



Second Experts' Symposium on
Multi-Hazard Early Warning Systems
(MHEWS – II)
with focus on the Role of National
Meteorological and Hydrological Services

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1. Background

1.1. International developments related to Early Warning Systems

Early warning systems have received significant international attention over the past few years, including (i) three International Early Warning Conferences hosted by Germany (1998, 2003, 2006)¹, (ii) recognition of early warning systems as an integral part of disaster risk reduction within the G8 Summit (2005) and UN General Assembly Resolutions, (iii) Report of the Global Survey of Early Warning Systems (2006)², (iv) First Experts' Symposium (May 2006) on Multi-Hazard Early Warning Systems (MHEWS-I), convened by WMO and co-sponsored by six international agencies. Second International Conference on Early Warnings specified four operational components of early warning systems, including:

- (i) Observation, detection, monitoring, analysis, forecasting and development of hazard warning messages;
- (ii) Assessing potential risks and integrating risk information into warning messages;
- (iii) Dissemination of timely, reliable and understandable warning messages to authorities and public at-risk;
- (iv) Community-based emergency planning, preparedness and training focused on eliciting an effective response to warnings to reduce potential impact on lives and livelihoods.

Based on these components, MHEWS-I identified criteria for “good practices” in early warning systems (EWS), and further discussed major gaps within these components, as revealed by the Global Early Warning Survey. Additionally, MHEWS-I identified the i) Shanghai Multi-Hazard Early Warning System and Emergency Preparedness; ii) French “Vigilance” System; iii) Republic of Cuba Tropical Cyclone Early Warning System; and iv) Bangladesh Cyclone Preparedness Programme as examples of “good practices”³. MHEWS-I further stressed that,

- (i) Development and sustainability of EWS requires political commitment and dedicated investments;
- (ii) EWS must be an integral part of all levels of the government's (national and local) disaster risk management plans and budgets;
- (iii) Legislation must explicitly define roles and responsibilities of various authorities and agencies;
- (iv) Implementation of EWS requires a clear concept of operations and standard operating procedures, enabling effective coordination among agencies across the components of EWS, at national and local levels (horizontally and vertically), and;
- (v) Systematic feedback and evaluation at all levels are needed with established mechanisms to translate the information gathered to corrective actions for system improvement over time.

Following the MHEWS-I, WMO Congress (XV) and Executive Councils (LVIII, LX) requested that WMO in collaboration with other key partners initiate EWS projects, particularly demonstrating National Meteorological and Hydrological Services' (NMHS) institutional cooperation and coordination with disaster risk management agencies and other stakeholders. Furthermore, WMO governing bodies requested that WMO in collaboration with other partners initiate pilots, whereby the concept of multi-hazard approach to EWS could be explored pertaining to benefits that could be realized through cost-effectiveness, interoperability and sustainability. In this regard,

- (i) WMO has facilitated the documentation of the four good practices that had been identified at MHEWS-I, with focus on intuitional coordination and collaboration and participation of NMHS; and;

¹ The three International Early Warning Conferences are as follows: i) First International Conference on Early Warning in 1998 (<http://www.geomuseum.com/ewc98/>); ii) Second International Conference on Early Warning in 2003 (<http://www.ewc2.org/pg000001.htm>); (iii) Third International Conference on Early Warning in 2006 (<http://www.ewc3.org/>)

² In 2005, following the Indian Ocean tsunami, UN Secretary General requested a global early warning survey. This survey was coordinated by ISDR Secretariat with support by a multi-agency task team, co-chaired by WMO and OCHA. This survey is available at: [http://www.reliefweb.int/rw/lib.nsf/db900sid/AMMF-6VKH6Z/\\$file/UNISDR-Sep2006.pdf?openelement](http://www.reliefweb.int/rw/lib.nsf/db900sid/AMMF-6VKH6Z/$file/UNISDR-Sep2006.pdf?openelement)

³ MHEWS-I co-sponsors included: WMO, IFRC, OCHA, UNDP, UNESCO, the World Bank and the ISDR Secretariat. The outcomes of MHEWS-I are available from http://www.wmo.int/pages/prog/drr/events/ews_symposium_2006.

- (ii) WMO is working with ISDR System partners⁴ to facilitate national early warning system projects aimed at strengthening operational coordination and cooperation of the NMHS with their national partners such as disaster risk management agencies and the Red Cross and Red Crescent Societies (RCRC) for meteorological, hydrological and climate-related hazards, and to explore benefits that could be realized through a multi-hazard approach.⁵

The ability to scale up these capacities requires systematic documentation, provision of guidelines based on lessons learnt to support capacity development through strategic training and development projects overtime. In this regard, WMO convened the “Second Experts’ Symposium on Multi-Hazard Early Warning Systems with focus on the Role of National Hydrometeorological Services (MHEWS-II),” hosted by Météo-France, in Toulouse, France on May 5-7, 2009.

2. MHEWS-II Goals

The Symposium brought together experts from NMHSs, disaster risk management authorities, Red Cross and Red Crescent Societies and other international and regional agencies, with the goals to:

- 1) Review and synthesize lessons learned from the four documented “good practices” in EWS, focusing on specific roles of NMHSs and how they can best support disaster risk management agencies and other stakeholders within the EWS operational framework at national to local levels;
- 2) Review and provide expert feedback to finalize the guidelines on “Capacity Development in Multi-Hazard Early Warning Systems with Focus on Institutional Coordination and Cooperation, and NMHS” developed based on the synthesis of the four good practices in EWS and other examples, and;
- 3) Provide recommendations to improve coordination and collaboration among agencies responsible for different aspects of early warning systems (national to local levels) for hydro-meteorological and climate-related hazards.

