



Leveraging AI to Enhance Multi-Hazard Early Warning Systems (MHEWS)

ITU-D Study Group 1, Question 3/1 Workshop: Telecommunications/ICTs Resilience for Disaster Management Utilizing Emerging Technologies and Services Including AI
ITU Headquarters, Geneva, 1 October 2026



Early Warnings for All



Disaster risk knowledge

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?



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?



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 prepared and ready to react to warnings?



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?

In March 2022, the UN Secretary General set a new target to

“ensure that everyone on Earth is protected by early warning systems.”

Who we are

- ITU leads the [AI for EW4All Group](#), established under the EW4All inter-pillar technical coordination mechanism with WMO, UNDRR and IFRC.
- Focus: applying AI responsibly and effectively, identifying best practices and addressing critical gaps in multi-hazard early warning systems.
- Unites 150+ global experts in AI & data science, disaster risk management, climate & environmental sciences.
- Aims to bridge the gap between cutting-edge AI research and the practical needs of early warning practitioners and communities worldwide.

Key Activities

Gap Analysis & Matchmaking: Identify priority gaps in early warning systems and connect them with suitable AI solutions and expertise.

AI Solutions Catalogue: An online catalogue of AI tools, organized by hazard type, maturity level, and EW4All priorities, with peer input.

Country Pilots: Targeted pilots in EW4All countries, supported by technical experts and national stakeholders.

Events, Capacity Building and Research: Solutions Spotlight sessions at monthly group meetings; Technical workshops and masterclasses; the AI for EW4All Innovation Challenge, whose finalists presented at the AI for Good Global Summit; research and case studies including university capstone projects, such as with IE Madrid and Sciences Po, feeding research into our work.

Resource Mobilization: Secure funding, projects and partnerships to develop, test, and scale AI solutions for early warnings.

Examples

Two country pilots

Where the AI for EW4All Group is testing solutions with partners

01

Early Warning Connectivity Map, 50+ countries

Mapping connectivity coldspots so no one at risk is left unreachable — with Microsoft AI for Good Lab, Planet and IHME.

02

Extreme heat & resilient warning infrastructure, Kenya

AI for heat risk and for keeping warning infrastructure standing — with the GEO Secretariat and national partners.

Early Warning Connectivity Map (EWCM)

Identifies **connectivity coldspots** where people are at risk of natural hazards but cannot receive early warning messages because they live in places beyond the reach of fixed broadband, 2G and 3G+ networks

Madagascar

Population covered ■ :

27,035,100

Population not covered ■ :

