on early warnings.

5. Strengthening policies, institutional coordination, and multi-stakeholder partnerships

For EWS and AA to be sustainable, governments must integrate them into national policies and ensure consistent implementation at local, regional, and national levels.

Establishing clear protocols, legal frameworks, and regulatory support will enhance disaster preparedness. Interagency coordination is crucial – government agencies, CSOs, humanitarian actors, and private sector partners must collaborate to maximise resource utilisation and improve disaster response efficiency.

Strengthening multi-stakeholder partnerships, particularly with international donors, private entities, and technology providers, will drive innovation and resilience-building in disaster management systems.

CASE STUDIES AND BEST PRACTICES

Building on the above insights, communities are increasingly leveraging EWS and AA to enhance their resilience against multiple hazards.

While progress is evident, only a few communities are meaningfully engaged in both localised early warning systems and locally-led anticipatory action, highlighting the need for greater inclusion, investment, and capacity-building to scale these efforts effectively.

Highlighting some of the key case studies and best practices as mentioned by the respondents:

1) North-East Affected Area Development Society (NEADS) - India - Community-based Flood Early Warning System' in the state of Assam, India

The Community-Based Flood Early Warning System (CBFEWS) integrates local knowledge and traditional practices to provide timely and context-specific alerts to communities in flood-prone areas. Its success lies in its localised and participatory approach, where local flood monitoring committees are trained to rapidly disseminate warnings through mobile phones and community networks.

By actively involving local communities, the system ensures that alerts reach even the most remote and vulnerable areas, enhancing inclusivity and effectiveness. Sustainability is reinforced through regular training, awareness programmes, and strategic partnerships with local governments, NGOs, and CSOs.

This approach exemplifies a culturally sensitive, community-led EWS that empowers local populations to respond proactively to flood risks.

2) Centre for Social Concern and Development (CESO CODE) - Malawi

CESO CODE provided mobile phones and megaphones to 100 Community-Based Early Warning Champions across Mwanza, Neno, Mulanje, Chikwawa, Blantyre, and Zomba districts in Malawi. Early warning messages were sent via SMS to these champions, who then disseminated the information to their respective communities.

Over the past two years, this initiative has led to a positive shift in community responsiveness to natural hazards, improving preparedness and early action.

3) Indreni Rural Development Centre - Nepal

For the past fourteen years, a voluntary flood early warning system has been operating in rural communities of Nepal to mitigate the impacts of flood disasters.

The Indreni Rural Development Centre Nepal established an emergency communication network connecting upstream and downstream communities along the Banganga River Basin in Kapilvastu, Nepal, a region highly vulnerable to flooding.

This system includes 14 communities, spanning from the river's origin in the hills to the Nepal-India international border, with one focal point selected in each community through a participatory process. These focal persons are trained in message dissemination and play a crucial role in relaying flood warnings.

During heavy rainfall, the upstream focal point alerts the next community's focal point via SMS, who then disseminates the warning within their community and forwards it downstream. This chain communication mechanism ensures that all flood-prone communities receive early warnings within minutes, enabling timely preparedness and response.

4) Action pour la Recherche et le Développement Durable (ARDED) - Chad

In Kanem province, Chad, Action pour la Recherche et le Développement Durable (ARDED) has significantly strengthened Early Warning and Surveillance Systems across 20 villages through a community-driven, multi-sectoral approach.

ARDED has built the capacity of decentralised government departments, local stakeholders, and community committees in data collection, agro-ecological monitoring, and risk analysis, ensuring informed decision-making.

The organisation has operationalised a multi-sectoral surveillance system, supporting the regular production of a quarterly bulletin and improving the monitoring of hazards, disasters, food security, health, nutrition, agriculture, and pastoralist conditions.

ARDED has facilitated joint field assessments with authorities, enabling real-time disaster evaluation and response planning while advocating with government bodies, technical and financial partners, and humanitarian organisations to secure greater support for anticipatory action.

Strengthening coordination, ARDED has trained village community relays to collect and transmit risk data to local sub-prefectural action committees (CLA), ensuring seamless information flow between departmental (CDA) and provincial action committees (CPA).

Additionally, the organisation actively contributes to food security sub-cluster meetings, reinforcing stakeholder collaboration.

Through these interventions, ARDED has empowered communities to anticipate, prepare for, and respond to crises, ensuring that EWS and AA are locally-led, actionable, and effective in safeguarding lives and livelihoods in Kanem.

