WORLD METEOROLOGICAL ORGANIZATION

WMO messages and position regarding multi-hazard early warning systems and services in the post-2015 framework for disaster risk reduction

A draft submission to UNISDR

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4 September 2014
[updated 9 October 2014]

This document outlines the key lessons and challenges for early warning systems and services from the implementation of the HFA and practice and the relevant texts of the HFA and the pre-zero draft of the post-2015 framework for disaster risk reduction. It also presents the messages of the WMO for consideration in strengthening the related provisions of the pre-zero draft.

A. Key lessons and challenges for *early warning systems and services* from the implementation of the Hyogo Framework for Action (from outcome statements of regional and global platform meetings on DRR)

Africa

1. "The development and enhancement of sub-regional climate information and multi-hazard early warning systems can inform, and thereby improve prevention, preparedness and early action and response."[1]

2. "Roles and responsibilities (for instance, of national agencies for disaster management, monitoring hazards and issuing warnings) need to be clarified through policies, legislation, and institutional coordination mechanisms. More systematic linkages should be established between technical agencies (such as meteorological, hydrological and climate services) and disaster risk management agencies. Climate information and early warning should be tailored to and accessible by different sectors and community-level actors. Related communications systems and channels should be strengthened with the goal of using information for early action."[2]

3. "The review (Mid-Term Review of HFA, 2011) raises concerns about: the lack of systematic multihazard risk assessments and early warning systems, factoring in social and economic vulnerabilities; the poor integration of DRR into sustainable development policies and planning at national and international levels; and the insufficient level of implementation of the HFA at the local level."[3]

4. "Presenting experiences from East Africa, (…) noted that drought is part of the natural cycle, while "famine is a failure of policy and a failure to act," and called for a focus on the root causes by, inter alia: supporting follow up action on early warning data..."[4]

5. "Nigeria Meteorological Agency (Nimet), Nigeria, observed the importance of early warning systems recalling the experience of floods in Nigeria in 2012. Noting the challenges of inappropriate policies and legislation, lack of legislation, enforcement and historical data, as well as limited education and public awareness, he highlighted the progress of Nimet through technological improvement, such as new hardware and software for meteorological forecast."[5]

6. Participants agreed that the post-2015 DRR framework should: focus on funding for prevention and early warning; improve advocacy work; enhance community

[1] Summary Statement 5th AfRP/ 3rd African Ministerial Meeting for DRR, p.3, item 7. http://www.preventionweb.net/files/37530_5afrpsummarystatementen16mayfinal.pdf
[2] Summary Statement 5th AfRP/ 3rd African Ministerial Meeting for DRR, B. Integration of Disaster Risk Reduction and Climate Change Adaptation, p. 4-5, item 20.
[3] Summary Statement 5th AfRP/ 3rd African Ministerial Meeting for DRR, B. Integration of Disaster Risk Reduction and Climate Change Adaptation, p. 2, par. 5.
[4] Summary Statement 5th AfRP/ 3rd African Ministerial Meeting for DRR, B. Integration of Disaster Risk Reduction and Climate Change Adaptation, p. 9, par. 3.
[5] Summary Statement 5th AfRP/ 3rd African Ministerial Meeting for DRR, p. 9, par. 2.

engagement in urban DRR; and learn from new institutional arrangements that facilitate DRR policies."[6]

7. "Kampala Communiqué calls for, inter alia: early warning and action at national and regional levels; establishment of common protocols to accelerate early warning; and scalable social protection schemes."[7]

8. "Tanzania observed its progress on DRR noting it is now part of its five year economic growth plan, but observed remaining challenges, such as: inadequate funding; lack of integrated early warning system; shift in mindset from DRM to a focus on prevention and preparedness."[8]

9. "Swaziland requested HFA2 to focus on risk identification, monitoring and early warning. He stressed remaining challenges to advance implementation policies related to weak integration of DRR into all ministries, including weak intersectoral communication and poorly developed early warning systems."[9]

Central Asia

10. "Use modern technologies for hazard monitoring and early warning of population."[10]

11. "Early warning systems should be adapted to children and people with disabilities."[11]

Americas

12. "In recent decades the lethality of disasters has diminished due to advances in health systems, improvements in early warning systems and greater efficiency in humanitarian help."[12]

13. "Provide guidance on terminology, methodologies and standards for risk assessments, risk modeling, taxonomies and the use of data."[13]

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[6] Summary Statement 5th AfRP/ 3rd African Ministerial Meeting for DRR, p. 9. par. 5.

