International Network for Multi-Hazard Early Warning Systems (IN-MHEWS)

A Multi-Stakeholder Partnership for Promoting and Sharing Best Practice in Multi-Hazard Early Warning Systems and Services for Disaster Risk Reduction and Resilience

Concept Paper

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Executive Summary

Early warning systems (EWS) have been an important factor in reducing the risk of death and injury from disasters triggered by natural hazards related to weather, climate, and water. Strengthened monitoring and assessment of natural hazards and improved forecasting and warning services have contributed to this progress. Just as important, people increasingly understand the risks posed by natural hazards and the measures they should take to protect themselves and their families. Advances in socio-economic development, renewed investment in disaster risk reduction (DRR), and national and international actions to implement the priorities of the Hyogo Framework for Action (HFA) over the past decade are among other factors that made this progress possible. These gains need to be sustained in the post-2015 era.

While good progress has been achieved in strengthening EWS over the 10 years of implementing the HFA, it is also true that the resulting societal benefits have been spread unevenly across countries and communities. Significant gaps remain, especially in providing services to grassroots communities and poor and vulnerable families.

Furthermore, the cascading impacts of natural hazards and climate change and the growing complexity of human society increasingly magnify the risks and vulnerabilities that people face. The Sendai Framework for Disaster Risk Reduction 2015−2030 (SFDRR) adopted at the Third United Nations World Conference on Disaster Risk Reduction (WCDRR)[i], held in Sendai, Japan, from 14 to 18 March 2015 called for enhancing and strengthening Multi-hazard Early Warning systems (MHEWS), to develop and invest in regional multi-hazard early warning mechanisms, and to achieve the global target for MHEWS. MHEWS inform the people of the potential impacts of impending natural hazards, the risks on their lives and livelihoods, and the action they should take. To be effective, this approach entails multi-stakeholder cooperation and coordination between and among national science, disaster-risk management agencies, and other relevant stakeholders. It also needs to be combined with actions to make communities more disaster resilient so that they can respond more effectively to natural hazards.

In response to the call of SFDRR, the **International Network for Multi-Hazard Early Warning Systems (IN-MHEWS)** is being proposed as a multi-stakeholder partnership that will facilitate the sharing of expertise and best practice on strengthening MHEWS as a national strategy for DRR, climate change adaptation (CCA), and building resilience. In doing so, it will support the implementation of SFDRR, including the *global DRR target for MHEWS*, and the *United Nations Plan of Action on Disaster Risk Reduction for Resilience.*

As a broad-based networking initiative on early warning, IN-MHEWS[ii] will exemplify the importance of multi-stakeholder cooperation and synergy in advancing MHEWS and promoting DRR for societal resilience.

1 Rationale

1.1 Background

Early warning systems (EWS) have received increasing international consideration in the past decade, as highlighted by the Hyogo Framework for Action[iii] (HFA) and three International Early Warning Conferences[iv] hosted by the Government of Germany, the appreciation of EWS during the G8 summit in 2005[v] and in various United Nations General Assembly Resolutions, and the recent natural hazard events such as storm surges and tsunamis that underlined the importance of EWS in saving lives and reducing losses.

In line with the international efforts to promote early warning, the World Conference for Disaster Reduction[vi] (WCDR) in 2005 adopted plans that put in place the International Early Warning Programme[vii] (IEWP) first proposed at the Second International Conference on Early Warning (EWC II) in 2003 in Bonn, Germany. As an implementation mechanism, the Platform for the Promotion of Early Warning (PPEW) was launched in 2004 and remained operational until 2008.

Considered as the defining challenge of our times by the Secretary General of the United Nations, climate change is exacerbating the impact of hydrometeorological hazards and compounding disaster risk. Efforts are needed to determine how EWS should incorporate impact and risk information on extreme weather and climate change to forewarn and guide individuals, groups and communities at risk, including decision makers, in taking appropriate action on preventing and reducing disaster losses.

