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# ISSUES BRIEF



## Climate Information and Early Warning Systems

October 2020

**Through our work on climate information and early warning systems, UNDP is protecting lives and livelihoods, providing people with the information they need to thrive and enhancing evidence-based decision making.**

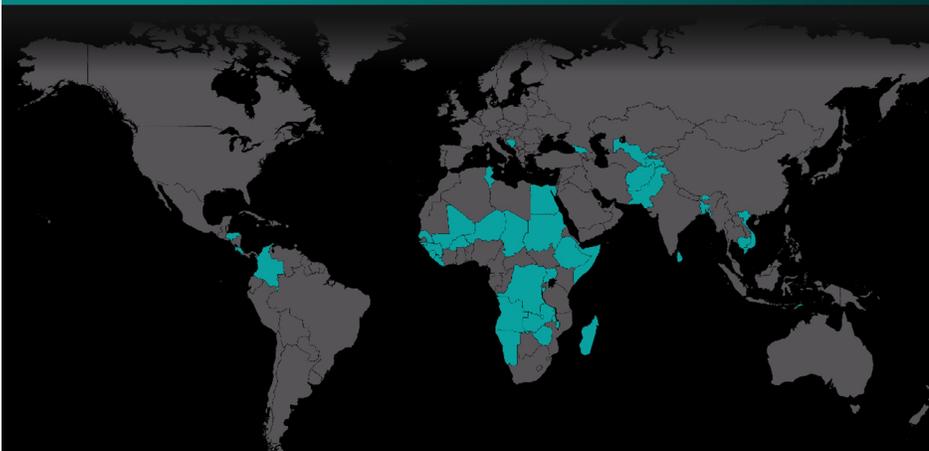
Climate change is expected to increase the exposure of many countries, especially least developed countries (LDCs), to climate and meteorological hazards which threaten lives, infrastructure and economic activities. Extreme meteorological and climate events, such as heavy rainfall causing flooding and landslides, or increasing heatwaves and droughts, are either already increasing in intensity, duration and frequency, or are likely to do so in the future. Forewarning of these events enables preventative action to be taken, and a key component of many climate information and early warning systems (CI/EWS) projects is to deliver accessible, credible, appropriate and actionable weather and climate information, at time and space scales that can be used for decision making in project-relevant sectors and areas.

To achieve this, investments are made in all aspects of the information value chain; from building and strengthening observation networks, developing risk-related and tailored

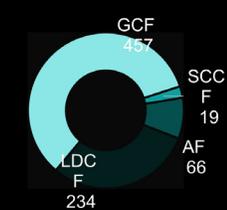
products, improving communications and information sharing, to building services for communities, decision makers and businesses to use and understand weather and climate-related information. In LDCs where human, technical and financial capacities may be limited, this involves focussing resources to address critical gaps in operating and maintaining observing and IT infrastructure, developing hazard modelling and forecasting capabilities, promoting institutional cooperation, introducing mobile-phone-based technologies, involving communities in both data collection and contributing to the development of warnings and advisories, among others. To do this in sustainable ways is often difficult but can be achieved by carefully building on existing capacities, developing links between projects and institutions, as well as introducing new low-cost technologies and promoting revenue streams through both the public and private sectors.

## Climate information and Early Warning Systems

Promoting access to climate information to improve livelihoods resilience and protect lives



### Portfolio under implementation



**46** COUNTRIES      **28** LDCs      **8** SIDS

### Since 2008 and currently under implementation



13.2 million people benefitting from increased access to climate information



860 automated weather stations installed



245 early warning systems installed



3,600+ technicians and officials trained on climate data generation, modelling and interpretation

\*The designations employed and the presentation of material on this map do not imply the expression of any opinion whatsoever on the part of the Secretariat of the United Nations or UNDP concerning the legal status of any country, territory, city or area or its authorities, or concerning the delimitation of its frontiers or boundaries.

## UNDP's comparative advantage

UNDP supports developing countries to access financing for climate change adaptation through several sources of global environmental finance, including those managed by the Global Environment Facility (LDCF, SCCF and AF), Green Climate Fund (GCF), bilateral and multilateral donors. These projects cover a wide range of sectors and involve governments, community-based organizations and NGOs working together to deliver information and solutions for adaptation to climate variability and change. As a convener, UNDP works across development sectors and helps bring diverse actors together to enable multi-disciplinary approaches to CI/EWS. Its on-the-ground presence in countries across the world ensures hands-on bespoke approaches to address unique national needs. With climate information serving as a key element for scaled up climate actions across any number of signature solutions, including ecosystems and biodiversity, energy and climate change adaptation, UNDP has the opportunity to better inform climate actions across multiple sectors, promoting evidence-based investments on everything from infrastructure to sustainable development.