3. Structure of the MHEWS-II

3.1. Participants

The MHEWS-II was participated by nearly 60 experts from National Meteorological and Hydrological Services (NMHSs), Disaster Risk Management Agencies of 14 countries (developed and developing, from different regions), as well representatives from seven international and regional agencies (see participant list included in Annex I). The participants represented a wide range of expertise in policy, development, financing, scientific and technical, humanitarian, education, and community preparedness and planning, related to different aspects of early warning systems. Furthermore, the diversity of the different national experiences presented at MHEWS-II helped enrich the discussions.

3.2. Sessions and working groups

The format of the three-day MHEWS-II was designed to ensure that the goals were fulfilled. The Annotated Agenda is provided in Annex II. During the first and second days of the workshop, four good practices (Bangladesh, China-Shanghai, Cuba, France) and 10 other examples of national EWS from Canada, Costa Rica, Croatia, Indonesia, Italy Japan, Mozambique, South-Africa, United Kingdom, and the United States of America, were presented and discussed.

On the afternoon of the second day, three parallel Working Groups, reviewed and provided comments on the draft guidelines on the “Role of National Meteorological and Hydrological Services in Multi-Hazard Early Warning Systems with Focus on the Institutional Coordination and Cooperation” (doc 10), which had been prepared based on the synthesis of lessons learnt from the four documented good practices. (Annex III).

⁴ WMO is working in close partnership with a number of international and United Nations’ partners such as the World Bank, International Strategy for Disaster Reduction (ISDR), United Nations Development Programme (UNDP), International Red Cross and Red Crescent Societies (IFRC), UNESCO and its Intergovernmental Oceanographic Commission (UNESCO-IOC), World Food Programme (WFP) and Food and Agriculture Organization (FAO).

⁵ Among these pilots are the Shanghai Multi-Hazard Early Warning System demonstration project (mega city), and a number of coordinated projects in South Eastern Europe, Central America, Central Asia and Caucasus, and later on in South East Asia.

Finally, a panel of experts from seven international and regional agencies addressed international and regional issues related to EWS: (i) transboundary issues related to the implementation of EWS, (ii) challenges and opportunities in regional and International cooperation and, (iii) coordinated initiatives to support the development of EWS at the national level, and (iv) use of EWS for improved international humanitarian preparedness and response.

All presentations and documents shared and discussed at MHEWS-II can be accessed at: http://www.wmo.int/pages/prog/drr/events/MHEWS-II/index_en.html.

4. Overall Synthesis of Presentations and Discussions

All presentations addressed a number of common issues, outlined in Annex IV. A synthesis of common experiences across the presentations is provided in this section.

4.1. Governance and Institutional Arrangements

A synthesis of all presentations indicates that:

(i) Significant political willingness and commitment are necessary to support the development of a successful and sustainable EWS.

Several themes emerged from the presentations and discussions, including; 1) An effective EWS requires a government led coordinated approach engaging all stakeholders; 2) there is need for a coordinated mechanism and processes for ongoing collaborations across all relevant government agencies and with other relevant stakeholders at all levels (horizontally and vertically); 3) the government collectively utilizes the expertise of all EWS stakeholders; such as technical agencies, disaster risk management agencies, media, etc.; and 4) the government with educational partners should ensure that the public is educated and trained in preparation, protection, response, and recovery for all hazards, with specific consideration for high-threat hazards.

(ii) The development, and/or improvement of EWS usually occurs after significant losses are incurred from disasters associated with natural hazards.

Most of the presentations indicated that a one (or more) major disaster(s) was the main motivation for the government to develop or implement changes to address gaps or weaknesses in their EWS. For example, in many countries after a disaster, the government tasked its agencies to review the effectiveness of their EWS by carrying out post disaster assessments for lessons learnt and other countries EWS for good practices that could be implemented.

(iii) EWS are supported by strong legislation and that specific institutional arrangements (e.g. Memorandum of Understanding) are needed to ensure that individual EWS stakeholders' requirements are fulfilled in a consistent and timely manner, to ensure that they can deliver their responsibilities.

The presentations and discussions emphasized that while legislation is an important aspect in the establishment of EWS, it is equally important that specific agreements are established among EWS stakeholders for effective operations of EWS. These agreements should ensure that: i) individual stakeholder requirements across stakeholders are identified and defined; and ii) collaborations are operationalized through standard operational procedures and that feedback mechanisms are established for improving the overall system.

(iv) Effective implementation of EWS requires alignment of policies, legislation and resources across national to local levels.

The presentations and discussions indicated that effective EWS requires alignment of policies, legislation and resources at national to local levels. In these cases, the national, provincial and local government agencies have clear roles and responsibilities and have been adequately resourced to serve their roles.

(v) In many countries coordination and cooperation among NMHS, disaster risk management agencies, and the media is essential for the communication of early warnings to the public

In most EWS presentations it was emphasized that collaboration of the NMHS, disaster risk management agencies and media is essential to effective communication of information and warnings to the public. It was highlighted that strong institutional and personal relationships among these agencies contributes to the efficient exchange of information and warnings. However, in a couple of examples, it was noted that media in some countries may not be the most effective means of transmitting warning information, for the reasons that the public may not have access to mass media, or there may be a lack of public trust in the media.

