EARLY WARNINGS FOR ALL

The UN Global Early Warning Initiative for the Implementation of Climate Adaptation

Executive Action Plan
2023-2027

WORLD METEOROLOGICAL ORGANIZATION

COP27 SHARM EL-SHEIKH EGYPT 2022

WEATHER CLIMATE WATER

Early warning system:

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.

As defined 1 December 2016 by resolution 69/284, United Nations General Assembly

Photographer: Mostafa Ghroz
Location: Ushgui Village, Georgia
WMO 2023 Calendar Competition

EARLY WARNINGS FOR ALL
ACTION PLAN

Today, one third of the world's people, mainly in least developed countries and small island developing states, are still not covered by early warning systems... This is unacceptable, particularly with climate impacts sure to get even worse. Early warnings and action save lives. To that end, today I announce the United Nations will spearhead new action to ensure every person on Earth is protected by early warning systems within five years. I have asked the World Meteorological Organization to lead this effort and to present an action plan at the next UN climate conference, later this year in Egypt.

UN Secretary-General
António Guterres on
World Meteorological Day
23 March 2022

Contents

Foreword

Ever-rising greenhouse gas emissions are supercharging extreme weather events across the planet. These increasing calamities cost lives and hundreds of billions of dollars in loss and damage. Three times more people are displaced by climate disasters than war. Half of humanity is already in the danger zone.

The world is failing to invest in protecting the lives and livelihoods of those on the front line. Those who have done the least to cause the climate crisis are paying the highest price. Entire populations are being blindsided by cascading climate disasters without any means of prior alert.

We must invest equally in adaptation and resilience. That includes the information that allows us to anticipate storms, heatwaves, floods and droughts. Communities and nations need adequate warning and the ability to respond to incoming extreme weather events. To that end, I have called for every person on Earth to be protected by early warning systems within five years, with the priority to support the most vulnerable first. This Executive Action Plan sets out the concrete way forward to achieve this goal. It describes how the United Nations system and a wide range of partners will work together to effectively deliver on this objective.

The facts are clear.Early warnings save lives and deliver vast financial benefits. COP27 is the COP for implementation. Now is the time to implement Early Warnings for All.
I urge all governments, financial institutions and civil society to support this effort.

H.E. António Guterres
Secretary-General of the United Nations

Early warnings save lives and provide vast economic benefits. Just 24 hours' notice of an impending hazardous event can cut the ensuing damage by 30 per cent. The Global Commission on Adaptation, found that spending just $800 million on such systems in developing countries would avoid losses of $3-16 billion per annum. Such progress is only possible with modern science, sustained systematic observing networks, daily international exchange of quality data, advanced supercomputing power, the translation of forecasts into impacts, plus advances in telecommunications and connectivity. We require improvements and deeper understanding of risk across all time scales, stronger National Meteorological and Hydrological Services, Disaster Risk Management Agencies, and Emergency preparedness measures, considered capacity development, regional support structures, expert technical assistance, accessible financial support, an anticipatory humanitarian sector. Overall we need a people-centred approach that prioritizes community engagement. These are the essential ingredients for protecting every person on Earth by early warnings within five years.
This Executive Action plan 2023-2027 sets out the recipe for how these ingredients can come together to achieve the goal. I thank the many partners who worked together to develop this Executive Action Plan, and count on your continued support to ensure implementation. It is our collective accountability and responsibility not to fail but to leave a legacy of implementation.

H.E. Prof. Petteri Taalas
Secretary-General
World Meteorological Organization

The hosting of COP27 in the green city of Sharm El-Sheikh this year marks the 30th anniversary of the adoption of the United Nations Framework Convention on Climate Change. In the thirty years since, the world has come a long way in the fight against climate change and its negative impacts on our planet; we are now able to better understand the science behind climate change, better assess its impacts, and better develop tools to address its causes and consequences.

The science is there and clearly shows the urgency with which we must act to assist those in need of support to adapt to the negative impacts of climate change. Climate hazards, especially water-related climate hazards, are already affecting billions of people worldwide. Disruption in the hydrological cycle gravely threatens food security, livelihoods and ecosystems, causing loss and damage, and mostly affecting those in vulnerable situations. Early warning systems are a tangible way to improve countries resilience to these hazards. They underscore the links between the water and climate agendas. The launch of this Executive Action Plan is an important contribution to adaptation and resilience, particularly in Africa, where 60% of people are not covered by early warning systems.

I deeply believe that COP27 is an opportunity to showcase unity against an existential threat that we can only overcome through concerted action and effective implementation.

H.E. Sameh Hassan Shoukry
Minister of Foreign Affairs
Arab Republic of Egypt
COP 27 President

Sharm El Sheikh, Egypt

Global collaboration

*A partnership across the United Nations, International Agencies
and International Financing Institutions*

Delivering on the UN Secretary-General's five year goal of early warnings for all requires global collaboration. There has already been significant work between many UN entities, the private sector and financing institutions in the lead-up to COP27. Several agencies are leading the work on the four individual pillars in the formulation of the Action Plan, namely for **Pillar 1**: UNDRR and WMO; **Pillar 2**: WMO, UNDP, UNESCO and UN Environment Programme; **Pillar 3**: ITU, IFRC UNDP, WMO ; and **Pillar 4**: IFRC, REAP, OCHA, FAO and WFP. Continued and scaled-up collaboration will be required over the next five years.

The Early Warnings for All Initiative gratefully acknowledges the support at the Cairo Roundtable held 5-6 Sept, 2022, and preparatory consultations on the Action Plan of the following entities, listed in alphabetical order:

Photo by Christophe Suarez
Geneva, Switzerland

The Early Warnings for All Initiative specially recognizes future collaboration with the following financing institutions:

*During the Third Multi-Hazard Early Warning Conference (MHEWC-III) in Bali in May, 2022, over 150 entities expressed interest to be involved in the further development of the Early Warnings for All Initiative. The Initiative looks forward to further collaboration with these entities, which could not be listed in their entirety here.
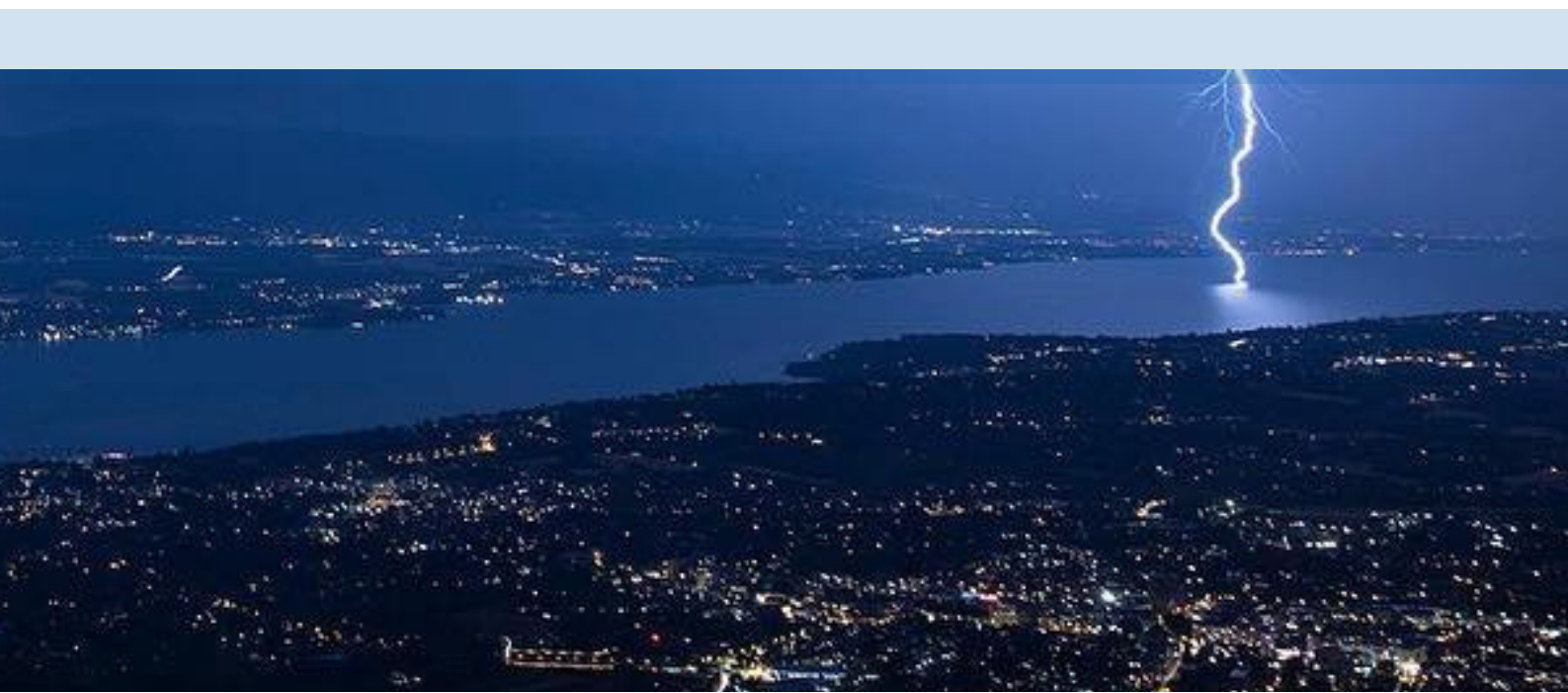
Executive Summary

Early Warning Systems are a proven, effective, and feasible climate adaptation measure, that save lives and provide at least a tenfold return on investment. The WMO State of the Climate 2021 Report shows that extreme weather, such as floods, droughts, heatwaves and storms, led to hundreds of billions of dollars of economic losses and wreaked a heavy toll on human lives and wellbeing. The IPCC's Sixth Assessment Report on Impacts, Adaptation, and Vulnerability recognized early warning systems and disaster risk management activities as key cross-cutting adaptation options, that enhance the benefits of other adaptation measures when combined(iv).

And yet, the recent UNDRR and WMO Global Status of Early Warning Systems: Target G report, highlighted that only half of countries have early warning systems in place with coverage especially low in Small Island Developing States (SIDS), Least Developed Countries (LDCs) and in Africa. Even where warning elements exist, coverage across the full warning cycle remains limited.

In March 2022, United Nations Secretary-General, António Guterres, announced(vi) the United Nations would spearhead **new action to ensure every person on Earth is protected by early warning systems within five years**. He tasked the World Meteorological Organization to lead this effort and present an action plan to achieve the goal at the UN Climate Change Conference in Sharm El-Sheikh, COP27.

This Executive Action Plan, developed in partnership with key partner organizations, summarizes the initial actions required to achieve the goal, and sets out the pathway to implementation. It calls for an estimated new targeted investments of **USD 3.1 Billion** over the five years to advance the four Multi-Hazard Early Warning System (MHEWS) pillars from a scientific & technical, policy and financial perspective.

The plan identifies key areas for advancing universal **disaster risk knowledge**, and outlines the priority actions required to achieve this, building on the aforementioned Sendai Target G report. It prioritizes the top technical actions required to enhance capacity to **detect hazards, close the observations gap, and advance global forecast data processing systems** and data exchange, optimizing international efforts. The plan highlights both the infrastructure, governance and people-centered approach required to effectively **disseminate and communicate warnings**. And it outlines the policies, capacities, finance and collaboration needed to improve **preparedness and response capabilities** over the next five-years.

The plan indicates how **key foundational financing mechanisms will be scaled up** to support the achievement of the goal, including a new framework developed by the Climate Risk and Early Warning Systems (CREWS) Initiative and Green Climate Fund, and the operationalization of the Systematic Observations Financing Facility (SOFF). The plan also calls for **increased coherence and alignment of existing and planned investments from international financing institutions**, utilizing the Alliance for Hydromet Development as an important uniting partnership of climate finance institutions. The plan recognizes existing successful bilateral funds for early warnings and calls for an acceleration of these mechanisms.

Tracking progress, informing decision making, and measuring success are all key to ensuring effective implementation, and so plans are outlined to develop an objective **Early Warnings for All Maturity Index** in advance of COP 28.

To ensure progress and the continued strategic alignment of activities with implementing bodies, the **United Nations Secretary-General is creating an Early Warnings for All Governing Board, co-chaired by the Executive Heads of the World Meteorological Organization (WMO) and the United Nations Office for Disaster Risk Reduction (UNDRR).** Board membership will include many of the key partners who have shaped this Executive Action Plan to date. The Board will report annually on progress to the United Nations Secretary-General in advance of the COP meetings.

In addition, an **annual Multi-Stakeholder Forum** will be organized to enhance consultation and foster collaboration with a wider group of partners.
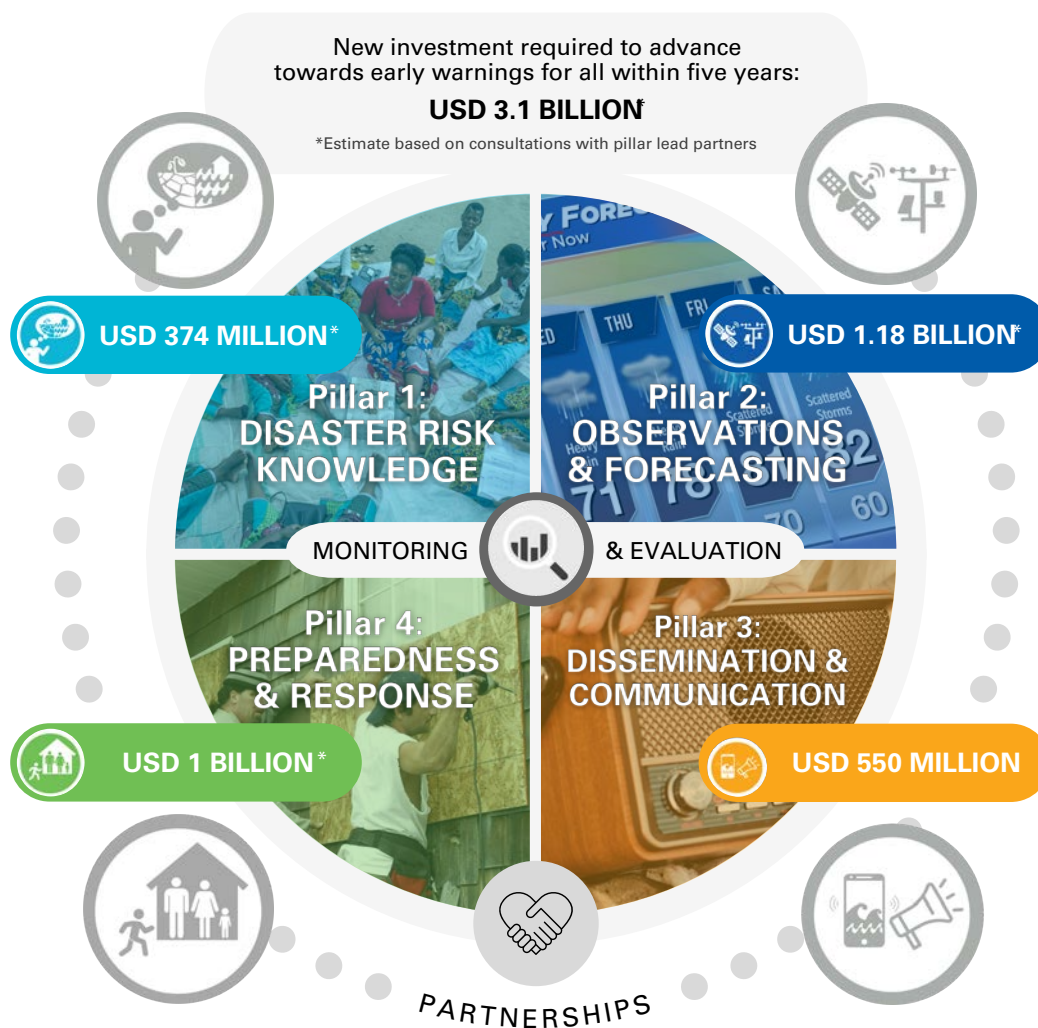
Photographer: Youngchoun Kim
Gimje-si, Jeollabuk-do, Republic of Korea
WMO 2023 Calendar Competition

Figure 1: Budget overview for the four Pillars of the Early Warnings for All Initiative

The Forum will provide an opportunity for the more than 150 organizations who have already registered their interest to supporting the initiative to shape its future implementation. Interested stakeholders ranging from the UN System, hydro-meteorological, early action, financial, academic, civil society, private and disaster sectors will be invited to join.

