

Early Warning and Anticipatory Action



This brief introduces early warning and anticipatory action as tools for protecting lives, livelihoods, and assets before disasters strike. In line with the current Governmental Aid Policy Framework, the Swedish Government has directed Sida to use development finance for anticipatory action as a means of making climate aid more effective. The brief serves as a resource for Sida staff, bringing together collective experiences in development-funded early warning and anticipatory action to date, and aims to inspire future investments in protecting people against preventable disasters. It complements an existing humanitarian brief on anticipatory action.¹

PROTECTING PEOPLE AGAINST ESCALATING BUT INCREASINGLY PREDICTABLE DISASTERS

Despite worsening extreme weather and significant advances in the predictability of climate-related disasters, people are not protected against foreseeable and thereby preventable danger and losses. Especially those who need it the most remain unprotected. The World Meteorological Organization's State of the Global Climate report confirms that 2015–2025 is the warmest 11-year period on record, with 2025 ranked as the second or third hottest year in history.² A warmer climate causes extreme weather; more frequent and intense heatwaves, wildfires, droughts, tropical cyclones, storms, and floods affecting millions of people. Extreme weather continues

to drive protracted and new displacement, with the most severe consequences recorded in fragile and conflict-affected settings.³ Climate-driven food insecurity is increasingly recognised as a compounding risk with consequences for social stability.⁴

Enabled by advances in climate prediction analytics, many of the most damaging events are becoming increasingly foreseeable: seasonal drought signals accumulate months ahead; cyclones can be tracked days in advance; and floods can be forecast with impact models that estimate which communities, roads, clinics and crops are most likely to be affected. The World Meteorological Organization (WMO) stressed that as extreme weather continues, predictions must go beyond what the weather will be to include what the weather will do, and enable people to protect themselves against foreseeable harm through empowering Early Warning Systems. When losses are predictable, “late response” becomes a costly pattern; financially, socially and morally. Early warning and action is a human rights issue, and a rights-based approach asks the degree to which people are effectively protected against predictable disasters, whether warnings reach those most exposed and whether they have the means to act upon the warnings.

WHAT IS EARLY WARNING SYSTEMS AND ANTICIPATORY ACTION?

Protecting people from climate hazards is inseparable from enabling them to adapt. One of the most effective and cost-efficient ways for protecting people is to establish Early Warning System (EWS). These systems alert populations to incoming hazards and inform governments, communities, and individuals about how to act in order to minimise harm before it arrives.⁵ Despite disasters becoming increasingly predictable, protection through

¹ Humanitarian Brief: Anticipatory Action, Sida, January 2026.

² World Meteorological Organization (2025a). State of the global climate 2025. WMO, p.8. Accessed on WMO's webpage on 30 June 2026.

³ Internal Displacement Monitoring Centre (2024). Global report on internal displacement. Accessed on IDMC's webpage on 30 June 2026.

⁴ Intergovernmental Panel on Climate Change (2022). Climate change 2022: Impacts, adaptation and vulnerability. Contribution of Working Group II to the Sixth Assessment Report. Cambridge University Press, p. 9.

⁵ World Meteorological Organization (2023). State of climate services 2023: Health. Accessed on WMO's webpage on 30 June 2026.

early warning remains deeply unequal. Approximately one third of the world's population, concentrated in the least developed countries and small island developing states, still lack access to early warning systems.⁶ The communities most exposed to climate hazards are precisely those least protected against them.

Early Warning Systems (EWS) and Anticipatory Action (AA) are both part of the broader agenda of Disaster Risk Reduction (DRR) and climate change adaptation aimed to build people's resilience against climate induced threats. They are part of a broader shift toward predictive analytics, risk-informed and future-informed flexible programming that anticipate rather than react to shocks. EWS is "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".⁷ Early warning systems include the following four key and interrelated components:

1. Risk knowledge: understanding the hazard types, exposure to hazards, and vulnerabilities of different population groups, in a given area;
2. Monitoring and forecasting: detecting and predicting hazard threats in real-time using scientific data and technology (for example, seismic sensors for earthquakes, satellites for cyclones);
3. Warning dissemination and communication: ensuring that alerts reach authorities, emergency responders, and the public through multiple communication channels (for example, sirens, mobile alerts, radio), and that warnings are understandable by those at risk;
4. Preparedness and response capability: ensuring communities and authorities are able to act on the warnings.⁸



