WMO OMM



World Meteorological Organization Organisation météorologique mondiale Organización Meteorológica Mundial Всемирная метеорологическая организация المنظمة العالمية للأرصاد الجوية 世界气象组织 **Secrétariat** 7 bis, avenue de la Paix – Case postale 2300 CH 1211 Genève 2 – Suisse Tél.: +41 (0) 22 730 81 11 Fax: +41 (0) 22 730 81 81 wmo@wmo.int – public.wmo.int

GENEVA, 22 August 2016

Our ref.: WDS/DRR/DRR-Roadmap

Annex: 1

Subject: WMO Disaster Risk Reduction Roadmap (Translated Version 1.3)

Action required: Review and comment by 16 September 2016

Dear Sir/Madam,

With reference to circular letter ref. WDS/DRR/DRR-Roadmap, dated 13 June 2016, I am pleased to inform you that the current version (1.3) of the WMO DRR Roadmap is now available in all official WMO languages for your review and feedback at the following link:

http://www.wmo.int/pages/prog/drr/documents/roadmap/index.html

I would appreciate your feedback on the document using the feedback form provided at the link above, specifically your views on the Objectives of the Roadmap (Section 1.2), the scope of the Thematic Areas (Section 3.1), cross-cutting Activity Pillars (Section 3.2), Linkages (Section 3.3), Activities (Section 4) and Implementation Arrangements (Section 5), as well as ideas for the Roadmap Implementation Plan (Section 5.3), as soon as possible but not later than **16 September 2016**.

As requested by EC-68, the Secretariat will then update this draft of the WMO DRR Roadmap based on the input and comments from Members and submit it to the Chairperson of the WMO Executive Council Working Group on Disaster Risk Reduction (EC WG/DRR) for the consideration of the WG, and forward its recommendation to the President of WMO for his approval on behalf of EC as per WMO Regulation 44.

Yours faithfully,

(E. Manaenkova)

for the Secretary-General

To: Permanent Representatives (or Directors of Meteorological or Hydrometeorological Services) of Members of WMO (PR-6920) Presidents of technical commissions Presidents of regional associations

cc: Hydrological Advisors to Permanent Representatives



A Disaster Risk Reduction Roadmap for the World Meteorological Organization

Draft Version 1.3, 3 June 2016 (Fig. 3 revised on 8 August 2016)



Contact:

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A Disaster Risk Reduction Roadmap for the World Meteorological Organization

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Acknowledgements

This draft Disaster Risk Reduction Roadmap of the World Meteorological Organization (WMO) is the result of a joint effort led by the Disaster Risk Reduction (DRR) Services Division of the WMO Department for Weather and DRR Services (WDS). Constructive feedback was received from representatives of the National Meteorological and Hydrological Services (NMHSs) of WMO Members, of WMO technical commissions, regional associations and technical programmes (including their DRR Focal Points), and Secretariat colleagues. In particular we wish to thank L Vardanyan (Armenia), David Grimes, Jennifer Milton, Diane Campbell (Canada), Guoguang Zheng and Mingmei Li (China), C.M. Cheng (Hong Kong, China), Jan Daňhelka (Czech Republic), Paola Pagliara & Angela Chiara Corina (Italy), Naohisa Koide (Japan), JJ Diepeveen (The Netherlands), Gavin Iley (United Kingdom), and Courtney Draggon (United States of America). The drafting team at the Secretariat included Jochen Luther, Alasdair Hainsworth, James Douris (DRR Services Division) with constructive and continuous inputs by Xu Tang and Abdoulaye Harou (WDS), Johannes Cullmann, Paul Pilon and Robert Stefanski (WMO Climate and Water Department (CLW)).

Foreword

The vision of World Meteorological Organization (WMO) is to provide world leadership in expertise and international cooperation in weather, climate, hydrology and water resources and related environmental issues and thereby contribute to the safety and well-being of people throughout the world and to the economic benefit of all nations. The successful contribution of WMO, and the National Meteorological and Hydrological Services (NMHSs) of its Members in particular, to disaster risk reduction (DRR), climate change adaptation (CCA) and increased resilience is, and will be, based on coordinated and collaborative initiatives between the WMO Members, partners, and specific communities whose aim will be to reduce the risks and impacts of disasters due to meteorological, climatic, and hydrological hazards, at the regional and national levels. It is hoped that this Roadmap can guide the Organization, in particular NMHSs and key partners, along the way towards this vision.

The WMO DRR Roadmap was developed at the request of the WMO Executive Council (EC), at its sixty-sixth session (EC-66) in June 2014 through Resolution 8 (EC-66)¹ and for consideration of the Seventeenth session of the World Meteorological Congress (Cg-17) in May 2015. Specifically, EC-66 requested the WMO Secretariat, "*in consultation with Members, to urgently develop a WMO DRR roadmap of prioritized and realistically achievable activities and deliverables that are consistent with the WMO Strategic and Operating Plans as well as the work plans for relevant WMO Programmes and projects*". In addition, EC called for a clear identification of the role of NMHSs and WMO, working with their partners, in the implementation of international frameworks and planning processes, such as the Sendai Framework for DRR 2015-2030², the successor to the Hyogo Framework for Action 2005-2015: Building the Resilience of Nations and Communities to Disasters (HFA)³.

Subsequently, Cg-17⁴ requested the Secretary-General, in consultation with Members and in collaboration with the technical commissions and regional associations, to develop a final draft of the WMO DRR Roadmap for consideration and approval by EC-68. In addition, Cg-17 requested EC to guide the further development and implementation of the Roadmap, including its monitoring, evaluation, and updating, in line with the Sendai Framework for DRR 2015–2030 and other relevant international development frameworks. These requests were timely, as 2015 marked a pivotal year in the global development agenda in which the rare alignment of international policy processes with national government, private sector, and civil society interests is an opportunity to position DRM as a cornerstone in the efforts to foster DRR, CCA and resilience as key components of sustainable development. It is also an opportunity for WMO to further demonstrate the wide range of services and products it has to offer.

This Roadmap is first and foremost a document that can be used by both WMO Members and the external side to understand how NMHSs can contribute to increasing the resilience of communities, nations, regions, and the world under the above-mentioned

¹ WMO Executive Council – Sixty-sixth session (EC-66), 2014: Abridged final report with resolutions, available at: <u>http://library.wmo.int/pmb_ged/wmo_1136_en.pdf</u>

² <u>http://www.unisdr.org/we/inform/publications/43291</u>, until its adoption at WCDRR called "post-2015 framework for DRR". <u>http://www.unisdr.org/we/inform/publications/1037</u>

³ <u>http://www.unisdr.org/we/coordinate/hfa</u>

⁴ Seventeenth World Meteorological Congress (Cg-17), 2015: Abridged final report with resolutions, available at: <u>http://library.wmo.int/pmb_ged/wmo_1157_en.pdf</u>

frameworks, through a coordinated WMO-wide plan of action on DRR. This Roadmap is intended to provide the framework for how to strengthen NMHSs capacities to serve their national DRR stakeholders through leveraging of related activities at the national, regional and international levels through the leadership of the WMO and its network. This present document is not intended to be a reference document for the theoretical or practical aspects of DRR. It will discuss the activities required to address DRR as one of the seven WMO priority areas within the WMO Strategic Plan 2016-2019⁵. Key features of this Roadmap are to leverage existing WMO mechanisms, activities and projects and to develop linkages to external initiatives in order to realise tangible benefits for WMO Members through collaboration and coordination at the national, regional and global levels. In this way, the document provides a means for the cross-cutting WMO DRR Programme to achieve its goals⁶. This comprehensive, cross-cutting set of activities will also contribute to the realization of other WMO priorities such as the Global Framework for Climate Services (GFCS)⁷ and capacity development⁸.

