LECTURE 2 PART1- Basics of IBFW: Multi-hazard Early Warning System(MHEWS) – IBFW a key component to provide early Warning for all

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Workshop on Impact-based Forecast and Warning Services (IBFWS)-1st WMO-PTC/GCC Workshop by Panel on Tropical Cyclones and Gulf Countries Council at Muscat

EARLY WARNING FOR ALL
MULTI-HAZARD EARLY WARNING SYSTEM(MHEWS): FOUR PILLARS

Disaster risk knowledge

- Are key hazards and related threats identified?
- Are exposure, vulnerabilities, capacities and risks assessed?
- Are roles and responsibilities of stakeholders identified?
- Is risk information consolidated?

Detection, monitoring, analysis and forecasting of the hazards and possible consequences

- Are there monitoring systems in place?
- Are there forecasting and warning services in place?
- Are there institutional mechanisms in place?

Warning dissemination and communication

- Are organizational and decision-making processes in place and operational?
- Are communication systems and equipment in place and operational?
- Are impact-based early warnings communicated effectively to prompt action by target groups?

Preparedness and response capabilities

- Are disaster preparedness measures, including response plans, developed and operational?
- Are public awareness and education campaigns conducted?
- Are public awareness and response tested and evaluated?

MHEWS and IBFW

- WMO Publications on IBFW and MHEWS
- Priority-wise hazards
- Linking all componest of MHEWS and IBFW

1. WMO ATLAS OF MORTALITY AND ECONOMIC LOSSES FROM WEATHER, CLIMATE AND WATER EXTREMES (1970–2019) WMO, 1267, 2021, https://library.wmo.int/viewer/57564/download?file=1267_Atlas_of_Mortality_en. pdf&type= pdf&navigator=1
2. Compendium of multi-hazard early warning cooperation—March 2023-Success stories of Indian Ocean TSHUMAI EWS , https://www.unescap.org/kp/2023/compendium-multi-hazard-early-warning-cooperation
3. Global status of multi-hazard early warning systems Target G-UNDRR-WMO-2022 :MHEWS, Sendai frameworks Goals, Survey, https://www.undrr.org/media/84088/download?start Download=true- https://www.undrr.org/sites/default/files/2022-09/MHEWS%20..
4. Methodology.pdf-MULTI-HAZARD EARLY WARNING SYSTEM CUSTOM INDICATORS & METHODOLOGIES FOR COMPUTATION cross -How to get communities into disaster preparedness and early action it. Red cross –June 2020 https://www.preventionweb.net/files/2743_Introdp.pdf-Red
5. Multi-hazard Early Warning Systems: A Checklist-Outcome of the first Multi-hazard Early Warning Conference 22 to 23 May 2017 (mwo, 2018) – Cancún, Mexico Prepared by the partners of the International Network for Multi-hazard Early Warning Systems, Published 2018, https://library.wmo.int/viewer/55893/download?file=MHEW_030918-08.pdf&type=pdf&navigator=1

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UNDP

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FIVE APPROACHES TO BUILD FUNCTIONAL

EARLY WARNING SYSTEM

WMO Guidelines on

Multi-hazard Impact-based

Forecast and Warning Services

World Meteorological Organization

Weather · Climate · Water

WMO-No. 1150

THE FUTURE OF FORECASTS:

IMPACT-BASED FORECASTING

FOR EARLY ACTION

Reviews of Geophysics

Review Article | Open Access

Impact Forecasting to Support Emergency Management of Natural Hazards

Bruno Merz, Christian Kuhlicke, Michael Kunz, Massimiliano Pittore, Andrey Babeyko, David N. Bresch, Daniela I. V. Domeisen, Frauke Feser, Inga Koszalka, Heidi Kreibich ... See all authors

First published: 24 August 2020 | https://doi.org/10.1029/2020RG000704 | Citations: 1