[7] Refers to IGAD Drought Disaster Resilience and Sustainability Initiative (IDDRISI) Heads of State Summit held in Kampala, Uganda on 27 March 2014. Summary Statement 5th AfRP/ 3rd African Ministerial Meeting for DRR, Ministerial Segment, p. 10, par. 1.

[8] Summary Statement 5th AfRP/ 3rd African Ministerial Meeting for DRR, Ministerial Segment, p. 11, par. 3.

[9] Summary Statement 5th AfRP/ 3rd African Ministerial Meeting for DRR, Ministerial Segment, p. 11, par. 10.

[10] Regional consultations for Central Asia and South Caucasus on the post-2015 Framework for DRR: II. Summary of Recommendations, C. Specific Recommendations, (vi) Inclusiveness and special groups, p. 3, 6th bullet.

[11] Regional consultations for Central Asia and South Caucasus on the post-2015 Framework for DRR: II. Summary of Recommendations, C. Specific Recommendations, (vi) Inclusiveness and special groups, p. 5, 4th bullet.

[12] Declaration of the advances in the HFA and recommendations for the post-2015 period, p. 1, item 6. http://eird.org/pr14-eng/docs/Pronunciamiento-MAH-ingles.pdf

[13] Science Statement - IV Session of the Regional Platform for DRR: Education and training, p. 1, 4th bullet. http://eird.org/pr14-eng/docs/science-statement-V3-English.pdf

Pacific

14. "Recognition that people's impairments are not a disability but that the exclusivity of society and systems creates a disability (e.g. early warning messages not targeted to cater for all peoples such as the hearing and visually impaired)."[14]

Asia

15. "Recognizing the progress made in early warning, education and awareness raising, disaster preparedness, response and recovery and stressing the need for their further strengthening at regional, national and local levels to contribute to resilience and sustainable development;"[15]

16. "On Science and Technology – Promote the use and further development of science, technology, and innovation. Strengthen exchanges among science, technology and innovation communities for synergies. Make innovation and technology accessible, available and affordable to national governments and local communities through development and transfer of technology. Share best practices and data through, inter-alia, open sources and networking. Promote hazard and risk assessments, scenario building, and other research and studies on disaster risk reduction. Empowering national efforts to improve collection and sharing of comparable data on disaster losses, hazards, and vulnerabilities and sharing for best practices."[16]

17. "Priority Area 2 (…) has seen the establishment of tsunami, cyclone, and other hydro-meteorological early warning systems, especially at the national level. The geographical coverage of regional multi-hazard early warning systems has increased through collaboration at national and regional levels. The focus now is on creating effective and comprehensive implementation of systems, especially to include remote local communities. More work is still needed to address extensive risks and trans-boundary risks. Other tools, such as multi-hazard risk assessments and cost-benefit analysis are gaining momentum. Capacity and information is needed to guide these activities, with many countries noting that generating, sharing, managing, and using data remains a complex task."[17]

18. "Comprehensive risk assessments are important in determining national and local priorities and interventions."[18]

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[14] Pre-Pacific Platform for Disaster Risk Management Workshop - Summary of Key Findings from Private Sector, Gender, Disability Stakeholders on Post-2015 Framework on DRR: Key Findings, Disability, p. 2, item 2.
http://www.preventionweb.net/files/35767_privatesectorgenderdisabilitykeyfin.pdf

[15] Bangkok Declaration on DRR in Asia and the Pacific 2014 - 6th AMCDRR, 2, par 6.

[16] Bangkok Declaration on DRR in Asia and the Pacific 2014 - 6th AMCDRR, Call on all governments and stakeholders, pp. 3-4, par 4.

[17] Bangkok Declaration on DRR in Asia and the Pacific 2014 - 6th AMCDRR, Learning from HFA, p. 6, par 4.

[18] Asia-Pacific Input Document for the Post-2015 Framework for DRR: Analysis of HFA multi-stakeholder consultation inputs in the Asia-Pacific, Strengthen resilience to disasters, p. 15, par 2.
http://6thamcdrr-thailand.net/6thamcdrr/Portals/0/Asia-Pacific%20input%20document%20for%20HFA%202%20FINAL.pdf

19. "Strengthen early warning systems, disaster preparedness and response capacities."[19]

20. "Use of new technologies and techniques in risk assessment activities such as risk modeling and space technologies and applications, which should be accessible, available and affordable."[20]

21. "Identify and prepare scientifically informed multi-hazard risk assessments and scenarios."[21]

22. "Halve the population without access to the basic early warning for natural hazards."[22]

Europe

23. "Promote the use of innovative technologies and instruments to support disaster risk management, such as information and communication technologies, early-warning systems, resilient infrastructure and buildings, green infrastructure, climate and integrated disaster risk modeling, ecosystem-based approaches, communication, knowledge management. This will also lead to increased business opportunities and contribute to green growth."[23]