(vi) For an EWS to be effective it requires, mutual trust and understanding among all stakeholders responsible for the system

The presentations and discussions highlighted the importance of trust and understanding among institutions and stakeholders (at all levels), emphasizing that this could be achieved through regular communication, reliable coordination and sharing of information. In this regard, two key elements were stressed, including; 1) the NMHSs ability to produce accurate information and forecasts (e.g., predictions of hazard location, time and event severity); and 2) hazard warnings must be communicated in timely fashion to the authorities and the populations at risk, to allow for activation of local emergency procedures.

(vii) Implementation of an effective client/customer relationship (NMHS as information provider and other government agencies as users) is key to effective communication and implementation and building of mutual trust.

A number of the presentations demonstrated different client/customer models (user-driven) by the NMHS that had led to the development and provision of relevant products and services to their partners such as the Disaster Risk Management Agencies and other stakeholders. A number of NMHS have established a specific programme to ensure effective liaison with other government agencies at national to local level, such as the United States' NOAA-National Weather Services' Warning Coordination Meteorologists and the UN Met Office's Public Weather Service Advisors.

(viii) Financial aspects of EWS

EWS require significant long-term and on-going investments associated with the development and sustainability of the four components, including, (i) Observation, monitoring, forecasting, (ii) integrating risk information into warning messages, (iii) Communication systems to authorities and public at-risk; (iv) Community-based emergency planning, preparedness and training. Also, there are costs associated with the activation of the system in case of a potential disaster. The costs associated with the sustainability of the system need to be considered within the design of or upgrades to the operational system. In this case, the concept of multi-hazard approach would result in cost-effectiveness, through ensuring leveraging of the various components and inter-operability of the systems for maximum utilization of the system as a whole. The participants agreed that EWS technical infrastructures need to be within the countries' capacity and resources to ensure sustainability

4.2. Utilization of Risk Information in Emergency Planning and Warnings

Presentations and discussions focused on a number of critical issues, including:

(i) Risk information is critical for effective emergency planning and response and that this development of this information requires cooperation across various agencies

All presentations stressed the importance of risk assessment for the development of policies, plans, procedures and measures needed within the EWS framework. Each case presented their capacities for the development to risk information database(s), although the approach and capacities varied from country to country. In most countries with good practices, development of risk information is fundamental to the design and implementation of the disaster risk management and EWS. All presentations described how risk and vulnerability information is incorporated into their warning messages. In all cases, this involves a multi-agency cooperation, involving sharing of hazard, exposure and vulnerability information. In some cases, centralized data depositories of these data has been established (e.g., Shanghai) while in other, data is shared across the agencies to the agency responsible for risk assessment (Italian Disaster Risk Management Agency, French Health ministry).

(ii) Hazard and vulnerability assessment, quantification and mapping

All the presentations highlighted the need for historical hazard databases and statistical analysis and mapping tools for various hazards as a critical input into risk assessment and mapping. In some countries, the NMHS carry out these analyses directly and provide to the agencies responsible for risk quantification, in other countries, data from the NMHS is sent to a centralized repository, where it is combined with exposure and vulnerability data to directly produce the risk information. Several of the presentations cited examples of flood inundation maps (e.g. inundation due to tropical cyclone and storm surges, etc). A number of presentations also noted the need to review continually and update databases, analyses and risk mapping to reflect changes due to factors such as population growth and land use. It was discussed that in light of climate variability and climate change, hazard analysis and mapping would require to be expanded beyond statistical analysis to utilize climate forecasts and information. These tools need to become operational in the years to come.

(iii) Storage and accessibility of disaster and national hazard risk information

Each of the presented cases identified the specific agency or agencies responsible for establishing and maintaining such a repository. As risk information is updated it is typically shared among the EWS stakeholders. In many countries, this information is readily accessible and used by NMHS and DRM in conveying the hazard impact information.

(iv) Development and utilization of hazard/risk information to support emergency planning and warnings

Many of the presentations indicated that their EWS had processes for the use of hazard/risk information to support emergency planning and warnings. In these cases, hazard/risk information was utilized in the identification of vulnerable areas with high risk to the general population. In most presentations, hazard/risk information was added to warnings to add better context to warning messages. For example, in most of the good practices, warning messages issued by the NMHS have been designed together with disaster risk management partners to ensure relevance of the warning information to emergency preparedness and response actions.

(v) Development and utilization of hazard/risk information to support emergency planning and warnings

A critical success factor for all good practices presented is the development of early warning readiness levels; where by the level of threat is linked to concrete of emergency preparedness and response actions. These readiness levels are defined based on specific thresholds (which may vary for the same hazard from country to country) and are commented with clear symbols (e.g., flags), color-code and standardized language.