5) Comision de Accion Social Menonita (CASM) - Honduras

CASM has extensive experience in installing EWS for drought and rainfall at both the community and municipal levels. These systems are also used for monitoring flooding in the country's largest rivers, providing critical data to government authorities to issue timely alerts for downstream communities and coordinate evacuations.

This life-saving initiative has significantly contributed to reducing disaster risks and protecting vulnerable populations. We will share videos and images showcasing this experience.

SECTION 5: ADDITIONAL COMMENTS

ADDITIONAL INSIGHTS ON EWS AND AA

Across many countries, EWS and AA are crucial for disaster preparedness, particularly for cyclones, floods, droughts, and landslides. These mechanisms help mitigate disaster impact by enabling pre-positioning of supplies, early evacuations, and public awareness campaigns. However, significant challenges remain in ensuring timely communication, last-mile connectivity, and coordination between stakeholders, particularly in remote and vulnerable communities.

Strengthening EWS and AA is critical to reducing disaster risks, minimising human suffering, and building community resilience by ensuring that populations are informed, prepared, and able to respond effectively.

Several countries have made significant progress in establishing localised EWS and AA, yet there is room for improvement in accessibility, data accuracy, financial investment, and community engagement. India, for example, has been integrating technology, local community engagement, and predictive early warning data to enhance disaster preparedness, particularly in flood-prone regions like Assam.

The government, in collaboration with local agencies and NGOs, has implemented pre-positioning relief materials, evacuation drills, and infrastructure reinforcements based on early warnings. However, enhancing last-mile connectivity, improving local data collection, and expanding real-time predictive models remains a priority for more inclusive and timely responses.

Similarly, Rwanda has made notable progress in institutionalising EWS and AA as part of its comprehensive disaster risk management strategy. The Rwanda Meteorology Agency (Meteo Rwanda) plays a pivotal role in providing timely weather forecasts and alerts, using advanced meteorological tools and satellite imagery to inform communities.

Community engagement is a cornerstone of Rwanda's approach, with local disaster management committees actively involved in disseminating information and preparing residents for emergencies.

Pre-positioning relief supplies, implementing soil conservation techniques, and improving public awareness have been key anticipatory actions. However, improving data collection, investing in resilient infrastructure, and fostering cross-sector collaboration remain crucial to strengthening Rwanda's disaster preparedness and response efforts.

In Yemen, where communities face natural disasters alongside ongoing humanitarian challenges, enhancing EWS and AA is vital. Successful initiatives, such as the electronic Disease Early Warning System (eDEWS) and FAO's agricultural alerts, showcase the potential of integrating technology with local knowledge to ensure culturally relevant and effective responses.

International collaborations with organisations like World Health Organisation (WHO) and Food and Agriculture Organisation (FAO) provide essential expertise, while capacity building for local authorities and community members ensures sustainability. However, infrastructure limitations, conflict, and resource constraints pose significant challenges.

Opportunities exist to innovate through mobile networks for communication,

solar-powered remote monitoring, and strengthening multi-hazard approaches. Establishing stronger policy frameworks and community-driven feedback mechanisms will be essential to enhancing Yemen's resilience and ensuring sustained protection of lives and livelihoods.

To further institutionalise EWS at the local level, integrating indigenous and indigenous knowledge into modern scientific systems is essential. This approach enhances local understanding and ownership of disaster preparedness, making early warnings more actionable and trusted by communities.

Moreover, a risk-based EWS that covers all hazards is required, necessitating capacity building across multiple levels – from government agencies and communication networks to intermediary organisations and local communities.

Strengthening multi-stakeholder collaboration, improving financial investments, and ensuring clear, localised communication strategies will be pivotal in creating more effective, inclusive, and sustainable early warning and anticipatory action systems.

While EWS and AA have proven effective in reducing disaster risks, systemic gaps remain that must be addressed to enhance resilience and safeguard vulnerable populations. By integrating localised solutions, leveraging technology, and fostering strategic partnerships, countries can transform disaster preparedness efforts, reduce losses, and build a more resilient future in the face of increasing climate threats.

SECTION 6: CONCLUSION

KEY FINDINGS

The key findings can be summarised as follows from the survey analysis:

1) Limited inclusion and participation in EWS communication

Persons with disabilities, women, and marginalised communities often remain passive recipients of early warnings, highlighting the need for more inclusive engagement in disaster preparedness.

