

**DRAFT CONSULTATION DOCUMENT ON MEASURING  
EARLY WARNING ACCESS AND EFFECTIVENESS**

The objective of the CREWS initiative is to significantly increase the capacity to generate and communicate effective impact-based, multi-hazard, gender-informed, early warnings and risk information to protect lives, livelihoods, and assets in Least Developed Countries (LDCs) and small island developing States (SIDS).

### CREWS Members



Australia



France (Chair)



Germany



Luxembourg



Netherlands

### CREWS Observers



Canada



Japan



New Zealand



Norway



Switzerland



USAID



ACP



UNDP  
Empowered lives.  
Resilient nations.

### CREWS Implementing Partners



## Measuring Early Warning Access and Effectiveness

1. The CREWS Monitoring and Evaluation Framework is the result-based management system to oversee project results and understand the development impact of the Trust Fund. See CREWS Operational Procedures Note No2 Monitoring and Evaluation, adopted by the Steering Committee on 9 November 2016.
2. The CREWS Monitoring and Evaluation Framework's highest level objective is to "*Substantially reduce global disaster mortality by 2030 (Sendai Framework Target A)*" while its final outcome is to "*Significantly increase the capacity to generate and communicate effective, impact-based, multi-hazard early warnings and risk information to protect lives, livelihoods, and assets in LDCs and SIDS (Aligned with Sendai Framework Target G)*".
3. Currently, few countries measure their capacity to generate and communicate effective, impact-based, multi-hazard early warnings. The tools and metrics to support such efforts are not sufficiently developed (UNISDR Readiness Review to Measure Sendai Targets, 2017).
4. A small number of regional and global reviews have been undertaken that assess early warning systems across different hazards and identify gaps and needs against the four elements of an effective multi-hazard, impact-based early warning system – these are: (i) a risk-informed system design; (ii) a monitoring, forecasting and warning service; (iii) communication and dissemination, and public access; and (iv) ability to respond to the warning.
5. Research and tools have been developed that look at the economic benefits of weather and climate services. While these studies are not normalized and systematically applied, they are used effectively in programmes and projects to demonstrate the cost-return of investment in early warning.
6. Metrics for countries to measure early warning access and effectiveness are required to guide priorities for programming, institutional capacity development and related resource allocation. Metrics will contribute to guide CREWS investments and the alignment of national needs with development-partners' support. They will also provide CREWS Implementing Partners with baselines and higher level outcomes against which to measure project results.
7. The tool will contribute to countries' efforts to systematize reviews of the effectiveness of an early warning post-disaster. There is a strong demand for such service lines by countries affected by extreme events.
8. The tool will contribute to international reporting requirements such as the target and indicators under the Sendai Framework, as set out by Open-ended Intergovernmental Expert Working Group on Indicators and Terminology Relating to Disaster Risk Reduction (OIEWG) in 2016 and the follow-up roll-out led by UNISDR.
9. CREWS is the only funding mechanisms whose operations focus exclusively on increasing the capacity to generate and communicate effective early warnings and risk information. CREWS, through its Implementing Partners, can assist both with the development of an initial set of analytics (see Annex Draft Consultation Document on Measuring Early Warning Access and Effectiveness) and assist, through its operations, to the validation and iterative development of the proposed tool.

## **ANNEX – Draft Consultation Document on Measuring Early Warning Access and Effectiveness**

### **Why do we need to measure the effectiveness of early warning systems?**

Early warning systems are a tool for local, national and regional institutions in managing disaster risks, by substantially reducing loss of life, the possibility of personal injury and damage to property, infrastructure and the environment from hazard events. By reducing loss and damage, early warning systems contribute to sustainable development, climate change adaptation, and national security.

Given the significance of early warning systems to social and economic security well-being, and the associated resource demands to operate them, it is clearly desirable to continually monitor and improve their efficiency and effectiveness.

To this end, the present consultation document aims to identify a set of metrics to provide guidance on how the effectiveness of, and access to, early warning systems can be measured, encompassing a conceptual framework of key elements, including sources of data and information and methodologies.

The main reasons national to local authorities, regional and international institutions need to systematically measure their early warning systems are as follows.

1. Regular review of early warning systems lead to better understanding of benefits, limitation and performance of the system relative to the user community. From the review, opportunities for improvement in regional, national and local systems can be identified to guide priorities for programming, institutional capacity development and related resources allocation.
2. Increasing the effectiveness of international aid, being provided through multiple channels, to strengthen early warning systems: measurement and the monitoring of the effectiveness of such programmes and projects from inception to completion will enhance the overall outcome of these development investments.
3. Measures of early warning system effectiveness will assist national, local and regional institutions in meeting their global commitments to support early warning capabilities such as in the Sustainable Development Goals, the Sendai Framework and the Paris Climate Change Agreements.
4. A framework of metrics will provide an essential basis for post-disaster reviews of the effectiveness of an early warning systems by national and local authorities.