WMO Guidelines on Multi-hazard Impact-based Forecast and Warning Services

Part II: Putting Multi-hazard IBFWS into Practice

2021 edition

Bulletin of the American Meteorological Society

Volume 100: Issue 10

Sections

References

Figures

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Editorial Type: Article

Evolving the National Weather Service to Build a Weather-Ready Nation: Connecting Observations, Forecasts, and Warnings to Decision-Makers through Impact-Based Decisi Support Services

Louis W. Uccellini[1] and John E. Ten Hoeve[1]

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Print Publication: 01 Oct 2019

DOI: https://doi.org/10.1175/BAMS-D-18-0159.1

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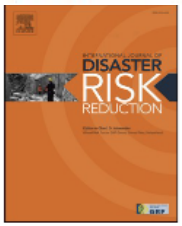

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'Where oh where is the data?': Identifying data sources for hydrometeorological impact forecasts and warnings in Aotearoa New Zealand

Sara E. Harrison [a,b,*], Sally H. Potter [b], Raj Prasanna [a], Emma E

[a] Massey University, New Zealand

National Weather Service (NWS) Service Description Document (SDD)
Impact-Based Decision Support Services for NWS Core Partners
April 2018

Contents

"What the weather will do" – results of a survey on impact-oriented and impact-based warnings in European NMHSs

Rainer Kaltenberger, Andreas Schaffhauser, and Michael Staudinger

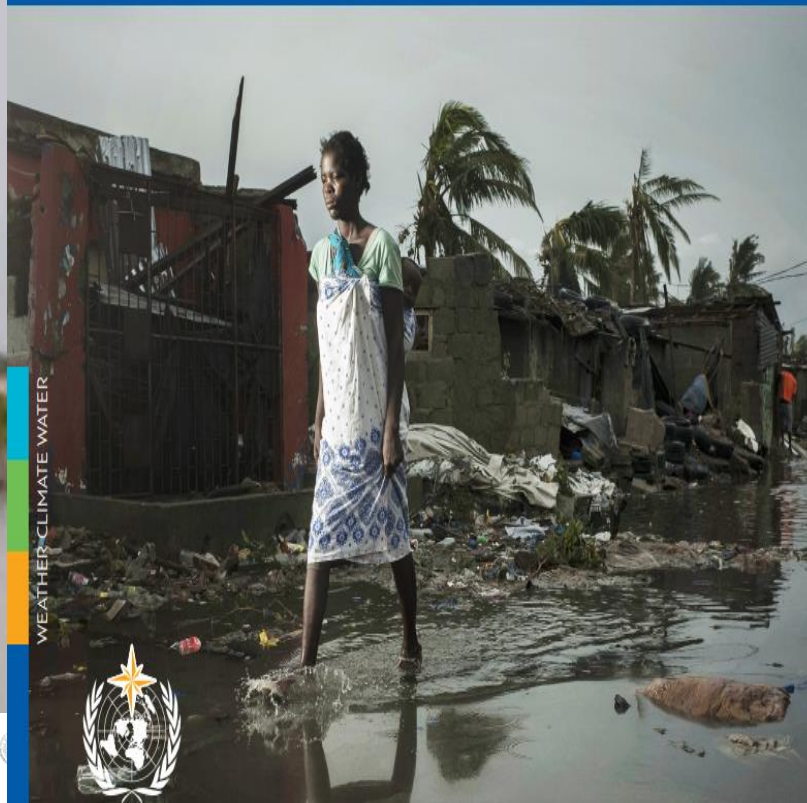
Zentralanstalt für Meteorologie und Geodynamik (ZAMG), Vienna, Austria

Multi-hazard Early Warning Systems: A Checklist

Outcome of the first
Multi-hazard Early Warning Conference

WORLD METEOROLOGICAL ORGANIZATION · UNISDR · United Nations Educational, Scientific and Cultural Organization · MÉXICO

WMO ATLAS OF MORTALITY AND ECONOMIC LOSSES FROM WEATHER, CLIMATE AND WATER EXTREMES (1970–2019)



WEATHER · CLIMATE · WATER

WMO ATLAS OF MORTALITY AND ECONOMIC LOSSES FROM WEATHER, CLIMATE AND WATER EXTREMES (1970–2019)

MULTI-HAZARD EARLY WARNING SYSTEM CUSTOM INDICATORS & METHODOLOGIES FOR COMPUTATION

UNDRR
UN Office for Disaster Risk Reduction

WORLD METEOROLOGICAL ORGANIZATION

CREWS CLIMATE RISK & EARLY WARNING SYSTEMS

Global status of multi-hazard early warning systems

Target G

UNDRR 2022.