WMO Members will play a key role in technical implementation, building on the standards and guidance provided by the Commission for Weather, Climate, Water and related Environmental Services and Applications (SERCOM) and the Commission for Observations, Infrastructure, and Information Services (INFCOM) plus other relevant constituent/advisory bodies. **National Meteorological and Hydrological Services (NMHSs) and Disaster Risk Management** agencies, as the relevant authoritative providers, will be central for enabling implementation at the national level.

In the political sphere, countries will continue to be engaged to advance Early Warnings for All through relevant upcoming platforms, such as the 2023 United Nations Water Conference, the Mid-term Review of the Sendai Framework, the United Nation SDG Summit, and future sessions of the UN General Assembly and UNFCCC Conference of Parties meetings.

The need for progress could not be more urgent as 3.3 to 3.6 billion people live in contexts that are highly vulnerable to climate change, and global temperatures are continuing to rise. Collectively, the actions outlined in this plan are designed to ensure **concrete progress** in the years ahead to ensure every person on earth is protected by Early Warning Systems by 2027.

Introduction to MHEWS

A Multi-Hazard Early Warning System (MHEWS) is an integrated system which allows people to know that hazardous weather or climate events are on their way, and informs how governments, communities and individuals can act to minimize impacts. End-to-end MHEWS include risk knowledge, observation and forecasting, communication, and response, as shown in Figure 1 and 2 below. MHEWS should be people-centred to empower those threatened by hazards to act in sufficient time and in an appropriate manner, and must build on partnerships within and across relevant sectors.
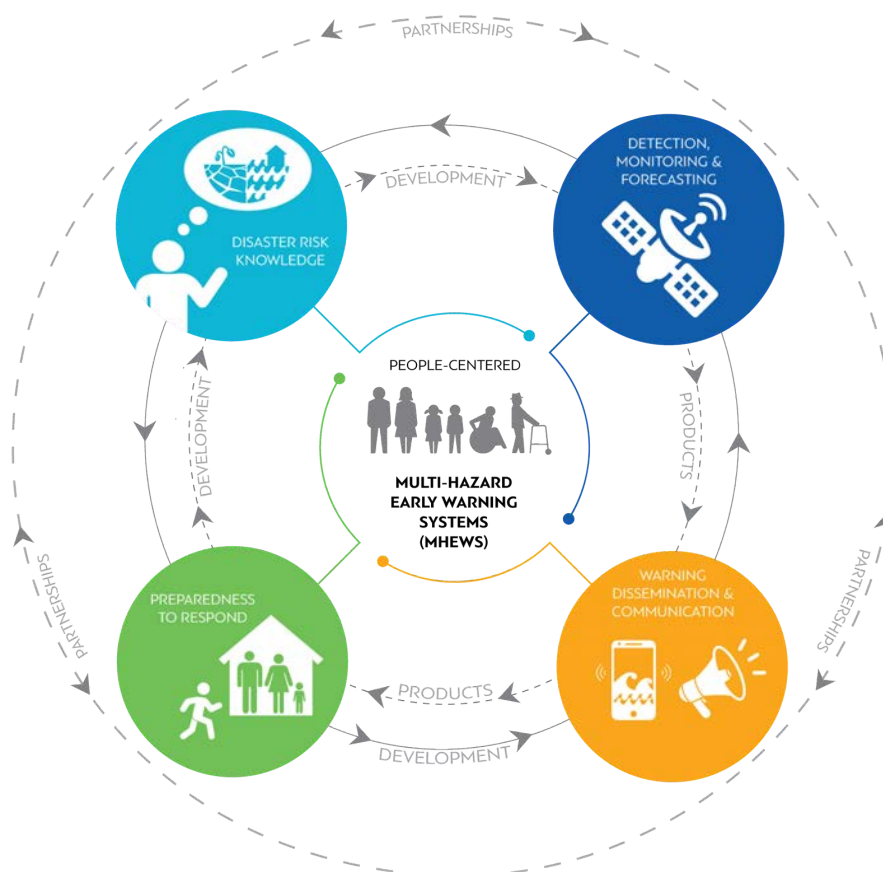
Figure 2: Graphical presentation of a Multi-Hazard Early Warning System (MHEWS)

Figure 3: More detailed explanation of the four components of an early warning system

The current definition of an early warning system was approved by the United Nations General Assembly in its resolution 69/284 on 1 December 2016 following the update of the publication "**2009 UNISDR Terminology on Disaster Risk Reduction**" by the Inter-Agency and Expert Group on Sustainable Development Goal Indicators. The subsequent publication of the "Report of the open-ended intergovernmental expert working group on indicators and terminology relating to disaster risk reduction" coincided with the resolution to develop a set of possible indicators to measure global progress in the implementation of the **Sendai Framework for Disaster Risk Reduction 2015-2030**.
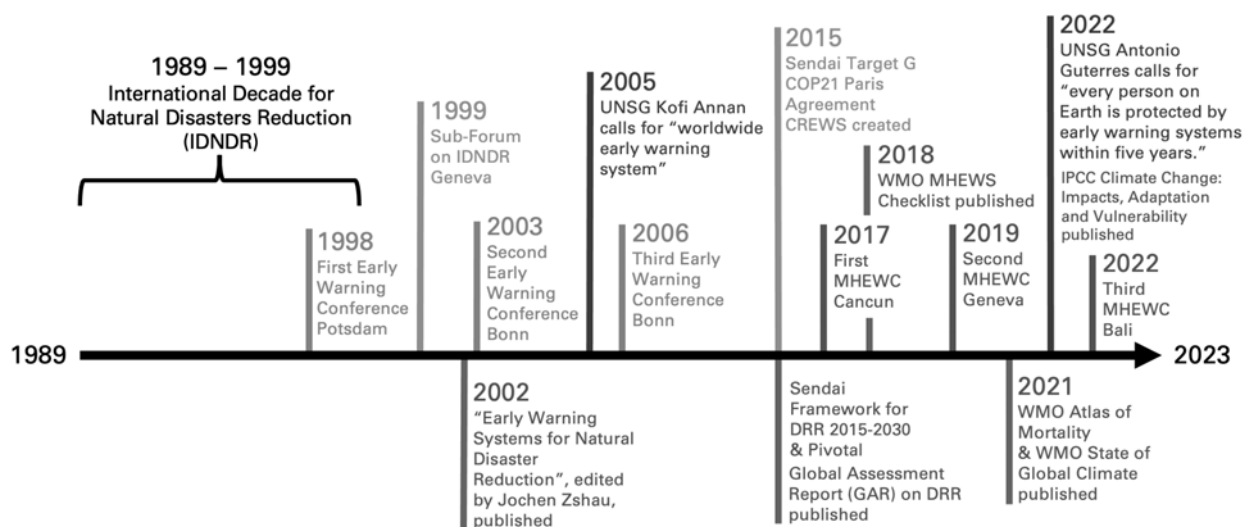
Figure 4: A brief history of event, publication, and announcement milestones in the development of early warning systems from 1989 to the present day

The Global State of Early Warnings
Across the four components of the value cycle

Half of the countries globally are not protected by multi-hazard early warning systems. Coverage is even worse for developing countries on the front lines of climate change.

Least Developed Countries (LDCs), Small Island Developing States (SIDS), and Africa suffer the greatest gaps in early warning systems.

Photographer: Andrés Miraglia
Location: Patagonia, Argentina
WMO 2023 Calendar Competition
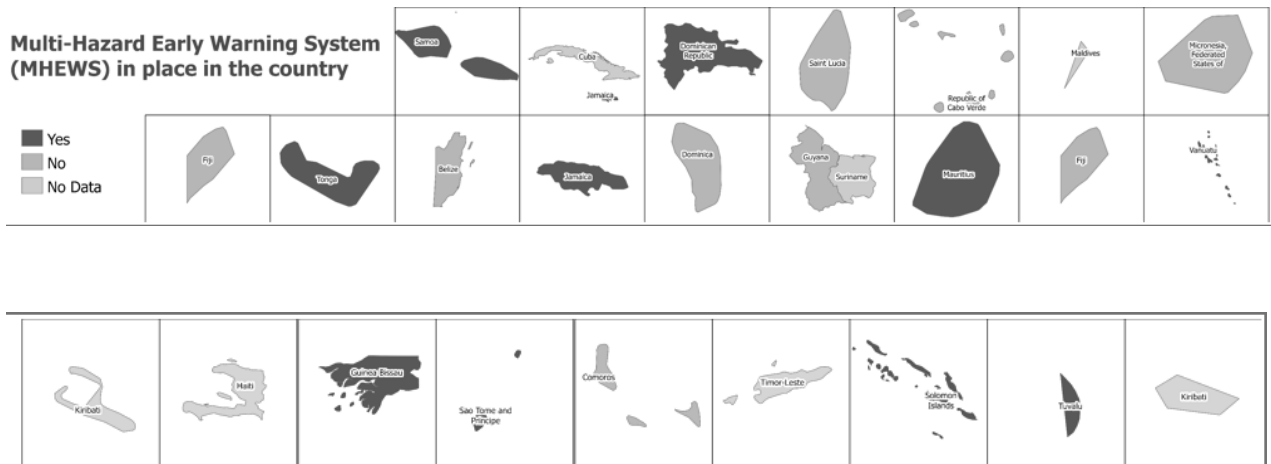
Figure 5a: Status of Small Island Developing States (SIDS) and Least Developed Countries (LDCs) relating to Multi-Hazard Early Warning Systems based on recent 2022 survey of the WMO Member countries.

Based on the **Target G analysis** from the Sendai Framework Monitor data, complemented with data from recent surveys by the World Meteorological Organization (WMO), a report on the Global status of Multi-hazard Early Warning Systems (MHEWS) was launched on 13 October 2022. It presents an overview and a baseline of the status of early warning coverage around the world.

While status reporting from the countries still needs improvement, it is clear at the global scale, that only half of the countries report having implemented MHEWS (Figure 5b). It is also clear that implementation is very uneven across regions. Least developed countries, small island developing states and Africa are in crucial need for improvement and, consequently, for support in doing so.

Disaster risk knowledge, the first classical pillar of MHEWS, suffers from significant shortcomings globally. Less than half of the countries reporting to have MHEWS, indicate they have disaster risk information and assessments available in an appropriate manner. Even fewer countries have MHEWS that are based in national legislation and regulatory frameworks for emergency response, which are essential to ensure their effectiveness (Figure 4). Beyond the technical issues related to data collection and interoperability, a lack of understanding of the socioeconomic benefits of MHEWS, a lack of legislation and governance among national institutions are key drivers to be addressed to remediate the situation.
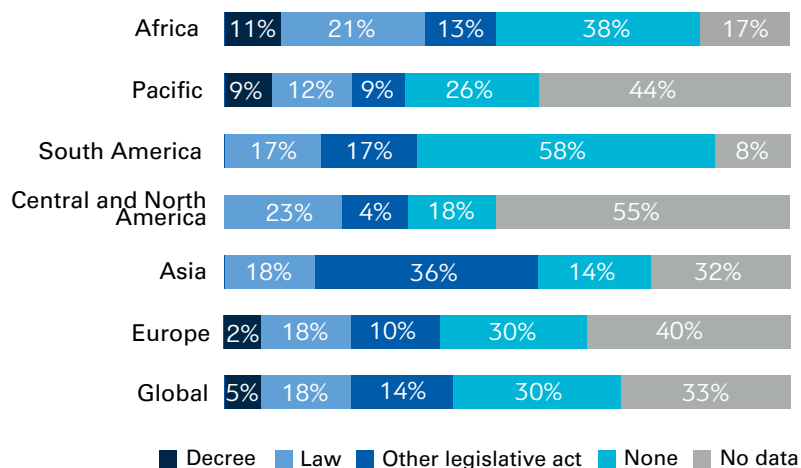
Figure 6: WMO Members reporting to have MHEWS legislation
Source: WMO Performance Monitoring System, August 2022
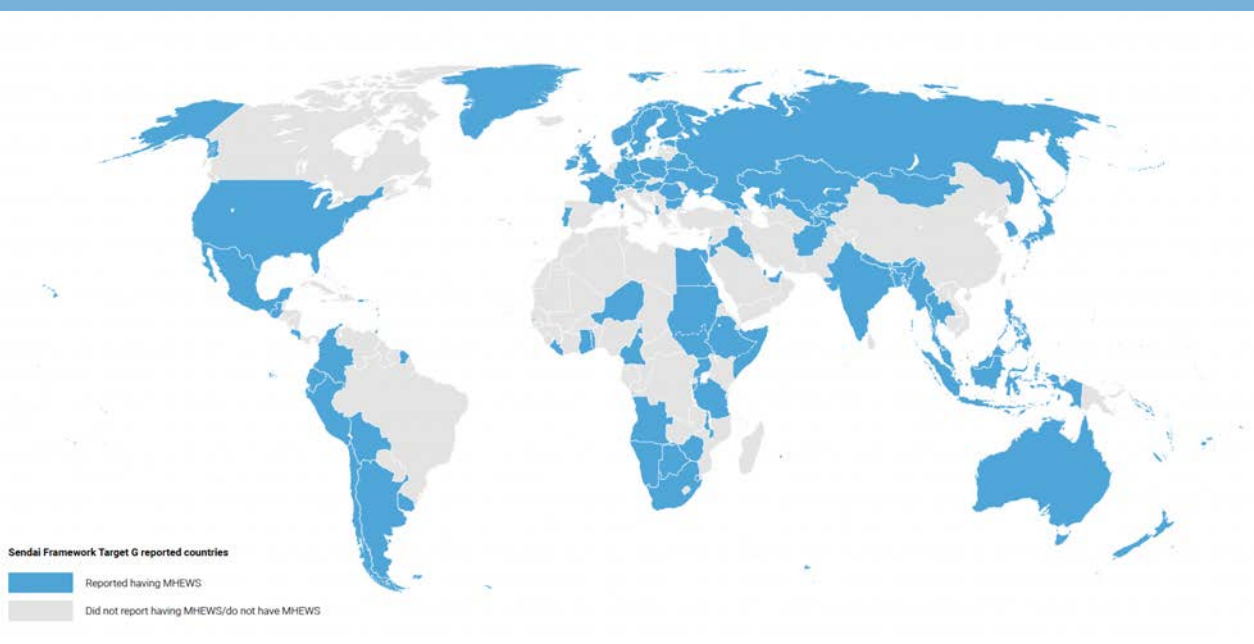
Figure 5b: Countries reporting early warning system coverage through the Sendai Framework Monitor