Diagram showing the four interrelated components of EWS.
Source: UNDRR 2025, Words into Action guidelines: Multi-hazard early warning systems | UNDRR

The fourth pillar includes anticipatory action, which has been defined as "acting ahead of a predicted hazardous event to prevent or reduce impacts on lives and livelihoods and humanitarian needs before they fully unfold".⁹

Anticipatory action supports climate change adaptation by using forecasts to act before climate-related hazards (like floods, droughts, or heatwaves) cause harm. Anticipatory action is sometimes conflated with disaster preparedness, but they are not the same. Disaster preparedness is a broad umbrella of measures while anticipatory action keeps a sharper operational focus and is hazard specific and forecast based. Operationally however, anticipatory action depends on preparedness investments to be effective.¹⁰ Strengthening government-led coordination and harmonising investments across EWS and anticipatory action remain critical to reducing fragmentation, optimising limited funds and avoiding duplication.¹¹

⁶ Ibid.

⁷ United Nations Office for Disaster Risk Reduction (2017). The Sendai framework terminology on disaster risk reduction: Early warning system. Accessed on UNDRR's webpage on 30 June 2026.

⁸ Jaime, C., de la Poterie, A.T., van Aalst, M. et al., The Long Road to Acting Ahead: Lessons from the Evolution of Early Warning Systems and Anticipatory Action. *International Journal of Disaster Risk Science*, 2026, vol. 17, p. 414-416.

⁹ Grand Bargain. (2024). Outcome document: Commitments of the Grand Bargain caucus on scaling up anticipatory action. Inter-Agency Standing Committee, p.2. Accessed on reliefweb.int on 30 June 2026.

¹⁰ Anticipatory action (AA) is also distinct from "early action" as a generic term. Early action can also be used for rapid measures taken after a disaster, whereas anticipatory actions clearly signals that interventions happen before the hazard strikes or before impacts are felt, and that they are forecast-triggered (Anticipation Hub, 2025).

¹¹ Jaime, C., et al. The Long Road to Acting Ahead [...]. 2026, p. 414.

SWEDISH AID POLICY - DEVELOPMENT FINANCE FOR ANTICIPATORY ACTION

Under the Swedish Governmental Aid Policy Framework “Development Assistance for a New Era - Freedom, Empowerment and Sustainable Growth”, the Government intends to strengthen efforts so that development finance can be increasingly used for anticipatory action in climate-related humanitarian crises, in order to make climate aid more effective. Moreover, the Government intends to work to build resilience, not least in protracted humanitarian crises, through development-funded climate adaptation in vulnerable communities.¹²

This aligns with international policy such as the Sendai Framework for Disaster Risk Reduction 2015–2030, which calls for strengthening people-centred multi-hazard early warning systems and disaster risk communication as part of reducing existing and preventing new disaster risk.¹³ Sweden, through the EU, also endorsed the COP30 Belem Declaration on Hunger, Poverty, and Human-Centered Climate Action, which calls for Anticipatory Action:

“Climate and humanitarian action, in synergy with development assistance and social protection systems, should strengthen national and local capacities by investing in anticipatory approaches and preparedness before crises occur, enabling effective response during extreme weather events and other climate related impacts, and supporting resilience building, recovery and long-term adaptation”¹⁴

COST-EFFECTIVENESS OF EARLY WARNING AND ANTICIPATORY ACTION

Early warning and anticipatory action can reduce the cascade of losses that makes later response more expensive. Households can avoid distress sales, malnutrition spikes and disrupted schooling; governments can reduce emergency fiscal shocks; and programmes can operate more efficiently when actions and financing are pre-arranged and available before disaster strike. For example, evidence from three projects of the World Food Programme in Lesotho, Madagascar, and Mozambique suggests that each \$1 spent on anticipatory action yields benefits equivalent to \$1.23–\$1.28 in post-shock response.¹⁵

“Just 24 hours’ warning of a coming storm or heatwave can cut the ensuing damage by 30%, yet one third of the world’s population are still not covered by early warning systems.”¹⁶

SIDA DEVELOPMENT FUNDED EARLY WARNING AND ANTICIPATORY ACTION

Somalia: Anticipatory and Early Action: Protecting Lives and Safeguarding Livelihoods for Vulnerable Communities