### **The main features of the present guidance**

A key principle adopted here is that effective early warning systems are ‘people-centred’ and impact-based, in addition to being technically sound, and therefore must comprise or address the following four elements:

- Risk-informed system design
- Monitoring and warning service
- Communication and dissemination
- Public access and ability to respond to the warning

The proposed metrics cover each of these elements and aims to reflect the system's ability to provide warning and risk information for the different hazard types.

From a development perspective, it is important that early warning systems be measured on their capacity to support:

- Targets for the reduction of loss of life, injury, and the loss of livelihoods;
- Objectives for sustainable development, vulnerability reduction and resilience building;
- Penetration of accurate and timely warnings; and,
- The ability of people to use warnings, respond appropriately and to provide feedback to the designated warning authority.

Early warning metrics, therefore, relate to three main international agreements, the Sustainable Development Goals (SDGs), the Paris Climate Change Agreements and the Sendai Framework for Disaster Risk Reduction, and, in particular, the indicators under Target G of the Sendai Framework. Target G calls on countries 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”*. Member States, through the United Nations, have identified indicators against which this target will be measured.

The present guidelines are expected to provide a methodology to assist countries achieve this.

Given the contribution that effective early warning systems can make in reducing the loss of lives and livelihoods, these metrics will also be ultimately measured through Sendai Targets A and B – loss of life and economic losses.

A substantive body of literature exists on measuring early warning effectiveness. Prior to the Indian Ocean Tsunami in 2004, the task was primarily developed around reviews of specific disaster events and the effectiveness of the warning systems. Since then, a number of important global and regional reviews have been undertaken. These are being compiled and the methodologies analysed as part of this consultation.

The present consultations are being carried out by the Climate Risk and Early Warning (CREWS) initiative, the World Meteorological Organization (WMO), the World Bank and the Global Facility for Disaster Reduction and Recovery (GFDRR) and UNISDR, in the context of the preparations for the Multi-Hazard Early Warning Conference, 22-23 May 2017, Cancun, Mexico. The initial consultations

also drew on and in-person consultations with international experts<sup>1</sup>, and the following document has been updated to incorporate additional feedback received up and until 6<sup>th</sup> of August 2017.

## Proposed Set of Metrics for Measuring Access and Effectiveness of Early Warning Systems

### 1 Risk-informed system design

**The design of the system is based on a documented understanding of hazards, and the exposure and vulnerability of people and property to the hazards.**

Proposed metric	Relevance	Measurability	Data requirement
1a. Is standardized and updated information available on potential hazards, as well as the people and property exposed and vulnerable to them?	High	Low - High	Mapping of the occurrences, characteristics and emerging trends of hazards Probabilistic multi-hazard risk models and maps Local, sub-national and national socio-economic exposure and vulnerability assessments Information on past losses, tied with changes and projected trends of exposed people and property
1b. Is hazard (including multi- and cascade), risk, vulnerability and exposure information available and provided in an accessible format to guide the design of the system?	High	Medium	Graphic representations and spatial assessments of 1a.
1c. Are target groups regularly and systematically identified along with their specific information needs?	High	Medium - Low	Target groups can be ascertained using the models/assessments in 1a. Regularly updated lists of identified target groups and their information needs.

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Additional inputs were received by Frank Thomalla, Edward Turvill and Albert Salamanca during an informal experts meeting kindly hosted by the Stockholm Environment Institute – Asia Centre on the 17<sup>th</sup> of May 2017.

			Documentation of user engagement events.
1d. To what degree has the system been designed and is it regularly assessed based on needs and priorities of the target groups?	Medium	Low	Documentation of regular user engagement programmes including identification of hazards based on user needs and priorities.
Comments: 1b: Measurability is dependent on the methodology and models used for conducting the risk assessments. The exclusion and weighting of variables or the models used will have varying results and attached uncertainty. That uncertainty will affect the ability to guide the development of the early warning system.			

## 2 Monitoring and warning service

**Appropriately resourced, scientifically-based operational systems exist that provide monitoring services and authoritative public warnings of circumstances for all hazards.**

Proposed metric	Relevance	Measurability	Data requirement
2a. Do relevant/identified hazards have monitoring and forecasting systems that are routinely verified?	High	Varied	Reports of system development and existing institutional set-ups (i.e. WMO for hydro-meteorological hazards, UNESCO/IOC for tsunamis)
2b. Does the forecasting system include predefined, localized thresholds and impacts for warning issuance?	High	Varied	Hazard impact and relation to responses to warnings is needed
2c. Is there cross-institutional cooperation and harmonization for relevant hazards?	Medium	High	Documentation of cross-institutional cooperation and progress reports on harmonization.
2d. Are warning authorities clearly identified and operational 24/7?	High	High	Listing of warning authorities and log books indicating 24/7 operations.
2e. Is the warning authority able to receive advisories from external service providers, and vice-versa?	Medium	Low	tbd
2f. For slow-onset hazards, is there a mechanism for the relevant authorities to meet and prepare ahead of the hazard event?	High	Medium	Documentation of meetings of relevant authorities ahead of the hazard event.
2g. Do collaborative and active partnerships exist between warning authorities and response	High		Partnership agreements, documentation of interaction between the warning authority and response communities, documentation of user verification and

communities to evaluate warning issued?			assessment of hazard warning.
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### 3 Communication and dissemination