HFA Consultations on Post-2015 Framework for DRR, April 2013

24. "Several mechanisms and operational areas have been identified as essential to creating the enabling environment for implementation to succeed. An element that is emerging with clarity is the need to have the reduction of disaster risk and prevention as an obligation under the law, inclusive of the question of early warning, risk assessments, and public access to risk information."[24]

Global Platform for DRR, October 2013

25. "Communities in urban areas are suffering the burgeoning effects of urbanization, while rural communities suffer from isolation. Both, however, can benefit from local early warning systems and need to be educated in disaster preparation and response using those systems. This education must be done using simple, accessible language that connects directly with the particular circumstances of each community. Likewise, local risk information needs to be improved, along

[19] Bangkok Declaration on DRR in Asia and the Pacific 2014 - 6th AMCDRR, Recommendations – Prevent and reduce risks, p. 22.
[20] Bangkok Declaration on DRR in Asia and the Pacific 2014 - 6th AMCDRR, Recommendations – Prevent and reduce risks, p. 23.
[21] Statement of Voluntary Commitments of the Asia Science, Technology and Academia Stakeholder Group for the 6th AMCDRR, Actions related to evolving HFA2 priorities, p. 3, item IX.
[22] Statement of Voluntary Commitments of the Asia Science, Technology and Academia Stakeholder Group for the 6th AMCDRR, Long-term target by 2025, p. 4.
[23] Outcome Statement of the European Ministerial Meeting on DRR, p. 4, item o).
[24] Synthesis: Consultations on a Post-2015 Framework for DRR (HFA2) April 2013, II Observations, 5. Stronger Governance and Accountability, p. 9, par. 2.

with disaster damage and loss data, and public access to this information must be enhanced."[25]

26. "Equally important, access to knowledge and information urgently needs to be facilitated and expanded. For instance, communities must have rapid and unimpeded access to information derived from early warning systems, while small-scale, recurring disasters need to be reported and given attention. In addition, general disaster risk reduction information must be downscaled and customized for local communities to make it more readily useable.[26]

27. "Participants emphasized the importance of early warning systems, counseling their strengthening at the national as well as at the community level."[27]

28. "Better risk reporting and information is needed to improve decision-making, particularly with regard to preparedness, early warning, recovery and reconstruction. The insurance industry could contribute its expertise to help develop the tools necessary for improving risk assessment."[28]

B. Current text regarding *early warning systems and services* in HFA

1. "Disaster risk is increasingly of global concern and its impact and actions in one region can have an impact on risks in another, and vice versa. This, compounded by increasing vulnerabilities related to changing demographic, technological and socio-economic conditions, unplanned urbanization, development within high-risk zones, under-development, environmental degradation, climate variability, climate change, geological hazards, competition for scarce resources, and the impact of epidemics such as HIV/AIDS, points to a future where disasters could increasingly threaten the world's economy, and its population and the sustainable development of developing countries."[29]

2. "To identify specific activities aimed at ensuring the implementation of relevant provisions of the Johannesburg Plan of Implementation of the World Summit on Sustainable Development on vulnerability, risk assessment and disaster management."[30]

[25] Global Platform for DRR 2013 Consultations on HFA2 - October 2013, Findings I. The Importance of Community-level Involvement, p. 3, par. 4.
[26] Global Platform for DRR 2013 Consultations on HFA2 - October 2013, Findings VIII. Knowledge Sharing and Education, pp. 8-9.
[27] Global Platform for DRR 2013 Consultations on HFA2 - October 2013, Findings IX. Capacity-Building: Financing, Risk Assessment, Preparedness and Early Warning, p.10, par 2.
[28] Global Platform for DRR 2013 Consultations on HFA2 - October 2013, Findings, IX. Capacity-Building: Financing, Risk Assessment, Preparedness and Early Warning, p. 10, par 6.
[29] Hyogo Framework for Action 2005-2015: Building the Resilience of Nations and Communities to Disasters - Extract from the final report of the World Conference on Disaster Risk Reduction (A/CONF.206/6), I. Preamble, A Challenges posed by disasters, p. 1, item 2.
[30] II. World Conference on Disaster Reduction: Objectives, expected outcome and strategic goals, A. Objectives, item 10 b), p. 3.