An assessment of observation, monitoring and forecasting of hazards, reveals significant global gaps. In-situ observations fall far short of meeting the requirements of the Global Basic Observation Network (Figure 6). In the forecasting area, many countries lack the capacity to incorporate an impact-based approach to forecasting and still have challenges in accessing, analyzing and translating prediction model outputs into actionable warning messages.
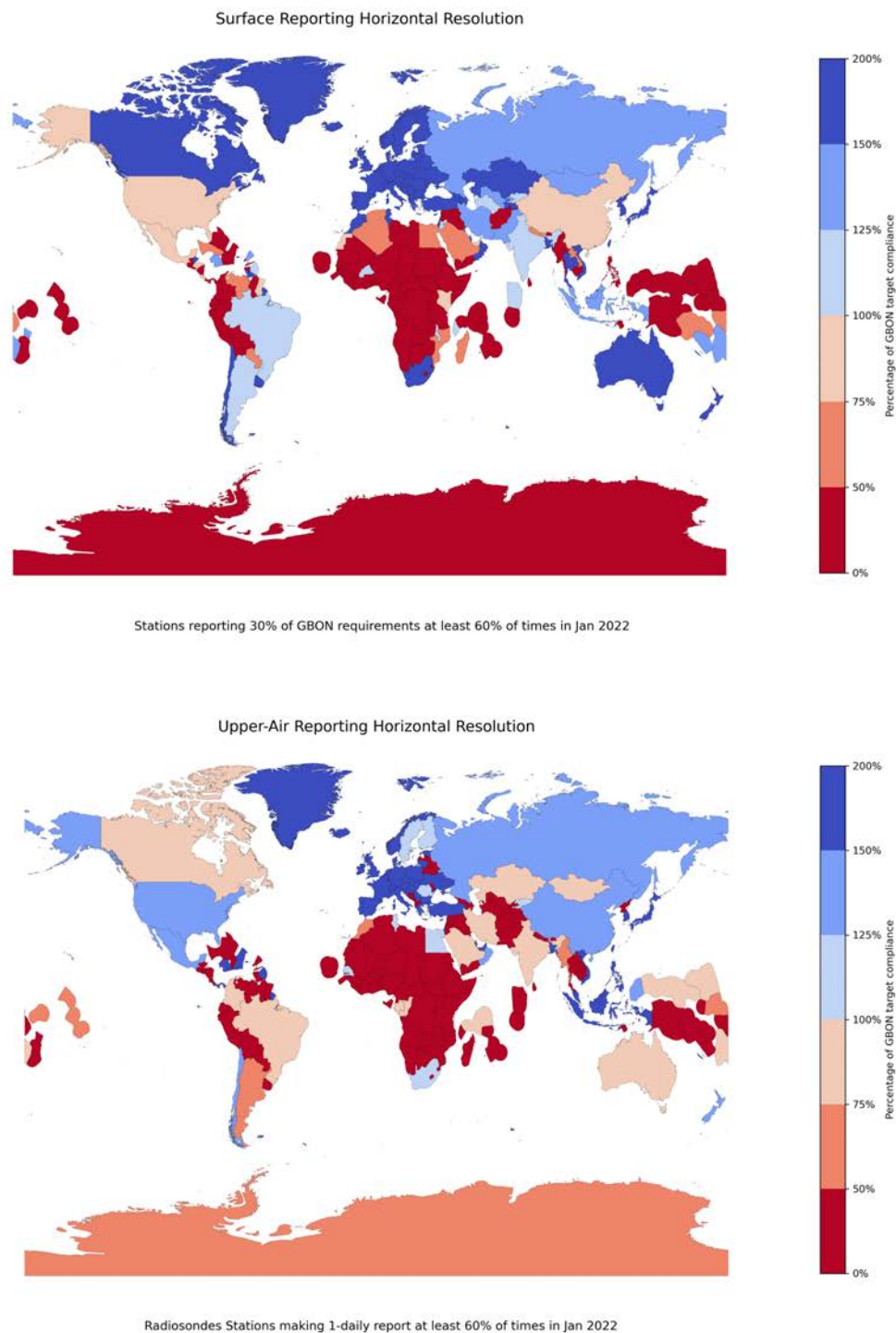
Figure 7: Global Basic Observing Network (GBON) compliance for surface (top) and upper-air (bottom) observations.

Considering **warning dissemination and communication**, the third pillar of MHEWS, alerting authorities, including national meteorological and hydrological services frequently use a variety of communication channels. Differences lie in the uptake of modern information and communication technologies in addition to the traditional mass media such as radios and TV channels, still on top in several regions. Challenges however remain in ensuring that public warnings from official sources are easily recognized, that redistribution including through relays of information at the community levels is inclusive enough to reach all people at risk, especially the most vulnerable. The implementation of the Common Alerting Protocol, although recognized as suitable and ensuring consistency for all hazards and all media is still a gap in many countries (Figure 7).
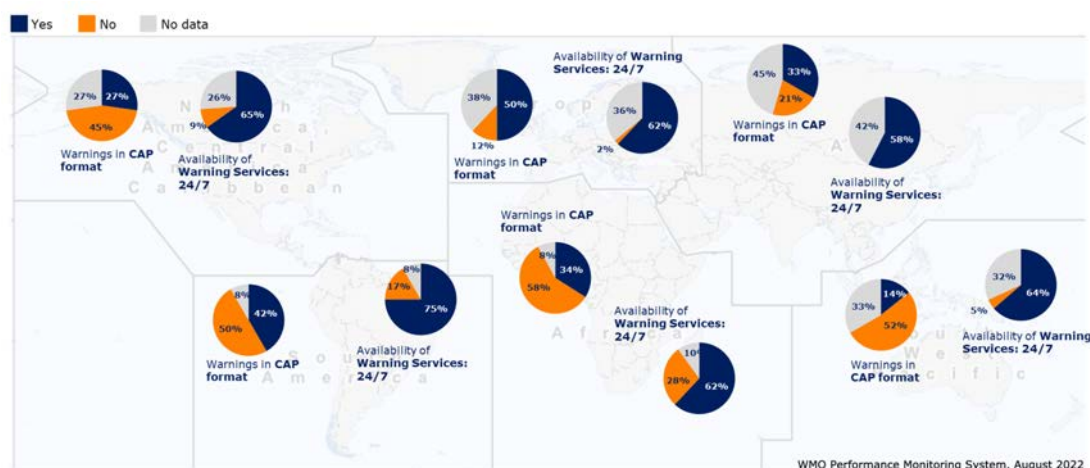
Figure 8: Warning Service Availability through the Common Alerting Protocol (CAP)
Source: WMO Performance Monitoring System, August 2022

Finally, having **preparedness and response** plans and capabilities, including at local government level is vital for responding to warnings issued by the regional or national hydro-meteorological services. Less than half of the countries which have MHWES in place report on the availability of such plans. Identified gaps in this area relate to policy development, governance, collaboration and inclusion at large.
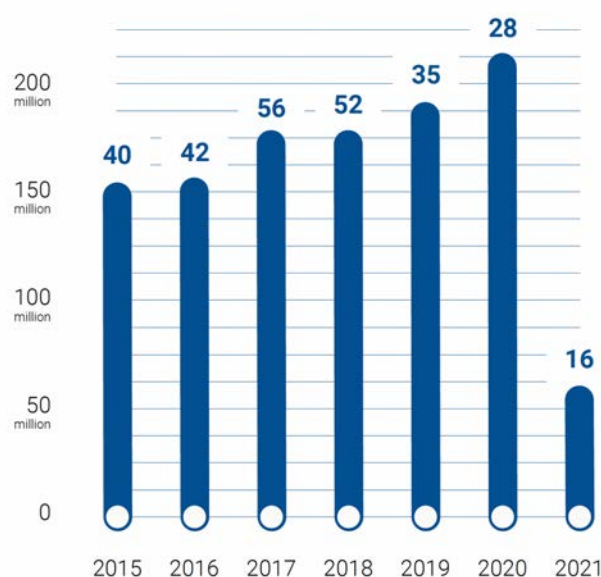
Figure 9: Number of people pre-emptively evacuated following early warnings. The numbers on top of the bars indicate the number of countries who evacuated people in that year. First shown in Target G Report. Note: The overall reporting by countries was degraded in 2021 showing a lower number and does not reflect the situation on the ground due to the lack of data.

Global Development Context
of early warning systems

Human-induced climate change is causing more frequent and intense extreme climate events, resulting in widespread adverse impacts and related losses and damages to nature and people, with the most vulnerable people and systems disproportionately affected. **Early warning systems are a proven, effective, and feasible climate adaptation measure**, that save lives, reduce poverty and economic losses, and are shown to provide near a tenfold return on investment. The IPCC recognizes early warning systems, climate services and disaster risk management activities as key cross-cutting adaptation options, that enhance the benefits of other adaptation measures when combined.

Early Warning Systems are a visible component of the **Sendai Framework for Disaster Risk Reduction**, as reflected in Target G, and are recognized as important areas of cooperation in the **Paris Agreement**, in relation to Article 7 on adaptation, and Article 8 on averting, minimizing and addressing loss and damage. The key components of the Early Warning System value cycle are already recognized in many countries National Adaptation Plans. Lessons learnt from the Early Warnings for All initiative could help to inform the Glasgow-Sharm El Sheikh work programme on the Global Goal on Adaptation.

Early warning systems support the advancement of the **2030 Agenda for Sustainable Development** and provide crossing-cutting benefits to nearly all of the Sustainable Development Goals (Figure 9). Whether it be through supporting agricultural productivity, water security, good health and wellbeing, reducing poverty, enhancing economic growth, or supporting resilient energy systems, cities, oceans and land; early warning systems are a vital tool for decision makers to help progress towards sustainable development. Progress on achieving universal early warning systems will most directly contribute to the achievement of **SDG Indicators 1.5, 11.5, 13.1 and 13.3**.

Figure 10: The United Nations Sustainable Development Goals

Executive Action Plan
to achieve universal coverage 2023-2027

The actions required to achieve the goal of ensuring every person on Earth is protected by early warnings within five years have been broken down into **four pillars aligned with the four components of a multi-hazard early warning system**, already described in more detail above.

The following four sections outline the key top level **financial, policy and scientific and technical actions** required to address the gaps in early warning status globally. Following the pillars are several **cross-cutting enablers**, which are required to bring the pillars together, and ensure effectiveness of the full **early warning value cycle**.

Photographer: Douglas Fischer
Location: Cambará do Sul, Brazil
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Five Year Action Plan Overview
A Framework for implementation

2023	2024	2025	2026	2027

CROSS-CUTTING ENABLERS

Partnerships	Locally led action	Financial	Private sector	Science, research and innovation

SUCCESS LOOKS LIKE:

🔴 POLICY   🔵 TECHNICAL   🟢 FINANCIAL

"All people on Earth must be protected by early warning systems within five years."
- UN Secretary-General Antonio Guterres, March 23, 2022

Sources: Sendai Framework Monitor Target G Indicators (2015-2030), OIEWG Report (2017), MHEWS Checklist (2018), CREWS Core Programme Indicators (2022)

PILLAR 1: DISASTER RISK KNOWLEDGE AND MANAGEMENT

POLICY

FINANCIAL

TECHNICAL

Lead: **UNDRR** UN Office for Disaster Risk Reduction   Supporting entities: WORLD METEOROLOGICAL ORGANIZATION

- **Data and risk assessments** are systematically collected 🔴🔵🟢
- Hazards and vulnerabilities are **well-known by communities** 🔴🔵🟢
- Factor **patterns and trends** are identified 🔴🔵🟢
- **Risk maps** and data are widely available 🔴🔵🟢
- All countries have **geo-referenced data platforms and tools** to **issue impact-based forecasts** 🔴🔵🟢
- All NMHSs or other relevant authorities benefit from **capacity building** measures 🔵🟢
- Sendai Target G Indicator G-5: All countries have **accessible, understandable, usable and relevant disaster risk information** and assessment available to people at national and local levels. 🔴🟢

PILLAR 2: OBSERVATIONS & FORECASTING

POLICY

FINANCIAL

TECHNICAL

Lead: WORLD METEOROLOGICAL ORGANIZATION   Supporting entities: UNDP | United Nations Educational, Scientific and Cultural Organization | UN environment programme

- Sendai Target G Indicator G-2: All countries have **multi-hazard forecast and monitoring systems** 🔵🟢
- The **correct parameters** are monitored 🔵🟢
- There is a **sound scientific basis** for making forecasts 🔵🟢
- **Accurate and timely warnings** are generated 🔵🟢
- All countries have **national plans, strategies and legislation** for their NMHSs 🔵🟢
- All **NMHSs regularly review and report** on the accuracy and timeliness of their services 🔴🔵🟢
- No priority hazards occur without associated **forecasting and warning services** 🔴🔵🟢
- Sendai Target G Indicator G-4: All countries' **local governments have a plan to act on early warnings**. 🔴🔵🟢
- **Achieve GBON compliance** 🔴🔵🟢

PILLAR 3: WARNING DISSEMINATION & COMMUNICATION

POLICY

FINANCIAL

TECHNICAL

Lead: ITU   Supporting entities: IFRC | REAP Risk-informed Early Action Partnership | UNDP | WORLD METEOROLOGICAL ORGANIZATION

- **Warnings reach everyone** at risk 🔴🔵🟢
- Risks and warnings are **understood** 🔴🔵🟢
- Warning information is **clear and useable** 🔴🔵🟢
- All countries have **updated registries of alerting authorities** 🔴🔵🟢
- All countries issue warnings in **Common Alerting Protocol (CAP)** format 🔴🔵🟢
- Sendai Target G Indicator G-3: All people are covered by early warning information through **local governments or through national dissemination mechanisms**. 🔴

PILLAR 4: PREPAREDNESS & RESPONSE CAPABILITIES

POLICY

FINANCIAL

TECHNICAL

Lead: IFRC   Supporting entities: REAP Risk-informed Early Action Partnership | WFP World Food Programme | Food and Agriculture Organization of the United Nations | OCHA United Nations Office for the Coordination of Humanitarian Affairs