The Roadmap will cover four intersessional periods of WMO, corresponding to the 15 years lifetime of the Sendai Framework, and will align closely with a number of global conventions and international development frameworks (apart from those mentioned above e.g. on environmental, humanitarian and urban issues) as well as with WMO frameworks and strategic documents (see Section 3.3). The timescales involved require the Roadmap to be a "living" document which will define an initial set of activity categories. It will be complimented by an implementation plan that corresponds to the four-year intersessional periods (with biannual work plans) and that will identify key milestones along this journey towards a "DRR service-ready" NMHS and Organization over all. Over the course of time the DRR landscape is certain to change, necessitating regular updates to this document which will require endorsement from the WMO decision-making bodies.

⁵ <u>https://www.wmo.int/pages/about/spla_en.html</u>

⁶ Sixteenth World Meteorological Congress, 2011:Abridged final report with resolutions, available at: <u>https://googledrive.com/host/0BwdvoC9AeWjUazhkNTdXRXUzOEU/wmo_1077_en.pdf</u>

⁷ <u>http://gfcs.wmo.int/</u>

⁸ http://public.wmo.int/en/programmes/capacity-development-programme

1 Introduction

1.1 Rationale

It is well documented that high-impact weather events and climate extremes, both rapid onset such as hurricanes and slow onset such as droughts, have devastating effects throughout the world, resulting in injury and loss of life, displacement of people, and destruction of livelihoods and assets. Events of hydrometeorological origin, such as tropical cyclones, storms, floods, droughts, wildfires and heat and cold waves, continue to trigger the large majority of disasters. During the term of the Hyogo Framework for Action (HFA) 2005–2015: Building the Resilience of Nations and Communities to Disasters alone, i.e. between 2005 and 2014, 83% (3253) of recorded disasters, 39% (283 035) of recorded deaths, and 95% (1.6 billion) of the recorded total affected population, and 70% (US\$ 983 million) of the recorded total damage were linked to natural hazards related to weather, water and climate.⁹ The personal and social costs of these losses and their financial impacts on the economy are enormous (Figure 1 & Figure 2).



Figure 1: Number of reported deaths by decade by hazard type (1971-2010) (Source: WMO and CRED, 2014)

It is therefore vital that National Meteorological and Hydrological Services (NMHSs) of Members of the World Meteorological Organization (WMO) – supported by the operational, service and research network of the Organization – continue to increase their technical capacity and their engagement with national decision-makers in order to better serve the needs of their respective disaster risk reduction (DRR) stakeholders across all temporal and spatial scales.

⁹ Disasters recorded in the EM-DAT database between 2005 and 2014 (<u>http://www.emdat.be</u>).



Figure 2: Recorded economic losses by decade by hazard type (1971-2010), in US\$ billion, adjusted to 2012 (Source: WMO and CRED, 2014¹⁰)

Despite successes in reducing mortality and economic loss in certain countries and cities and for some hazards¹¹, overall disaster risk and the frequency and intensity of disasters are on the rise and significantly impede progress towards sustainable development. The Pocket Global Assessment Report on Disaster Risk Reduction 2015¹² states that "one especially alarming development is that both the mortality and economic loss associated with smaller-scale, recurrent localized disasters are trending up". Evidence indicates that exposure of people and assets in all countries has increased faster than vulnerability has decreased – especially to weather and climate extremes – thus generating new risk and a steady rise in disaster losses with significant socioeconomic impact in the short-, medium- and long-term, especially at the local and community level. Urbanization as a global phenomenon is expected to accelerate, resulting in a rapid increase in population density in a growing number of megacities and large urban complexes, many of which include coastal areas which are prone to urban flooding or water stress and have obsolete infrastructures. These social and economic vulnerabilities will continue to exist and - most likely - grow, and together with prevailing high-impact weather such as tropical storms, pose elevated risks to the safety of lives and property, particularly in developing and least developed countries (LDCs) and in small island developing states (SIDS). Typhoon Haiyan that devastated the Philippines in 2013 is a stark reminder of this ongoing reality.

and to engagement with DRR stakeholders which have led to improvements in preventing the creation of new risks, mitigation measures, early warning and community preparedness.

¹⁰ WMO and CRED, 2014: Atlas of Mortality and Economic Losses from Weather, Climate and Water Extremes (1970–2012). Geneva, available at:

http://library.wmo.int/opac/index.php?lvl=notice_display&id=16279#.VTo1JmOfqRo. Note: "mass movement wet" includes any type of downslope movement of earth materials (such as snow avalanches, debris and mud flows, and rockfalls) that involves the occurrence, movement, and distribution of surface and subsurface water. ¹¹ These achievements have largely been due to advancements in hydrometeorological science and technology

¹² Available at: <u>http://www.preventionweb.net/english/hyogo/gar/2015/en/gar-pdf/GAR15_Pocket_EN.pdf</u>

Through a cascading effect, which is exacerbated due to the interdependency of economies, the impact of such natural hazards tends to broaden with indirect and lingering consequences (e.g. the 2010 eruptions of Iceland's Eyjafjallajökull volcano or the 2011 Thailand floods). Moreover, climate extremes and variability and their environmental consequences as well as other global risks such as health threats impose new challenges for building disaster resilience and prompt and efficient economic post-disaster recovery.

2015 marked a pivotal year in the global development agenda which addresses these challenges: The Sendai Framework for DRR 2015-2030¹³, the successor to the HFA, was adopted at the Third United Nations World Conference on DRR (WCDRR) in Sendai, Japan, in March 2015. The Third International Conference on Financing for Development in July 2015 resulted in the Addis Ababa Action Agenda¹⁴, an intergovernmentally negotiated and agreed outcome on financing sustainable development. In October 2015, the outcome document Transforming our world: the 2030 Agenda for Sustainable Development¹⁵ of the United Nations summit for the adoption of the post-2015 development agenda in New York, USA, in September 2015. Its set of Sustainable Development Goals (SDGs)¹⁶ supersedes the Millennium Development Goals (MDGs)¹⁷, of which disaster risk management (DRM) for achieving DRR is an integral part. In addition, at the 21st Session of the Conference of the Parties (COP 21/CMP11) to the United Nations Framework Convention on Climate Change (UNFCCC), in December 2015 in Paris, France, 195 countries adopted the Paris Agreement¹⁸, the agreement, which will be implemented from 2020 onwards. Provisions of this treaty include measures to reduce and transfer disaster risk and how to deal with loss and damage if climate change mitigation and adaptation are not sufficient. This rare alignment of the international policy processes of national governments, the private sector, and civil society interests is an opportunity to position DRM as a cornerstone in the efforts to foster DRR, climate change adaptation (CCA) and resilience as key components of sustainable development. As a specialized agency of the United Nations, WMO is committed to the implementation of these frameworks, for which the WMO community has a wide range of services and products on offer.

In addition to these commitments, an increasing number of actors are demanding access to timely multi-hazard warnings and information, both on weather and climate time scales, in order to better inform their own tactical and strategic decision-making. For many of these actors the demand for information is being successfully met by WMO. However, this demand is also being served by third-party organizations including regional intergovernmental organizations, the private sector and non-governmental organizations (NGOs), which may undermine the role of an NMHS and lead to ambiguous messages for decision-makers. It is therefore important that this Roadmap provides a vehicle by which WMO looks to improve coordination and collaboration at the national

¹⁸ UNFCCC, 2015: The Paris Agreement, available at: http://unfccc.int/resource/docs/2015/cop21/eng/10a01.pdf

¹³ UNISDR, 2015: The Sendai Framework for Disaster Risk Reduction 2015-2030, available at: <u>http://www.unisdr.org/we/inform/publications/1037</u>

¹⁴ UN, 2015: Addis Ababa Action Agenda, available at: <u>http://www.un.org/esa/ffd/wp-content/uploads/2015/08/AAAA_Outcome.pdf</u>

¹⁵ UN, 2015: Transforming our World: The 2030 Agenda for Sustainable Development, available at: <u>https://sustainabledevelopment.un.org/post2015/transformingourworld/publication</u>

¹⁶ Sustainable Development Goals, available at: <u>http://sustainabledevelopment.un.org/?menu=1300</u>

¹⁷ Millennium Development Goals, available at: <u>http://www.un.org/millenniumgoals/</u>

level as well as significantly contribute to the DRR focus in the global development agenda outlined above.