## Challenges

There are many challenges to overcome in order to promote the effective use of CI/EWS in LDCs, including but not limited to:

- **Lack of data sharing** between National Hydro-Meteorological Services (NHMS) and sectoral agencies leading to delays in warnings and hindering the development of sectoral products.
- **Low numbers of employees in government institutions**, leading to limited effectiveness of training and not enough people to develop new sectoral products or engage in dissemination activities.
- **Difficulties in setting up fair and sustainable public-private partnerships (PPP)**, including paying for services and data sharing/ownership agreements.
- **Inefficient collection of data** and production/dissemination of warnings. Often the result of inefficient standard operating procedures. Communities do not receive warnings in time to use them.
- **Communities not able to understand and interpret advisories** and warnings. Including how to use technical outputs such as a probabilistic seasonal forecasts, interpret SMS messages, etc.
- **Lack of technical capacity** to develop, interpret and revise sectorally-specific information packages based on climate and non-climate data
- **Limited access to computational resources** for weather, climate and impact modelling
- **Limited numbers of automatic weather** and hydrological monitoring stations



Photo: UNDP Malawi

## COVID-19

A robust early warning system supports response and recovery from pandemics like Covid-19 by using early warning communication channels to share awareness messages, inform on best practices and build understanding of life-saving behaviors. As part of the COVID-19 response in Malawi, early warning system tools were used to inform the community of the virus and spread knowledge on how to limit its spread.

## Main areas of work

- **Reduce reliance on one type of technology** or medium by utilising combinations of automatic and manual equipment, mobile telecommunications, radio, TV and internet
- **Develop shared databases** and promote institutional cooperation and engagement to develop new products
- **Involve communities in product design** and operations and maintenance of equipment; develop a sense of ownership
- **Information sharing within and between countries**, as well as systematic reviews of data quality, reporting frequencies, and dissemination channels are critical to inform and iteratively improve CI/EWS systems
- **Development of climate information infrastructure**
  - Procurement and installation of automatic hydro/ weather stations
  - Low-cost community-based stations
- **Climate information dissemination**
  - Creation of climate information packages
- **Climate information value chain development**
- **Capacity building for modelling and forecasting**
  - Nowcasting
- **Alternative technologies**
- **Private sector engagement**
  - Revenue generation
  - Public-private partnerships for the siting of weather stations and distribution of messaging
- **Digitizing historical records**
- **Impact of warnings and advisories on livelihoods and behavior**

## Successes and key programmes

Looking forward to our continued work in this field, with emerging opportunities to support countries through the Green Climate Fund and other sources, important lessons include:

- The use of CI and EWS within developing countries is often part of a suite of actions designed to increase resilience and adaptive capacity. To be useful CI and EWS need to be integrated into the associated planning and decision processes.
- No one size fits all; each country and project starts with different baseline infrastructure and capacities, as well as development needs.
- Sharing, access and the ability to develop tailored climate/weather related information is critical for the successful operation of EWS and the use of CI for adaptation.
- Farmer training and community-based EWS, Malawi (GCF)
- Participatory Integrated Climate Services for Agriculture (PICSA) approach to farmer engagement
- Low-cost sensors
- Hydro-Meteorological Data Burkina Faso (LDCF)
- Weather forecasts
- Early warnings for floods and droughts Applications Niger (LDCF)
- Farmer rain gauges
- Advisories and agricultural risk information Risk Assessment Viet Nam (GCF, SCCF)
- Flood mapping

- Impacts on rural infrastructure
- Glacial Lake Outburst Floods (GLOFs) Bhutan, Nepal (LDCF)
- Monitoring equipment linked to sirens
- Disaster risk management institutionalized
- Artificial lowering system for lakes Flood Management, Papua New Guinea (AF)
- Flood EWS
- Mangrove restoration
- Community-based risk management Coastal Management Liberia, Egypt (LDCF, SCCF)
- Coastal monitoring system
- Coastal development planning
- Disaster preparedness and response plan Drought Management Mali (LDCF, Canada)
- Climate-smart agriculture
- Adjust planting times, crop types