SENDAI FRAMEWORK FOR DISASTER RISK REDUCTION 2015-2030

UNDRR UN Office for Disaster Risk Reduction

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MHEWS(Global status of multi-hazard early warning systems Target G, UNDRR, 2022)

- MHEWS is an integrated system that “addresses several hazards of similar or different type in contexts where hazardous events may occur alone, simultaneously, cascading or cumulatively over time, and taking into account the potential interrelated effects”. They may include warning for hazards related to meteorological and hydrological events, geo-hazards, environmental, biological, chemical, and technological.
- MHEWS should be resource-efficient, enable integrated disaster risk reduction, and should be easily understood by the communities. Multi-sector and multi-disciplines coordination, involvement of individuals and community at risk, having an enabling institutional and legislative environment, clear roles and responsibilities, and adequate operational capacities, are essential for effective and consistent warning through MHEW .

Compendium of multi-hazard early warning cooperation

Launched at the G20 Disaster Risk Reduction Working Group Side Event: Early Warning Early Action, 30 March 2023

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Effective and people-centred MHEWS must be:

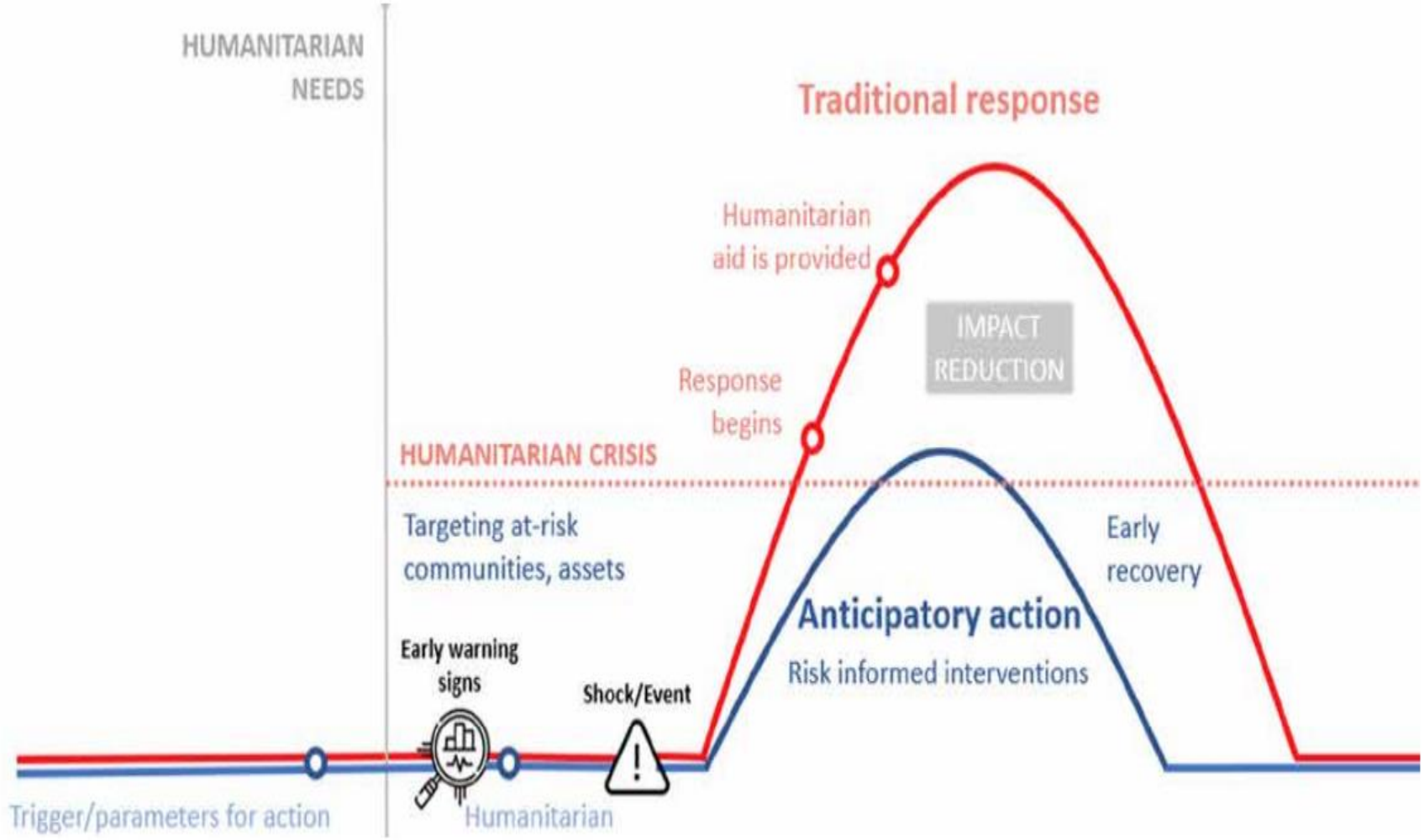
The implementation of the four components, plus the overarching governance component, can ensure an integrated approach for an end-to-end MHEWS.