1.2 Objectives of the Roadmap

This Roadmap aims at guiding WMO activities in **all components and phases of DRM** as well as their further enhancement and coordination across WMO constituent bodies and Programmes. It will be complimented by a coordinated, Organization-wide implementation plan with prioritized activities, deliverables and milestones. The expected benefits of the Roadmap to WMO Members and corresponding NMHSs are in alignment with WMO's and the DRR Programme's vision statements and the Programme's five strategic goals. Thus, the Roadmap looks to guide the NMHSs and the wider WMO community to enhance service delivery to national, and in some cases regional and global DRR stakeholders, and therefore to play an increasing role in improving long-term disaster and climate resilience. Such a "DRR services-ready NMHS" would – supported by WMO as a whole – be able to:

- Co-produce and co-deliver user-driven services for DRR to multiple sectors and at various spatial and temporal scales, in all phases of DRM, through strong partnerships and joint efforts that facilitate standardized preparedness and response plans;
- Fully link vulnerability and exposure data to hazard information in data processing, production, and service delivery in order to contribute to and use impact-based forecasts and risk-informed warnings of multiple hazards to inform national DRR decision-making within the framework of MHEWS;
- Advance and apply science (natural and social) and technology to support the development and delivery of such services for DRR.

Through the WMO DRR Programme, the Roadmap will:

- 1. Provide a framework for WMO Members to enhance their NMHSs' contributions to their national DRR efforts;
- 2. Provide a mechanism to enhance WMO programmatic coordination and collaboration in respect of DRR;
- 3. Serve as guidance to Members, the WMO operational and research networks, and the Secretariat, for their support to local, national, regional, and global DRR activities under these frameworks;
- 4. Reference and leverage developments in capability such as impact-based forecasting and risk-informed warnings of multiple hazards;
- 5. Identify both tactical and strategic opportunities for enhancing the role of NMHSs and WMO in global and regional DRR in developing a coordinated and focused engagement with the international DRR stakeholder community (e.g. the United Nations system, regional and sub-regional organizations¹⁹, the private sector, charities, NGOs, etc.) and in the implementation of relevant international frameworks and processes;
- 6. Describe requirements both in terms of non-monetary resources and funding needed to support its further development and implementation.

Based on the achievements by WMO Members prior to and over the lifetime of the HFA, the Roadmap will thus provide a basis for WMO's contribution to the DRR aspects of the

¹⁹ For example, the European Union (EU), the Economic Community of West African States (ECOWAS), etc.

wider post-2015 agenda, specifically to the Sendai Framework with its seven global targets and the DRR Priority of the Global Framework for Climate Services (GFCS)²⁰ as well as the United Nations Plan of Action on DRR for Resilience²¹.

Figure 3 provides a schematic overview of the Roadmap, highlighting how the latter will look to identify activities (the actual Roadmap) which can then be delivered by existing (to be expanded and complemented by DRR-specific components) and planned or potential future programmes, projects, and frameworks (the Implementation Plan, Section 5.3). Where appropriate, this will be done in partnership with DRR-related third-party initiatives (e.g. through leveraging their respective plans, such as the UNFCCC's National Adaptation Programmes for Action (NAPAs) for Least Developed Countries (LDCs) which could form an important component of increasing national DRR capacity).



Figure 3: WMO DRR Roadmap – schematic overview

1.3 Benefits of the Roadmap to WMO Members

Recognizing that capacities for NMHSs to service their national DRR mechanisms vary, the Roadmap and its implementation plan will help NMHSs to increase their engagement in and capacity to support their national DRR agenda and ultimately contribute towards increased resilience. While the social, economic, and environmental benefits are

²⁰ <u>http://www.gfcs-climate.org/disaster_risk_reduction</u>

²¹ <u>http://www.preventionweb.net/files/33703_actionplanweb14.06cs1.pdf</u> (to be updated in 2016)

described in further detail below, the key benefit areas to Members are increased resilience through:

- Reduced loss of lives and livelihoods;
- Reduced economic losses;
- Improved sectoral planning, including increased use of weather, climate and hydrological services for long-term strategic planning and the design and implementation of preventive measures;
- Improved preparedness for response and recovery through more effective EWS and MHEWS and risk information;
- Improved coordination of cross-organizational activities in DRR.

Some of the key expected benefits for the corresponding NMHSs are:

- NMHSs are well positioned in their national DRR governance mechanisms and enjoy a high profile, with the Roadmap providing guidance to NMHSs on how to effectively engage in these mechanisms;
- Increased sustainability of the NMHS, both in terms of funding for their core operations and also after having been affected by disasters themselves;
- Promotion of training and capacity development activities for NMHSs, based on identified areas of good practice where NMHSs (Members) can learn from tested methods of others.

Social benefits: Effective DRR related to hydrometeorology is centred on science-based weather, climate, and water information about potential hazards. NMHSs and other agencies (e.g. geological surveys, environmental agencies, etc.) of WMO Members contribute to the safety and well-being of society through their efforts to provide information on natural and partly human-induced hazards and their impacts on lives and livelihoods. Such information is an essential input for DRR and CCA strategies, plans and measures, including sectoral plans such as for the improvement of the safety of transport on land, at sea and in the air and for human and environmental health. Seasonal climate forecasts are useful for planning of climate-sensitive activities, while the analysis of multi-year hazard patterns and trends, combined with climate change scenarios, can underpin longer-term strategic planning, prevention, mitigation and disaster risk financing to reduce the impacts of disasters at various levels. For example, improving operational climate services through the GFCS will enhance national capabilities to support climate-smart decision-making. This will further strengthen the resilience of society to longer-term climate variability and change. Critical to success are the service delivery interactions with the community of users, including open access to global weather, water and climate data, knowledge, and impact-relevant products and services.

Economic benefits: Accurate, timely and impact-oriented weather, climate, water and related environmental products and services from Members, in particular from their NMHSs, make a significant contribution to economic stability, efficiency and growth in many sectors. Examples include water resource management, food production, aviation and marine transportation, energy (especially hydro, solar and wind power) and insurance. Early warning services and forecasts inform economically-driven decisions that mitigate the effects of meteorological and hydrological hazards in the short and longer terms. Broader risk management planning allowing the design and implementation of preventative measures to reduce risk exposure needs to complement

early warning activities. WMO Members also monitor space weather conditions and processes (e.g. solar flares, geomagnetic storms etc.) which can have significant impacts on economic sectors such as aviation, telecommunications, satellite operations, and electricity transmission. Governments and the aviation industry rely on WMO and its Members to provide advice on the dispersion of volcanic ash, a significant hazard to aircraft, with associated downstream impacts on numerous economic sectors. In response to nuclear or industrial accidents, WMO works in close collaboration with agencies such as the International Atomic Energy Agency (IAEA) and the World Health Organization (WHO) to provide advice and information to reduce the impacts of these hazards.

Environmental benefits: WMO and its Members monitor the environment over time, providing insight into possible impacts on the world's climate, food and water security, natural ecosystems, and human health. Changes are occurring in rainfall and temperature, the chemical composition of the atmosphere, surface and groundwater availability, land cover and soil condition, the temperature and chemical balance of the oceans, and pollutants in the air, water, and soil. Subtle changes in these parameters can have profound consequences for ecosystems, biodiversity, and food production systems.