The recent decade has witnessed a significant evolution in information and communication technologies (ICT). Access to space-based data is now more open, made possible by the changes in related policies. The development of personal mobile devices, such as smart phones and tablets, and in the use of geographic information systems and geo-viewers advanced remarkably with a fast pace. In this regard, there is a need to determine the best ways of applying these advances in ICT to improve EWS operations worldwide.

1.2 Recent Advances in Early Warning Systems

In line with the Priority for Action 2[viii] of the Hyogo Framework for Action (HFA), regions and countries across the world have made significant progress in strengthening multi-hazard, end-to-end, people-centred EWS over the past 10 years. Progress has been evident in the development of observation and monitoring systems and the strengthening of communication and information on risks, as part of the overall efforts to strengthen disaster resilience. Today, EWS are established and operational in many countries of the world, focusing on a variety of natural hazards and utilizing available scientific knowledge and modern ICT.

Regarding EWS for hydrometeorological hazards that remain a major trigger of disaster events, significant advances have been seen in predicting weather, water, and climate extremes and the application of disaster risk reduction (DRR). On average, a five-day weather forecast of today is more reliable than a two-day weather forecast of two decades ago.[ix] There has also been consistent

progress in risk assessment and hazard mapping, and the recognition of indigenous warning knowledge in enhancing the operations of EWS.

EWS, together with other DRR-related measures, have in many regions led to a substantial reduction in the number of lives lost due to natural hazards. A study conducted by the Centre for Research on the Epidemiology of Disasters (CRED) illustrated how, in the period 1974-2003, the number of disaster-related deaths had decreased significantly.[x] Moreover, the Global Assessment Report on Disaster Risk Reduction 2011 (GAR 2011) [xi] published by the United Nations Office for Disaster Risk Reduction (UNISDR) reported that in most of the world the risk of being killed by a tropical cyclone or a major river flood is lower today than it was in 1990.

Examples of advances in EWS in the recent decade include: The Common Alerting Protocol (CAP) which provides an international standard for emergency alert and public warning for all hazards and all media; the multi-hazard Meteoalarm System, operated in Europe by a network of 35 European countries[xii] under the umbrella of the World Meteorological Organization (WMO); the multi-hazard Vigilance System in France; the Natural Hazard Partnership in the United Kingdom; the Weather Ready Nation Roadmap in the United States of America (USA); the Multi-Hazard Early Warning System for the Megacity of Shanghai in China; the Indian Ocean and Caribbean Sea Tsunami Warning Systems implemented under the coordination of the Intergovernmental Oceanographic Commission of the United Nations Educational, Scientific and Cultural Organization (UNESCO-IOC) and supported by WMO's operational infrastructure; and the establishment of the WMO Global Data Processing and Forecasting System (GDPFS) and the WMO Integrated Global Observation System – WMO Information System (WIGOS/WIS) for early warning services.

1.3 Challenges related to Early Warning Systems

Notwithstanding these advances in EWS in the past decade, many countries still have not benefited from them as much as they could have, and significant gaps remain, especially with the "last mile" of EWS.

A key challenge has been in reaching the most remote and vulnerable population with timely, meaningful, and actionable warning information. Several gaps persist due to weak coordination among the actors and agencies concerned, feeble public awareness and participation as well as insufficient political commitment. Additional efforts are needed to institutionalize and strengthen multi-hazard, end-to-end, people-centred EWS for all communities, and to deliver warnings from one authoritative source or "voice" at the national level.

Also, despite these efforts on EWS, the world has seen an increasing trend of economic losses from the impact of natural hazards such as storms in the USA, the Philippines, and Myanmar; floods in European countries, Thailand, India and Pakistan; droughts in Africa and heat waves in Europe and Asia; and tsunamis in the Indian Ocean and the Northwest Pacific Ocean.

Moreover, the impact of natural hazards could cascade into more serious consequences. For example, the 2010 eruptions of Iceland's Eyjafjallajökull volcano created havoc in the airline industry, triggering many cancellations and delays in flights. This and similar cascading disaster events such as the 2006 Philippines landslide, 2011 Thailand floods, and the 2013 Typhoon Haiyan in the Philippines

and its storm surge manifested the need to broaden the scope of EWS to address and cope with multiple hazards and risks.