Photo: UNDP Bhutan

## Innovation and looking ahead

- **Rain Fade.** Rainfall from cell towers and phones (rain fade) can be used to create localized monitoring and dissemination – need access/negotiation with mobile phone companies and 3rd parties e.g. <https://www.climacell.co>
- **Lightning and severe thunderstorm detection** – may depend on willingness to have data processing outside country/on cloud e.g. <https://www.earthnetworks.com/>, <https://www.ubimet.com/en/>
- **Global tools for forecasting and modelling.** Willingness to allow use of cloud-based forecasting tools. GLOFAS <http://www.globalfloods.eu>
- **Use of machine learning and crowdsourcing** for weather forecasts and emergency response e.g. <http://project.i-react.eu/>
- **Greater use of remote sensing** (satellites and drones) to collect data and supplement on-the-ground observations
- **Last mile.** With the effective collection of climate information, targeted packages need to be created to take the information to end users to create actionable results.

### CIRDA

The Programme on Climate Information for Resilient Development in Africa (CIRDA) worked with vulnerable countries in Africa to strengthen national climate information systems. It provided capacity building on meteorological, climate and hydrological observing and forecasting systems, disaster risk management and viable communication systems/processes for disseminating alerts, and the use of alternative cost-effective technologies.

### Connecting with the big picture

**UNDP's Climate Promise.** Information will be essential in accelerating the ambition of Nationally Determined Contributions to the Paris Agreement. This information can be used to inform future investments in infrastructure, adaptive measures, energy and others.

**SDGs.** Climate information doesn't just save lives from fast-acting storms, it also paves the way for more effective agriculture production and food security, expanded livelihoods opportunities, and increased linkages with cities.

### Partnerships

#### Existing Partnerships

**Private Sector.** Pilot projects to engage with the private sector have been experimented with in Liberia, Malawi, Sierra Leone and Uganda. These included connections with private-service and cloud providers for monitoring and reporting, engagement with telecoms for dissemination and siting of weather stations, and engagement with the private sector to expand climate services to the last mile.

**Risk informed Early Action Partnership (REAP).** The partnership, to which UNDP is a member, aims to make 1 billion people safer from disasters by creating a new partnership to greatly expand early action financing and improve early warning systems and the capacity to act on the risks they identify.

New and emerging areas of partnerships

**Alliance for Hydromet Development.** Launched at COP25, the alliance aims to ramp up action that strengthens the capacity of developing countries to deliver high-quality weather forecasts, early warning systems, water, hydrological and climate services. The founding members of the Alliance for Hydromet Development are the Adaptation Fund, African Development Bank, Asian Development Bank, European Bank for Reconstruction and Development, Global Environment Facility, Green Climate Fund, Islamic Development Bank, United Nations Development Programme, United Nations Environment Programme, World Bank, World Food Programme and World Meteorological Organization.

## Impact



Photo: UNDP Zambia

**“Indigenous knowledge of predictions have become more like tossing a coin. We now see that traditional ways of predicting the weather just don’t work. With climate updates, I now know that if it rains tomorrow I can save my fertilizer for another day.” – Musepei, 44, Zambian farmer.**

Like many Zambian small-scale farmers, Musepei, 44, has long relied on traditional weather indicators, such as the blossoming of certain indigenous trees to manage his crops. But such traditional know-how has become increasingly unreliable in the face of climate change, which has disrupted the seasons and led to prolonged dry spells, greater flooding and erratic rainfall.

Droughts and floods over the last 30 years have cost Zambia more than \$13.8 billion according to recent estimates – that is equivalent to 4 per cent of annual GDP. The impacts of climate change could cost the country an additional \$4.3 billion in lost GDP over the next decade if immediate climate actions are not taken.

With funding from the Global Environment Facility Least Developed Countries Fund, UNDP worked with the met department and district agriculture officers through the CI/EWS project to notify farmers like Musepei about planting conditions and advise them on substitute crops.

The ground-work laid by this initial project is now being take to scale by the Government of Zambia, through a United Nations-led partnership including UNDP, FAO and WFP, which accessed \$32 million from the Green Climate Fund for a 7-year, \$137 million project (known locally as the SCRALA project) that is indirectly supporting three million small-scale farmers in Zambia in building climate resilient lives.

Implemented by the Zambian Ministry of Agriculture, the SCRALA project is helping farmers in 16 districts across five provinces cope better with climate change threats through modern technology, sustainable growing techniques and better understanding of climate issues.

To broaden the reach of weather updates, the project partners with community radio stations to interpret and broadcast weather information in local languages and intends to train the presenters on how to better interpret the information.

Each hour, the community radio stations pass on weather information including cost-benefit analysis of which crops to grow and new techniques in climate-smart agriculture to help farmers adapt to erratic weather.