Inclusive by taking into account the needs, perspectives, priorities, and meaningful participation of the various people in society, which depends on their age, sex, disability, gender roles, sexual orientation, literacy, language, cultural practices, race, geographic location, socioeconomic position, among many others.

Accessible to all to ensure that information can reach everyone who may be impacted, and in a way that can be easily understood, regardless of their individual circumstances including disability, literacy, and language.

Actionable in terms of providing information that includes potential impacts and recommended action that people should have the capacity to take, which enables people to reduce their disaster risk, and potential damages and loss.

Figure 1-2: Tackling the extent of humanitarian crisis by anticipatory action.



The following section showcases best practices to advance multi-hazard early warning systems with cooperation being the major, common enabling factor.

Global status of multi-hazard early warning systems

Target G

UNDRR 2022.

SENDAI FRAMEWORK FOR DISASTER RISK REDUCTION 2015-2030

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TARGETS OF THE SENDAI FRAMEWORK

(a) Substantially reduce global disaster mortality by 2030, aiming to lower the average per 100,000 global mortality rate in the decade 2020-2030 compared to the period 2005-2015;

(b) Substantially reduce the number of affected people globally by 2030, aiming to lower the average global figure per 100,000 in the decade 2020-2030 compared to the period 2005-2015

(c) Reduce direct disaster economic loss in relation to global gross domestic product (GDP) by 2030;

(d) Substantially reduce disaster damage to critical infrastructure and disruption of basic services, among them health and educational facilities, including through developing their resilience by 2030;

(e) Substantially increase the number of countries with national and local disaster risk reduction strategies by 2020;

(f) Substantially enhance international cooperation to developing countries through adequate and sustainable support to complement their national actions for implementation of the present Framework by 2030;

(g) Substantially increase the availability of and access to multi-hazard early warning systems and disaster risk information and assessments to people by 2030

- **The Sendai Framework, through its Target G, aims "to substantially increase the availability of and access to multi-hazard early warning systems and disaster risk information and assessments to the people by 2030". UNDRR has been mandated to monitor the implementation of the Sendai Framework, which it does through the online Sendai Framework Monitor (SFM), also contributing to the monitoring of selected targets of SDGs 1, 11 and 13.**

- **Progress towards Target G enables governments to assess their availability of, and access to, MHEWS, along with necessary governance arrangements for its implementation, contributing to the overall efforts in implementing the Sendai Framework.**