4.3. Hazard Monitoring, Forecasting, and Mandates for Warning Development

Presentations and discussions focused on a number of critical issues, including

(i) Organizational responsibilities for monitoring, forecasting and development of hazard warnings

It was demonstrated in the presentations that role of NMHS in supporting the warning process, fall into three categories, based on their mandates for specific hazards, which delineate the roles and responsibilities and coordination requirements related to warning development and issuance. These categories are:

Type I hazards: The NMHS has sole mandate for the development and issuance of the warning for the hazard (e.g., high winds, thunderstorms, tropical cyclones). The NMHS communicates and coordinates directly with emergency managers and the government. Other technical agencies provide support to the NMHS where appropriate;

Type II hazards: The NMHS has joint mandate with another agency for the development and issuance of the hazard warning. The joint-mandate requires these agencies to coordinate for the development and issuance of the warning message. Other agencies may provide support where appropriate;

Type III hazards: The NMHS has no direct mandate for the development of the hazard warning but is required to provide information to other agencies that have the mandate. Also, under this category, in some cases, the agencies with warning mandate, may be required to utilize the NMHS communication network for the dissemination of the warning.

Based on the level of mandate of an NMHS, its coordination and cooperation and operational procedures with other technical agencies and the disaster risk management and civil protection agencies would vary. In addition to its role in the warning process, NMHS are expected to provide support to the emergency planning, response and relief operations through provision of relevant hydro-meteorological information, analysis, forecasts and other technical support. In these regard development of integrated observation and forecasting platforms and communication mechanisms within NMHS and with their partners that enable issuance of warnings for multi-hazards was highlighted in several presentations.

(ii) Organizational collaboration and coordination for development of hazard warnings

The coordination mechanisms between NMHS and other technical agencies were discussed in detail. It was emphasized that timely sharing of data and information are critical to maintaining the highest levels of situational awareness during the entire course of an event. Such awareness was deemed critical to each EWS stakeholder's decision-making and response. The discussions highlighted the need for operating and maintaining a reliable communications system for exchange of information as well as coordinating actions and emergency messaging.

4.4. Development of Understandable, Authoritative, Recognizable and Timely Warnings

Presentations and discussions focused on a number of critical issues, including:

(i) Warning message development cycle

All presentations indicated that their warning messages were based on predefined thresholds based on hydrometeorological criteria. These thresholds have been, in most cases, defined in cooperation with disaster risk management agencies in order to reflect the various levels of actions to be triggered on the ground. During the presentations and discussions, many of the countries had developed pre-warning notification coordination calls to initiate agreed upon actions and tasks in preparation for the potential event. In some systems, additional and more frequent messages and warnings are communicated as the event draws closer. Such messages were used to initiate the upgrading of the alert status and as the event became imminent the warning would be issued. Initially most messages are internal to the EWS, but once the decision is made to inform the public, these messages contain preparedness and mitigation actions expected of the public. In all the presented cases, the NMS/NMHS coordinates closely with the disaster risk management authorities to ensure that the warning message contains all relevant response action information and safety recommendations.

(ii) Warning system improvement cycle

All presentations reflected that they had a feedback mechanism to improve their warning system as a whole. In every presentation, it was noted that the EWS conducts a post-event review that can include both public and emergency services response to warnings. Respondents are asked for their perceptions of the warning information, its dissemination and the coordination across agencies to activate actions linked to the different levels of threat with the goal to identify gaps and weaknesses that could be improved.

4.5. Warning Dissemination Mechanisms

Presentations and discussions focused on a number of critical issues, including

(i) Reliable and sustainable communication mechanism should be established to ensure timely dissemination of warnings to all authorities, stakeholders and the public at risk.

Participants agreed that reliable communication systems are vital to effective EWS and that the dissemination processes must target at least two different audiences: (i) disaster risk management authorities and the emergency services, and (ii) the general public. Furthermore, the participants agreed that EWS communication systems and dissemination processes need to effectively address such issues as population density (city vs. rural areas), cultural diversity, and specific vulnerable people such as the women, children, elderly and the disabled. In this respect, specific channels, procedures and methodologies must be developed accordingly.

In many of the cases presented, the NMHS relies heavily on radio and television media to broaden the dissemination of warning information. However, in some instances EWSs have taken the initiative to broaden warning dissemination using other means including centralized warning centers, Internet, mobile telephone, and unique approaches such as open area signage at or near large gathering locations, and special elevated lighting, etc. In some countries, particularly in the coastal and rural areas, short-wave radio notification or the use of volunteer messengers has been most effective.

(ii) In most countries, media plays a critical role in education of the population and dissemination of the warnings, through close collaboration with the NMHS

The participants agreed that the role of the media is to communicate vital hazard and warning information to the general population. The presentations indicated that the role of professional broadcasters has been strengthened through effective communication and coordination with NMHS and government agencies responsible for warning and disaster impact information. In a number of countries, through extensive collaboration of the NMHS with the media, public programmes targeted at educating the population have been developed.

4.6. Emergency Preparedness and Response Activities

Presentations and discussions focused on a number of critical issues, including

(i) Disaster preparedness, response planning and emergency response activation

Participants agreed that effective emergency planning and preparedness at national to local level is essential for the EWS to achieve its objectives. The presentations demonstrated various approaches to emergency planning described how personnel, equipment, and other governmental, non-governmental, and private

resources are to be allocated in supporting sustainability and/or re-establishment of essential community functions.

In all presentations, emergency incidents are classified according to their severity and potential impact, so that appropriate emergency response operations can be implemented. In several presentations, these classifications illicit specific levels of response by various response groups and as the event escalates the scope of response actions also increase and accelerate.

Participants representing the humanitarian community expressed the need for greater attention through emergency response plans to address special needs of populations and people with disabilities during and following a catastrophic event.