Sweden has partnered with the Food and Agriculture Organization (FAO) to deliver proactive, preventive support to more than 5,800 highly vulnerable households (nearly 35,000 people) in the drought affected districts of Jowhar (Middle Shabelle) and Qansax Dheere (Bay Region) during 2026. The support enables FAO to implement a package of early, preventive, and livelihood protecting actions to reduce negative humanitarian impacts before drought conditions deepen, protecting lives and livestock before drought impacts reach crisis levels. Key interventions include: a) Unconditional cash transfers to 3,326 drought affected households, enabling families to meet urgent food and basic needs during the most critical period, b) Treatment of 150,000 livestock, supporting 2,500 agropastoral households whose herds are central to food security and income generation.

Zambia: Anticipatory Social Protection

In Zambia, Sida supports the joint UN programme “UN Improved Livelihoods through Social Protection 2025–2028” which includes objectives to strengthening shock-responsiveness through anticipatory action. It will strengthen Zambia’s national social protection system to enable proactive responses to forecasted shocks. By enhancing the system’s capacity to act on credible early warnings, the human and economic impact of crises can be mitigated, lowering the long-term costs of disaster response. The strategic focus is on shifting from reactive to anticipatory action, protecting food security and livelihoods before shocks escalate. The plans will be community-driven, ensuring local contexts and experience inform response triggers – such as rainfall thresholds or flood alerts. Tailored early warning systems (EWS) for social protection of households, particularly farmers, will provide timely agricultural advice, while anticipatory and climate financing will ensure rapid and increased access to resources for early intervention and inclusive climate adaptation.

¹² Government of Sweden. Development assistance for a new era – freedom, empowerment and sustainable growth (2023). Retrieved 19 December 2025.

¹³ United Nations Office for Disaster Risk Reduction (2015). Sendai framework for disaster risk reduction 2015–2030. Accessed on UNDRR’s webpage on 30 June 2026.

¹⁴ COP30 Brazil. (7 November 2025). Belém Declaration on Hunger, Poverty, and Human-Centered Climate Action, p.4

¹⁵ de Brauw, Alan, Cost-Effectiveness of Anticipatory Action, CGIAR, February 2025, p.8.

¹⁶ United Nations Office for Disaster Risk Reduction (2026). Words into action guidelines: Multi-hazard early warning systems. Accessed on UNDRR’s webpage on 30 June 2026.

UNDRR: The Early Warning for All (EW4All) Initiative

Sida in partnership with the United Nations Office for Disaster Risk Reduction (UNDRR) entered into an Agreement in 2021 for the implementation of the Sendai Framework, and in November 2023, Sweden generously contributed funding to accelerate the implementation of the Early Warning for All (EW4All) initiative in five high-risk countries: Bangladesh, Liberia, Haiti, Mozambique, and Somalia. This support was instrumental in enhancing local disaster preparedness capacities, strengthening early warning systems, and reducing vulnerability to climate-induced hazards.

The initiative included the development of a nationally developed and owned EWS Roadmap, bringing together a variety of stakeholders, including government actors, multilateral, bilateral development and humanitarian partners, national Red Cross societies, and civil society. The Roadmap brought forward a national prioritisation of EWS investments, including through state finance, and expenditure frameworks to address pressing gaps to improve the effectiveness of nationally operated multi-hazard early warning systems.

Mozambique: Use of Anticipatory Crisis Modifiers

Crisis modifiers constitute pre-allocated funds that can be rapidly activated within existing programmes on the basis of risk analysis and data from early warning systems or worsening conditions.¹⁷ In Mozambique, Sida finances anticipatory action through crisis modifiers. The mechanism is embedded within development interventions to enable early action in response to climate- and conflict-related shocks. Crisis modifiers were integrated into four interventions in northern and central Mozambique, implemented together with Oxfam, ACF, NRC, the Red Cross, and IFDC. A concrete illustration of the proactive approach is the Red Cross's forecast-based activation of the crisis modifier in Manica Province in the context of the El Niño drought. Drawing on clearly defined triggers built on meteorological, hydrological, and crop data, vouchers for climate-resilient seeds were distributed in combination with guidance from early warning systems. This enabled timely planting, protected livelihoods and strengthened local resilience.