- Response plans are **up-to-date and tested** 🔴🔵🟢
- **Local capacities and knowledge** are utilized 🔴🔵🟢
- All people are **prepared and ready to react** to warnings 🔴🔵🟢
- All people are covered by **forecasts and warnings** for a given hazard 🔴🔵🟢
- All people who are living in areas covered by forecasts and warnings have **access to communications** 🔴🔵🟢
- All countries report on **Sendai Target A and G** 🔴🟢
- Sendai Target G Indicator G-6: All populations exposed to or at risk from disasters are **protected through pre-emptive evacuation** following early warnings. 🔴🟢

PILLAR 5: MONITORING & EVALUATION

Step 1: Setting up a working group composed of key stakeholders and relevant experts for each EWS component

Step 2: Defining a conceptual framework, critical components, sub-components and variables for each EWS element

Step 3: Defining levels of maturity (e.g. deficient, basic, intermediate, advanced)

Step 4: Mapping existing data sources, identifying the data needs for targeting and tracking EWS investment and support

Step 5: Integrating the various existing data and information sources for the provision of coordination information to the partners, stakeholders and beneficiaries

Continuous improvement and evolution of the **Early Warnings for All Maturity Index** 🟢

Initial minimum investment required to advance
towards early warnings for all within five years:

USD 3.1 BILLION*

*Estimate based on consultations with pillar lead partners

USD 374 MILLION

DISASTER RISK KNOWLEDGE & MANAGEMENT

- In support of comprehensive risk management
- In the context of a changing climate
- Connecting hazard recording with loss and damage accounting

USD 1.18 BILLION*

OBSERVE, MONITOR AND FORECAST

- With a full Earth system approach,
- Leveraging global and regional resources to support national efforts
- Optimizing and sustaining international exchange of data and information

MONITORING & EVALUATION

USD 1 BILLION *

BE PREPARED AND ANTICIPATE

- Building on enhanced national policies and legislation
- Strengthening preparedness capacities of local government and actors
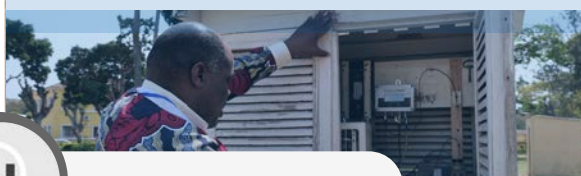- Leveraging existing partnerships at all levels

USD 550 MILLION*

DISSEMINATE AND COMMUNICATE

- Registering and empowering national official alerting authorities
- Leveraging geolocated cell-broadcast among multiple channels
- Using inclusive and people focused approaches to reach all people at risk

PARTNERSHIPS

connect across and within all aspects of the
early warning value cycle

Disaster risk knowledge and management

Disaster risk knowledge and management
Systematically collect data
and undertake risk assessments

- Are the hazards and the vulnerabilities
  well known by the communities?
- What are the patterns and trends in these
  factors?
- Are risk maps and data widely available?

Photographer: Sangseok Kim
Location: Seogwipo-si, Jeju-do, Republic of Korea
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Estimated minimum new investment to deliver early warnings for all in five years: **USD 374 MILLION**

Led by

UNDRR
UN Office for Disaster Risk Reduction

Supported by

**WORLD
METEOROLOGICAL
ORGANIZATION**

**CENTRE OF EXCELLENCE
CLIMATE AND DISASTER RESILIENCE**

Pillar 1: Disaster risk knowledge and management

POLICY | FINANCIAL | TECHNICAL

2023   2024   2025   2026   2027

Knowledge about risk is the first component of a successful early warning value chain. To be effective, this risk knowledge requires a deep and **locally-grounded understanding** of hazards, vulnerabilities, livelihoods, social inclusion, and exposure among other important aspects to **contextualize disaster risk knowledge**. This risk knowledge is not just the domain of experts but is most impactful when **incorporating all forms of knowledge**, from indigenous to scientific, and with a specific focus on understanding risk from the perspective of those who are most vulnerable and those who can help mitigate it.

Building on a long history of engagement, consultation and research, seven risk knowledge outcome themes have been identified, along with associated outcome statements (see Box 1) that will help us achieve the global goal of Early Warnings for All: 1. production 2. access 3. application 4. monitoring and evaluation 5. governance and collaboration 6. locally led action; and 7. innovation.

From these outcomes, a set of priority actions have been identified. Whilst action at all scales is important (including regional and local) the actions presented here are categorized according to global and national scales for clarity in this initial strategy. All of the actions and outcomes are focused on **decision making in support of the most vulnerable** and are designed to raise the capability of risk knowledge to support early warning.

Priority actions

In Year 1 - Building on the Global Status Report of MHEWS (Target G), the focus will be on establishing the state of risk knowledge through the identification of gaps (global, national and sub-national); agreeing on global to sub-national application of knowledge and policies; accelerating the use of innovation and technology to achieve the goal; and identifying a *minimum risk knowledge global and national data and capability* for early warning. This will result in a costed, national level focused plan to build this capability in coordination with existing global risk databases, relative to priority hazards, impacts and vulnerabilities.

In Year 2 - The foundations required for implementing the plan will be laid, including commitments and allocations of funding. Implementation will be initiated in a first tranche of countries. A minimum risk knowledge capability will be agreed upon and worked towards, with gaps filled at a global scale through application and integration of global projects and processes. Institutional capacity to deliver support with and by national actors will be built.

Year 3 - Will be about further implementing the plan with an increase percentage of target countries (at least 40%) starting to achieve the minimum.

Year 4 - Will accelerate implementation with 80% of countries starting to achieve the minimum risk data and capability.

Year 5 - Will see all countries achieving the minimum risk data and capability for risk knowledge.

The Seven Risk Knowledge Outcome Themes

1. Risk Knowledge – Production (25%) USD 93.7 million
- Outcome: Countries have a minimum capability where they are able to produce quality, timely and contextually relevant risk information, where vulnerable communities are able to participate in the process.
- Catalytic Action: Significantly strengthen the ability of countries to produce national, sub/national, and local risk information, integrating existing community knowledge, to a defined minimum capability (vulnerability, exposure, hazard).

2. Risk Knowledge – Access (20%) USD 75 million
- Outcome: Those who need it are able to access standardized, interoperable and updated risk information that can inform their decisions
- Catalytic Action: Ensure that countries have access to open and relevant risk data, metrics and analysis to support decision-making.

3. Risk Knowledge – Application (15%) USD 56.2 million
- Outcome: Relevant actors are able to use risk information to inform decision-making for early warning.
- Catalytic Action: Develop institutional capacity to incorporate risk knowledge into early warning systems.

4. Risk Knowledge - Monitoring and Evaluation (5%) USD 18.7 million
- Outcome: Countries are able to monitor the availability and effectiveness of early warning systems, and use this to update their approaches.
- Catalytic Action: Enhance national capacities to report better on Sendai Framework Target G and custom indicators.

5. Risk Knowledge – Governance/Collaboration/Inclusion (10%) USD 37 million
- Outcome: Strengthened collaboration between key Ministries, academia, the private sector and vulnerable communities generates improved risk information
- Catalytic Action: Support countries to define roles/responsibilities and ways of working that prioritize collective action, including at community-level.

6. Risk Knowledge – Robust Locally led understanding (15%* (assumes most of this is covered in pilar 3)) USD 56 million
- Outcome: Risk knowledge capability is built through a combination of local, traditional, Indigenous, generational and scientific knowledge that can enable resilience under a range of future risk scenarios.
- Catalytic Action: Build on existing approaches to ensure that all risk knowledge capability is locally led where possible, people centered and strengthened through an increased use of citizen science.

7. Risk Knowledge – Innovation (10%) USD 37 million
- Outcome: Innovation, particularly through the use of new and existing technologies drives a step change in risk knowledge capability at all scales that is for all, rather than those who are most developed.
- Catalytic Action: Shift focus of technology application, innovation and development in risk knowledge from 'state of the art' to driving rapid change in all other themes.

Estimated minimum new investment to deliver early warnings for all in five years: **USD 374 MILLION**

Disaster risk knowledge and management

Action Track	2023	2024	2025	2026	2027	Financials
1. Fill Gaps: global, national and sub-national	Building on Global Status Report of MHEWS: identification of gaps (global, national and sub-national)	Gaps filled at a global scale through application and integration of global projects and processes				(based on assumption of **150 countries targeted and $500k cost per year per country**). Broken down according to outcome theme in $ (based on above) and % of total: 1. Risk Knowledge – Production (25%) **$93.7m** 2. Risk Knowledge – Access (20%) **$75m** 3. Risk Knowledge – Application (15%) **$56.2m** 4. Risk Knowledge - Monitoring and Evaluation (5%) **$18.7m** 5. Risk Knowledge – Governance/Collaboration/Inclusion (10%) **$37m** 6. Risk Knowledge – Robust Locally led understanding (15%* (assumes most of this is in pilar 3)) **$56m** 7. Risk Knowledge – Innovation (10%) **$37m**
2. Plans/Policy (Global to sub-national)	Agreeing global to sub-national application of knowledge and policies	**A minimum risk data and capability will be agreed and worked towards** $500k per country targeted				
3. Governance/Collaboration	*Identifying a minimum risk knowledge global and national capability*	Improve access/quality of risk data and enhance loss and damage tracking systems in 125 countries, with 100% coverage for LDCs & SIDS and 40% of countries achieving minimum capability.		80% of countries achieve the minimum risk knowledge capability	All countries achieve the minimum risk knowledge capability	
4. Application	WMO hazardous events database synergized with the UNDRR Sendai Framework disaster losses and damage tracking system & Risk Information Exchange (RiX)					
5. Capability building: Global and national institutions/actors	Developing a national level focused plan to build capability in coordination with existing global risk databases, relative to priority hazards, impacts and vulnerabilities	Building Institutional capacity to deliver support with and by national actors Strengthen national and local capacities to produce, access and apply risk information				
6. Innovation and technology: Global to sub-national	Accelerate the use of innovation and technology to achieve the goal	Innovation and technology applied to gap filling				
7. Financial: Agencies/international actors do better with existing funding, donors provide new funding	Cost the national-level capability plan	Commitments and allocation of funding (USD 50 million in total based on 200k per country and remainder for work planning)				

● POLICY　　● TECHNICAL　　● FINANCIAL

Detection, Observations, Monitoring, Analysis and Forecasting

Detection, observations, monitoring, analysis and forecasting of hazards

Develop hazard monitoring and early warning services

- Are the right parameters being monitored?
- Is there a sound scientific basis for making forecasts?
- Can accurate and timely warnings be generated?

Photographer: Yurii Bershadskiy
Location: Nikolaev, Ukraine
WMO 2023 Calendar Competition

Estimated minimum new investment to deliver early warnings for all in five years: **USD 1.18 BILLION**

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Pillar 2: Observations and Forecasting

POLICY | FINANCIAL | TECHNICAL

2023 2024 2025 2026 2027

Early Warning Systems are underpinned by a global upward reporting of surface and space-based observation data, exchanged freely between all countries, and ingested into several highly advanced supercomputing modelling centres. These centres run numerical models which replicate the physical interactions of the full Earth System (weather, hydrology, ocean, cryosphere and more) to create predictions, which are then cascaded back down from global to regional and national levels, so that National Hydrological and Meteorological Services can provide forecast services to their citizens. Without this daily, complex, global effort, modern day weather and hydrology forecasts would not be possible.

Observations are the fuel that feeds this system. They are critical for predictions of all timescales and can be particularly important for predictions of high-impact weather and water hazards on timescales up to six hours. Closing the gap on the Global Basic Observing System (GBON) is an essential step for supporting Early Warnings for All, measured through a global indicator of change, including specific sub-indicators for SIDS and LDCs to ensure that priority gaps are closed. The Systematic Observations Financing Facility (SOFF) is the dedicated funding mechanism for the implementation of GBON (see SOFF deep dive box, page 25).

Hydrological observations also suffer significant gaps and hydrological data is often not exchanged between countries as freely as atmospheric observation data. This poses major challenges for warnings of droughts and floods – two of the most impactful climate hazards for people. Around the globe 145 countries share 263 transboundary basins, covering half of Earth's land surface, making hydrological data sharing an issue of high regional importance.

The networks that enable the exchange of data, namely the WMO Information System (WIS) is going through a process of modernisation to enable weather, water and climate information to be more related to socioeconomic and other data through an open ecosystem of tools, applications and services. This too is a critical step for advancing early warnings.

Moreover, from the forecast and alerting perspective, countries have access to global products, but require support in identifying and assessing information reliability across timescales. Supporting countries in evaluating multiple sources of information and to identify which products offer good skill for the parameters of interest and downscaling these products to decision relevant forecasts and enable actionable alerts.

The Global Multi-Hazard Alert System (GMAS) Framework, an initiative of the WMO in which many partner agencies have engaged and significantly contributed, aims to enhance the alerting capabilities of countries to close the EWS coverage gaps and support regional coherence in dealing with common hazards and alerts.

Additionally, supporting the paradigm shift from providing information on "what the weather/climate will be" to "what the weather/climate will do" or impact-based forecasting and warning services (IBFWS) underlies actionable alerts. It requires a structured approach and effective partnership to combining hazard related information with exposure and vulnerability data (from the first pillar, Disaster Risk Knowledge) to identify risk and support decision-making. Its ultimate objective is to encourage early action that reduces damages and loss of life from natural hazards by providing information about the hazard, about the potential impacts it may cause and recommended actions to minimize the effects of these impacts for society (UNESCAP, 2021 and WMO 2021).

WMO Members will continue to play a vital role in the technical implementation of this pillar through the work of the Commission for Weather, Climate, Water and related Environmental Services and Applications (SERCOM) and the Commission for Observations, Infrastructure, and Information Services (INFCOM) and other important constituent and advisory bodies.

Key action areas

1. **Enhancing capacity to detect hazards:**
   a. Conduct gap analyses on early warning needs (national, regional) e.g. flood and drought, flash flood, tropical cyclones, heatwaves, tsunami, glacier lake outburst floods etc. Expand the Cataloguing of Hazardous Events (WMO-CHE) to all climate driven hazards and their monitoring requirements.
   b. Enhance the timely access to, and use of satellite observations and of advanced technologies (radar, lightning detection) to build up detection and forecasting capabilities: action: establish satellite nowcasting facilities in Africa and South America; funding requirements.