(ii) Community response capacities

Participants agreed that the Red Cross and Red Crescent Movement, non-governmental organizations (NGO), effective utilization of school curricula (primary, secondary and university), and activates around community centers are among effective mechanisms to raise awareness, particularly linked to community response capacities. These activities included assisting in community based response planning and related actions, trainings for hazard awareness and hazard warning response procedures, etc. The presentations cited the importance of involving the community in drills and EWS exercises to provide the community with a better understanding of the protective actions required before, during, and after a natural hazard incident.

(iii) Public awareness and education is critical to the implementation of EWS

Participants agreed that public awareness and understanding are critical for disaster preparedness. Most presentations indicated that as part of the EWS process they had on-going training programmes in risk assessment, emergency preparedness planning as well as approaches to improved coordination and the exercise and management of preparedness plans. These have been achieved through different mechanisms in different countries. All the good practices have incorporated educational programmes in their school curricula. Some NMHS together with their disaster risk management and community-level partners have developed awareness programmes targeted at the public.

The discussions concluded that that there was a growing need for more education and awareness programs targeting most vulnerable communities (urban and rural). In this respect, participants expressed the need for educational materials on hazards, their impacts and protection methods that could be used in schools, and other public venues.

4.7. Improvement of the overall operational framework of the EWS

Many of the presentations highlighted the importance for establishing an assessment and reporting system, which incorporates post event reviews, evaluations and lessons learned. This must be augmented with an ongoing implementation of improvements to the system. It was emphasized that these evaluations must be carried out for all aspects of the EWS such as preparedness planning, inter-agency cooperation, standard operational procedure within and across agencies, training, and drills to ensure and maintain EWS effectiveness.

5. Summary of Discussions and Recommendations of the Working Groups

Following the presentations of the EWS, during Session two/Day two, the experts were grouped into three Working Groups to review and finalize the guidelines on the “Role of NMHS in Multi-Hazard Early Warning Systems, with Focus on Institutional Coordination and Cooperation”. The List of Working Group members is attached in Annex III. Each of the three Working Groups systematically reviewed, edited and made comments on the guidelines. The discussions and comments can be categorized into two main areas including: i) recommendations for improving the document, and ii) recommendations for future activities and systematic documentation of other good practices and development of guidelines.

5.1. Recommendations for the overall improvement of the document

The findings and recommendations of the working groups for overall improvement of the guideline document are as follows:

- 1) The title of the guidelines should be changed to “Guidelines on Capacity Development in Multi-Hazard Early Warning Systems with focus on Institutional Coordination and Cooperation and NMHS”; to better reflect the goals and outcomes of the Guidelines.

- 2) The guidelines (section 3) would be better placed in the beginning of the document as section 2 and supported through references to the relevant specific topics in the synthesis of the four good practices (section 2).
- 3) The target audience and the focus of the document need to be better clarified.
- 4) The terminology in the document should be consistent with ISDR standard terminology. Additionally, a glossary of specific terms should be attached or included in the document.
- 5) The document should provide a definition of “Multi-Hazard EWS”, particularly emphasizing multi-agency coordination and collaboration, cost-effectiveness and inter-operability issues.
- 6) Connections between NMHS and disaster risk management agencies should be further described through more concrete examples.
- 7) The four documented good practices be more comprehensively referenced in the document, with clear linkages to the guidelines and messages
- 8) The four documented good practices be further amended to address, (i) each countries EWS sustainability planning and capacities, (ii) client/customer relationship of NMHS with other EWS stakeholder (government and non-government) that have led to building credibility and effective working relations, (iii) impact analysis of the benefits of the system. A synthesis of the lessons learnt in these areas, from the four good practices, should be incorporated in the guidelines as this information is highly valuable to other WMO Members.
- 9) The number of guidelines should be reduced to a maximum of ten through consolidation of the existing guidelines. Additionally, the outline structures of the guidelines need to be de-linked from the outline of the good practice documents. The guidelines should further stress coordination and collaborative aspects of early warning systems.

5.2. Recommendations for Development of other Guidelines in Multi-Hazard Early Warning Systems

The Working Groups strongly supported the documentation methodology adopted by WMO to document systematically good practices in EWS around the world. In this regard, it was recommended that:

- 1) Good practices of other EWS presented at the MHEWS-II be documented through an inter-agency approach by the respective countries' NMHS and their partners;
- 2) Future documentation of the EWS, should also address the following issues:
 - i. Operational cooperation of NMHS with their EWS partners based on Concept of Operations and related Standard Operational Procedures.
 - ii. Cooperation and collaboration with neighbouring countries on transboundary hazards and related EWS issues
 - iii. EWS that are focused on saving of livelihoods such slow onset hazards such as droughts and related sectoral (e.g., agriculture and water resource management) management
 - iv. Inclusion of programmes used by various NMHS to educate their stakeholders on the limits of forecasting technologies for different hazards to manage expectations of the users;
- 3) WMO should facilitate access to the documented good practices and the guidelines through a website that would also provide links to other related websites; and
- 4) The development of an EWS mentor programme across countries to facilitate transfer of these experiences to countries in need of development or strengthening of their EWS.