GLOBAL STATUS OF MULTI-HAZARD EARLY WARNING SYSTEMS

One of the most effective ways to reduce disaster impact is to have an effective MHEWS in place which allows people to engage in risk reduction actions. **There is evidence suggesting that countries reporting good coverage of MHEWS have lower mortality rates compared to countries that have little or no early warning systems.** For this analysis, countries were grouped into two categories: 'Limited to moderate coverage', with Indicator G1 score higher than 0 and lower or equal to 0.5; and 'Substantial to comprehensive coverage', with G1 score higher than 0.5. As can be seen in the Table 2 1, higher MHEWS coverage corresponds to a lower reported mortality ratio – countries with limited to moderate MHEWS coverage have nearly eight times the mortality ratio compared to that in the countries with substantial to comprehensive coverage[13].

Category of countries by coverage of MHEWS (Target G)	Mortality per 100,000 population, 2005-2021 (Target A)
Limited to moderate coverage	4.62
Substantial to comprehensive coverage	0.60

Table 2 1: Mortality rate by MHEWS coverage

This section provides an overview of the global and regional progress on Target G since 2015, as officially reported by countries. Each of the indicators from G2 to G6, representing the four MHEWS elements, is crucial to the successful implementation of MHEWS, and this section provides key insights into the contribution and status of these indicators.

Sendai Framework: Target G

The Sendai Framework for Disaster Risk Reduction 2015-2030 has seven strategic targets and 38 indicators for measuring progress on reducing disaster risk and losses. These indicators align implementation of the Sendai Framework with implementation of the SDGs and the Paris Agreement on climate change.

Target G of the Sendai Framework aims to *Substantially increase the availability of and access to multi-hazard early warning systems and disaster risk information and assessments to people by 2030.*

UN Members States agreed to the following indicators when measuring Target G:

- **G-1** (compound G2-G5): Number of countries that have multi-hazard early warning systems.
- **G-2** Number of countries that have multi-hazard monitoring and forecasting systems. [MHEWS element: Observation & forecasting]
- **G-3** Number of people per 100,000 that are covered by early warning information through local governments or through national dissemination mechanisms. [MHEWS element: Warning & dissemination]
- **G-4** Percentage of local governments having a plan to act on early warnings. [MHEWS element: Preparedness to respond]
- **G-5** Number of countries that have accessible, understandable, usable and relevant disaster risk information and assessment available to the people at the national and local levels. [MHEWS element: Risk knowledge]
- **G-6** Percentage of population exposed to or at risk from disasters protected through pre-emptive evacuation following early warning.

(See Annex 1 for technical details)

2.1 GLOBAL MHEWS COVERAGE [G1]

The number of countries participating in the SFM has increased iteratively and, **as of March 2022, 120 countries had provided information on their Target G status. Of those 120 countries, 95 reported the existence of MHEWS** (Figure 2.1). **While this represents a two-fold increase from the achievement reported in 2015, this represents less than half of countries in the world that have MHEWS.**

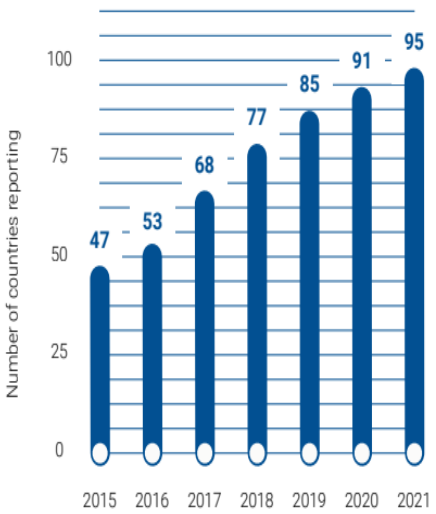


Figure 2.1: Cumulative number of countries reporting existence of MHEWS (Source: SFM)