2. **Close the observing gaps to meet the data needs for monitoring hazards (Estimated for 70 priority countries**
   a. Establish and implement the Global Basic Observing Network to deliver timely data to global weather prediction systems - the critical foundation for EWS;
   b. Close ocean and cryosphere observation gaps in hot spots (coastal areas, high mountains, etc.)
   c. Accelerate the implementation of the WMO Action plan for hydrology, including establish regional hydrological status systems (HydroSOS)

3. **Enhance the existing framework and the capabilities of global data processing, forecasting, and analysis systems.**
   a. Expand the network of Regional Specialized Hydro-Meteorological Centres and the associated National Hydro-Meteorological Centres with at least 13 new centres (e.g Northern Africa, South America, Middle East, Caucasus, Eastern Europe, Oceania, Central Asia) to meet region specific needs, e.g. Severe Weather Forecasting, flood and flashflood forecasting, high resolution weather prediction, nowcasting, tropical cyclones, impact-based forecasting, tsunami, etc. Estimated funding requirement

4. **Sustainable data and Information exchange infrastructure to support EWS**
   a. Technical development: Accelerate the implementation of the WMO Information System 2.0 (WIS 2.0) – to enable timely and sustained data access and develop technical capabilities.
   b. Policy advocacy and implementation: Policy development that would enable the increased sharing of data or critical importance for early warnings, underpinned by the implementation of the WMO Unified Data Policy.

5. **Optimize international efforts on observation, monitoring, and forecasting in support of EWS, as fostered by, for example, UNDP, UNEP, UNESCO. and upscale successful regional initiatives on sharing data and forecasting products**

Estimated minimum investment to deliver early warnings for all in five years: **USD 1.18 BILLION**

Detection, Observations, Monitoring, Analysis and Forecasting

Action Track	2023	2024	2025	2026	2027	Financials
1. EWS infrastructure gap analysis and hazard cataloguing. At least 100 countries – 65 SIDS and 35 ODA countries. WMO, UNDRR, UNEP, UNDP, UNESCO*	Gap analysis and Cataloguing of hazards Target support coverage of 26 countries*	Gap analysis regional/national	Gap analysis regional/national	Gap analysis and impact evaluation	Gap analysis regional/national	USD 60 M
2. SOFF implementation At least 100 countries – 65 SIDS and 35 ODA countries	35 countries investment support, 15 countries operations and maintenance finance		55 countries technical assistance, of which	100 countries technical assistance, of which 65 countries investment support, 50 countries operations and maintenance finance		USD 400 M
3. Global Observations: *surface: at least 100 countries. *satellite data use (6 hubs) –WMO, UNESCO, UNEP, UNDP, + Sat Agencies	Surface (Terrestrial/Marine) Stations – planning Satellite data hub phase 1	Surface Terrestrial/Marine Stations roll out phase 1 Satellite data hub phase 2	Surface Stations Terrestrial/Marine roll out phase 2 Satellite data hub phase 3	Surface Stations Terrestrial/Marine roll out phase 3 Satellite data hub phase 4	Surface Stations Terrestrial/Marine roll out phase 4 Satellite data hub phase 5	USD 500 M
4. Establish 13 new Regional Specialised Meteorological and Hydrological Centres – progressively. WMO and partners	Pilot and Launch phase 1. RSMC and RMHS	RSMC and RMHS phase 1	RSMC and RMHS phase 2	RSMC and RMHS phase 3	RSMC and RMHS phase 4	USD 120 M
5. Data policy & data and information exchange infrastructure (WIS) WMO, UNESCO, UNDP, UNEP	• Advocacy/policy development • Technical development • International exchange of tropical cyclone warnings piloted in WMO Information System (WIS) 2.0	• Advocacy/policy development • Tech. Implementation • International exchange of 2 additional hazard event types piloted in WIS 2.0	• Advocacy / policy implementation phase 1 • Tech. Implementation • International exchange of 2 additional hazardous event types piloted in WIS 2.0	• Advocacy / policy implementation phase 2 • Tech. Implementation • WIS 2.0 pilots brought to scale	• Advocacy / policy implementation phase 3 • Tech. Implementation phase 3 • WIS 2.0 operationally exchanges all warnings	USD 100 M

● POLICY   ● TECHNICAL   ● FINANCIAL

A deep dive on SOFF

Systematic Observations Financing Facility (SOFF) – Closing the basic weather and climate data gap in SIDS and LDCs

SOFF was launched in July 2022 and has an ambitious target to support 100 countries. 65 SIDS and LDCs with technical assistance, investments, and open-ended results-based funding and 35 ODA eligible countries with technical assistance. In November 2022, the first 26 countries to receive SOFF support have been approved.

According to the WMO Global Basic Observing Network Global Gap Analysis 2022, the Pacific, Caribbean and Sub-Saharan Africa are areas with significant data gaps. Out of the 26 countries, 17 have less than 25% of the required GBON infrastructure. The initial group of countries represents about 40% of the total GBON gap in SIDS and LDCs. Implementation of SOFF in these initial countries will bring large improvements in upper air observations critical for Numerical Weather Prediction models; opportunities to improve existent upper air and surface stations; and high potential for regionally coordinated action to optimize the global basic weather and climate observing network.

	West Africa	Central and East Africa	Southern Africa
Africa	4	6	3
Asia	4		
Pacific	5		
Latin America and the Caribbean	4		

Table 1: On 2nd November 2022, the first 26 countries to receive SOFF support have been approved.

Figure 11: Countries for the first batch of SOFF programming. Closing the most significant gaps while maximizing opportunities for regionally coordinated action. Source: SOFF Secretariat

This material therein does not imply the expression of any opinion whatsoever on the part of SOFF concerning the legal status of any country, area or territory or of its authorities, or concerning the delimitation of its borders.
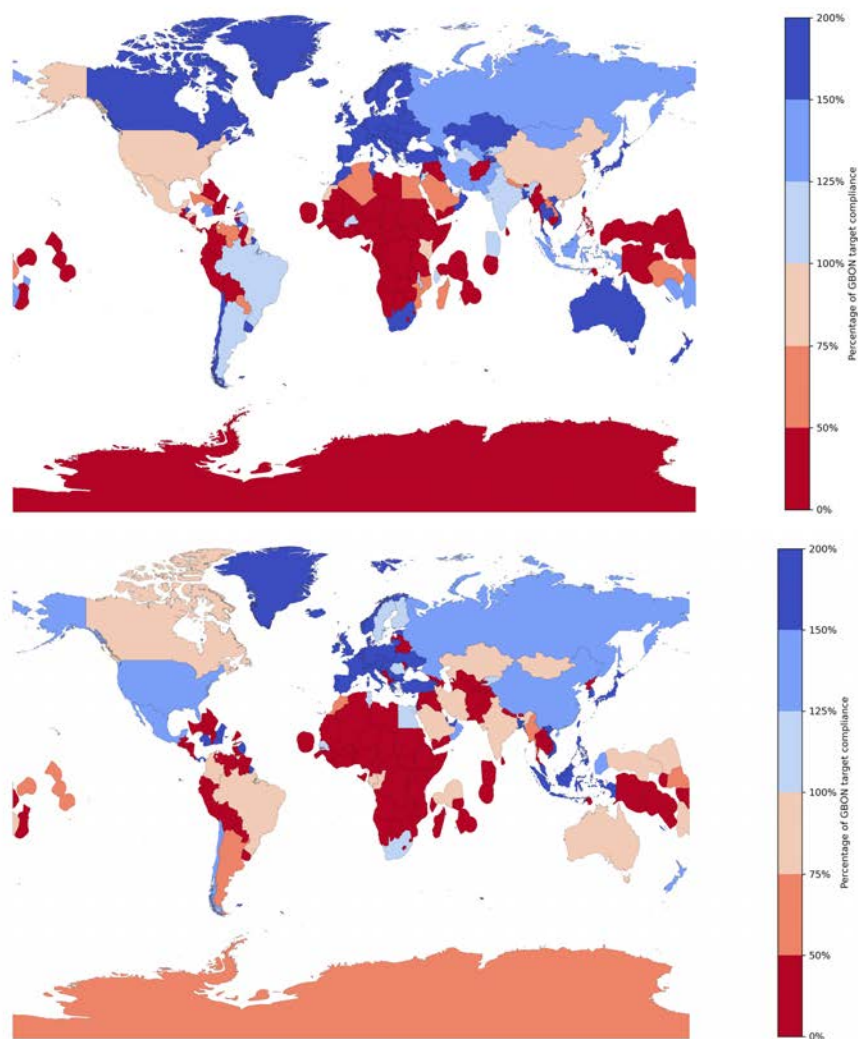

Figure 12: WMO Global GBON Gap Analysis for surface (top) and upper air (bottom) stations. Areas in dark red are far from meeting the GBON requirements. Source: WMO Global GBON Gap Analysis, January 2022.

A deep dive on integrating water and climate agendas

Water is the primary vehicle through which we feel the threats of climate change. Over the past twenty years, water-related hazards have consistently increased in frequency and intensity with at least 1.6 billion people having been affected by floods and 1.4 billion by droughts. (World Bank, 2021)[1]. A weather, climate or water-related disaster has occurred on average every single day within the past 50 years– taking the lives of 115 people daily and causing US$ 202 million in daily losses (WMO, 2021)[2]. As currently 1/3 of the world's population is not covered by early warning systems, we are risking to at least doubling the population exposed to floods and droughts due to climate change (IPCCC, 2022)[3]. These challenges will intensify with future climate change, population growth and increasing economic activities in flood prone areas, underscoring the importance of building resilience to socio-economic impacts of extreme events.

In Summer 2022, Pakistan was severely affected by extensive floods following a record heat wave earlier this year. This caused approximately $10 billion in damages to infrastructure, homes and farms, affecting more than 33 million people (about 15% of the population) and their livelihoods[4]. In the previous year, extreme flood events affected Western Europe, causing an estimated 40 billion damages in Germany alone[5]. On the flip side of the coin, droughts have a slower onset but can cause dramatic food insecurity, economic downturn, unemployment, poverty, conflict, and internal displacement or migration. Estimates from the NOAA attribute to droughts a cost to the USA of at least $249 billion since 1980, with an average of more than $9.6 billion incurred during each major event[6].

To overcome these challenges and build resilient societies and economies effective end-to-end early warning systems for floods, droughts and water-related hazards are urgently needed. WMO, joining forces with the Global Water Partnership and other partners, has been promoting an integrated approach to flood and drought management, since 2001 through the Associated Programme on Flood Management and since 2013 through the Integrated Drought Management Programme. Moreover, the World Meteorological Congress adopted in its Extraordinary 2021 session the WMO Vision and Strategy for Hydrology, articulating over 8 long-term ambitions of which the first two are "No one is surprised by a flood" and "Everyone is prepared for a drought".

These are supported by other ambitions covering the need to have high quality data to support the science feeding operational hydrology. Developing a global early warning system mechanism will enhance capacity to anticipate and manage floods and droughts across scales, which is also supported the Water and Climate Coalition (cofounded by WMO with 9 UN Agencies and GWP, now with more than 160 members). Fragmentation and gaps in water and climate data at the local, national and regional levels constitute, together with the lack of forecasting system and good governance systems and proper communication and preparedness at the grass-root level, are the biggest challenges in managing risks of floods and droughts. More and better (quality assured) data needs to be accessible across countries and scales to benefit all. The AWARe Initiative (to be launched at CO27, led by Egypt) will help addressing these challenges.

Photographer: Abbas Raad
Location: Iraq
WMO 2023 Calendar Competition

Budget for Water, Hydro and Cryosphere related challenges*

In USD, for minimum 100 countries

🔴 POLICY 🔵 TECHNICAL 🟢 FINANCIAL

Pillar 1 — 12 mil
- Global flood and drought risk mapping and information tool **10 mil** 🔴🔵🟢
- Development of tools and modules to assess and analyse the uncertainty of extreme conditions is available **2 mil** 🔵🟢

Pillar 2 — 1.65 bil
- Optimize the hydrological observation network and monitoring. **5 mil per country** 🔵🟢
- Global Water Data Portal. **1 mil (250 K per year)** 🔵🟢
- Implementation of Hydro Status and Outlook System (HydroSOS) at the global, regional and national scale; Define set of parameters to monitor and support sustainable development on a long-term scale in cooperation with relevant organizations. **5 mil per country; 50 mil for global scale** 🔵🟢
- GDPFS – development of hydrological centres, including regional forecasting and assessment centres/systems **20 mil; 1.2 mil per year** 🔴🔵🟢
  - 1) establishment of global centres on flood, drought and cryosphere within GDPFS and training of NMHSs to process and apply the information to the local context
  - 2) Global products for local use – Regional Specialized Hydrological Centre (RSHC) of GDPFS provide to Members Water Regional Assessment products, including training products and tools for interpretation
- Development of Regional/National/Global data and products for flood (urban/flash/riverine) and drought modeling and forecasting systems (including cryosphere) **2 mil per country; 30 global** 🔵🟢
- Development of water quality monitoring and modeling system at global, regional, and national level including training materials development and implement **1.2 mil per country; 25 mil global scale** 🔵🟢

Pillar 3 — 360.6 mil
- Development of global, regional/ national flood and drought early warning platforms including training. **1.5 mil per country; 10 global** 🔴🔵🟢
- Capacity building activities organized through APFM and IDMP, including curricula and training material based on needs identification, developed to enhance Members' flood and drought management capacities and capabilities. **1.3 mil per year** 🔵🟢
- Identification of requirements on globally/regionally/nationally produced information for use in flood and drought assessment, modelling and prediction at the national scale by NHSs, and Development of an interface for NHSs to search, use and interpret the products including training. **2 mil per country; 30 mil global** 🔵🟢
- Operational guidance and tools for verification of available products. **600k** 🔵🟢

Pillar 4 — 75 mil
- Simulation exercise to test the effectiveness of flood and drought early warning systems and platforms **200k per country** 🔴🔵🟢
- Capacity development on Search and Rescue operation for floods. **300k per country** 🔵🟢
- Coordination and collaboration with multi-stakeholders for effective flood and drought response. **250k per country** 🔴🔵🟢

*This is a calculation of comprehensive global hydrological capacity development which are not included in the overall global envelope amount.

Warning dissemination and communication

Warning dissemination and communication

Communicate risk information and early warnings

- Do warnings reach all of those at risk?
- Are the risks and warnings understood?
- Is the warning information clear and usable?

Photographer: Rodolfo Romeor
Location: Sossusvlei Desert, Namibia
WMO 2023 Calendar Competition

Estimated minimum new investment to deliver early warnings for all in five years: **USD 550 MILLION**
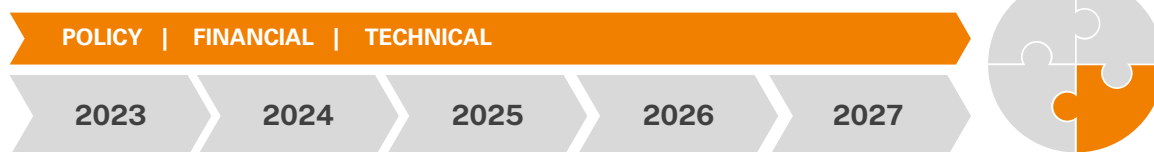
Led by   *Supported by*

ITU

IFRC   REAP Risk-informed Early Action Partnership   UNDP   WORLD METEOROLOGICAL ORGANIZATION

Pillar 3: Warning dissemination and communication

POLICY | FINANCIAL | TECHNICAL

2023   2024   2025   2026   2027

The fundamental purpose of an early warning system is to ensure people receive warnings in advance of impending hazardous events, so that they can take the necessary actions to save lives, livelihoods and to support longer-term resilience.