Focused coordination of DRR activities across WMO: DRR is a priority area for WMO and is a consistent theme for all NMHSs and throughout many WMO regional associations (RAs), technical commissions (TCs), Programmes and projects. As such, it is important that DRR is addressed in a coordinated manner. This Roadmap will not only help guide WMO's approach to DRR but will also help coordinate DRR activities across WMO and will act as a focal point for national and international actors, DRR initiatives and service providers.

1.4 WMO commitment to servicing disaster risk reduction within the global development agenda

In order to respond to the requirement for WMO to commit to servicing disaster risk reduction within the global development agenda, DRR has been a priority for WMO for many years. In the WMO Strategic Plan 2016-2019²², DRR is the first of the seven strategic priorities with the expected results of enhanced capabilities of Members to reduce risks and potential impacts of hazards caused by weather, climate, water and related environmental elements through producing better weather, climate, hydrological and related environmental information, predictions, warnings and services to support DRR and climate impact and adaptation strategies.

In this context, the Fourteenth World Meteorological Congress (Cg-XIV) in 2003²³ established the WMO DRR Programme to provide an Organization-wide coordination framework for DRR. Its vision²⁴ is "*to enhance the contributions of NMHSs, in a more cost-effective, systematic and sustainable manner, towards the protection of lives, livelihoods and property, through enhanced capabilities and cooperation in the field of*

²² WMO Strategic Plan 2016-2019, available at <u>http://library.wmo.int/pmb_ged/wmo_1161_en.pdf</u>

²³ Resolution 29 (Cg-XIV). The original name in 2003 was "Natural Disaster Prevention and Mitigation Programme" which was changed to "DRR Programme" by Cg-XV in 2007.

²⁴ Developed by the WMO Executive Council in 2007, through its Advisory Group on Natural Disaster Prevention and Mitigation (EC AG DPM) at the time.

DRR at national to international levels". The scope and the goals²⁵ of the Programme are underpinned by the HFA, which shifted the traditional focus of post-disaster response to a more comprehensive approach involving prevention and preparedness measures.

With this Roadmap, the Programme is being realigned with the Sendai Framework (see Annex I for provisions in the Framework with immediate relevance to WMO), specifically with its four Priorities for Action through which States call to: (1) strengthen the understanding; and (2) management of risk; (3) invest in DRR; and (4) enhance disaster preparedness for effective response, recovery, rehabilitation, and reconstruction ("build back better"). The Sendai Framework is built on elements that ensure continuity with the achievements made by countries and other stakeholders under the HFA. However, it introduces a number of innovations including a strong emphasis on disaster risk management as opposed to disaster management; the substantial reduction of disaster risk and losses in lives, livelihoods and health, and in the economic, physical, social, cultural and environmental assets of persons, businesses, communities and countries as an expected outcome; and a goal focused on preventing the creation of new risks, reducing existing risks and strengthening resilience. Furthermore, seven global targets (Annex II) were agreed that will be measured at the global level by appropriate indicators to support the assessment of global progress in achieving the expected outcome. Moreover, national targets and indicators will also contribute to achieving the goal of this Framework. States also defined the role of stakeholders and of international cooperation and global partnership.

NMHSs play an important role in the entire DRM process and thus in achieving all seven Sendai targets. However, with their operational capacities (often 24/7) NMHSs are uniquely placed for delivering multi-hazard early warnings, including those that are fast on-set for which 24/7 operations are beneficial (relating to target (g)), by increasing the availability of and access to national MHEWS and disaster risk information and assessments. Thereby NMHSs are also able to contribute to response and recovery activities. In addition, NMHSs are well placed to provide hazard information for risk assessments and to assist in the design, planning and implementation of preventative measures, which also contribute to mitigation, preparedness and recovery activities. Combining these attributes will greatly contribute to decreasing societal exposure to hazards and consequently, losses and damages. Finally, WMO's leading role in international cooperation is directly supporting Sendai target (f), which helps to implement the commitments made by the United Nations system and Member States.

²⁵ Sixteenth World Meteorological Congress, 2011:Abridged final report with resolutions, available at: <u>https://googledrive.com/host/0BwdvoC9AeWjUazhkNTdXRXUzOEU/wmo_1077_en.pdf</u>

2 Conceptual framework – What is disaster risk reduction and management?

Over the years a number authoritative bodies have devised definitions of DRR (e.g. UNISDR 2009²⁶ & 2015²⁷, IPCC 2012²⁸). It is generally accepted that DRR is a series of activities known as **disaster risk management (DRM)** which require multidisciplinary expertise involving numerous actors and which, when implemented, contribute towards assessing, avoiding and reducing, and transferring the risks and adverse impacts of disasters together with an increase in **resilience**.

A prerequisite of the DRR process is a **risk assessment** which determines the nature and extent of past, existing and potential future risks. It involves the identification, analysis and evaluation of: (i) hazards in terms of their location, intensity, frequency, duration and probability; (ii) vulnerability in terms of its physical, social, economic and environmental dimensions; (iii) exposure of people and assets; and (iv) effectiveness of prevailing or alternative coping and adaptive capacities. Post-disaster hazard as well as loss and damage data serve as input for estimating future impacts. Such data needs to be, temporally and geographically referenced with the hazard event, quality-assured, consistently catalogued and properly archived. Risk assessment is applied differently in the recovery/prevention (or "cold") phase of DRM, when long-term hazard, vulnerability and exposure analyses need to be conducted, and in the preparedness/response (or "hot") phase, when real-time analyses are needed.

Equipped with such risk information, countries can develop **risk reduction** and adaptation strategies and activities that are frequently presented as a cycle or upward winding spiral, including four components:

- 1. **Prevention and mitigation:** Disaster prevention expresses the concept and intention to completely avoid the adverse impacts of hazard events through actions taken, normally, in the absence of or in advance of a potentially disastrous event. Since the adverse impacts of hazard events often cannot be fully prevented, their scale or severity can be substantially lessened by mitigation measures. Measures can also be taken during or after an event to prevent secondary hazards or their consequences, for example, air, soil or water contamination. Meteorological, hydrological and climate information is essential to determine effective risk prevention and mitigation measures, both structural (e.g. the design of the levels of embankments that protect flood-prone areas where settlement and economic activities are vulnerable) and non-structural (e.g. improved environmental policies and public awareness raising). It should be noted that in climate change policy, mitigation is defined differently by IPCC, being the term used for the reduction of greenhouse gas emissions.
- 2. **Preparedness:** Preparedness encompasses the knowledge and capacities to effectively anticipate, respond to and recover from the impacts of likely, imminent

²⁷ UNISDR, 2015: Making Development Sustainable: The Future of Disaster Risk Management. Global Assessment Report on Disaster Risk Reduction available at:

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http://www.preventionweb.net/english/hyogo/gar/2015/en/gar-pdf/GAR2015 EN.pdf
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²⁶ UNISDR, 2009: UNISDR Terminology on Disaster Risk Reduction, available at: <u>http://unisdr.org/files/7817_UNISDRTerminologyEnglish.pdf</u>

²⁸ IPCC (2012). Glossary of terms. In: Managing the Risks of Extreme Events and Disasters to Advance Climate Change Adaptation [Field, C.B., V. Barros, T.F. Stocker, D. Qin, D.J. Dokken, K.L. Ebi, M.D. Mastrandrea, K.J. Mach, G.-K. Plattner, S.K. Allen, M. Tignor, and P.M. Midgley (eds.)]. A Special Report of Working Groups I and II of the Intergovernmental Panel on Climate Change (IPCC). Cambridge, UK, and New York, NY, USA, pp. 555-564, available at <u>https://www.ipcc.ch/pdf/special-reports/srex/SREX-Annex_Glossary.pdf</u>

or current disasters. Such actions aim at the efficient management of emergencies and orderly transitions from response through to sustained recovery, including activities such as contingency planning, stockpiling of equipment and supplies, the development of arrangements for coordination, evacuation and public information, and associated training and field exercises. These must be supported by formal institutional, legal and budgetary capacities. Multi-hazard early warning systems (MHEWS) are an essential component of preparedness.