**Communication and dissemination systems are in place and are used to convey accurate, timely warnings to all those who may be at risk from a hazard event, including relevant authorities and enterprises.**

Proposed metric	Relevance	Measurability	Data requirement
3a. Is there an increasing percentage of warning communication and dissemination systems that use public warnings in the interoperable format defined by the international standard Common Alerting Protocol (CAP), ITU-T Recommendation X.1303.	High	High	The ratio of CAP-enabled warning systems increases over time until it reaches nearly 100% at the national level. A system can be considered CAP-enabled if: ingested warning messages are accepted by the system when valid and rejected when not valid, and emitted warning messages from the system are always valid according to the CAP standard.
3b. Are organizations regarded by the national government as official sources of warnings registered in the international Register of Alerting Authorities maintained by WMO.	High	High	Are all organizations regarded by the national government as official sources of warnings registered in the international Register of Alerting Authorities maintained by WMO.
3c. Is the warning message understandable and actionable for different audiences?	High	Medium	Availability of supplementary material to enhance usability by users; Survey results from different audiences; Reports on system development
3d. Are multiple dissemination channels available (e.g. for cross-verification) including local media?	Medium	Low	List of warning dissemination pathways (websites, sms, apps, email etc) and maps of network access.
3e. Does the dissemination mechanism reach/cover all of the at risk exposed/population	High	Medium with some uncertainty attached	ICT data (ITU)
3e. Are users systematically involved in identifying the most appropriate warning information and dissemination pathways for their			User engagement programmes and events, and assessments of user preference on the different

decision making needs?			warning dissemination pathways.
<p>Comments:</p> <p>Message needs to be simple, trustful and actionable. Balance needs to be struck between a simple message and one that is informative that conveys risk, potential impact loss and damage, thresholds etc. but runs the risk of being too complex. Warnings should be simplistic in that all audiences should be able to understand the warning. Having warnings tailored to different groups complicates the design of an early warning system and can reduce effectiveness in its delivery. A simple message/warning tailored to all audiences in an affected area optimizes the early warning system's effectiveness.</p> <p>Additional metric to be considered: Are the warning message pathways tailored for different audiences and locations? This can be measured through the existence of user engagement programmes and user surveys.</p>			

## 4 Ability to respond [Response capacity]

**All those who receive the warnings understand them and are equipped with the knowledge and capacities to effectively respond to different levels of warning advice to reduce human and material losses and injury.**

Proposed metric	Relevance	Measurability	Data requirement
4a. Are there agreed standard operation procedures (SOPs) for responding to early warning in existing preparedness and response plans and strategies that all relevant parties are committed to?	High	Medium - High	Local, sub-national and national emergency management plans with agreed SOPs depending on country and severity of impending hazards. Indication of commitment from the relevant parties.
4b. Are mechanisms in place that enable at risk population to take early action?	High	High	Initiatives such as cash transfers that are disbursed once a threshold is breached.
4c. Are mechanisms available to transfer knowledge to people and institutions in the exposed areas on the nature, functions and limitation of the system; types, and form of warnings messages, and the standard operation procedures and how to act on them?	High	Low	Education curriculum and evidence from relevant institutions that transfer of knowledge on warning response have taken place. Survey of household preparedness and knowledge on warning response.
4d. Are mechanisms available to transfer knowledge to people and institutions in the exposed areas on hazards and understanding risks?	High	Low	Education curriculum and evidence from relevant institutions that transfer of knowledge on hazards and risks have taken place.
<p>Any other proposed metrics and comments:</p> <p><u>Regarding 4a.:</u> The definition of standard procedures will vary with different parts of society – for example, public education, private sector, etc. The standard procedures will vary with education – 4d. – so there needs to be connections in terms of these metrics.</p> <p><u>Regarding 4c.:</u> Does this include pre-disaster/warning preparedness? There is an important relationship between pre-disaster preparedness at the household level and the effectiveness of an early warning system in terms of the ability to respond when a warning is issued. There needs to be greater emphasis as</p>			

to the role of the individual in responding to a warning in this set of metrics.

Regarding Measurability of 4c.: Whether or not the education system being evaluated includes warning response is not necessarily a complete assessment as to evaluating the effectiveness of the people's ability to respond. It certainly is a necessary metric that is measurable if using the existence of educating response to warning, but it does not capture the receptiveness of the education provided – usually this is only captured post-event. As such, measurability was indicated as being low. A survey of household preparedness and knowledge of responding to a warning should be considered in terms of data requirement for this receptiveness.

Additional metric is needed on measuring behavioral change