Digital Innovation: mobile phone warnings and anticipatory cash

Mobile and digital technologies are central to anticipatory action as they can enhance forecasting capabilities, enable timely life-saving alerts, and facilitate rapid access to cash and essential services. Through its support to the Global System for Mobile Communications Association (GSMA), a global organisation unifying over 1000 mobile operators and businesses globally, Sida is funding a nexus-broad programme for the use of digital technologies in humanitarian and development outcomes between 2025-2028. The programme works across sectors to maximise the potential of connectivity and digital technology for communities vulnerable to, and affected by crises, including recurrent disasters, food insecurity, and forced displacement. A core focus is refugee digital inclusion and the advancement of effective anticipatory action and early warning systems. Building on this, it will generate evidence on scaling digital solutions for anticipatory action and early warning systems, and develop insights into anticipatory action in contexts like the Philippines, Nepal, and Cambodia.¹⁸

Zimbabwe: Partnering with Weather Services for Disaster Forecasts

Under Sweden's bilateral strategy 2022–2026 for Zimbabwe, Sida is partnering with Oxfam, the Swedish Meteorological and Hydrological Institute (SMHI), the Zimbabwean meteorological authority, the national water authority (ZINWA), and the University of Zimbabwe to strengthen local capacity. The work centres on protecting communities from preventable disasters through the establishment of early warning systems; building sustainable IT infrastructure, digitising historical data, developing forecast models, and establishing operational routines and products. Together, partners will operationalise a joint meteorological and hydrological flood forecasting centre, train staff in hydrological modelling, and deliver media training for MSD in collaboration with SMHI and Swedish Television. The forecasting products and services will ultimately be tested with end users in the field, farmers.¹⁹

¹⁷ Embedding anticipatory crisis modifiers within existing development programmes offers a practical model for ensuring that development investments can flex ahead of predictable shocks without requiring a full programme redesign (Scott, 2024). Sida has supported crisis modifiers in Burkina Faso, Mozambique, Somalia, and South Sudan.

¹⁸ Contribution 16945 GSMA 2025-2028

¹⁹ Contribution 17523 Oxfam Simbiso 2025-2028

LESSONS AND WAYS TO PROTECT MORE PEOPLE AGAINST PREDICTABLE DISASTERS

The evolution of early warning systems (EWS) and anticipatory action has been shaped by major disasters, scientific advances in forecasting, and successive global policy frameworks.²⁰ Over decades, the ambition of EWS has expanded from narrow, hazard-centred monitoring toward more integrated, impact-based, multi-hazard and people-centred approaches. Yet despite this progress, a persistent gap remains between the issuance of warnings and the ability of the most vulnerable to act on them. Forecasts alone do not save lives, action does, and the conditions enabling timely action remain deeply unequal, particularly in fragile and conflict-affected settings where high exposure and vulnerability combine with limited institutional capacity, contested authority, and sparse data.²¹

Effective early warning and anticipatory action must be government-led. Embedding protection against climate shocks into national laws, adaptation and disaster management policies, and standard operating procedures clarifies authority, trigger thresholds, roles, and accountability, while also helping to institutionalise cross-sectoral coordination between finance ministries, meteorological services, and sector-specific authorities before a crisis strikes. This requires genuine systems thinking across institutions, spanning the full chain from technical forecasting to last-mile communication and the practical capacity to act.²²

At the same time, locally led anticipatory action is equally central. Communities must have the power to design systems and exercise self-protection, which means localisation is not only about implementation but about decision-making: who defines relevant risks, what actions are considered feasible, and whose knowledge counts. Local and indigenous knowledge is indispensable for complementing scientific forecasts.²³ Ultimately, anticipatory systems must be built on people-centred approaches that are inclusive by design, ensuring that the most marginalised, those most exposed and least able to act on warnings, are prioritised rather than left behind.²⁴

National Meteorological and Hydrological Services (NMHS) remain foundational for credible, locally owned

warning systems, and their collaboration with disaster management authorities, finance ministries, and development actors is essential for translating forecasts into coordinated, cross-sectoral action.²⁵

EWS are only as strong as their weakest link, and technical sophistication at the national level means little without last-mile outreach. Critically, a people-centred EWS must be understood not as a single technical system but as a society-wide knowledge system based on trust: a network of channels through which information is generated, shared, and acted upon by communities, local organisations, radio stations, and social media groups, as much as by national meteorological offices. In conflict and recurring crisis contexts in particular, conflict analysis must inform all EWS decision-making, since conflict shapes how all other hazards affect people and what actions are feasible.²⁶

The communities, institutions, and funding streams driving early warning systems on one hand and anticipatory action on the other have historically operated in separate spheres, with lost impact as a result.²⁷ Climate finance, development finance, disaster risk financing and humanitarian funding each operate according to different logics but share the same goal of protecting people and could be more effectively aligned towards this goal.