Effective early warning services are **co-designed** with the 'clients' they serve and have **feedback mechanisms** to help ensure messages reach people through **preferred and trusted** communication channels, in **actionable formats** and in a **timely manner** to support decision making. This co-design process duly recognizes and seeks to address the structural inequalities too often facing women, youth, children, disabled, displaced, Indigenous Peoples and marginalised ethnic groups in receiving, understanding and acting on early warning services.

Building on a long history of engagement, the following outcomes and priority actions were identified for the warning dissemination and communication pillar.

1. **Governance**
    a. Outcome: All countries have agreed on functions, roles and responsibilities for each actor in the warning dissemination process and this is defined through government policy
    b. Catalytic Actions:
        i. Advocate and support efforts to establish designated functions, roles and responsibilities in national warning dissemination process through legislation. Review the design and process of updating the WMO Register of Alerting Authorities (RAA)
        ii. Promote advocacy efforts to populate the RAA with mandated alerting agencies
2. **Infrastructure networks and services**
    a. Outcome: Last-mile communication - All countries ensure the warnings reach those at risk by using multichannel dissemination and communication alerting
    b. Catalytic Actions:
        i. Identify and strengthen several of the most efficient, preferred and trusted communication channels to reach communities at risk
        ii. Promote the implementation of geo-located mobile early warning services using cell-broadcast and/or location-based SMS
        iii. Promote a regulatory approach, based on the model adopted by several countries including the EU, which has mandated the use of geo-located alerts using mobile networks
        iv. Work with mobile network operators and the GSM Association to provide support and expertise in strengthening networks and services in countries
        v. Together with the private sector develop an investment model to support countries in establishing a basic mobile EWS
        vi. Leverage Artificial Intelligence to support the development of 'client' profiles and scale the dissemination of actionable

1. **Inclusion and people-centered approach** including through existing local networks
   a. Outcome: Strengthened and expanded alert dissemination and feedback channels reaching all people with actionable information.
   b. Catalytic Actions:
      i. Leverage existing community-based infrastructures such as Indigenous Knowledge Systems (IKS), Community-based flood and drought management, IFRC, civil society and faith-based organization in the dissemination of early warnings.
      ii. Establish locally led feedback mechanisms to inform iterative service development and delivery plans
      iii. Establish partnerships with intermediaries (i.e., journalists, extension officers, etc.) and provide training to appropriately interpret and disseminate authoritative and actionable alerts without distorting the intended information
      iv. Promote co-development of actionable early warning repository messages with last mile users to ensure information is easily understood by the target community (including the language)
      v. Strengthen collaboration with the social science research community to better understand HOW to communicate warnings in an effective manner to ensure they are understood and appropriately acted upon.
2. **Quality and trust**
   a. Outcome: All countries have the capability for effective, authoritative emergency alerting that leverages the Common Alerting Protocol (CAP), suitable for all media and all hazards.
   b. Catalytic Actions:
      i. Establish a CAP Help Desk to support countries in adopting and effectively using the CAP standard
      ii. Establish CAP editor and Alert Hub to further enhance multi-hazard CAP based emergency alerting
      iii. Training of various sectoral 'clients' to support the use of CAP messages in decision making processes
      iv. Develop an attribution statement for redistributors, such as the private sector, when using alerting information
      v. Develop global, regional and national dashboards that display active early warning messages / alerts

Photo credit: IFRC

Estimated minimum investment to deliver early warnings for all in five years: **USD 550 MILLION**

Warning dissemination and communication

Action Track	2023	2024	2025	2026	2027	Financials
1. Governance arrangements support efficient and effective EWS (WMO - GMAS, IFRC, UNDRR, etc)	Develop a strategy and action plan to clarify roles/ responsibilities in national warning procedures	25% of target countries have legislation clarifying warning procedures	Redesigned Register of Alerting Authorities	75% of target countries have legislation clarifying warning procedures	100% of target countries have legislations clarifying warning procedures.	**USD 70 million** (500k for each of the 140 countries)
2. Infrastructure networks and services (ITU with IFRC, UNDRR, WFP, WMO, etc. and private sector support)	• 15% of target countries, identify and strengthen trusted communication channels • Develop a strategy and action plan to support a regulatory approach to geo-located EWS • Develop an investment model to establish a basic mobile EWS	• An additional 25% of target countries strengthen trusted communication channels • 25% of the target countries have adopted a regulatory approach to geo-located EWS • All target countries have satellite distribution backup and regional centre supporting agreements	• An additional 30% of the target countries strengthen trusted communication channels • An additional 25% of the target countries have adopted a regulatory approach to geo-located EWS	Artificial Intelligence supports scaling of authoritative and actionable alerts	All countries have basic mobile EWS and strengthened communication channels 100% of target countries have geo-located EWS	**USD 420 million** (3 million for each of the 140 countries)
3. Inclusion and people-centered approach (ITU with IFRC, UNDRR, WFP, WMO, etc. and private sector support)	• Existing community-based infrastructures in 15% of target countries is enhanced to scale the dissemination of authoritative EW • Develop multi-sectoral guidance of key intermediaries (i.e., journalists, extension officers, etc.) to support accurate dissemination of authoritative information • Co-development of actionable EW repository messages	• An additional 75% of target countries have strengthened community-based infrastructures to scale the dissemination of authoritative EW • Training key intermediaries supports accurate dissemination of authoritative information • Co-development of actionable EW repository messages refined • Social science research supports effective warning communication	Continued activities from previous years	Fragile states Transformational change enables last mile connection for the most vulnerable	All CAP messages are actionable	**USD 54.5 million**
4. Quality and Trust (WMO, ITU, IFRC, UNDRR) GMAS	• CAP HelpDesk • CAP Editor and Alert Hub • Develop training curriculum for countries to support onboarding, alert harmonization, quality measures and uptake	Continued activities from previous years	Big Tech Attribution statement of alert source for redistributors, such as private sector, agreed and used	Alert Dashboards Global, regional, and local display of active alerts	All countries use CAP	**USD 5 million**

● POLICY ● TECHNICAL ● FINANCIAL

Preparedness to respond

Preparedness and response capabilities

Build national and community response capabilities

- Are response plans up to date and tested?
- Are local capacities and knowledge made use of?
- Are people preapred and ready to react to warnings?

Photographer: Pierandrea Folle
Location: Minas de San Josè, Tenerife, Spain
WMO 2023 Calendar Competition

Estimated minimum new investment to deliver early warnings for all in five years: **USD 1 BILLION**

Led by

IFRC

Supported by

REAP Risk-informed Early Action Partnership

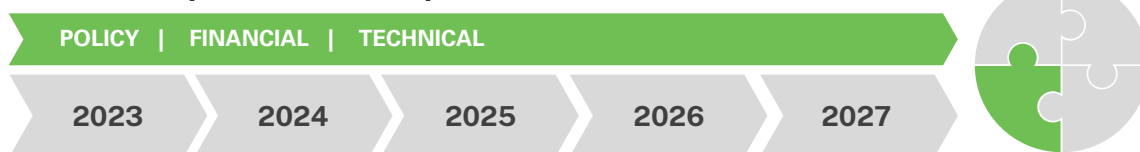OCHA United Nations Office for the Coordination of Humanitarian Affairs

FAO Food and Agriculture Organization of the United Nations

WFP World Food Programme

Pillar 4: Preparedness to respond

POLICY | FINANCIAL | TECHNICAL

2023 **2024** **2025** **2026** **2027**

Preparedness to Respond is the approach that translates early warnings into life-saving actions. In contrast to humanitarian contingency plans, the actions covered here are activated by a warning to a specific shock, not a disaster. When an early warning is issued, it is a call for actors on the ground, including national and local authorities, businesses, communities, NGOs, the International Federation of Red Cross Red Crescent Societies (IFRC), the United Nations (UN) and community groups to activate their respective response plans to reduce the impact of the hazard. To be sustainable over time, plans should be embedded in government systems and rely on local priorities, knowledge, and resources. These actions should strive to offer no-regrets interventions that benefit exposed groups, even if the hazard does not materialize. Plans must be tested and updated regularly and should factor in climate change trends and compounding risk factors.

Top level actions:
There is a spectrum of ways that we can ensure that early warning for all results in reduced losses and harm. At one end of the spectrum, it is critical that people at risk are prepared and able to respond to a warning themselves and at the other it is vital that in situations where national and local stakeholders are required, that their capacities are strengthened along the following:

1. **POLICY: Preparedness to Respond - Comprehensive Risk Management Policy, Laws and Strategies**
Outcome: Crisis/disaster risk management and climate adaptation laws, policies and/or plans are reviewed, ensuring they reduce climate change impacts and exposure on people and the environment. [REAP Target 1]

Catalytic Action:
* Develop a strategy and action plan to deliver **increased support to the development of national policy and legislation** to ensure the mainstreaming of Early Warning and Anticipatory Action across national and local policy frameworks for finance and delivery mechanisms, social protection, and Disaster Risk Management.
* Embed the principles of anticipatory action into social assistance through a shock-responsive social protection system.

2. **TECHNICAL: Preparedness to Respond - Local capacities**
Outcome: Preparedness capacities, that are risk informed and impact-based, are ensured at the local level, enabling local first responders to act quickly and effectively based on the early warning alerts.

Catalytic Action:
* Strengthen the preparedness capacities, systems and procedures of local governments and responders including IFRC through training and equipping them to respond based on integrated community and national early warning systems (EWS).
* Develop and implement a National Hydromet Early Warning Service training programme to both enhance capability and to develop a sustainable knowledge baseBuild capacities at institutional and operational level by scaling up investments in readiness, cash systems, supply chains and logistics, as well as enhancing accountability of local responders.

3. **FINANCIAL: Preparedness to Respond - Financing**
Outcome: Financing and delivery mechanisms are connected to effective anticipatory action plans, for action ahead of predicted hazards and crises. [REAP Target 2]

Catalytic Action:
* Develop and implement global, regional and national EWS/Anticipatory Action **financial advocacy campaigns** to support the mainstreaming of the key principles into international financial systems
* Develop coordinated **local community and national anticipatory action plans** with pre-arranged and reliable funding attached

- **Existing ODA and climate finance is flexible, suited to anticipatory action** and channelled through existing pooled funds supporting anticipatory action
- **Financial resources are mobilized to strengthen the capacities of key local and national governments and partners such as IFRC** to develop and implement anticipatory action plans.
- **Integrate anticipatory action into layered disaster risk financing strategies**

4. **Preparedness to Respond - Monitoring and Evaluation**
Outcome: Countries and local actors are able to monitor the availability of early warnings, associated financing and the feasibility and effectiveness of anticipatory action.

Catalytic Action:
- **Design specific Early Warning/Anticipatory action standards** that support realistic and achievable development, whilst developing underpinning metrics through which to monitor and evaluate progress
- **Enhance national capacities to report better on the anticipatory action plan**, particularly Sendai Framework Target G and custom indicators
- Anticipatory action plans continue to include **collective learning**

5. **Preparedness to Respond - Governance/Collaboration/Inclusion**
Outcome: Strengthened collaboration between stakeholders for informed action on the ground.

Catalytic Action:
- Coordination and collaboration across and within the meteorological services, national disaster management authorities, academia, the private sector, IFRC, UN agencies, etc.
- Continue to increase **local, national, regional and global commitments** towards stronger regional leadership
- Leverage existing **global partnerships**, e.g., Anticipatory Action Task Force, Risk-informed Early Action Partnership and Anticipation Hub to ensure synergies and collaboration, whilst supporting local, regional and national intergovernmental bodies.

WMO Coordination Mechanism (WCM)

Agreed at the 18th World Meteorological Congress (Res 14) a concept to support the humanitarian activities of the United Nations using authoritative information and products from WMO members including via the Global Multi-Hazard Alert System (GMAS) and the designated Global Data Processing and Forecasting System. The fundamental role of the National Meteorological and Hydrological Services as the official providers of warnings is emphasized.

Estimated minimum investment to deliver early warnings for all in five years: **USD 1 BILLION**

Preparedness and response capabilities

Action Track	2023	2024	2025	2026	2027	Financials — Tracks: USD 1 billion
1. POLITICAL: Comprehensive risk management policy, laws and strategies incorporating preparedness and AA	Develop a strategy and action plan to deliver mainstreaming of preparedness and AA across national policy and legislation	35 countries have reviewed and integrated risk-informed early action into plans, policies and laws	50 countries [REAP T1: **50 countries** have reviewed and integrated their crisis/disaster risk management and climate adaptation laws, policies and/or plans to ensure that they reduce climate change impacts and exposure on people and the environment.]	75 countries	100 countries	USD 60,000 per country **USD 6,000,000**
2. TECHNICAL: Increase local capacities to respond effectively and timely based on EW alerts	Identify local capacities (key systems and procedures of local governments and responders) and **develop and implement a holistic National EWS** training to establish sustainable knowledge baseline **80 countries have AA plans**	Support capacity strengthening of **90 national governments** and local National Societies through identified systems and procedures (inc. trainings) to develop holistic Anticipatory Action plans based on EW	**100 countries** have developed a holistic early warning and anticipatory action (EWAA) plan	**110 countries** have EWAA plans	**125 countries** have EWAA plans	5 million per country **USD 625,000,000**
3. FINANCIAL: Increasing financing for preparedness and anticipatory action (including system-strengthening and pre-arranged financing)	5% of humanitarian financing allocated to anticipatory action	10% of humanitarian financing allocated to anticipatory action	**1 billion more people are covered by** financing and delivery mechanisms connected to effective early action plans, ensuring they can act ahead of predicted disasters and crises.	15% of humanitarian financing allocated to anticipatory action	20% of humanitarian financing allocated to anticipatory action	**USD 369,000,000** (complementing already existing anticipatory financing mechanisms e.g. CERF, DREF, SFERA etc.)
(Cross-cutting element) Capacity to monitor and evaluate availability of EW and associated preparedness/AA action	As part of strengthening local actors/governments develop monitoring and evaluation capability/standards	EWAA plans in 90 countries have a methodology for monitoring and evaluation	In 100 EWAA plans with clear monitoring and evaluation component	In 110 EWAA plans with clear monitoring and evaluation component	In 125 EWAA plans with clear monitoring and evaluation component	The cost forms part of the technical and political tracks
(Cross cutting element) Strengthen collaboration between key stakeholders for informed action on the ground	Baseline for existing MoUs and partnerships at global, regional and national levels	Identify and analyse the needs for strategic partnerships and collaboration	Partnerships and collaboration established in 100 countries	Increased global and regional frameworks on EWAA, and 110 countries have established partnership and collaborations	Increased global and regional frameworks on EWAA, and 125 countries have established partnership and collaborations	The cost forms part of the technical and political tracks

● POLICY   ● TECHNICAL   ● FINANCIAL

Cross cutting enablers

Partnerships
Locally led action
Financial - CREWS deep dive
Private sector
Science, research and innovation

Partnerships
Bridging the pillars

Early Warning Systems can only save lives and protect livelihoods if incorporate all of the MHEWS components and ensure strong connections between the four components. An effective early warning is only possible if the full cycle works together.