3. An integrated, multi-hazard approach to disaster risk reduction should be factored into policies, planning and programming related to sustainable development, relief, rehabilitation, and recovery activities in post-disaster and post-conflict situations in disaster-prone countries."[31]

4. "A gender perspective should be integrated into all disaster risk management policies, plans and decision-making processes, including those related to risk assessment, early warning, information management, and education and training."[32]

5. "The promotion of a culture of prevention, including through the mobilization of adequate resources for disaster risk reduction, is an investment for the future with substantial returns. Risk assessment and early warning systems are essential investments that protect and save lives, property and livelihoods, contribute to the sustainability of development, and are far more cost-effective in strengthening coping mechanisms than is primary reliance on post-disaster response and recovery;"[33]

6. "Priorities for action: 2. Identify, assess and monitor disaster risks and enhance early warning."[34]

7. "Develop early warning systems that are people centered, in particular systems whose warnings are timely and understandable to those at risk, which take into account the demographic, gender, cultural and livelihood characteristics of the target audiences, including guidance on how to act upon warnings, and that support effective operations by disaster managers and other decision makers."[35]

8. "Establish, periodically review, and maintain information systems as part of early warning systems with a view to ensuring that rapid and coordinated action is taken in cases of alert/emergency."[36]

9. "Establish institutional capacities to ensure that early warning systems are well integrated into governmental policy and decision-making processes and emergency management systems at both the national and the local levels, and are subject to regular system testing and performance assessments."[37]

10. "Implement the outcome of the Second International Conference on Early Warning held in Bonn, Germany, in 2003, including through the strengthening of

[31] II. World Conference on Disaster Reduction: Objectives, expected outcome and strategic goals, A. Objectives, item 10 c), p. 3.
[32] III. Priorities for action 2005–2015, A. General considerations, p. 4, item 13 d).
[33] III. Priorities for action 2005–2015, A. General considerations, p. 5, item 13 i).
[34] III. Priorities for action 2005–2015, B. Priorities for action, 2, p. 7.
[35] III. Priorities for action 2005–2015, B. Priorities for action, 2. Identify, assess and monitor disaster risks and enhance early warning, ii) Early Warning, p. 7, item d).
[36] III. Priorities for action 2005–2015, B. Priorities for action, 2. Identify, assess and monitor disaster risks and enhance early warning, ii) Early Warning, p. 8, item e).
[37] III. Priorities for action 2005–2015, B. Priorities for action, 2. Identify, assess and monitor disaster risks and enhance early warning, ii) Early Warning, p. 8, item f).

coordination and cooperation among all relevant sectors and actors in the early warning chain in order to achieve fully effective early warning systems."[38]

11. "Implement the outcome of the Mauritius Strategy for the further implementation of the Barbados Programme of Action for the sustainable development of small island developing States, including by establishing and strengthening effective early warning systems as well as other mitigation and response measures."[39]

12. "Support the development and improvement of relevant databases and the promotion of full and open exchange and dissemination of data for assessment, monitoring and early warning purposes, as appropriate, at international, regional, national and local levels."[40]

13. "Support the improvement of scientific and technical methods and capacities for risk assessment, monitoring and early warning, through research, partnerships, training and technical capacity- building. Promote the application of in situ and space-based earth observations, space technologies, remote sensing, geographic information systems, hazard modelling and prediction, weather and climate modelling and forecasting, communication tools and studies of the costs and benefits of risk assessment and early warning."[41]

14. "Establish and strengthen the capacity to record, analyze, summarize, disseminate, and exchange statistical information and data on hazards mapping, disaster risks, impacts, and losses; support the development of common methodologies for risk assessment and monitoring."[42]

15. "Cooperate regionally and internationally, as appropriate, to assess and monitor regional and trans-boundary hazards, and exchange information and provide early warnings through appropriate arrangements, such as, inter alia, those relating to the management of river basins."[43]

16. "Promote and improve dialogue and cooperation among scientific communities and practitioners working on disaster risk reduction, and encourage partnerships among stakeholders, including those working on the socioeconomic dimensions of disaster risk reduction."[44]

[38] III. Priorities for action 2005–2015, B. Priorities for action, 2. Identify, assess and monitor disaster risks and enhance early warning, ii) Early Warning, p. 8, item g)
[39] III. Priorities for action 2005–2015, B. Priorities for action, 2. Identify, assess and monitor disaster risks and enhance early warning, ii) Early Warning, p. 8, item h)
[40] III. Priorities for action 2005–2015, B. Priorities for action, 2. Identify, assess and monitor disaster risks and enhance early warning, (iii) Capacity, p.8, item j).
[41] III. Priorities for action 2005–2015, B. Priorities for action, 2. Identify, assess and monitor disaster risks and enhance early warning, (iii) Capacity, p.8, item k).
[42] III. Priorities for action 2005–2015, B. Priorities for action, 2. Identify, assess and monitor disaster risks and enhance early warning, (iii) Capacity, p. 8, item l).
[43] III. Priorities for action 2005–2015, B. Priorities for action, 2. Identify, assess and monitor disaster risks and enhance early warning, (iv) Regional and emerging risks, p. 8, item n).
[44] III. Priorities for action 2005–2015, B. Priorities for action, 3. Use knowledge, innovation and education to build a culture of safety and resilience at all levels, Key activities, (ii) Education and training, p.9, item 18 c).