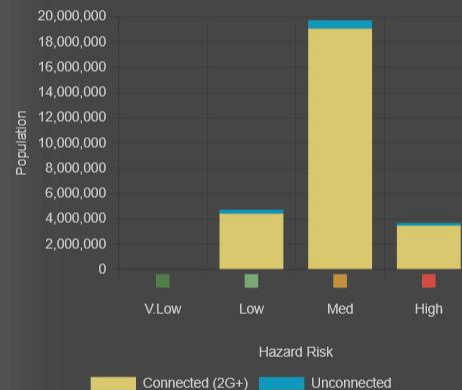
1,111,770

Source: Planet Labs – Microsoft AI for Good Lab – IHME

Early Warnings to All



Landslide hazard risk / connectivity

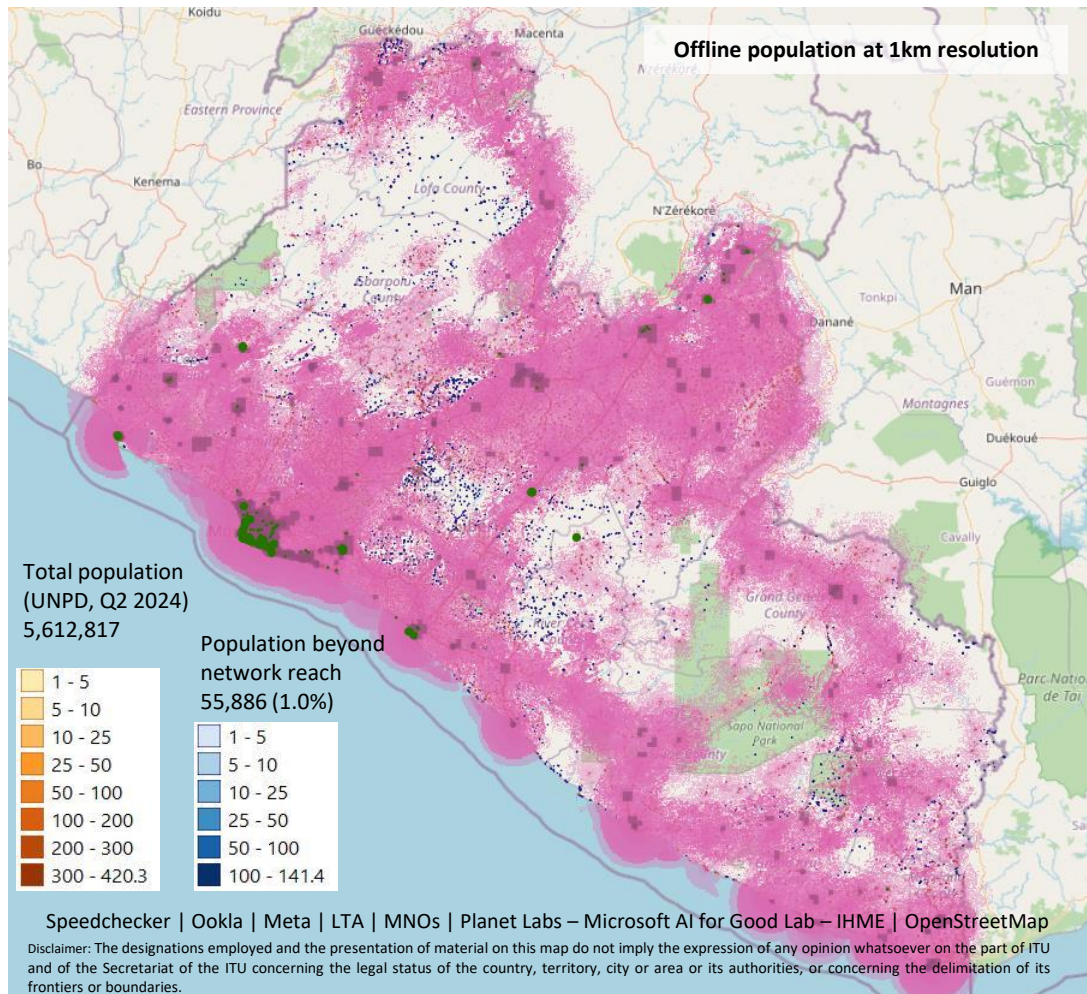


Disclaimer: The designations employed and the presentation of material on this map do not imply the expression of any opinion whatsoever on the part of ITU and of the Secretariat of the ITU concerning the legal status of the country, territory, city or area or its authorities, or concerning the delimitation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

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Early Warning Connectivity Map (EWCM)

- **Population density.** High resolution (100m), time-enabled population density maps produced by Planet Labs – Microsoft AI for Good Lab – IHME (University of Washington).
- **Connectivity and coverage datasets.** What is the extent of fixed and mobile telecom coverages, and therefore which channels can be used to send early warning notifications.
- **Hazard datasets.** How many people, and where, are vulnerable to natural hazards as they cannot receive emergency notifications, because they live in places beyond the reach of fixed broadband, 2G and 3G+ networks.





Connectivity Collapses Under Heat

Extreme surface temperatures cause telecommunication and power grids to dim or fragment when needed most.