6. International and Regional Aspects of Multi-Hazard Early Warning Systems

During session 4, presentations were given by seven representatives from international organizations, including EUMETNET/METEOALARM, ISDR, UNDP, IFRC, UNICEF, FAO and IAEM, on the international and regional issues related to MH-EWS. The presentations focused on a number of critical issues, including:

- 1) The majority of humanitarian organizations have their own operational EWS tailored to their planning and operational environments;
- 2) Humanitarian agencies utilize sequential triggers that lead to actions on the ground. Each sequential trigger requires additional information (e.g. hydrometeorological bulletins,

- warning, etc.) NMHSs need to become more engaged with these humanitarian organizations to fully understand their requirements;
- 3) It is important that the NMHSs provide information based on new technologies such as the seasonal-to-interannual climate forecasts that provide probabilistic information with longer lead-times, to the humanitarian organizations even if there are uncertainties associated with the forecasts. Low resolution information is required by these organizations to start their planning and preparedness processes, which may take weeks or even months;
 - 4) Local knowledge and information is important to be integrated into EWS (e.g. bottom-up information with regard to signs of danger, observation of hazard impacts, etc.);
 - 5) Information and warnings need to be customized to the user needs and requirements. (e.g., impacts on specific local areas or specific sections of a city, etc.);
 - 6) Development agencies require hazard risk information and analysis to better serve the development needs;
 - 7) It is critical that emergency managers and NMHSs maintain a close ongoing working relationship to ensure that communication of hazard warnings and hydrometeorological information during disaster events is succinct and relevant to response efforts;
 - 8) EWS that are focused on saving of livelihoods such slow onset hazards such as droughts and related sectoral (e.g., agriculture and water resource management) management; and
 - 9) Cooperation and collaboration with neighbouring countries on transboundary hazards and related EWS issues is critical.

7. Conclusions and Recommendations

The Symposium made the following main conclusions and recommendations:

- 1) The four documented good practices be further amended to address, (i) each countries EWS sustainability planning and capacities, (ii) client/customer relationship of NMHS with other EWS stakeholder (government and non-government) that have led to building credibility and effective working relations, (iii) impact analysis of the benefits of the system. A synthesis of the lessons learnt in these areas, from the four good practices, should be incorporated in the guidelines as this information is highly valuable to other WMO Members;
- 2) The Guidelines on Capacity Development in Multi-Hazard Early Warning Systems with focus on Institutional Coordination and Cooperation and NMHS“, should be finalized based on incorporation all of the comments from the MHEWS-II and additional information that will be included in the four documented good practices;
- 3) The final version of the Guidelines on “Capacity Development in Multi-Hazard Early Warning Systems with focus on Institutional Coordination and Cooperation and NMHS,“ should be utilized systematically in trainings associated with disaster risk reduction and early warning system development projects (training and learning by doing). These projects should be monitored and evaluated for feedback to improve the guidelines overtime;
- 4) Good practices of other EWS presented at the MHEWS-II should be documented through an inter-agency approach by the respective countries' NMHS and their partners;
- 5) Future documentation of the EWS, should also address the following issues:
 - (i) Operational cooperation of NMHS with their EWS partners based on Concept of Operations and related Standard Operational Procedures;
 - (ii) Cooperation and collaboration with neighbouring countries on transboundary hazards and related EWS issues;
 - (iii) EWS that are focused on saving of livelihoods from slow onset hazards such as droughts and related sectoral (e.g., agriculture and water resource management) management; and
 - (iv) Inclusion of programmes used by various NMHS to educate their stakeholders on the limits of forecasting technologies for different hazards to manage expectations of the users;
- 6) WMO should facilitate access to the documented good practices and the guidelines through a website that would also provide links to other related websites; and
- 7) The development of a EWS mentor programme across countries to facilitate transfer of these experiences to countries in need of development or strengthening of their EWS.

Annexes

**Second Experts' Symposium on
Multi-Hazard Early Warning Systems
(MHEWS – II)
with focus on the Role of National Meteorological and Hydrological Services
5 - 7 May 2009
Météo-France Conferences International Centre
42 avenue Gaspard Coriolis, Toulouse, France**

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**Second Experts' Symposium on
Multi-Hazard Early Warning Systems
(MHEWS – II)
with focus on the Role of National Meteorological and Hydrological Services
5 - 7 May 2009
Météo-France Conferences International Centre
42 avenue Gaspard Coriolis, Toulouse, France**