2) Challenges in communication, accessibility, and comprehension

Language barriers, inconsistent warning updates, and limited feedback mechanisms reduce the effectiveness of early warning messages, affecting timely community responses.

3) Variability in EWS effectiveness across countries

While many countries have established EWS, their effectiveness varies, with some lacking multi-hazard coverage, real-time data integration, and robust disaster response mechanisms.

4) Strengthening community engagement and localised EWS

Locally-led initiatives, including the integration of indigenous knowledge with modern forecasting, improve trust, adoption, and preparedness at the community level.

5) Addressing the funding crisis with forecast-based financing (FbF)

Sustainable and flexible funding mechanisms, including forecast-based financing, are crucial for ensuring timely and proactive disaster response.

6) Need for stronger infrastructure, data systems, and communication networks

Expanding real-time data collection, integrating AI and satellite monitoring, and improving multi-channel communication will enhance the reach and accuracy of early warnings.

7) Enhancing policies, institutional coordination, and multi-stakeholder collaboration

Embedding EWS and AA into national policies, strengthening coordination among governments, CSOs, and private sector partners, and ensuring sustained investment will improve disaster preparedness and response.

RECOMMENDATIONS

Key recommendations can be drawn out from the findings above:

1) Enhance inclusion and community participation

- Ensure active engagement of persons with disabilities, women, and marginalised groups in EWS design, dissemination, and decision-making
- Promote community-led disaster preparedness initiatives by integrating indigenous knowledge with modern forecasting techniques

2) Improve communication and accessibility

- Simplify early warning messages, ensuring they are clear, culturally sensitive/appropriate, and available in local languages
- Establish standardised, regular update frequencies to improve the timeliness and reliability of warnings
- Strengthen feedback mechanisms through community consultations, mobile reporting systems, and structured evaluations

3) Expand and strengthen EWS infrastructure and data systems

- Invest in real-time data collection, AI-driven forecasting, IoT sensors, and satellite monitoring to improve prediction accuracy
- Strengthen multi-channel communication, including SMS, social media, radio, TV and community loudspeakers, to reach all at-risk populations
- Develop Multi-Hazard Early Warning Systems (MHEWS) to cover a broader range of disaster risks

4) Ensure sustainable and flexible funding mechanisms

- Adopt FbF to ensure pre-arranged funding is released based on early warnings, enabling timely interventions
- Establish public-private partnerships and pooled funding mechanisms to support long-term sustainability
- Decentralise funding distribution to empower local governments and community-based organisations

5) Integrate EWS and AA into national policies

- Embed EWS and AA into national disaster risk reduction (DRR) policies and ensure legal frameworks for implementation
- Strengthen institutional coordination between governments, CSOs, private sector actors, and international partners for more effective disaster preparedness
- Promote cross-border cooperation for data sharing and regional disaster response strategies

6) Invest in capacity building and knowledge sharing

- Provide technical training for disaster management agencies, CSOs, and local leaders on risk assessment, forecasting, and early action protocols
- Conduct regular simulation drills, community awareness campaigns, and participatory workshops to strengthen disaster preparedness
- Foster international collaboration and knowledge exchange to adopt best practices and innovative technologies in EWS

CALL TO ACTION

Based on the above findings and recommendations, following are the points for a Call to Action:

1) Prioritise inclusive and locally-led EWS – Actively engage women, persons with disabilities, and marginalised groups in the design, implementation, and dissemination of locally driven EWS and locally-led AA.

2) Improve communication and accessibility at the community level – Ensure timely, clear, and localised early warnings through multi-channel communication systems, local languages, and standardised update frequencies to reach the most at-risk populations.

3) Secure sustainable and locally accessible funding – Establish FbF, pooled funding, and decentralised financial mechanisms to empower local governments, community organisations, and grassroots responders in disaster preparedness and response.

4) Enhance locally-led EWS infrastructure and data integration – Invest in real-time data collection, AI-driven forecasting, and Multi-Hazard Early Warning Systems (MHEWS) while integrating indigenous knowledge and local monitoring systems for more reliable and community-trusted alerts.

5) Strengthen policies and multi-stakeholder coordination for localised action – Embed EWS and AA into national policies, while fostering local leadership, multi-stakeholder collaboration, and regional coordination to ensure context-specific and community-driven disaster resilience.

ANNEXURES

Survey Questionnaire: The full survey questionnaire
Acknowledgements: Recognition of contributors and respondents
Report: Validation of the findings from the Global Survey

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