- 3. **Response:** Response actions are taken during or immediately after a disaster in order to save lives, reduce impacts, ensure public safety and meet the basic subsistence needs of the people affected. Some response actions, such as the supply of temporary housing and water supplies, may extend well into the recovery stage. It is therefore the focus of humanitarian planning and assistance.
- 4. **Recovery:** Recovery decisions and actions are aimed at restoring or improving livelihoods, health, as well as economic, physical, social, cultural and environmental assets, systems and activities following an emergency or disaster, aligning with the principles of sustainable development and resilience, including building back better to avoid, reduce or adapt to future disaster risk.

Figure 4 provides an overview of how meteorological and climate information is integrated within a DRM cycle with reference to specific meteorological phenomena.

Disasters affect human life and have profound impacts on local and national economies, sometimes setting back development gains by many years in those countries with limited resources. Weather, climate and hydrological services are therefore essential also for financial protection mechanisms in order to cope with residual risks. Residual risks that cannot be effectively reduced can be addressed by **disaster risk financing**, **including risk transfer**, such as government backed insurance schemes and weather-indexed insurance.

DRR is inextricably linked to and informs climate change adaptation (CCA). Natural hazards, including those associated and exacerbated by climate variability and change, threaten society. As reiterated by several United Nations World Conferences and Summits, DRR and CCA are therefore not only an imperative to protecting investments in development, but also as an opportunity for a transformative shift towards more resilient, sustainable development. Improved collaboration between DRR and CCA and their mainstreaming into development activities is seen as a way to enhance their effectiveness and longer-term impacts. DRR and CCA both share the concern for reducing the negative impacts of hazards through prevention, mitigation, preparedness, response and recovery measures, for reducing vulnerabilities and exposure and for increasing resilience in the long-term. However, CCA deals only with climate change while DRR deals with all hazards including climate-related hazards. CCA specifically deals with the long-term (since climate is defined as average weather), while DRR deals with all time scales, including sudden-onset hazards such as earthquakes and slow-onset hazards such as drought and creeping environmental changes. CCA can therefore be seen as a focused subset within DRR, which in turn must be placed within its wider contexts of development and sustainability. An efficient and effective NMHS is a core component of DRR and CCA, providing essential and high-quality hydrometerological information. For example, when "building back better" after a disaster, the location and construction of infrastructure should take into account various climate change scenarios. If construction cannot be undertaken to a certain level, then the appropriate EWS must be put in place to warn communities of when critical thresholds that result in threats to

lives and property are expected to be exceeded. National strategic plans for strengthening and modernizing the NMHSs should be derived from and consistent with broad national planning objectives with relevant areas including, inter alia, emergency management, sustainable development, CCA, aviation, agriculture, energy and water resources. These plans should also be consistent with, and specify linkages to, regional and global plans/policies in relevant areas of weather, climate and hydrological services, as appropriate, as well as compliant with WMO standards.

Figure 5 presents a high-level overview of the pivotal role a NMHS can play in its national DRR governance and demonstrates both routine service delivery and more DRR-specific activities. One of the key points to note here, and one which is often missed during DRR discussions, is that a NMHS has a role to play across all timescales, from weather- and flood-specific early warnings through to slower onset seasonal or climate-service related information. A second key point is that NMHSs also have a key role to play in prevention, thereby helping to reduce exposure of society to risks and increasing their resilience.



Figure 4: Incorporating climate information into the disaster risk management cycle (Source: Hellmuth et al., 2011)²⁹

²⁹ Hellmuth M.E., Mason S.J., Vaughan C., van Aalst M.K. and Choularton R. (eds) 2011. A Better Climate for Disaster Risk Management . International Research Institute for Climate and Society (IRI), Columbia University, New York, USA, available at: <u>http://iri.columbia.edu/wp-content/uploads/2013/07/CSP3_Final.pdf</u>.

What does DRR mean to a NMHS? For a NMHS, DRR is the desirable outcome of effective service delivery that identifies, provides and communicates hazard and risk information in such a way that the appropriate stakeholders, decision-makers, and general public can take actions to protect lives, reduce economic losses and disaster risks and ultimately increase community resilience through structural and non-structural measures – preventive, responsive and adaptive.

What does DRM mean to a NMHS? For a NMHS, DRM includes the processes by which a NMHS, working in partnership with other stakeholders, understands user requirements and disaster risks – hazards, exposure and vulnerabilities – and delivers effective and meaningful products and services to DRM decision makers.

What is the role of NMHSs in DRM? Hydrometeorological observations, monitoring, predictions and related data management and processing by NMHSs are a fundamental input into sound DRM. A NMHS's role in all phases of DRM is to:

- Provide a single authoritative voice for hydrometeorological hazard information (and other hazards under their individual mandates) to be used in prevention, mitigation, preparedness (including early warning), response and recovery as well as for risk and loss/damage assessments and financial protection;
- 2. Provide advice and approaches that could be taken to reduce exposure and vulnerabilities and increase societal resilience, through both structural and non-structural measures such as the provision of climate advice which highlights the potential vulnerability of particular areas to known hazards;
- 3. Inform, mobilize and partner with academic institutions and other experts that can contribute to this information and advice; and,
- 4. Educate and raise awareness of the general public and tactical and strategic decision-making authorities (governmental and non-governmental entities) to understand hazards and related risks, warnings and associated uncertainties.

The importance of **service delivery** in the DRM cycle is most apparent in the descriptions listed above. Therefore, all of the activities described in later sections will align with the six elements of service delivery as defined in the WMO Strategy for Service Delivery³⁰. Moreover, there is a strong argument for considering DRR across all stages of the service delivery cycle (Figure 6). The development of approaches by NMHSs to support DRR should therefore follow the basic principles of establishing user engagement and partnerships to ensure that the development and delivery of services will respond to user needs and be continually monitored and improved. The success of service delivery for DRR depends on these factors as well as on respective capacity development and knowledge management.

³⁰ WMO, 2014: The WMO Strategy for Service Delivery and its implementation plan, available at: <u>http://www.wmo.int/pages/prog/amp/pwsp/documents/WMO-SSD-1129_en.pdf</u>



Figure 5: Overarching framework for the development and delivery of products and services by National Meteorological and Hydrological Services and related partners to support national disaster risk management (Source: WMO DRR Programme, 2016)



Figure 6: Stages and elements of the WMO Strategy for Service Delivery (Source: WMO, 2014)

3 Identification and design of priority activities

The previous sections have described both the requirements and the rationale behind the development of a WMO DRR Roadmap. In this section, the principles behind the identification and design of priority activities as the key element of the Roadmap will be described. On-going and future WMO activities and projects related to DRR can be structured according to:

- Thematic areas (aligned with the Sendai Framework, Section 3.1); and
- **Cross-cutting activity pillars as enablers** (aligned with the WMO Strategy for Service Delivery, Section 3.2).

A key feature of this Roadmap is further to leverage existing WMO mechanisms, activities and projects and to develop linkages to external initiatives in order to realize tangible benefits for WMO Members through collaboration and coordination at the national, regional and global levels (Section 3.3). Since the time coverage aligns with the Sendai Framework and spans almost four WMO intersessional periods, the Roadmap will need to be a "living" document which defines an initial set of activity categories, complimented by an implementation plan that corresponds to the four-year intersessional periods (with biannual work plans) and identifies key deliverables and milestones.

Over the course of time the DRR landscape is certain to change, necessitating regular consultations on and updates to this document, which will require endorsement from the WMO decision-making bodies. Sessions of Cg and EC, circular letters to Members, EC WG meetings, sessions of RAs and TCs and the meetings of their presidents, management groups, DRR focal points and relevant expert teams and working groups as well as the meetings of the DRR User-Interface Working Groups (UI-WGs) will be used to elicit inputs into the WMO DRR Roadmap. Regular consultations will also take place within the Secretariat and among selected key partners and users (see Section 5).