ANNOTATED AGENDA

Day 1 (5 May 2009)	
0730	Bus departs from Toulouse City Centre to Symposium venue
0800 – 0900	Registration
0900 – 0930	Welcome Address and Opening Session - Mr François Jacq (Permanent representative of France to WMO) - Dr Maryam Golnaraghi (Representative of WMO Secretary-General) - Ms Caroline Wittwer (Representative of French Ministry of Ecology, Energy, Sustainable Development and Town and Country Planning) - Mr Reid Basher (Representative of International Strategy for Disaster Reduction Secretariat)
0930 – 1000	<u>Background and Objectives of the MHEWS - II</u> - Dr Maryam Golnaraghi (WMO) Review of Agenda and documents Introduction of chairpersons and rapporteurs Group photo
1000 – 1030	Coffee break
Symposium Chair: Dr Jean-Marie Carrière (France)	
Session 1: Discussion of National Early Warning Systems <i>Issues:</i> Four documented good practices will be discussed during this session on May 5. <i>Format:</i> For each case, a 45-minute joint presentation by the delegation of experts from the respective country, followed by 30-minute Q&A and discussion. <i>References:</i> Doc 6 – Doc 7 – Doc 8 – Doc 9	
1030 – 1145	<u>The French Vigilance System</u> (Doc 6) - Mr Cyrille Honoré (Météo-France) - Mr Philippe Estiez (Direction de la Sécurité Civile) - Ms Caroline Wittwer (Direction Générale de la Prévention des Risques – SCHAPI)
1145 – 1300	<u>Bangladesh Cyclone Preparedness Programme</u> (Doc 7) - Mr Md. Shadikul Alam (Bangladesh Meteorological Department) - Mr Fazlul Wahab (Bangladesh Red Crescent Society)
1300 – 1430	Lunch at Météo-France Cafeteria
1430 – 1545 Coffee break (1545 – 1615) 1615 - 1800	<u>Shanghai Multi-Hazard Early Warning and Emergency Preparedness</u> (Doc 8) - Dr Tang Xu (Shanghai Regional Meteorological Centre) - Mr Zou Yongjie (Shanghai Emergency Response Office) - Mr Mu Haizhen (Shanghai Meteorological Bureau) <u>Early Warning System For Tropical Cyclones in the Republic of Cuba</u> (Doc 9) - Dr José Rubiera (Institute of Meteorology) - Mr Miguel A. Puig (National Staff of the Civil Defense)
1815	Bus departs to the Préfecture
1845 – 2000	Cocktail-Dinner hosted by the Préfecture of Toulouse

Day 2 (6 May 2009)			
0800	Bus departs from Toulouse City Centre to Symposium venue		
Session 1: Discussion of National Early Warning Systems (continued)			
<i>Issues:</i> Other National Early Warning Systems will be presented during this session on May 6.			
<i>Format:</i> For each case, a 15-minute presentation by the delegation of experts from the respective country, followed by 5-minute Q&A and discussion.			
0900 – 1300	<u>Presentation of other National Early Warning Systems</u>		
	<ul style="list-style-type: none"> - JAPAN - Mr Keiji Doi (Japan Meteorological Agency) - Mr Akira Terakawa (International Centre for Water Hazard and Risk Management) - SOUTH AFRICA - Mr Eugene Poolman (South African Weather Service) - USA - Mr Curtis Barrett (NOAA/National Weather Service) - Mr Lynn Maximuk (NOAA/National Weather Service) - Mr Michael D. Selves (MDS-EM Consulting and Advocacy) - UNITED KINGDOM - Mr David Robinson (Met Office) - ITALY - Mr Pierluigi Soddu (Dipartimento della Protezione Civile) - Mr Sergio Pasquini (General Office for Air Space and Meteorology) - INDONESIA - Ms Sri Woro B. Harijono (Meteorological, Climatological and Geophysical Agency) - Mr Paulus Joseph Prih Harjadi (Meteorological, Climatological and Geophysical Agency) - MOZAMBIQUE - Mr Xavier Junior Gulele (Disaster Management Institute) - Mr Mussa Mustafa (National Weather Service) - CANADA - Mr Michel Jean (Meteorological Service of Canada) - CROATIA - Dr Branka Ivancan-Picek (Meteorological and Hydrological Service) - Ms Vesna Stajcic (National Protection and Rescue Directorate) - COSTA RICA - Ms Rosario Alfaro O. (Instituto Meteorologico Nacional) 		
Coffee break (1040 – 1100)			
1300 – 1400	Lunch at Météo-France Cafeteria		
Session 2: Review and Finalization of the guidelines on the “Role of NMHS in Multi-Hazard Early Warning Systems, with Focus on Institutional Coordination and Cooperation” (Working Groups)			
1400 – 1415	Introduction of the draft guideline document and format of the working groups - Dr Maryam Golnaraghi, WMO		
1415 – 1730	<i>Format:</i> The meeting will be divided into small parallel working groups to provide inputs and comments on the first draft guidelines on the “Role of NMHS in Multi-Hazard Early Warning Systems, with Focus on Institutional Coordination and Cooperation”. The Chairperson will summarise the outcomes and present the results at session 3. <i>References:</i> Doc 10		
Coffee break (1545 – 1600)	<u>Working Group A</u> Room n°1 Chair: Mr Bhupinder Tomar (IFRC) Rapporteur: Mr James Douris	<u>Working Group B</u> Room n°2 Chair: Mr Yuichi Ono (ISDR) Rapporteur: Mr Rainer Dombrowsky	<u>Working Group C</u> Room n°4 Chair: Dr Michel Jean (Canada) Rapporteur: Mr Charles Baubion
1815	Bus departs for the Mairie of Toulouse		
1845 – 2000	Cocktail hosted by Mairie of Toulouse		