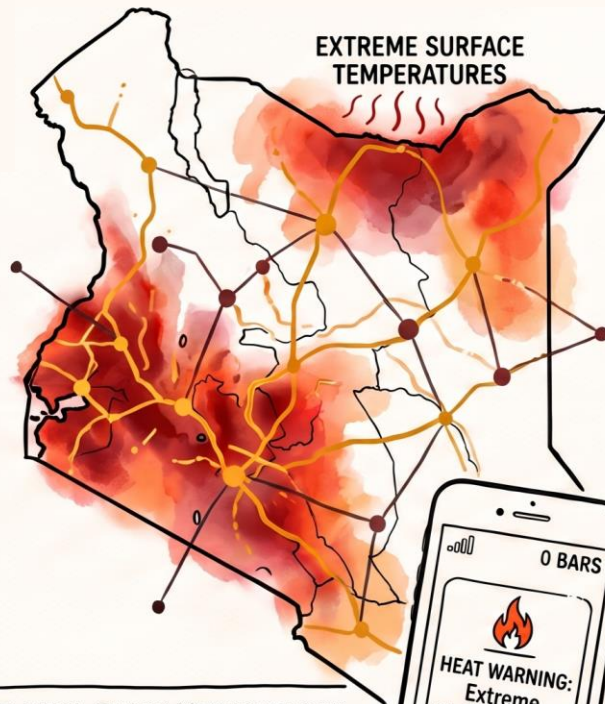
The “Silent Zone” Risk

Rural and peri-urban areas face total signal loss, preventing heat alerts from reaching at-risk communities.



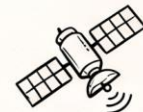
**Global
Heat
Resilience
Service**

Extreme Heat Infrastructure Resilience Pilot



KENYA PILOT: DUAL-TRACK METHODOLOGY

TRACK	FOCUS AREA	GOAL
Primary	Population Connectivity	Identifying coverage gaps preventing warning reception
Secondary	Infrastructure Vulnerability	Mapping hardware failure thresholds under extreme heat



GEO's Heat Intelligence



ITU's Infrastructure coverage maps

AI-POWERED DATA FUSION

Combining neighborhood-scale heat data with digital infrastructure maps.



TARGETED RESILIENCE MAPPING

Identifying specific coordinates for infrastructure hardening to prevent system failure during future heat events.

**0 BARS =
0 WARNINGS**

Even with perfect hazard data, warnings fail if mobile device signal drops to zero.

Leveraging AI to Enhance MHEWS

Launched at the AI for Good Global Summit 2026

What this report provides:

- **Showcases practical AI solutions** that can strengthen all four pillars of MHEWS, highlighting technologies already being applied around the world.
- Identifies **operational gaps in MHEWS where AI can add value** and the conditions needed for responsible, effective implementation.

Use the report to identify priority applications, contribute to pilots and support uptake in countries.