The importance of this concept is described by the book 'Towards the "Perfect" Weather Warning: Bridging Disciplinary Gaps through Partnership and Communication". It describes a pathway, connecting key elements of the early warning process (such as observations, weather forecasts, hazard forecasts, socio-economic impact forecasts and warning messages), through a set of bridges that cross the divide between the relevant organizations and areas of expertise. Each bridge represents the communications, translation, and interpretation of information as it passes from one area of expertise to another. Partnerships are the vital to aiding this translation, and it is important that as much focus is put on bridging the pillars of this action plan, as it is on each individual pillar. At the national level it is vital that National Meteorological and Hydrological Services (NMHSs) and Disaster Risk Management Agencies, as the authoritative national entities, are empowered to work together, in partnership, across the full value cycle to enable this.

Figure 13: The four pillars of the Multi-Hazard Early Warning Systems Cycle represented in the format of the "Valleys of death" concept outlined in the book 'Towards the "Perfect" Weather Warning: Bridging Disciplinary Gaps through Partnership and Communication'

The Risk-Informed Early Action Partnership (REAP) has already made significant progress to enhance communication and understanding across the different stakeholders involved in the early warning/Early action value cycle. REAP, the newly established WMO-UNDRR Centre of Excellence for Climate and Disaster Resilience will continue work to bridge the pillars through the implementation phase. Partner engagement will also be important for the future Monitoring and Evaluation Framework and Governance mechanisms, described later in this document.

Photographer: Muhammad Amdad Hossain
Location: Sunamganj, Bangladesh
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Locally led action
Civil society engagement

Locally led action plays an important role in advocating for policies, governance and finance that will be crucial for ensuring the implementation of this action plan. "Civil society" is made up of many entities and groups, including international and national NGOs, community-based groups, academia and other organizations whose mandates include supporting governments to protect residents of their country. These groups also play an important advocacy role, using their voice to advocate for policies and resources that create an enabling environment for the implementation of this action plan.

A recurring problem in early warnings is that the authors of warnings rarely know the end users well. Recipients, when they receive the message, often do not understand its full meaning, particularly when it incorporates technical language – this can result in a misunderstanding of warnings and a lack of trust in the issuing authorities.

For early warning systems to be effective, civil society organizations play an important role as a bridge between technical scientific agencies and the community, including local volunteer networks that are often the only ones able to reach specific groups. It is ultimately community first responders that will take actions to protect vulnerable households and disadvantaged individuals. A fully inclusive approach which emphasizes empowerment and access to information for those in society who face significant challenges and disabilities. With the support of civil society organizations, "last mile" communities are better imagined as "first mile" actors, where warning information will be customized, disseminated, understood and acted upon.

To ensure the success of the initiative, the inclusion of diverse civil society organizations will be critical. Their role in the initiative will be guided by the application of the Principles for Locally Led Adaptation directly applicable to early warning systems, namely:
- Principle 1: Devolving decision making to the lowest appropriate level, by giving local institutions and communities more direct access to finance and decision-making power over how early warnings are defined, prioritized, designed, implemented; how progress is monitored; and how success is evaluated.
- Principle 2: Addressing structural inequalities faced by women, youth, children, disabled, displaced, Indigenous Peoples and marginalized ethnic groups through meaningfully participate in the process.
- Principle 3: Providing patient and predictable funding that can be accessed more easily.
- Principle 5: Building a robust understanding of climate risk and uncertainty through a combination of local, traditional, Indigenous, generational and scientific knowledge.

Financial enablers
Scaling up over five years

Overall coherence and alignment for Global Early Warnings and Early Action investments

The UN Global Early Warning initiative of the UN Secretary-General provides an umbrella for the international community to target investments in the critical parts of the value cycle where there are deficiencies and avoid duplication. The suite of international financing vehicles that are available should be aligned to ensure a range of global, regional, and national support frameworks to enhance sustainability across the four pillars. The challenge is ensuring a coordinated approach and scaling up targeted financial instruments such as the Systematic Observation Financing Facility (SOFF) and the Climate Risk and Early Warning Systems (CREWS) initiative. Further mobilizing partners including the World Bank, Climate Investment Fund (CIF), regional development banks is also critical e.g. encouraging portfolio assessments by financial institutions for early

warning investments in Asia, SW Pacific, Africa, Central and South America, where clusters of countries need to work together to achieve enhanced regional capacities. There needs to be scaling up and alignment of funds related to the UNFCCC and Paris Agreement such as Green Climate Fund and Adaptation Fund, Global Environment Facility and stimulating private and insurance sector investments for warning and dissemination through public/private sector partnership. Other substantial mechanisms such as the alignment of European Commission development financing and programming will be important.

Critical new investments in the value cycle to ensure response to the impacts of extreme weather

> **The world is failing to invest in protecting the lives and livelihoods of those on the front line.**
>
> UN Secretary-General António Guterres on International Day for Disaster Risk Reduction (IDDRR) 2022, on early warning systems

The global estimates of new investments of **3.1 Billion USD** injected across the various pillars in the value cycle provided in this five-year action plan are based on consultations with key UN and international partners. **These investments represent approx. 6% of the total global adaptation financing which has been called for annually (50 billion USD)**. The new investment will further stimulate extensive public/private finance required for transformational steps over the next five years in line with the UNSG Goal. Enhancing the maturity of observational infrastructure, ensuring human capital and skills, enhancing the effectiveness of warning processes and responding to the challenges of adaptation to extreme weather impacts that many countries are now facing. This is especially important in countries which have the highest vulnerability and needs such as the least developed countries (LDCs), Small Island developing states (SIDs) where there are critical gaps resulting in high-mortality and impact to the economies and impact and slow development pathways for decades.

Scaling-up Finance.

In line with the UNSG call for a greater dedication of financing for adaptation The UN Global Early warning initiative action plan will focus on ensuring the concrete implementation on the ground to make a difference and sustainable financing of foundational elements to ensure rapid progress over the next five years. Without this implementation countries will face increasingly severe impacts of extreme weather and longer-term mortality and economic of climate change with less ability to cope with multiple cascading threats. A key to ensuring rapid progress in the international community's response will be further commitment to investing in underpinning foundational elements. The scale of the up-front financing required is modest to the return in investment to protect lives and property. The Early Warning for all initiative contributes significantly to the global adaptation agenda.

Underpinning foundational elements to ensure success in the UNSG five-year Goal

- The Systematic Observations Financing Facility (SOFF) enhancing the base and sustainability of global basic weather and climate information in support of the overall enhancement of numerical weather prediction and quality of warnings
- The Climate Risk and Early Warning Systems (CREWS) ensuring the transformation and enhancement of meteorological and warning services, human capacities and last mile action.
- Action on Water and climate to address the threats posed by water related disaster's and ensure better hydrological and meteorological monitoring and the fusion of information in support of impact-based forecasting and decision making by regional national and local authorities. The Water and Climate Coalition has pointed to the importance of developing a global water data monitoring system and ensuring that there are sufficient national hydrological observation capacities contributing to Sustainable Development Goal 6.
- Critical to saving lives and protecting economies will be ensuring adequate financial investments in the 'last mile' early action and anticipation to ensure warnings and information are delivered to the communities and acted upon. It is clear that enhanced resources are required for this part of the value cycle and the plans drawn up by key stakeholders of the Risk and Early Action Partnership REAP and the humanitarian community will be key to this and an enhanced coordination of humanitarian actors. Collaboration with private sector 'Big-Tech' companies will also enhance the reach and speedy delivery of National authoritative information to the communities at risk.

Alliance for Hydromet Development

Working together globally to ensure alignment of financing instruments for Early Warnings for All

The **Alliance for Hydromet Development** brings together the key financing institutions investing in infrastructure, services and capacity development. This coordination mechanism for the international community will be a key delivery outlet for moving the Early Warning global action plan forward in its implementation phase. The umbrella of the UNSG Early Warning for all initiative will ensure, alignment, reduction of duplication. It will encourage prioritization of investments based on needs assessments and ensuring enhancement in the maturity of national meteorological and hydrological services and their connection to emergency management authorities and whole of government approach to Early Warning and Early Action. Commitment to scale-up financing in for Early Warnings/Early Action will ensure the required concrete steps to filling the critical gaps that have been identified in the recent target G Report.

Photographer: Aleksandar Gospić
Location: Velebit, Croatia
WMO 2023 Calendar Competition

Existing pooled and bilateral funds for early warnings

Several countries also contribute financially, through multi-lateral and pooled funds, to early warning systems. These include the Governments of Australia, Canada, France, Germany, Luxembourg, Finland, Switzerland, The Netherlands and the United Kingdom, through their funding of CREWS, and the United States, the Nordic Development Fund, Denmark, Norway, Austria, Finland, Ireland and Iceland, through their funding of SOFF.

Countries are also making important contributions through bilateral programmes, such as the UK's Weather Climate and Information Services (WISER) programme and Australia's Climate and Oceans Support Program in the Pacific (COSPPac). Environment Canada contributes to WMO's work in LDCs and SIDS and, in 2022, they announced a new contribution through CREWS. The European Commission contributes to the CLIMSA programme and to CREWS, while USAID is scaling-up its support to WMO to strengthen, coordinate and support early warnings to Members. The Government of Italy supports early warnings in Africa through UNDRR.

Actions for financing over five years

The primary principles for the financial plan over the next five years will be to:

1. Balance financing across the whole MHEWS value cycle, in an inclusive manner
2. Increase financing for early action through people-centres, risk-informed approaches
3. Adopting multi-hazard programmes
4. Incentivizing private sector actors to play a role, along with the acedemic community
5. Tracking financing by development partners for effectiveness.

This will be delivered through a three-step approach, which aligns finance with demand, increases coherence and effectiveness of financing and scales up what works.

Current State

Step-1: Set Targets and Align Finance with Demand
- Ensure access to climate science as basis for climate finance and action

Step-2: Increase the effectiveness and coherence of early warning financing
- Engaging development partners through the Alliance for Hydromet Development
- Promote pooled funding mechanism, such as CREWS and SOFF
- Tracking financing by development partners for effectiveness.

Step- 3: Scale up financing
- Commitment to Effectiveness and Financing
- Facilitate access to funds by countries, systems, such as the scaling-up framework for early warning of GCF Inked to SAP
- Leverage an additional funds through Development Assistance for Early Warning
- Promote private sector engagement in all early warning invesmets

Figure 14: The three-step approach to Early Warning for All financials

Further specialist funds aligned with Early Warnings for All

- Adaptation Fund (AF)
- Climate for Development in Africa ClimDev Special Fund (CDSF)
- Climate Investment Funds

Contributions of the Green Climate Fund and CREWS to support Early Warnings for All

A GCF/CREWS Scaling-Up Framework on Early Warnings linked to the GCF Simplified Approval Process (SAP) is being set up to accelerate the deployment of climate finance towards investments in early warning systems for LDCs and SIDS. It is part of the implementation of the recent GCF Board decision (May 2022) that requested SAP fast-track projects that scale up previously successful climate investments – in this case CREWS projects. The Scaling Up Framework has been developed and a piloting phase with CREWS, the GCF countries and accredited entities will begin in 2023 with regular results monitoring. An initial target is for 20 countries to access SAP funds of up to USD 25 million for early warnings by 2027.

Closing the gap in the Global Basic Observing Network- the Systematic Observations Financing Facility (SOFF)

 To respond to the substantial basic weather and climate data gap, the WMO, the UN Development Programme and the UN Environment Programme established the Systematic Observations Financing Facility (SOFF) as a UN Multi-Partner Trust Fund, with the support of funding partners. SOFF became operational in July 2022. It provides long-term, technical and financial support to the countries with the largest capacity gaps to close their GBON data gap, with a focus on LDCs and SIDS. SOFF contributes to achieving the adaptation and systematic observation goals of the Paris Agreement through improved climate and weather observations essential for effective climate services and early warnings.

Over the next five years, SOFF is expected to support 100 countries. 65 SIDS and LDCs with technical assistance, investments, and open-ended results-based funding to ensure sustained international exchange of data and 35 ODA eligible countries with technical assistance. To achieve this, SOFF requires USD 400 M. Financial support for implementation of GBON in non SIDS and LDCs is expected to be provided by other existing financial mechanisms.

Science Basis for Climate Finance and Action

Climate science information (access to historical climate data and projected impacts) is an essential ingredient for effective climate financing that delivers adaptation benefits for vulnerable populations. These resources are needed for providing risk information for climate-relevant early warning system strengthening and adaptation planning and for the development of proposals for climate finance. At the UN Climate Change Conference in Glasgow, Scotland (COP26), GCF and WMO released the Climate Science Information for Climate Action resource pack. The pack includes state-of-the-art technical guidance; a Climate Information Data Platform (CIP); and, online access to Climpact - for calculation of over 70 indices associated with climate impacts, from historical daily temperature and precipitation data. The Early Warning for All Plan will facilitate access to these tools, through the readiness support of the GCF and, the capacity building and technical assistance of CREWS.

A deep dive on CREWS

The Climate Risk and Early Warning Systems initiative (CREWS) is a specialized financing mechanism for climate risk and early warnings that save lives, assets and livelihoods in LDCs and SIDS.

CREWS is operational, with a **USD 84 million portfolio** of technical assistance, capacity building and expert advisory services that covers **over 50 LDCs and SIDS**, through **14 country and regional projects**. CREWS responds to the priority capacity gaps and needs identified in the Early Warnings for All Plan.