The global changes in societal structures, rapid urbanization, growing exposure of populations and assets, and climate change, altogether result in a highly dynamic and complex state of disaster risk. This situation, together with the increasing globalisation of risk, calls for strengthened EWS at all levels. It also calls for an integrated and holistic approach to early warnings for multiple hazards and risks tailored to user needs across sectors. In this regard, international and regional collaboration as well as multi-stakeholder partnership at all levels is critically necessary, given the transboundary nature of most natural hazards.

Moreover, there is a need for a periodic global inventory of EWS implemented and operated worldwide. While the surveys conducted between 2005 and 2012 provide an overview of EWS operated in many regions of the world, there is not yet a comprehensive global inventory of EWS to serve as baseline to monitor progress in the coming decades. In addition, there is no official mechanism for reporting on regional or global efforts on early warning, including advances in early warning for tsunamis since 2005.

Lastly, there is a present need for a prominent "voice" for early warning at the international level that could raise the visibility and advance the agenda of multi-hazard early warning systems (MHEWS) worldwide and advocate the usefulness of MHEWS in international platforms and among key stakeholders, including donors, and across all sectors.

1.4 Call for Multi-Hazard Early Warning Systems

EWS have often been developed to target specific hazards. In some cases, EWS are operated for multiple hazards, particularly in the context of hydrometeorological phenomena. It is important to consider a holistic and integrated multi-hazard approach to EWS as a strategy to streamline such systems, to apply lessons learned from their operations, and to contribute effectively to DRR. It is also important for warning messages to originate from an official authoritative source and communicated through broadened channels of dissemination, including the social media.

At the Third United Nations World Conference for Disaster Risk Reduction (WCDRR), Member States of the United Nations, through the post-2015 framework for DRR, agreed on the necessity of enhancing MHEWS (paragraph 10 of draft 1 of the post-2015 framework for DRR, dated 28 January 2015).[xiii] States also called for strengthened regional and international cooperation to develop science-based methodologies and tools to strengthen MHEWS (paragraph 23). States have also expressed the need to continue to invest in, develop, maintain and strengthen people-centred MHEWS, to promote the application of simple and low cost early warning equipment and facilities, and to broaden release/dissemination channels for early warning information (paragraph 31-b).

Furthermore, States agreed on a global target for DRR specifically on MHEWS (i.e. Target 7: Substantially increase the availability of and access to MHEWS and disaster risk information and assessments to the people by 2030.).

Considering the enormity and complexity of the disaster and climate risk problem and the call for action of States in the post-2015 framework for DRR on enhancing MHEWS, partnership and networking among relevant stakeholders and actors concerned are critical to advance and usher the next generation of MHEWS and service delivery for DRR and resilience building.

2 International Network for Multi-Hazard Early Warning Systems

One of the major outcomes of the Working Session on Early Warning during WCDRR, was the endorsement of the proposal for the establishment of an **International Network for Multi-Hazard Early Warning Systems (IN-MHEWS),** a multi-stakeholder partnership under SFDRR that will foster cooperation, collaboration, and networking in strengthening MHEWS.

Building on their respective programmes and activities and institutional mechanisms for cooperation on EWS, the IN-MHEWS partners will work together to promote a holistic and integrated approach to early warning. This innovative approach supports MHEWS and services and fosters multi-stakeholder partnerships in building the capacity of national science and disaster risk management agencies and the resilience of communities to natural hazards.