17. "Promote the implementation of local risk assessment and disaster preparedness programmes in schools and institutions of higher education."[45]

18. "Develop improved methods for predictive multi-risk assessments and socioeconomic cost–benefit analysis of risk reduction actions at all levels; incorporate these methods into decision-making processes at regional, national and local levels."[46]

19. "Strengthen the technical and scientific capacity to develop and apply methodologies, studies and models to assess vulnerabilities to and the impact of geological, weather, water and climate-related hazards, including the improvement of regional monitoring capacities and assessments."[47]

20. "Disaster risks related to changing social, economic, environmental conditions and land use, and the impact of hazards associated with geological events, weather, water, climate variability and climate change, are addressed in sector development planning and programmes as well as in post-disaster situations."[48]

21. "Protect and strengthen critical public facilities and physical infrastructure, particularly schools, clinics, hospitals, water and power plants, communications and transport lifelines, disaster warning and management centres, and culturally important lands and structures through proper design, retrofitting and re-building, in order to render them adequately resilient to hazards."[49]

22. "Promote the establishment of public–private partnerships to better engage the private sector in disaster risk reduction activities; encourage the private sector to foster a culture of disaster prevention, putting greater emphasis on, and allocating resources to, pre-disaster activities such as risk assessments and early warning systems."[50]

23. "Incorporate disaster risk assessment into rural development planning and management, in particular with regard to mountain and coastal flood plain areas, including through the identification of land zones that are available and safe for human settlement."[51]

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[45] III. Priorities for action 2005–2015, B. Priorities for action, 3. Use knowledge, innovation and education to build a culture of safety and resilience at all levels, Key activities, (ii) Education and training, p.10, item 18 i).
[46] III. Priorities for action 2005–2015, B. Priorities for action, 3. Use knowledge, innovation and education to build a culture of safety and resilience at all levels, Key activities, (iii) Research, p.9, item 18 n).
[47] III. Priorities for action 2005–2015, B. Priorities for action, 3. Use knowledge, innovation and education to build a culture of safety and resilience at all levels, Key activities, (iii) Research, p.9, item 18 o).
[48] III. Priorities for action 2005–2015, B. Priorities for action, 4. Reduce the underlying risk factors, p. 10, item 19.
[49] III. Priorities for action 2005–2015, B. Priorities for action, 4. Reduce the underlying risk factors, Key activities, (ii) Social and economic development practices, p. 11, item 19 f).
[50] III. Priorities for action 2005–2015, B. Priorities for action, 4. Reduce the underlying risk factors, (ii) Social and economic development practices, p. 11, item l).
[51] III. Priorities for action 2005–2015, B. Priorities for action, 4. Reduce the underlying risk factors, (iii) Land-use planning and other technical measures, p, 12, item 19 q).

24. "Promote and support dialogue, exchange of information and coordination among early warning, disaster risk reduction, disaster response, development and other relevant agencies and institutions at all levels, with the aim of fostering a holistic approach towards disaster risk reduction."[52]

25. “States and regional and international organizations should also support the capacities of regional mechanisms and organizations to develop regional plans, policies and common practices, as appropriate, in support of networking, advocacy, coordination, exchange of information and experience, scientific monitoring of hazards and vulnerability, and institutional capacity development and to deal with disaster risks.”[53]

26. “Small Island Developing States have undertaken to strengthen their respective national frameworks for more effective disaster management and are committed, with the necessary support of the international community, to improve national disaster mitigation, preparedness and early warning capacity, increase public awareness about disaster reduction, stimulate interdisciplinary and inter-sectoral partnerships, mainstream risk management into their national planning process, address issues relating to insurance and reinsurance arrangements, and augment their capacity to predict and respond to emergency situations, including those affecting human settlements stemming from natural and environmental disasters.”[54]

27. "Disasters in Africa pose a major obstacle to the African continent’s efforts to achieve sustainable development, especially in view of the region’s insufficient capacities to predict, monitor, deal with and mitigate disasters. Reducing the vulnerability of the African people to hazards is a necessary element of poverty reduction strategies, including efforts to protect past development gains. Financial and technical assistance is needed to strengthen the capacities of African countries, including observation and early warning systems, assessments, prevention, preparedness, response and recovery."[55]