Anticipatory action must be treated as a shared responsibility across development, climate, and humanitarian actors, embedded in national law and budgets, not dependent on individual projects. Development financing has a critical and largely underutilised role in building the systemic foundations that make anticipatory action possible and sustainable. Long-term development investments are needed to strengthen forecasting capacity, digitise historical data, support meteorological institutions, and embed early warning functions within national disaster risk management systems, all of which require sustained funding well beyond the timeframe of individual projects.²⁸

Development actors, in support of governments, can fund operational anticipatory action directly, particularly by scaling forecast-informed social protection systems. These systems hold particular promise: shock-responsive programmes activated ahead of a crisis, delivering temporary top-ups or benefit expansions before a shock peaks.

20 Jaime, C., et al. *The Long Road to Acting Ahead* [...]. 2026, p. 411.

21 Gogerty, E., & Levine, S. Ten ways to create people-centred early warning systems in conflicts and recurrent crises. SPARC, 2025, p.5.

22 United Nations Office for Disaster Risk Reduction (UNDRR) & World Meteorological Organization (WMO) 2025. Early warning systems and early action in fragile, conflict-affected and violent contexts. Accessed 30 June 2026.

23 Gogerty, E., & Levine, S., SPARC 2025, p.4, p.7.

24 United Nations Office for Disaster Risk Reduction & World Meteorological Organization. (2025). Early warning systems and early action in fragile, conflict-affected and violent contexts. p.9

25 Red Cross Red Crescent Climate Centre (2018). Collaborating with national meteorological and hydrological services (updated 2024). RCCC. Accessed on Climate Centre's website on 30 June 2026.

26 Gogerty, E., & Levine, S., Policy Brief: Ten Ways to Create People-Centred Early Warning Systems [...] SPARC 2025.

27 Jaime, C., et al. *The Long Road to Acting Ahead* [...]. 2026, p. 27.

28 United Nations Office for Disaster Risk Reduction (UNDRR) & World Meteorological Organization (WMO) 2025. Early warning systems and early action in fragile, conflict-affected and violent contexts. Accessed 30 June 2026.

South-South cooperation represents an equally underutilised pathway to scale. Structured peer learning between countries facing comparable hazard profiles and institutional challenges, offers a faster and more contextually grounded route to operationalising anticipatory systems than traditional technical assistance. Where countries have built nationally owned capacities in data management and operational forecasting, these represent assets that can be directly shared with peers at earlier stages of development.

Public-private partnerships are central to extending reach and improving forecast quality. Business actors can contribute AI-powered analytics, non-traditional data streams such as satellite imagery, mobility data,

and market signals, and mobile platforms for warning dissemination and cash transfers.¹ Private sector logistics companies and retailers also offer significant potential for the prepositioning of emergency goods ahead of forecast events, reducing lead times and costs when action is triggered.

Finally, the cost effectiveness of proactive financing can significantly increase return on investments. Innovative financing mechanisms, including parametric insurance, crisis modifiers, and contingency funds, work best as part of a layered approach, each reinforcing the others to ensure pre-arranged finance is available when forecasts demand action.²

1 Elsner M, Atkinson G., and Zahidi S. World Economic Forum (WEF) 2025. Global risks report 2025.

2 Scherer, N., & Shumba, S. Leveraging insurance for anticipatory action: Insights and emerging lessons. Anticipation Hub, June 2025.

SWEDISH INTERNATIONAL DEVELOPMENT COOPERATION AGENCY

Visiting address: Rissneleden 110, 174 57 Sundbyberg
Postal address: Box 2025, SE-174 02 Sundbyberg, Sweden
Telephone: +46 (0)8-698 50 00. Telefax: +46 (0)8-20 88 64
E-mail: sida@sida.se Web: sida.se/en