Day 3 (7 May 2009)	
0800	Bus departs from Toulouse City Centre to Symposium venue
<p>Session 3: Synthesis and Finalization of draft guidelines Issues: During this session, the outcomes of the parallel working groups will be reviewed and consolidated to finalize the draft guidelines. Plans for distribution and utilization of the guidelines will be presented and discussed. Format: This session will include 20-minute presentations by the chair of the working groups, followed by discussions.</p>	
0900 – 1200 Coffee break (1030 – 1100)	<p><u>Presentation of the Chairpersons of the Working Groups' on the outcomes</u> - Mr Bhupinder Tomar (Chair Working Group A) - Mr Yuichi Ono (Chair Working Group B) - Dr Michel Jean (Chair Working Group C) Format: 20-minute presentation of outcomes of each Working Group by the Chairperson, followed by final discussions on input to the guidelines.</p> <p><u>Plans for Distribution and Utilization of the Documented Good Practices and Guidelines to Assist Countries in building their Early Warning Systems</u> - Dr Maryam Golnaraghi (WMO)</p>
1200 – 1230	Presentation of Météo-France International
1230 – 1400	Cocktail-lunch hosted by Météo-France International
<p>Session 4: Panel discussion on International and Regional aspects of Early Warning Systems Issues: During this session, regional and international issues related to EWS will be discussed. Format: Each expert will deliver a 5-8-minute statement followed by discussions on the following issues:</p> <ul style="list-style-type: none"> - Transboundary issues related to the implementation of EWS - Regional and International cooperation challenges, opportunities and initiatives to support the development of EWS at the national level - Use of EWS for improved international humanitarian response - Moving from hazard warnings to risk warnings for different sectors 	
1400 – 1530	<p>Panel: - Mr Michael Staudinger, (EUMETNET/Meteoalarm) - Mr Yuichi Ono (International Strategy for Disaster Reduction Secretariat) - Mr Rahul Sengupta (UNDP) - Mr Bhupinder Tomar (International Federation of Red Cross and Red Crescent) - Ms Heidi Peugeot (UNICEF) - Ms Shameza Abdulla (UNICEF) - Ms Liliana Balbi (FAO) - Mr Michael D. Selves (International Association of Emergency Managers)</p>
1530– 1600	Overall Conclusions of the Symposium and the way forward Closing of the meeting
1615	Bus departs to Toulouse City Centre through Toulouse Airport

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LIST OF WORKING GROUPS

WORKING GROUP A

Room n°1

Chair: Mr Bhupinder Tomar (IFRC)
Rapporteur: Mr James Douris
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1. Mr Md. Shadukul Alam
2. Mr Md. Farhad Uddin
3. Mr Fazlul Wahab

FRANCE

4. Ms Mireille Mayoka
5. Ms Catherine Borretti
6. Mr Yves Le Bars
7. Mr Cyrille Honoré
8. Ms Caroline Wittwer

USA

9. Mr Curtis Barrett
10. Mr Lynn Maximuk
11. Mr Michael D. Selves

INDONESIA

12. Ms Darwahyuniati
13. Mr Paulus Joseph Prih Harjadi
14. Ms Sri Woro B. Harijono
15. Mr Budi Sunarso

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16. Ms Shameza Abdulla (UNICEF)

WORKING GROUP B

Room n°2

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Rapporteur: Mr Rainer
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1. Mr Mu Haizhen
2. Mr Tang Xu
3. Mr Min Jinzhong
4. Mr Zou Yongjie

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5. Ms Françoise Bénichou
6. Ms Karine Laaïdi
7. Mr. Bernard Strauss
8. Mr. René Feunteun

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9. Mr Keiji Doi
10. Mr Akira Terakawa

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11. Mr Eugene Poolman
12. Mr Wiseman Mkhonza

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13. Mrs Sophie Purdey
14. Mr David Robinson

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15. Mr Rahul Sengupta (UNDP)

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Rapporteur: Mr Charles Baubion
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4. Ms Vesna Stajcic

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5. Mr Miguel A. Puig González
6. Mr José Rubiera

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7. Ms Ariane de Billy
8. Mr Jean-Marie Carrière
9. Mr André Bachoc
10. Mr François Gérard

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11. Mr Giovanni Menduni
12. Mr Sergio Pasquini

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13. Mr Xavier Junior Gulele
14. Mr Mussa Mustafa

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15. Ms Heidi Peugeot (UNICEF)

Template used by experts to present EWS in their respective countries

- 1) Overview of Early Warning Systems (EWS) and the role of National Meteorological and Hydrological Services (NMHS)**
- 2) Background in the establishment of EWS in your country**
- 3) Governance and Institutional Arrangements (national to local levels)**
 - a) Policy, institutional and legal frameworks to support emergency planning and response
 - b) National to local emergency planning and related linkages to EWS
 - c) Organizational structure for implementing the plans
 - d) Institutional capacities and concept of operations (coordination and operational collaboration)
 - e) Financial and budgetary aspects
- 4) Utilization of risk information in emergency planning and warnings**
 - a) Organizational responsibilities and arrangements for the development of risk information
 - b) Hazard assessment, quantification and mapping (national to local)
 - c) Assessment of vulnerabilities and exposure (national to local)
 - d) Storage and accessibility of disaster and national hazard risk information
 - e) Development and utilization of hazard/risk information to support emergency planning and warnings
- 5) Hazard Monitoring, forecasting, and mandates for warning development**
 - a) Organizational responsibilities for monitoring, forecasting and development of hazard warnings
 - b) Organizational collaboration and coordination for development of hazard warnings
- 6) Development of understandable, authoritative, recognizable and timely warnings**
 - a) Warning message development cycle
 - b) Warning message improvement cycle
- 7) Warning dissemination mechanisms**
- 8) Emergency preparedness and response activities (national to local)**
 - a) Disaster preparedness and response planning and emergency response activation
 - b) Community response capacities
 - c) Public awareness and education
- 9) Improvement of overall operational framework of EWS**
- 10) Examples of previous events where the operational EWS has led to improvements in emergency preparedness and prevention**
- 11) Overall lessons learned and future steps for improving NMHS contribution in EWS particularly focusing on institutional coordination and cooperation**