3.1 Thematic areas aligned with the Sendai Framework for Disaster Risk Reduction 2015-2030

The implementation of the HFA has led to changes in national legal and institutional frameworks and policies on DRR, with implications on the role of and working arrangements for NMHSs. These changes provided opportunities for NMHSs such as increased recognition by their governments and stakeholders which could result in strengthened partnerships and increased resources. However, this also means that NMHSs face increasing demand and liabilities in terms of providing products and services to a larger and more diverse group of DRR decision-makers and stakeholders. To meet these challenges, the WMO DRR Programme has highlighted the contribution of NMHSs to DRR in a number of thematic areas, such as: (i) hazard and risk analysis; (ii) MHEWS; (iii) sectoral risk management; (iv) humanitarian planning and response; and (v) disaster risk financing and transfer. These thematic areas were derived from the general DRM cycle (Section 2) and aligned with the HFA, also expressed as priority categories of activity for the implementation of the GFCS DRR Exemplar³¹.

Each of these DRR Programme themes remains valid and adheres to a "people-centred approach" which was ratified in the Sendai Framework. However, now that this new

³¹ <u>http://www.gfcs-climate.org/sites/default/files/Priority-Areas/Disaster%20risk%20reduction/GFCS-DISASTER-RISK-REDUCTION-EXEMPLAR-FINAL-14467_en.pdf</u>

Framework is in force, with further implications for NMHSs and WMO, the WMO DRR Roadmap explicitly links to the four Priorities for Action of the Sendai Framework (Table 1) and identifies how NMHSs and WMO are already, or will be in the future, contributing to the implementation of each of these priorities. By doing so, it addresses also the DRRrelated goals and priorities of other international development frameworks.

Core NMHS functions Thematic areas of the DRF		the DRR Programme	Sendai
/ operations and			Framework
capacities			Priorities for
	Disaster	Absence of a	Action
	("hot" phase)	disaster	
		("cold" phase)	
Observations,	Real-time risk	Long-term risk	Understanding
monitoring, data	assessment	assessment	disaster risk
management and	(hazard and risk	(hazard and risk	
exchange	identification,	identification,	
	analysis and	analysis and	
	evaluation)	evaluation)	
	Prevention and	Prevention and	Investing in DRR
	mitigation through	mitigation to	for resilience
	(temporary)	reduce risks in	
	structural and non-	sectors through	
	structural measures	structural and non-	
		structural measures	
		Disaster risk	
		financing and	
		transfer	
Data processing,	Preparedness for	Preparedness for	Enhancing
modelling and	effective response	effective response	disaster
seamless prediction	and recovery	and recovery	preparedness for
(forecasting)	through MHEWS *	through MHEWS *	effective
(· · · · · · · · · · · · · · · · · · ·	(impact-based early	(impact-based early	response, and to
	warning for rapid-	warning for slow-	"Build Back
	onset hazards	onset hazards)	Better" in
	Assistance to	Assistance to	recovery,
	humanitarian	humanitarian	rehabilitation and
	response (during	planning	reconstruction
	emergencies)	(preparedness and	
	5	recoverv)	
Enablers such as		Engagement of	Strenathenina
regulatory work		NMHSs and WMO	disaster risk
(standards, manuals,		in DRR governance	governance to
guidelines, guality		at different levels	manage disaster
management, etc.).			risk
capacity development			
(demonstration projects.			
training, etc.),			
partnerships,			
coordination,			
cooperation and			
exchange			

Table 1: Linking the Sendai Framework Priorities for Action to the thematic areas of the DRR Programme

* The thematic area MHEWS cuts across all four priorities for action.

3.2 Cross-cutting activity pillars as enablers aligned with the WMO Strategy for Service Delivery

The Roadmap aims at improving the development, delivery, and uptake of meteorological, hydrological and climate services for DRR. Each thematic area is addressed by the following activity pillars³² which largely correspond to the stages and elements of the WMO service delivery model (indicated by \rightarrow):

- Stakeholder and user engagement;
- **Partnerships and collaboration** (including resource mobilization) → engage users and evaluate their needs and develop partnerships;
- Capacity development through knowledge products (e.g. guidelines, standards, training modules) → design and deliver services, link products and services to user needs, sustain services, develop skills and share good practices;
- Capacity development through **pilot and demonstration projects** (showcasing and improving knowledge products, e.g. through training at workshops) → design and deliver services, link services to user needs, sustain services, develop skills and share good practices;
- **Research and development** → develop and improve services; and,
- Related events

Making this a reality requires substantial development of the operational and service capacities of many NMHSs, particularly in developing and least developed countries. As one strategy for achieving this, significant efforts have been taken to engage with NMHSs/Members, RAs, TCs, scientific and technical programmes, to participate in international networks, and to establish strategic partnerships and linkages with internal and external programmes, frameworks, and events (Section 3.3 below).

3.3 Internal and external linkages and coordination

Recalling that the Roadmap is not a separate programme, there is a need to link to a number of internal and external mechanisms and processes that influence the DRR activities of WMO – a critical component of everything that NMHSs do.

Internal linkages: Resolution 8 (EC-66) calls for "coherent and consistent implementation of WMO DRR priorities within all relevant Programmes and projects of WMO, in the light of the recommendations of RAs and, where appropriate, the advice of the TCs", the "identification of the role of NMHSs ... among WMO partners, United Nations bodies, and external planning processes", and consistency "with the WMO Strategic and Operating Plans, as well as the work plans for relevant WMO Programmes and projects".

The WMO Strategic Plan 2016-2019 includes DRR as one of WMO's seven key priorities, specifically the improvement of the accuracy and effectiveness of impact-based forecasts and multi-hazard early warnings of high impact meteorological, hydrological and related environmental hazards, thereby contributing to international efforts on DRR, resilience and prevention, in particular in response to the risks associated with increased urbanization. Table 2 shows the strategic documents and implementation plans of other WMO priorities with which the Roadmap and its Implementation Plan need to link.

³² Based on the WMO DRR Work Plan 2012-2015 (Annex to Resolution 8 (EC-64)).

WMO Priority	Strategic Document	Implementation
		Document
Disaster Risk Reduction	WMO Disaster Risk	WMO DRR Roadmap
(DRR)	Reduction (DRR) Roadmap	Implementation Plan
Global Framework for	Implementation Plan for the	GFCS 2016-2018
Climate Services (GFCS)	GFCS and its Annex "User	Operational and Resource
	Interface Platform (UIP)	Plan (ORP)
	Component", which in turn	
	contains the DRR Exemplar	
WMO Integrated Global	WIGOS Development and	WIGOS Implementation
Observing System (WIGOS)	Implementation Strategy	Plan (WIP)
	(WDIS)	
Aviation meteorological	ICAO Global Air Navigation Pl	an (GANP) 2013-2028
services		
Polar and high-mountain		Global Cryosphere Watch
regions		(GCW) Implementation Plan
Capacity development	WMO Capacity Development S	Strategy and Implementation
	Plan	
Governance	White Paper submitted to	
	the EC Working Group on	
	Strategic and Operational	
	Planning	
Overall	WMO Strategic Plan	WMO Operational Plan
	2016-2019	2016-2019

Table 2: Linkages to the strategic documents and implementation plans of other WMO priorities

Other important work plans for relevant WMO Programmes and projects that the Roadmap and its Implementation Plan need to consider are shown in Table 3.