Targets for the next 5 years:
- 50 LDCs and SIDS with **predictive capacity** for floods, droughts, storm surges, sand and dust storms, heat waves and forest fires
- **500 million people in LDCs and SIDS** (households and individuals) living in areas covered by forecasts and prediction with access to warnings
- 50 LDCs and SIDS using **common alerting protocols**
- 50 LDCs and SIDS using **georeferenced risk and prediction data** platforms and tools and issuing impact-based forecasts
- All LDCs and SIDS with **national plans, strategies and legislation** for NMHSs
- All LDCs and SIDS **reporting progress against the Sendai Framework** and other relevant early warning targets

CREWS will contribute to the objectives of the Early Warning for All Plan through the application of the following principles

People-centered – local organizations are listened to and engaged so that investments are co-produced and driven by the needs of the end-users

Gender-sensitive – women's empowerment is fundamental for building resilience, and gender influences the way people access, process, and respond to information and warnings

Solution-oriented – innovative practices are applied and shared continuously across national and regional projects

Multiplier – all CREWS investments promote a favorable environment for, and leveraging of, effective additional financing

To achieve its objectives, CREWS has the following funding targets:
- **USD 40 million** immediate funding requirements - based on the list of pipeline countries (countries with needs, demand and leveraging potential and ready to implement projects)
- **USD 155 million** funding needs to the CREWS Financial Intermediary Fund (FIF) over next 5 years – in addition to the **USD 84 million** already committed
- **USD 700 million** to be leveraged over the next 5 years through development partners and financing mechanisms
- **25 LDC and SIDS**, provided with just-in-time technical assistance and expert advisory services through the CREWS Accelerated Support Window – USD 50'000 to USD 150'000 (maximum USD 250'000)
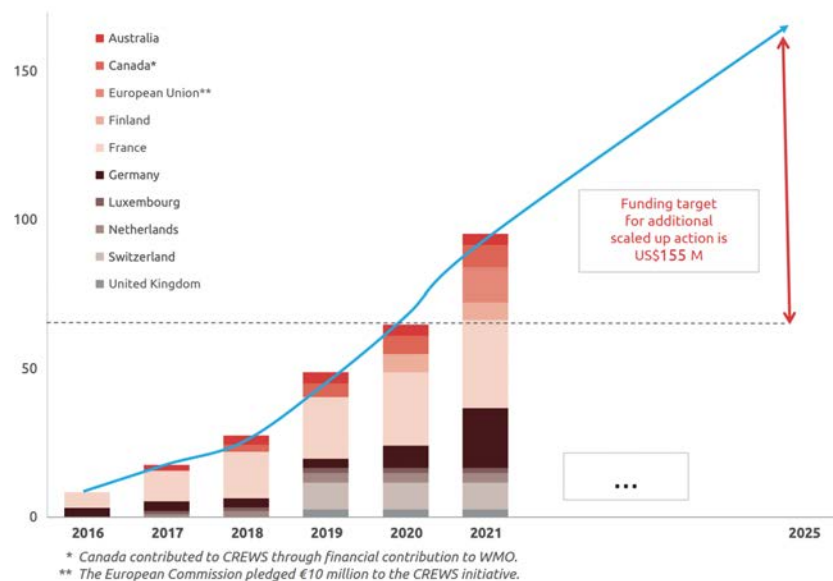

Figure 15: CREWS Operational Procedures 2021-2025 funding projections

Role of the private sector

Ensuring that every person on Earth is protected by early warnings within five years is a global challenge that will require the combined efforts of the public and private sectors and will not be possible without the vast and varied capabilities of businesses. Throughout the Multi-Hazard Early Warning System (MHEWS) value cycle – whether it be in relation to community engagement, communications and outreach, data, or technical infrastructure - the global supply chains providing the enabling and underpinning technology and systems largely consist of private entities.

Weather information and early warnings can help businesses to manage their logistics, plan for climate risks and reduce the impact of hazardous weather or climate events on their own operations, supply chains and employees. Investment in the weather and climate value chain can therefore provide direct benefits and further, can be aligned be businesses' public good or corporate social responsibility priorities, especially in relation to climate adaptation efforts.

WMO has taken a proactive approach to greater engagement between the public, private and academic sectors operating across the early warnings value cycle, and particularly within what is often referred to as the 'global weather enterprise' - which primarily aligns with the first three MHEWS pillars. This includes a policy framework which provides a set of principles for successful public-private partnerships between government entities and private businesses. Initiatives such as the UN Global Compact offer further mechanisms through which businesses can adopt sustainability principles and take steps to support UN goals.

WMO recognises that the role of the private sector could go beyond a supporting role and that the private technology sector could be a leading contributor to the five-year goal through private-public-partnerships. In October 2022, WMO hosted a Technical Conference on Early Warnings with key 'Big Tech' companies to consider new models of collaboration and partnerships. The conference aimed to facilitate a dialogue between WMO, National Meteorological and Hydrological Services, other UN entities and the private sector on the potential contributions of technological advancements, big data, and the continued rise of social media and related digital platforms.

The conference identified a number of potentials for collaboration including
1. Advanced analysis of forecast and vulnerability data, using AI and other technology, to support warning decision making,
2. Utilizing private sector digital platforms to enable data analysis and delivery, enhance warning dissemination, drive better awareness and reach those most vulnerable, and
3. More generally tapping into the wealth of innovative technical expertise held by the private technology sector to enhance the effectiveness throughout the value cycle.

The complexity and urgency of climate challenges require coordinated efforts and an agile approach, which businesses – large and small, from many sectors – can have an important role in. The rationale for strong engagement with the private sector is clear, and so private-public-engagement will continue to be prioritized through the upcoming implementation stage.

Science, research and innovation

Despite advances in science related to weather, water and climate, there are still scientific and technological challenges that must be addressed in order to improve the provision of accurate and effective early warnings. For example, advancements are needed to improve impact-based, people-centered forecasting as well as to enhance our understanding of how our climate will continue to change in order to ensure that MHEWS are effective not only in today's climate, but tomorrow's. Further research is also needed to better understand how to best communicate warnings and scientific uncertainty to ensure that warnings are understood and acted upon. It is also important to enhance the research to operations process to ensure the latest scientific and technological advances are being applied in operational settings and, ultimately, inform decision-makers.

There is already work taking place to address these scientific challenges, such as improving forecasting abilities in lower-income countries using new technologies, enhancing collaboration between scientists, and improving climate projections at regional and local scales. The science and research communities, including both the physical and social sciences, will be key partners for addressing these challenges through scientific and technological innovations, enabling this action plan and providing early warnings for all.

Recommendations:

1. Integrate scientific and technological advancements with local, traditional, Indigenous and generational knowledge.
2. Ensure activities to implement MHEWS are grounded in best available scientific and technological information.
3. Embrace cross-discipline research and innovation, recognizing that a challenge this big can't be tackled by one discipline alone.
4. Encourage further research and innovation related to MHEWS across diverse research communities in order to foster scientific and technological advancements.

Photographer: Joohyoung Kim
Location: Gwangju-si, Gyeonggi-do, Republic of Korea
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Monitoring and evaluating the success of the initiative over the next five years

Tracking progress, informing decision-making and measuring success are key in achieving the five-year goal of the Early Warnings for All Initiative. To this end, an integrated approach to monitoring is envisioned, capitalizing on the data strengths of partners and rooted in the principles of results-based management.
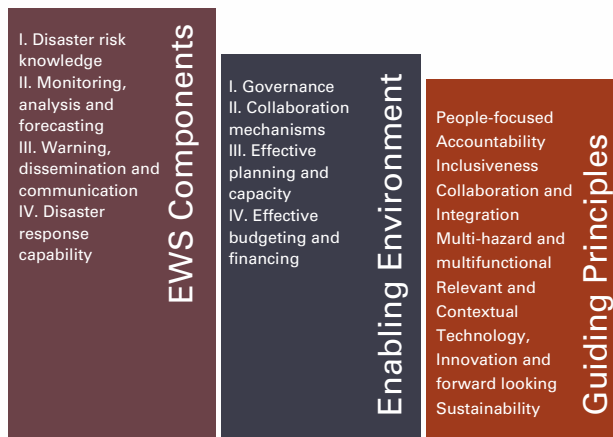
I. Disaster risk knowledge
II. Monitoring, analysis and forecasting
III. Warning, dissemination and communication
IV. Disaster response capability

EWS Components

I. Governance
II. Collaboration mechanisms
III. Effective planning and capacity
IV. Effective budgeting and financing

Enabling Environment

People-focused
Accountability
Inclusiveness
Collaboration and Integration
Multi-hazard and multifunctional
Relevant and Contextual
Technology, Innovation and forward looking
Sustainability

Guiding Principles

Figure 16: Monitoring framework guiding principles

Diagram Ref: Collymore, Jeremy, Model National Multi-Hazard Early Warning Systems (MHEWS) Policy, Caribbean Disaster Emergency Management Agency, January 2020

In terms of roles and ownership, the Early Warnings for All Initiative partners will be invited to co-lead the index development across the key components, based on a commonly agreed methodology.

The process will involve a series of actions, by a newly created working group, including defining a conceptual framework, defining maturity levels, mapping existing data sources, integrating data sources, integrating data sources, continuous improvement of the index and the eventual roll out at national, regional and global levels. Key partners, such as the Alliance for Hydromet Development, Members and technical experts will be closely engaged throughout and a detailed work plan will be elaborated in the coming months. An emphasis will be placed on ensuring a transparent, participatory and inclusive process.

Photographer: Andriy Nestruiev
Location: Ukraine
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Developing the Early Warnings for All Maturity Index

Based on the four components of the initiative, a theory of change will be constructed, turning the main objectives and deliverables into a comprehensive logical framework of expected outputs, outcomes and societal impacts. At each level, a set of monitoring indicators will be designed and systematically tracked. Both quantitative and qualitative data will be used, with a focus on objective, validated, quality-assured data, to the extent possible. Given the existing challenges in data availability and global coverage, an evolution in the scope and granularity of the monitoring framework is expected, starting with a smaller dataset and gradually refining and capitalizing on partners' data strengths.

In parallel, to ensure medium- to long-term sustainable measuring of success, WMO in collaboration with its partners and stakeholders will develop an objective Early Warnings for All Maturity Index. This Maturity Index will be an important contribution to the Global Goal on Adaptation. The index will be supported by an interactive monitoring, evaluation and learning service provided by WMO which will comprehensively support and enable the coordination of additional investment initiatives in the long-term. The index will:

- Create a common understanding of the basic requirements and maturity levels of early warnings and early action among Member States, NMHS and stakeholders;
- Harness and integrate the data of all partners;
- Cover all four elements of the end-to-end, people-centred early warning systems as well as the enabling environment;
- Provide reliable information on capacity gaps and facilitate targeted investments and technical support.

The Early Warnings for All Maturity Index will be structured along the four components of a MHEWS, plus a fifth component to capture the maturity of the enabling environment, including governance arrangements, collaboration mechanisms, planning, resources, monitoring and institutional capacity. The monitoring framework shall further seek to adequately reflect the guiding principles of a modern Multi-Hazard Early Warning System, as presented in Figure 13.

Timeline for Establishing the Early Warning for All Index

Figure 17: Timeline for establishing the Early Warnings for All Maturity Index

The way forward

Governance and key milestones

To ensure implementation, the United Nations Secretary-General is creating a new **Early Warnings for All Governing Board, co-chaired by the Executive Heads of the World Meteorological Organization (WMO) and the United Nations Office for Disaster Risk Reduction (UNDRR)**. Board membership will include many of the partners who have shaped this Executive Action Plan to date, including the pillar lead agencies, selected implementing partners, financing entities, and the United Nations Climate Action Team, representing the United Nations Secretary-General.

The Board will meet twice annually throughout the five years and will monitor and report on progress against the achievement of the goal to the United Nations Secretary-General, against four parameters (1) political and policy advances, (2) scientific and technical development, and (3) finance mobilization. and (4) assess progress in the global EWS Maturity levels. The Board will ensure the continued strategic alignment of activities to maximize benefit and ongoing engagement with implementing bodies. Existing coordinating bodies such as REAP and the Alliance for Hydromet development plus the newly created WMO-UNDRR Center of Excellence for climate and disaster resilience will play important roles in supporting this board.
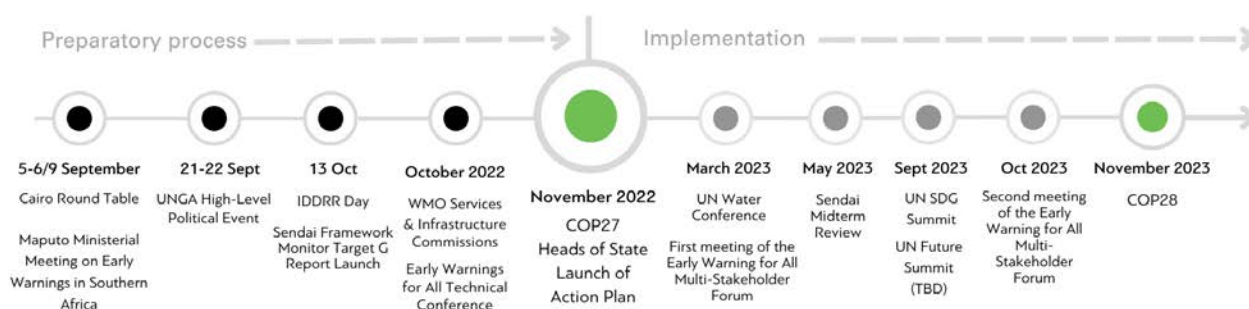
WMO Members will play a key role in technical implementation through the work of the Commission for Weather, Climate, Water and related Environmental Services and Applications (SERCOM) and the Commission for Observations, Infrastructure, and Information Services (INFCOM) and other important constituent and advisory bodies. National Meteorological and Hydrological Services (NMHSs) and Disaster Risk Management agencies, as the relevant authoritative providers, will be central for enabling implementation at the national level. Consideration will be given to coordination with the UN Sustainable Development Group, through the Regional Collaborative Platforms, Issue Based Coalitions, and UN Country Teams, to ensure coordinated implementation on the ground from the UN System.

The Board will present annual reports on progress to the Secretary-General of the United Nations in advance of the COP meetings, in addition to special thematic reports, such as the Second Hydromet Gap Report due in 2023, which the Alliance for Hydromet Development will dedicate to early warnings.

Photographer: Joel Hinkson
Location: Guasca, Colombia
WMO 2023 Calendar Competition

In addition, an **annual Multi-Stakeholder Forum** will be organized to enhance consultation with a wider group of partners. The Forum will provide an opportunity for the more than 150 organizations who have already registered their interest to support the initiative to shape its future implementation. Interested stakeholders ranging from the UN System, hydro-meteorological, early action, financial, academic, civil society, private and disaster sectors will be invited to take part. These stakeholders will also be invited to contribute over the coming months to the development of the Early Warnings for All Maturity Index.

At the political level, countries will continue to be engaged to advance Early Warnings for All through relevant upcoming platforms including the 2023 United Nations Water Conference, the Mid-term Review of the Sendai Framework, the SDG Summit, and future UN Climate Change Conferences. The inclusion of the Early Warnings for All initiative is also being considered within the work of the Second Committee of the United Nations General Assembly.

Milestones

Preparatory process ———————→   Implementation ———————→

5-6/9 September	21-22 Sept	13 Oct	October 2022	November 2022	March 2023	May 2023	Sept 2023	Oct 2023	November 2023
Cairo Round Table	UNGA High-Level Political Event	IDDRR Day	WMO Services & Infrastructure Commissions	COP27 Heads of State Launch of Action Plan	UN Water Conference	Sendai Midterm Review	UN SDG Summit	Second meeting of the Early Warning for All Multi-Stakeholder Forum	COP28
Maputo Ministerial Meeting on Early Warnings in Southern Africa		Sendai Framework Monitor Target G Report Launch	Early Warnings for All Technical Conference		First meeting of the Early Warning for All Multi-Stakeholder Forum		UN Future Summit (TBD)		

WEATHER CLIMATE WATER

WORLD
METEOROLOGICAL
ORGANIZATION

COP27
SHARM EL-SHEIKH
EGYPT 2022