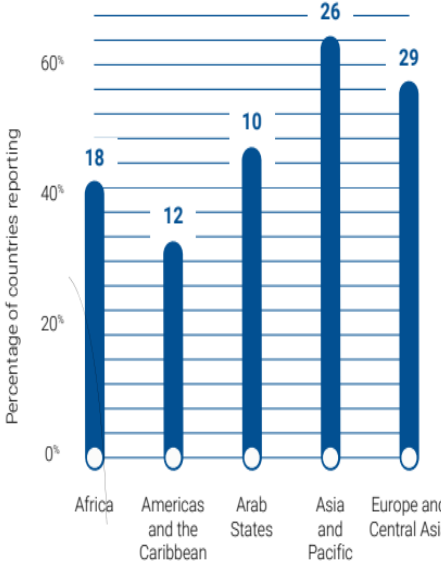
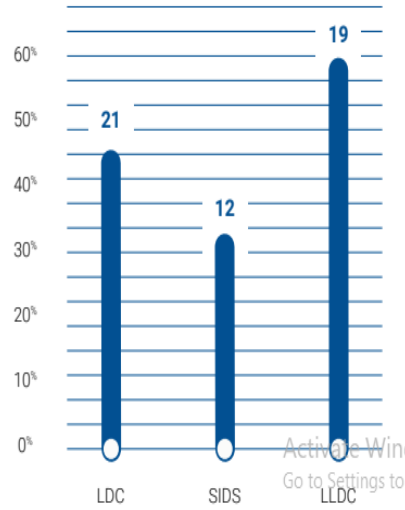


Figure 2.2: Proportion of countries per region reporting existence of MHEWS (Source: SFM). Numbers on the bars indicate the number of countries reportin



Regions fare differently in their progress and effort in establishing MHEWS. Figure 2.2 and Figure 2.3 show

LDC	Least Developed Countries
LLDC	Landlocked Developing Countries
SIDS	Small Island Developing State

ANNEX: SENDAI FRAMEWORK TARGET G: METHODOLOGY

(Guidance and complete methodology are available online[43])

Target G of the Sendai Framework comprises six indicators that measure availability of, and access to, MHEWS (including availability of, and access to, disaster risk information and assessments) and pre-emptive evacuation based on the MHEWS. Four of the six indicators align with the four key elements of MHEWS, which are referred to as relevant in the related Target G indicators below:

G-1 NUMBER OF COUNTRIES THAT HAVE MULTI-HAZARD EARLY WARNING SYSTEMS

G-1 is a compound indicator, which measures nationally and globally, the existence and quality of MHEWS in countries, based on four global indicators, G-2 to G-5, that are aligned with MHEWS elements.

The indicators as they relate to the four elements are summarized as below:

Four interrelated key elements of MHEWS	Target G indicators
Key Element 1: Disaster risk knowledge based on the systematic collection of data and disaster risk assessments	G-5
Key Element 2: Detection, monitoring, analysis and forecasting of the hazards and possible consequences	G-2
Key Element 3: Dissemination and communication, by an official source, of authoritative, timely, accurate and actionable warnings and associated information on likelihood and impact	G-3
Key Element 4: Preparedness at all levels to respond to the warnings received	G-4

The compounded G-1 is measured as the arithmetic average of the scores of the four indicators G-2 through G-5, where each Member State reports a score from 0 to 1 for all scoring as relevant in each of the four indicators.

$$Score_{G1} = (Score_{G2} + Score_{G3} + Score_{G4} + Score_{G5}) / 4$$

The aggregated global score of all country reporting is considered as an average of country scores and reflects the coverage of MHEWS, measured through the four interrelated elements. Countries are categorized as below:

G-1 Score	MHEWS Coverage
Zero	No MHEWS
Below - 0.25	Limited
0.25 - 0.50	Moderate
0.50 - 0.75	Substantial
0.75 and Above	Comprehensive

(Exclusive class intervals)

If a country reports in one year and does not do so for subsequent years, the last reported score is considered as applicable until the country reports again.

G-6 PERCENTAGE OF POPULATION EXPOSED TO, OR AT RISK FROM, DISASTERS PROTECTED THROUGH PRE-EMPTIVE EVACUATION FOLLOWING EARLY WARNING

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Thank you