28. "Support the development of regional mechanisms and capacities for early warning to disasters, including for tsunami."[56]

29. "In close collaboration with existing networks and platforms, cooperate to support globally consistent data collection and forecasting on natural hazards, vulnerabilities and risks and disaster impacts at all scales. These initiatives should include the development of standards, the maintenance of databases, the development of indicators and indices, support to early warning systems, the full and open exchange of data and the use of in situ and remotely sensed observations;"[57]

[52] III. Priorities for action 2005–2015, B. Priorities for action, 5. Strengthen disaster preparedness for effective response at all levels, Key activities, p. 12, item 20 b).
[53] Implementation and follow-up, A. General considerations, p. 14, item 23.
[54] IV. Implementation and follow-up, A. General considerations, p. 14, item 25.
[55] IV. Implementation and follow-up, A. General considerations, p. 14, item 27.
[56] IV. Implementation and follow-up, C. Regional organizations and institutions, p.15, item, e).
[57] IV. Implementation and follow-up, D. International organizations, p. 16, item f).

30. "Prepare periodic reviews on progress towards achieving the objectives and priorities of this Framework for Action, within the context of the process of integrated and coordinated follow-up and implementation of United Nations conferences and summits as mandated by the General Assembly, 24 and provide reports and summaries to the Assembly and other United Nations bodies, as requested or as appropriate, based on information from national platforms, regional and international organizations and other stakeholders, including on the follow-up to the implementation of the recommendations from the Second International Conference on Early Warning (2003)."[58]

31. "The Johannesburg Plan of Implementation of the World Summit on Sustainable Development, held in 2002, paragraph 37 requests actions under the chapeau: "An integrated, multi-hazard, inclusive approach to address vulnerability, risk, assessment and disaster management, including prevention, mitigation, preparedness, response and recovery, is an essential element of a safer world in the 21st century", supporting the International Strategy for Disaster Reduction as the first action. The theme of "vulnerability, risk reduction and disaster management" is included in the multi-year programme of work of the Commission on Sustainable Development in 2014-2015, and as a cross-cutting theme throughout the programme."[59]

C. Current text regarding *early warning systems and services* in the pre-zero draft of the post-2015 framework for disaster risk reduction

1. "In particular, since the adoption of the HFA, and as reported in the HFA Monitor and in the consultations on the post-2015 framework for disaster risk reduction, countries in all regions have made gradual progress in strengthening their institutional, legislative and policy frameworks, in particular in early warning, and disaster preparedness for response. This has contributed to decreasing mortality risk, especially in the case of floods and tropical storms. There has also been significant progress in risk assessment, education, research and public awareness. Countries report increasing their investments in risk reduction, as well as developing risk-transfer mechanisms, such as insurance, index-based insurance for crop losses and hurricanes, marked disaster bonds, and family and community insurance schemes. "[60]

2. "The consultations on the post-2015 framework for disaster risk reduction have provided clear guidance on the following: (…) The mainstreaming and integration of disaster risk assessment in development cooperation programs of bilateral and multilateral nature should be promoted."[61]

3. "There is a call to further strengthen early warning and preparedness systems, motivated by the increase in disaster events as well as evidence that such

[58] IV. Implementation and follow-up, E. The International Strategy for Disaster Reduction, p. 18, item g).
[59] Annex p. 20, 3rd bullet.
[60] A: Preamble, p. 2, item 2.
[61] A: Preamble, p. 4, item 5.

systems contribute to saving lives and increasing efficiency of preparedness and response. With the increase in magnitude of disaster impacts, not least in highly urbanized settings, and of disasters affecting large numbers of people and high-value national and local infrastructures and economic assets, the cost and complexity of reconstruction is rising."[62]

4. "Continuing to further strengthen early warning systems and tailoring them to users' needs, including social and cultural requirements."[63]

5. "Promote the incorporation of disaster risk assessment into rural development planning and management, in particular with regard to mountain and coastal flood plain areas, including through the identification of land zones that are available and safe for human settlement."[64]

6. "Common methodologies for risk assessment, monitoring, disaster recording and statistics, and sharing of information should remain a priority, together with the necessary support for data gathering and risk modeling for planning purposes."[65]

7. "Promote the further development of regional early warning mechanisms to ensure that information is acted on across all relevant countries."[66]

D. Recommendations to strengthen the reference(s) to early warning systems and services in the pre-zero draft of the post-2015 framework for disaster risk reduction

Priorities for Action:

General

1. The Hyogo Framework for Action is unequivocal on the integral role of early warning systems in disaster risk reduction.[67] Country experiences in the past decade have shown the effectiveness of early warning systems and services in reducing mortality from natural hazards related to weather, climate, and water extremes, even though economic losses continue to rise in many areas. This gain of the Hyogo Framework for Action needs to be sustained and further strengthened through a multi-hazard approach, more so in view of rising exposure and vulnerability and uncertainty of natural hazard extremes

[62] D: Priorities for action, under "Preparedness for Response, Recovery and Reconstruction – "Build Back Better," p. 9, item 16.
[63] D: Priorities for action, p. 9, item 16 b).
[64] D: Priorities for action, under Investing in Social, Economic and Environmental Resilience," p. 11, item 17 j)
[65] D: Priorities for action, under II. Global and regional context, Understanding Disaster Risk, p.11, item 18 a).
[66] D: Priorities for action, under Preparedness for response, recovery and reconstruction, p. 13, item 20 d).
[67] Hyogo Framework for Action 2005-2015: Building the Resilience of Nations and Communities to Disasters - Extract from the final report of the World Conference on Disaster Risk Reduction (A/CONF.206/6), III. Priorities for action 2005–2015, A. General considerations, p. 5, item 13 i).

exacerbated by climate change.

2. A culture of risk and prevention should be promoted as an approach to sustainable development. This critical paradigm shift from response to prevention, from reactive to proactive approach to disaster risk, calls for available, accessible, and reliable risk-informed services to support planning and decision-making in all sectors and at all levels.[68]

3. An Effective multi-hazard early warning system includes four components[69]: (1) detection, monitoring, and forecasting of hazards, (2) risk information and analysis, (3) dissemination of timely and authoritative warnings, and (4) availability and activation of emergency preparedness and response plans. These components need to be coordinated across many actors at the national and community levels for the system to work. Failure in one component, or lack of coordination, can lead to failure of the whole.

Understanding Disaster Risk

4. Events of hydro-meteorological origin still trigger the large majority of disasters. Around 90 percent of disasters caused by natural hazards are related to weather, climate, and water.[70] Through a domino effect and because of the interdependency of economies, the hazard impact tends to broaden with indirect and lingering consequences. Thus, this understanding of disaster risk should define the development of disaster risk reduction interventions.

5. There is a need for a standardized, integrated and holistic approach to risk assessment, using meteorological, climate, hydrological, geological and environmental information. Hazard, loss, and vulnerability databases, mapping, and monitoring as well as statistical analysis are important requisites of risk assessment. The advances in science and technology should support decision-making for multiple and cascading hazards, across all socio-economic sectors, levels and scales, and actors.[71]

Strengthening Governance to Manage Disaster Risk

6. Climate change exacerbates disaster risk, especially with its significant effect of increasing intensity and frequency of extreme weather events. Thus, legislation, policies, and actions on climate change adaptation and disaster risk reduction should give considerable importance to this circumstance.[72]

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[68] (1) Preventing and mitigating natural disasters WMO (2006); (2) Working together for a safer world WMO (2005); (3) Climate Information for Disaster Risk Reduction WMO (2012)

[69] Second International Conference on Early Warnings (2003) http://www.unisdr.org/2006/ppew/info-resources/docs/EWCII-conclusions.pdf

[70] WMO-CRED (2014): Atlas of Mortality and Economic Losses from Weather and Climate Extremes 1970-2012, Geneva. http://www.wmo.int/pages/prog/drr/transfer/2014.06.12-WMO1123_Atlas_120614.pdf

[71] Based on joint input by WMO, UNESCO and ITU to the Joint UN Statement at the Open-ended Informal Consultative Meeting on 9 October 2014. http://www.wcdrr.org/preparatory/viewsandcomments

[72] Special Report of the IPCC: Managing the Risks of Extreme Events and Disasters to Advance Climate Change Adaptation (SREX) (2012)

7. Strengthening a multi-hazard early warning system through partnership and coordination among stakeholders across all sectors and at all levels is important in pursuing a holistic and integrated approach to disaster risk reduction and management.[73]

8. The issuance of warnings is a national responsibility; thus, roles and responsibilities of various public and private sector actors and stakeholders who are implementing and benefitting from early warning systems need to be clarified and reflected in national to local regulatory frameworks, planning, budgetary, coordination/collaboration, and operational mechanisms. Inclusion of principles of co-design, co-development and co-delivery in multi-hazard early warning systems will render them high efficiency and effectiveness.[74]

9. National technical agencies such as meteorological, hydrological, geological, and marine services play a crucial role for collecting and analysing hazard and risk information. Their collaboration with e.g. disaster risk management agencies, natural and social scientists and the media is important for making effective use of this information and the services provided.[75]

10. Moreover, since hazards do not respect national boundaries and may overwhelm a country's coping capacity, multi-hazard early warning systems need to be complimented by regional cooperation frameworks.