Why This Report Matters

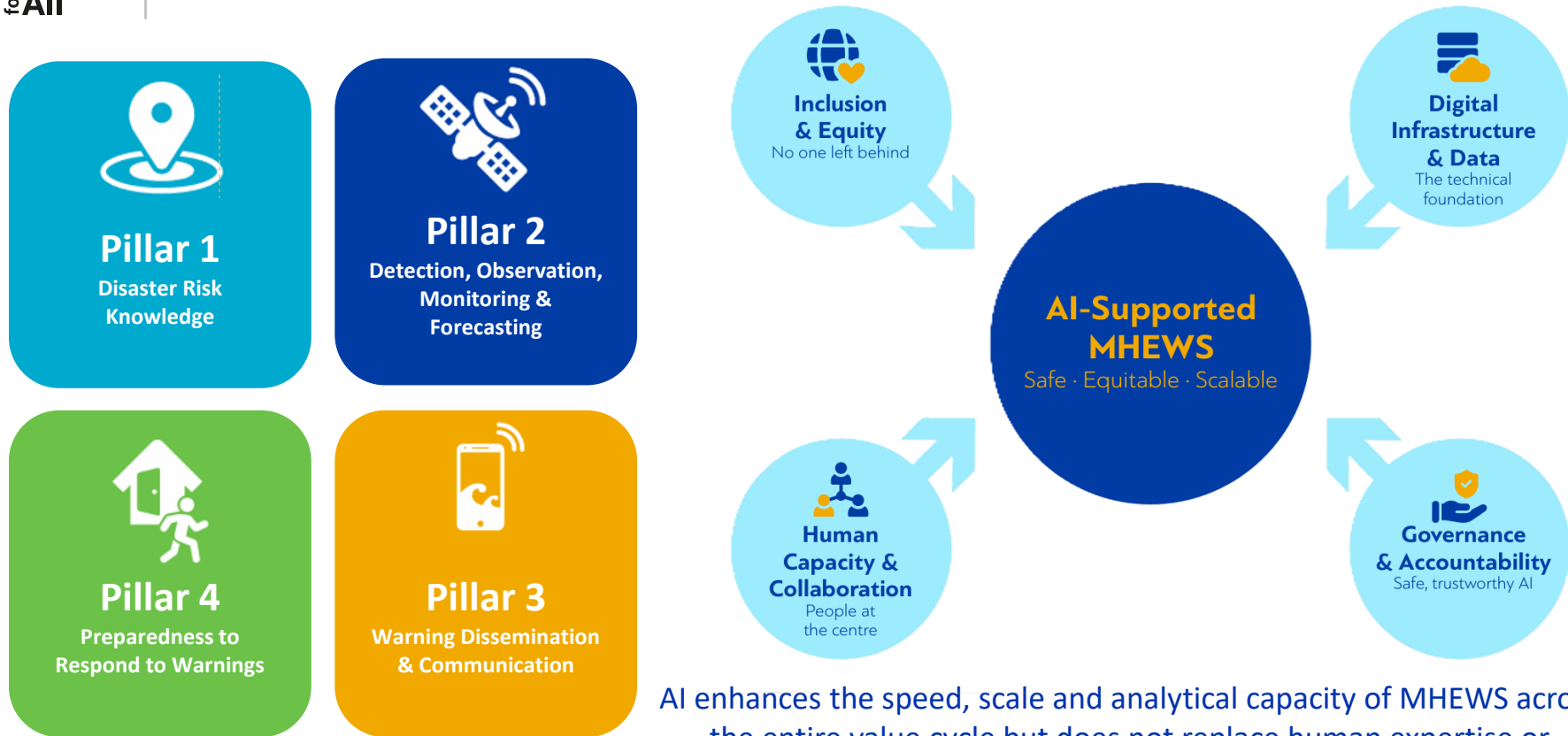
The challenge:

- 128 countries now report having MHEWS (as of 1 April 2026), but major gaps remain in end-to-end system maturity.
- Last mile communities and vulnerable populations, particularly in LMICs, LDCs and SIDS, remain underserved.
- National EWS frameworks remain insufficiently adapted to complex risk environments.

AI can help address operational gaps across the entire MHEWS value cycle.



The MHEWS Framework & Where AI Fits



AI enhances the speed, scale and analytical capacity of MHEWS across the entire value cycle but does not replace human expertise or institutional decision-making

AI Opportunities Across MHEWS Pillars

Disaster Risk Knowledge



- Risk data discovery and integration
- Exposure and vulnerability baselines
- Use of risk information in early warning and early action
- Loss and damage data tracking & analysis

Detection, Observation, Monitoring, Analysis, and Forecasting



- Nowcasting
- AI weather prediction
- Flood and cyclone forecasting
- Impact-based forecasting

Warning Dissemination and Communication



- Automated translation
- Personalised alerts
- Misinformation management

Preparedness to Respond to Warnings



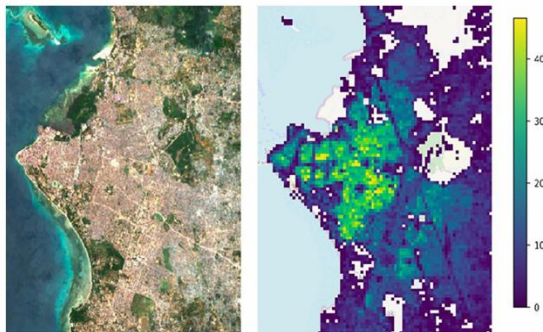
- Scenario modelling
- Resource optimisation
- Anticipatory action triggers