2.1 Objectives

The key objectives of IN-MHEWS are:

a) To identify effective strategies and actions to promote and strengthen MHEWS in support of the implementation of SFDRR, including the *global DRR target for MHEWS*, and the *United Nations Plan of Action on Disaster Risk Reduction for Resilience*;
b) To facilitate the sharing of best practices and making available to governments and key stakeholders expertise and policy-relevant guidance to enhance MHEWS and related services, as an integral component of their national strategy for DRR, climate change adaptation (CCA), and building community resilience;
c) To promote synergies between and among stakeholders at national, regional and international levels and those in charge of operating EWS at the national and local levels, and the strengthening of user-interface platforms as a contribution to the DRR Priority of the *Global Framework for Climate Services (GFCS)*; and,
d) To advocate the usefulness of MHEWS in regional and international platforms and among key stakeholders, including donors, and across all sectors.

2.2 Strategy

The underpinning strategy for the Network is to utilize existing forums, conferences, and frameworks to complement existing and emerging strategies for DRR, CCA, and sustainable development. This will help support a wider strategic approach to enhancing the quality and optimizing the level and scope of early warning services for society, which could include the following:

a) To promote the shift from a single-hazard approach to a multi-hazard approach for EWS;

b) To promote the best application of scientific and technical advances to EWS as well as the effective use of data processing and modelling, information, communication, space and geospatial technologies, and knowledge on hazards and risks;
c) To build on the paradigm shift underway in national or local agencies, such as the National Meteorological and Hydrological Services (NMHSs), in:

   i. Advancing from the current status as providers of forecasts and early warnings to providers of impact-based forecasts and risk-informed warnings;
   ii. Assuming active roles in all aspects of disaster risk management to better support national disaster management agencies and local communities in reducing disaster risk;
   iii. Providing better risk-based decision support services.

d) To contribute to capacity development of countries, particularly in strengthening the linkages between national technical agencies providing data on hydrometeorological, geophysical, and other hazards, and relevant disaster risk management agencies or organizations; and to facilitate sharing of experiences and good practices, such as through regional demonstration projects.
e) To facilitate the dialogue between and among stakeholders on the scientific, technological, and social issues concerning EWS and to promote the sharing of case studies and lessons learned among regions, countries, cities, and local communities (e.g. lessons learned from the use of indigenous knowledge in early warning);
f) To facilitate the development of guidelines, procedures and indicators that guide countries in tracking their respective progress in MHEWS in line with the post-2015 framework for DRR; including those to measure:

   i. The number of people, including vulnerable people, with access to early warning and risk information and assessments;
   ii. Advances in the incorporation of the gender perspective in EWS;

g) To provide policy-relevant guidance to national authorities and key stakeholders on enhancing MHEWS and mainstreaming related goals and strategies into development processes, including legislation, policy development, and planning development programmes and investments;
h) To address and review emerging issues related to early warning with an international or global perspective (e.g. cascading effects of natural hazard impacts; climate change, urbanization, and the amplification of risks to global scales; issues on accountability and liability in EWS operation, etc.) and mobilize additional actors and stakeholders to contribute to up-scaled and accelerated efforts for MHEWS worldwide;
i) To serve as the “preferred source of information” on MHEWS and related efforts worldwide;
j) To conduct regular forums for stakeholders concerned to discuss emerging issues and to share information and knowledge, including the application of advances in science and technology to MHEWS; and,
k) To provide visibility to MHEWS in established international and national platforms for DRR (facilitated by UNISDR) and other forums related to DRR.

2.3 Initial Activities and Outputs

As a first step, the convening of organizational and planning meetings in 2015 to discuss the collaborative arrangements and activities of IN-MHEWS is proposed.

The potential priority outputs of IN-MHEWS include the following:

a) A *common priority agenda and plan of action* of IN-MHEWS;
b) A global review of MHEWS to be published every four years;
c) Guidelines for reviewing and measuring progress in MHEWS in line with the priorities of the post-2015 framework for DRR and the global DRR target on MHEWS;
d) Development of guidelines on multi-stakeholder partnerships for MHEWS at international, national and community levels;
e) Stocktaking and baseline study on the state of hazard and risk analysis and the roles and capacities of United Nations agencies;
f) Contribution to the development of a catalogue-and-inventory system for extreme natural hazard events and related loss-and-damage database;
g) Annual background reports as contribution to key publications on loss and damage and risk, such as the GARs, the WMO-CRED-UCL Atlas of Mortality and Economic Losses from Weather, Climate, and Water Extremes, etc.; and
h) Regular publication of bulletins that promulgates articles, case studies, lessons learned, emerging issues on MHEWS, as well as related policy developments in countries.