Preparedness for Response, Recovery and Reconstruction – "Build Back Better"

11. Further to the call on "strengthening early warning and preparedness systems and tailoring them to users' needs, including social and cultural requirements", it is critical to recognize multi-hazard early warning systems as a life-saving tool and an integral part of disaster risk reduction. In this regard, multi-hazard early warning systems provide integrated and seamless services for disaster risk reduction in relation to various hazard types and lead times, from the national level to local communities. Such an approach would lead to impact-based forecasts and risk-informed warnings and would require a framework for standardized and interactive operations for preparedness and response.

12. Ensuring access to timely environmental hazards information and communicating impact-based forecasts of hazards and the risk to end-users in an efficient manner are crucial in decision-making for disaster risk reduction. Through multi-hazard early warning systems, risk-informed warnings should be issued and disseminated to the public, emergency management actors, and other end-users, in a manner that is timely, understandable, and actionable for saving life and property.

13. In this regard, multi-hazard early warning systems should consider the sensitivity and vulnerability of women, children and youth, persons with disabilities,

[73] Institutional Partnerships in Multi-Hazard Early Warning Systems WMO (2012)

[74] Based on joint input by WMO, UNESCO and ITU to the Joint UN Statement at the Open-ended Informal Consultative Meeting on 9 October 2014. http://www.wcdrr.org/preparatory/viewsandcomments

[75] Second Experts' Symposium on Multi-Hazard Early Warning Systems final report, 5-7 May 2009, Toulouse, France. Link to final report: http://www.wmo.int/pages/prog/drr/events/MHEWS-II/index_en.html

indigenous peoples, and older persons, and a focus on cities and communities highly exposed to the varying intensity and impact of natural hazards.

14. Promoting the availability and application of science and technology to decision-making for disaster risk reduction, the use of post-disaster reviews in facilitating learning, and enhancing public policy and people engagement are important aspects of preparedness for response, recovery and reconstruction.

Investing in Social, Economic and Environmental Resilience

15. For disaster risk reduction to be truly meaningful, significant resources should be made available. This calls for appropriate financial mechanisms and technology transfer. In particular, ten percent of resources allocated for post-disaster relief, rehabilitation, and reconstruction should be earmarked for reducing risk, especially by investing in multi-hazard early warning systems.[76]

16. Multi-hazard early warning systems are an essential cost-effective component of a holistic and integrated disaster risk reduction approach.[77] Resources put into multi-hazard early warning systems are not expenditures, but rather investments with very significant returns. For every dollar invested in multi-hazard early warning systems, at least seven dollars of losses are offset, with averted environmental and ecological losses excluded.[78]

17. In order to make effective multi-hazard early warning systems a reality, there is a need for further investments in hazard observation networks and recordings of impacts. It is equally important to ensure that investments are materialized in Information and Communication Technologies (ICT). ICT facilitate monitoring the environment, retrieving and processing vital data, and disseminate and receive information before, during and after disasters strike. This is important particularly for early warning where timely evacuation can save thousands of lives. These investments should move beyond hardware requirements and ensure that the human capital of the country is capacitated to develop, operate and maintain such systems.[79]

[76] (1) Conference on Social and Economic Benefits of Weather, Climate and Water Services PWS-23/ROE-1 (2012); (2) Social and Economic Benefits of Weather, Climate and Water-related information and services (Madrid Conference Statement and Action Plan, 2007); (3) Economic and Social benefits of Meteorological and Hydrological Services WMO-No.733 (1990)

[77] (1) Institutional Partnerships in Multi-Hazard Early Warning Systems WMO (2012); (2) Strengthening Multi-Hazard Early Warning Systems and Risk Assessments in the Western Balkans and Turkey WMO (2012); (3) Guidelines on Early Warning Systems and Application of Nowcasting and Warning Operations – WMO/TD 1559 (2010); (4) Report of UNESCAP/WMO Typhoon Committee Members: Early Warning Systems WMO/TD 1475 (2009)

[78] "Unnatural Disasters" by Janet Abramovitz, Worldwatch Institute, Worldwatch Paper 158 (October 2001).

[79] Based on joint input by WMO, UNESCO and ITU to the Joint UN Statement at the Open-ended Informal Consultative Meeting on 9 October 2014. http://www.wcdrr.org/preparatory/viewsandcomments