Strategic Document	Implementation Document			
The WMO Strategy for Service Delivery and its Implementation Plan ³³				
WMO Quality Management Fran	mework (WMO-QMF) / Quality Management System (QMS) ³⁴			
WMO Resource Mobilization				
Strategy ³⁵				
Madrid Conference Statement	Madrid Action Plan ³⁶ (adopted by the International			
	Conference on Social and Economic Benefits of Weather-,			
	Climate-, and Water-related Information and Services in			
	2007)			
Strategic and operating/work p	lans of RAs, TCs and relevant WMO Programmes (including			

 Table 3:
 Linkages to other work plans for relevant WMO Programmes and projects

Strategic and operating/work plans of RAs, TCs and relevant WMO Programmes (including associated/co-sponsored programmes),systems and projects and their working groups and expert teams (Annex III)

External linkages: The United Nations Plan of Action on Disaster Risk Reduction for Resilience United Nations/international development frameworks and related events ("external drivers", examples): Other 3rd party DRR initiatives and MoU (UNOCHA & WMO, etc.).

Торіс	Framework documents
DRR	Sendai Framework for DRR 2015-2030 and the
	- United Nations Plan of Action on DRR for Resilience ³⁷
	- Implementation guides "Words into Action"
SIDS	SIDS Accelerated Modalities of Action [S.A.M.O.A.]
	Pathway ³⁸
Financing development	Addis Ababa Action Agenda (AAAA) of the Third
	International Conference on Financing for Development ³⁹
Sustainable Development	Transforming our World: The 2030 Agenda for Sustainable
	Development
	Sustainable Development Goals (SDGs) ⁴⁰
Climate change mitigation	Paris Agreement ⁴¹
and adaptation	
Humanitarian action	Outcome of the World Humanitarian Summit 2016
Urban issues	Outcome of the United Nations Conference on Housing and
	Sustainable Urban Development (Habitat III) (Quito,
	Ecuador, October 2016)
Earth observation	Group on Earth Observations (GEO) 2016-2025 Strategic
	Plan: Implementing Global Earth Observation System of
	Systems (GEOSS) ⁴²

Table 4:Linkages to external frameworks and plans

³³ <u>http://www.wmo.int/pages/prog/amp/pwsp/documents/WMO-SSD-1129_en.pdf</u>

³⁴ <u>http://www.bom.gov.au/wmo/quality_management.shtml</u>

³⁵ <u>http://www.wmo.int/pages/prog/dra/rmo.php</u>

³⁶ <u>http://www.preventionweb.net/files/2621</u> madrid07ActionPlanwebE.pdf

³⁷ <u>http://www.preventionweb.net/files/33703_actionplanweb14.06cs1.pdf</u>

³⁸ <u>http://www.sids2014.org/samoapathway</u>

³⁹ <u>http://www.un.org/ga/search/view_doc.asp?symbol=A/RES/69/313</u>

⁴⁰ <u>https://un.org/sustainabledevelopment/en/topics-sustainabledevelopmentgoals</u>

⁴¹ <u>http://unfccc.int/resource/docs/2015/cop21/eng/l09r01.pdf</u>

⁴² <u>https://www.earthobservations.org/geoss_wp.php</u>

4 WMO activities in support of disaster risk reduction

As discussed earlier, the DRR activities and deliverables will be realized through existing WMO or partner frameworks, expert groups, RAs, TCs, and, in some cases, through partner organizations. Wherever possible, these activities will be structured according to:

- Thematic areas and cross-cutting, enabling activity pillars;
- Whether they pertain to **national and local levels**, i.e. rather to NMHSs, or **global and regional levels**, i.e. rather the WMO regional and global network and the Secretariat, and
- Whether they pertain to the **near term** or the **longer term**.

It should be noted that the activities below are described as broad activity categories, and for this present edition of the WMO DRR Roadmap focussed on the global and regional levels and the period 2016-2019. These will be updated and agreed upon by WMO Members. Several activities from the DRR Work Plan 2012-2015 and the plans of other WMO entities are likely to be continued under the Roadmap Implementation Plan and its biennial Work Plans. Further details that will be included over the course of time are regarding to which entity will be responsible for each activity, and how each Region (and Member or other WMO entity) may adjust the Roadmap according to its needs.

The WMO community has a wide range of services and products on offer for the implementation of the Sendai Framework. In the following, an attempt has been made to place a number of on-going and proposed activities⁴³ under the Priorities for Action of the Sendai Framework⁴⁴ based on a thorough benchmarking which will identify how past and on-going activities have contributed and still contribute to the implementation of these four priorities. The Implementation Plan will then further outline how future cross-cutting and specific WMO activities could contribute to the implementation of the Sendai Framework as well as the goals and targets, pertaining to DRR, of other international frameworks.

Moreover, most activities will cut across all thematic areas, pillars, and also the priorities for action of the Sendai Framework, for example:

- Identification and compilation of training initiatives related to DRR at the regional, transboundary basin and national levels and potential for cross-sectoral or organizational learning activities and of opportunities for training through WMO-ETR initiatives for NMHSs, as well as for users of information (e.g. through a WMO training symposium, sector-specific workshops as with Humanitarian Agencies);
- Establishment of a document library (including knowledge products such as **guidelines** and **good practices** in the thematic areas and pillars mentioned earlier, e.g. the establishment of partnerships and Help Desks such as those on Integrated Flood and Drought Management);
- Identification of **projects** where an additional DRR focus could deliver improved results, such as a stakeholder engagement module for the WMO Severe Weather Forecasting Demonstration Projects (SWFDP); and,

⁴³ By representatives of NMHSs of WMO Members

⁴⁴ See also the WMO Bulletin, Vol 64(2) article "Towards Substantially Reduced Disaster Risk in 2030 <u>http://www.wmo.int/bulletin/en/content/towards-substantially-reduced-disaster-risk-2030</u>

• Use of existing and identification of potential new **partnerships** to assist with the initial set of core activities.

Table 5 provides an example of how these activities can be structured along the thematic areas and the activity pillars.

	Pillar					
Thematic area	Stakeholder and user engagement	Partnerships, collaboration and network engagements	Knowledge products	Pilot and demonstra- tion projects (incl. trainings)	Research and development	Events
Hazard and risk assessment	DRR UI-WG HRA GFCS UIP	UNFCCC Loss and Damage IRDR INFORM	WMO-CRED Atlas Event identifiers Flood Mapping Manual	Country profiles	IPCC	COP 21
Prevention and mitigation	APFM IDMP	UNISDR WHO APFM ⁴⁵ / IDMP ⁴⁶	Manuals	APFM IDMP	Health research	Habitat III GP DRR
Preparedness / MHEWS	DRR UI-WG MHEWS GFCS UIP	IN-MHEWS ⁴⁷ / CREWS ⁴⁸ UNEP CADRI ⁴⁹	Guidelines	SWFDP CIFDP FFGS	Impact-based forecasts and risk-informed warnings HIWeather	IC-MHEWS Madrid+10 GP DRR
Humanitarian planning and response	WMO Humanitarian Task Team	Coordination with GDACS ⁵⁰ IASC ⁵¹	Guidelines	Pilot projects		World Humanita- rian Summit
Disaster risk financing and transfer	DRR UI-WG DRF	UNEP Finance Initiative	Guidelines Good practice book			Understand -ing Risk Forum

Table 5:Suggested structuring of priority activities per thematic area and activity
pillar, including examples of on-going activities (not an exhaustive list).