2.4 Coordination

It is proposed that IN-MHEWS will have a **Steering Group**, comprised of representatives of the Network Partners, and will constitute **Expert Groups** to support the collaborative activities of IN-MHEWS in response to the requirements of countries.

2.5 Network Partners

The networking partnership is open to all stakeholders committed to sustaining the achievements of countries in implementing HFA Priority 2, and to promoting a holistic, integrated, and multi-hazard approach to early warning in accordance with the SFDRR. Network partners could include government agencies, international organizations, NGOs, academia, media, and providers and users of early warning services.

Currently, the following stakeholders have expressed intention to collaborate and to contribute to the work of IN-MHEWS as network partners: WMO, WHO, UNDP, UNESCO-IOC, UNESCAP, UNISDR, UNOOSA/UN-SPIDER, IFRC, ITU, GFZ (Helmholtz-Centre Potsdam – GFZ German Research Centre for Geosciences), and GIZ (German Development Corporation).

3 References

[i] WCDRR - http://www.wcdrr.org/conference/programme

[ii] The proposed IN-MHEWS is included in the DRR-related reports and documents for the 17th Session of the World Meteorological Congress and 67th Session of the Executive Council, 25 May to 17 June 2015, Geneva, Switzerland (documentation will be available at http://www.wmo.int)

[iii] HFA - http://www.unisdr.org/we/coordinate/hfa

[iv] EWCs - http://www.geomuseum.com/, http://www.unisdr.org/2006/ppew/info-resources/ewc2-summary.htm, http://www.unisdr.org/we/inform/publications/608

[v] G8 Summit 2005 - http://www.g8.utoronto.ca/summit/2005gleneagles/

[vi] WCDR - http://www.unisdr.org/2005/wcdr/wcdr-index.htm

[vii] IEWP - http://www.unisdr.org/2006/ppew/iewp/about-iewp.htm

[viii] HFA document, page 17 - http://www.unisdr.org/we/inform/publications/1037

[ix] ECMWF. 2012. Joint WMO Technical Progress Report On The Global Data Processing And Forecasting System And Numerical Weather Prediction Research Activities For 2012. European Center for Medium-Range Weather Forecasts. Reading, United Kingdom.

[x] CRED - http://www.cred.be/

[xi] GAR 2011 - http://www.preventionweb.net/english/hyogo/gar/2011/en/home/index.html

[xii] Austria, Bosnia-Herzegovina, Belgium, Bulgaria, Switzerland, Cyprus, Czech Republic, Germany, Denmark, Estonia, Spain, Finland, France, Greece, Croatia, Hungary, Ireland, Iceland, Italy, Luxemburg, Latvia, Former Yugoslav Republic of Macedonia, Malta, Montenegro, Netherlands, Norway, Poland, Portugal, Romania, Serbia, Sweden, Slovenia, Slovakia, United Kingdom

[xiii] Mentions of MHEWS in the Sendai Framework for Disaster Risk Reduction 2015−2030 (SFDRR):

- Ensuring the full coverage of multi-hazard early warning systems (para. 14);
- Enhance the development and dissemination of science-based methodologies and tools (…) to strengthen multi-hazard early warning systems (para. 25-a);
- Invest in, develop, maintain and strengthen people-centred multi-hazard, multi-sectoral forecasting and early warning systems (…) Promote the application of simple and low-cost early warning equipment and facilities and broaden release channels for natural disaster early warning information (para. 33-b); and
- Promote the further development and investment in effective, nationally compatible, regional multi-hazard early warning mechanisms, where relevant, in line with the Global Framework for Climate Services, and facilitate sharing and exchange of information across all countries (para. 34-c).

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