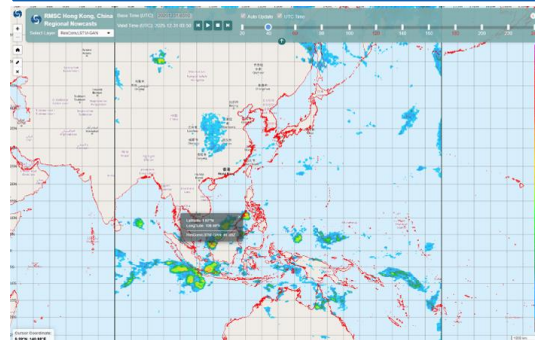
AI allows for end-to-end solutions - connecting all four pillars into interoperable, people-centred warning systems

Example Case Studies

AI-Supported Population Mapping for Humanitarian and Early Warning



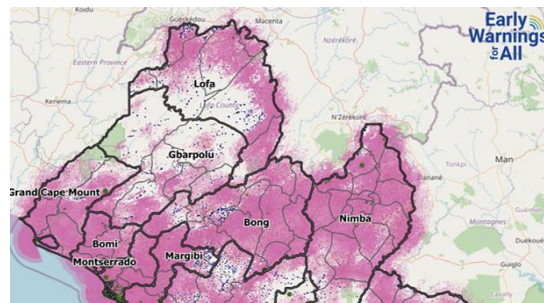
AI-Enabled Nowcasting and Capacity Development in Southeast Asia



AI-Driven Anticipatory Cash Aid for Flood Resilience in Bangladesh



Applying the Early Warning Connectivity Map to strengthen warning dissemination in Liberia



AI Solutions Catalogue for Early Warning Systems



Submit a solution:
www.itu.int/ew4all

Add AI tools, pilots or products relevant to MHEWS



AI-based cyclone predictions

- Publication, Research, Tool
- Piloted (TRL 4-7)
- Cyclone

Google DeepMind and Google Research have developed AI-based cyclone predictions which can help experts issue more timely and accurate warnings.

Observations & forecasting

Learn More



Open Buildings – A dataset of building footprints

- Tool
- Operational and/or Commercialized (TRL 8-9)
- Building footprint

Google's Open Buildings dataset offers building footprints detected from satellite imagery to aid in humanitarian efforts and urban planning.

Disaster risk knowledge

Observations & forecasting

Dissemination & communication

Preparedness & response

Learn More



Google flood forecasting

- Publication, Research, Tool
- Operational and/or Commercialized (TRL 8-9)
- Flood

Google's Flood Forecasting provides users with locally relevant flood forecasts up to 7 days in advance. Flood Forecasts are currently available in over 150 countries...

Disaster risk knowledge

Observations & forecasting

Dissemination & communication

Preparedness & response

Learn More



AI4SIDS: AI-driven climate resilience for small island developing states

- Methodology, Publication, Research, Tool
- Conceptual/Proof of Concept (TRL 1-4)
- Flash flood, Flood, Pluvial

An AI-powered platform for real-time disaster risk prediction, ethical decision support, and early warning systems in Small Island Developing States.

Disaster risk knowledge

Observations & forecasting

Dissemination & communication

Preparedness & response

Learn More



IntelliWarn: AI-ready off-grid flood early warning & community mesh

- Methodology, Tool
- Operational and/or Commercialized (TRL 8-9)
- Flash Floods, GLOF, Hill Torrents

AI-ready, off-grid flood early warning that fuses LoRaWAN/GSM sensors, mesh-based community comms, and cloud-edge alerts to protect remote valleys where...

Observations & forecasting

Dissemination & communication

Learn More



Public warning chatbot

- Publication, Research, Tool
- Piloted (TRL 4-7)
- Multi-hazard

A chatbot that supports the public with all their questions, translations and any additional information they may seek, when public warning alerts are issued.

Dissemination & communication

Learn More

Recommendations for Action

The report recommends we:

1. Strengthen interoperable data ecosystems as the foundation
2. Anchor AI integration in strong governance with human oversight.
3. Prioritize inclusive, people-centred AI designs.
4. Design AI-based solutions with interpillar integration from the outset.
5. Mobilize resources to support AI pilots and accelerate transition to operational scale.

Submit Solutions to the AI Catalogue, connect country demand with implementers, and support dissemination and uptake.



Thank you

Join the AI for EW4All Group

Read the Leveraging AI to
Enhance MHEWS Report



Submit your AI Solution to
the Catalogue



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Early
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for All