⁴⁷ international Network for Multi-Hazard Early Warning Systems, <u>http://www.wmo.int/pages/prog/drr/documents/IN-MHEWS/IN-MHEWS.html</u>

⁴⁵ Associated Programme on Flood Management (APFM), <u>http://www.apfm.info/</u>

⁴⁶ Integrated Drought Management Programme (IDMP), <u>http://www.droughtmanagement.info/</u>

⁴⁸ Climate Risk and Early Warning Systems (CREWS) initiative, <u>http://newsroom.unfccc.int/lpaa/resilience/climate-risk-and-early-warning-systems-initiative-strengthening-the-systems-at-the-heart-of-resilience/</u>

⁴⁹ Capacity for Disaster Reduction Initiative (CADRI), <u>http://www.cadri.net/</u>

⁵⁰ Global Disaster Alert and Coordination System (GDACS), <u>http://www.gdacs.org/</u>

⁵¹ Inter-Agency Standing Committee (IASC) on Humanitarian Assistance, <u>https://interagencystandingcommittee.org/</u>

4.1 Establishment of a baseline and prioritization of activities

Underpinning all of the below will be an initial exercise to establish a solid foundation (baseline) of Member capacities, gaps, and requirements on which to move forward. This exercise may include:

- Survey of Members, RAs, TCs, other programmes and the Secretariat, identifying main activities and challenges supporting DRR on the regional, national and local levels, including a compendium of recent or current activities within WMO (e.g. the WMO DRR, Public Weather Services (PWS), and Hydrology and Water Resources Programme (HWRP), and Capacity Development programmes, the WMO Commission for Climatology (CCl), etc.) addressing DRR and CCA;
- Symposium/conference that brings together Members, TCs, RAs, WMO Secretariat and external partners and experts to discuss the roles of WMO and NMHSs in the implementation of the Sendai Framework and other international frameworks and to identify new priorities for the DRR Programme (based on a thorough reading of these frameworks and the outcomes of the Survey); and,
- Identify and understand complementary capabilities and requirements of non-WMO actors and key global, regional, national, and local partners and users such as the European Union and appropriate private sector organizations (e.g. understanding early warning requirements of key sectoral organizations such as the WHO and WFP).

4.2 Understanding disaster risk (Sendai Framework Priority 1)

In support of the Sendai Framework's first Priority for Action, Cg-17 decided to standardize weather, water, climate, space weather and other related environmental hazard information for loss damage assessment. It also decided to develop identifiers for cataloguing extreme and high-impact weather, water and climate events. These measures will promote interoperability among datasets and facilitate Members' efforts to assess risks and track climate-related loss and damage. Enhanced capabilities to monitor and model future climate conditions will improve the attribution of extreme weather events to climate change. Such capabilities will also support preparedness and adaptation at all timescales and will provide quality assurance of these data, including the official designation/validation of extreme events and archiving of event data and trend indices.

WMO continuously improves the quality and quantity of hydrometeorological data, e.g. through the WMO Integrated Global Observing System (WIGOS), which enables the collection of data from satellites, ocean buoys, aircraft, ships and land-based stations. However, in collaboration with key partners, NMHSs need to also gather impact and vulnerability information related to specific sectors and hydrometeorological hazards in order to support the conduct of hazard and risk analyses/assessments at national and local levels as well as impact-based forecasting and risk-informed warning and decision-making. For this, it will be necessary to compile an overview of existing WMO guidance materials relevant to DRR in order to provide guidance on hydrometeorological hazard and risk analyses.

4.3 Strengthening disaster risk governance to manage disaster risk (Sendai Framework Priority 2)

Contributing to the second Priority for Action, WMO encourages NMHSs to actively engage in their national DRM and the wider risk governance, e.g. at national, sub-

regional, regional and global platforms for DRR. This can help to clarify the roles and responsibilities of various public- (including NMHSs) and private-sector actors and stakeholders who are providing and benefiting from weather and climate services. WMO advocates for reflecting these roles in national and local regulatory frameworks, planning, budgets, coordination/collaboration and operations, supported by, for example, standard operating procedures and guidelines.⁵²

4.4 Investing in disaster risk reduction for resilience (Sendai Framework Priority 3)

Investments in disaster risk prevention and reduction through structural and nonstructural measures are essential to enhance the economic, social, health and cultural resilience of persons, communities, countries and their assets, as well as the environment. Activities undertaken in the Integrated Drought Management Programme (IDMP) and Associated Programme on Flood Management (APFM) are consistent and contribute to this action priority area.

For NMHSs, the third Priority for Action applies to the maintenance, modernization, integration and further development of core capacities including:

- Operational weather, climate and hydrological observations, information and services to inform risk reduction and adaptation measures and medium- and longterm strategic planning for community resilience in the context of climate change; and,
- 2. High-impact weather and climate research, including modelling. WMO is helping Members to access funding and showcase the socioeconomic benefits of weather and climate services and to implement capacity development and demonstration projects.

It is also equally important to ensure that investments are materialized in information and communications technologies (ICTs). These ICTs facilitate monitoring of the environment, retrieving and processing vital data, and disseminating and receiving information before, during and after disasters. 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 competent to develop, operate and maintain such systems.

Further areas that will be explored include:

- Identification of portable models for engagement of NMHSs with private sector disaster insurance organizations;
- Designing, in partnership with external stakeholders, a generic NMHS DRR capacity assessment process to determine targeted investments, e.g. in observation systems, modelling facilities, information platforms, etc.; and,
- Monitoring if DRR measures and initiatives supported by NMHSs and WMO do reduce risks and losses; and monitor and assess pilot projects (by NMHSs and collaborative partners) to ensure product and service improvements.

⁵² Proposal for a new activity

4.5 Enhancing disaster preparedness for effective response, and to "Build Back Better" in recovery, rehabilitation and reconstruction (Sendai Framework Priority 4)

It is likely that the largest contribution WMO can make to the implementation of the Sendai Framework is under the fourth Priority for Action – "Enhancing disaster preparedness for effective response". The focus is on supporting the four components of MHEWSs:

- 1. Analyses and assessment of risks involved;
- 2. Detection, monitoring, analysis and forecasting the hazards;
- 3. Dissemination and communication of timely, accurate, actionable, inclusive and authoritative warnings; and,
- 4. Preparedness and response capabilities.

While the first component of MHEWS is dealt with under the first Priority for Action, the second component is supported by the WMO Global Data-processing and Forecasting System (GDPFS). It involves three World Meteorological Centres and 40 Regional Centres, including Regional Specialized Meteorological Centres, Regional Climate Centres and Regional Drought Management Centres. These centres process data and routinely provide countries with analyses and meteorological forecasts, and support the early warning capacities of NMHSs. Hazard-specific (for example, flash floods, tropical cyclones, coastal hazards or technological hazards) and sector-specific (for example, agriculture, transport and humanitarian assistance) warning services are supported by WMO Programmes through the following:

- Strengthening of impact-based forecast and risk-based warning services;
- Addressing weather, climate, water and environmental issues for improved service delivery for DRR in the sectors of health, agriculture, land transportation and energy, and in megacities and large urban complexes;
- Further strengthening people-centred MHEWSs for tropical cyclones and further strengthening the global mechanisms to reduce the disaster risk associated with tropical cyclones;
- Promoting risk-informed decisions by the aviation community and transportation sector concerned with the impact of airborne dust and particles during volcanic eruptions, wildfires, sandstorms, dust storms and the like, through enhanced information systems and services; and,
- Developing approaches to deal with the emerging challenges and opportunities to access, use and manage Big Data, crowd sourced data and data obtained through social media, particularly those relevant to risk assessment.

The third component of MHEWS is supported by the WMO Global Telecommunication System (GTS) that interconnects all NMHSs for the collection and distribution of meteorological and related data, forecasts and alerts, including tsunami and seismicrelated information and warnings. This system is being transformed into an overarching WMO Information System that enables systematic access, retrieval, dissemination and exchange of data and information of all WMO and related international programmes. In addition, the Common Alert Protocol (CAP) provides the international standard for emergency alerting and public warning for all hazards, including those related to weather events, earthquakes, tsunamis, volcanoes, public health, power outages and many other emergencies. This Protocol also applies to all media, including communications media ranging from sirens to mobile phones, faxes, radio, television and various web-based communication networks.

For the fourth component, emergency response is supported by WMO, especially on the global level. Through its work with the Inter-Agency Standing Committee (IASC), the Global Disaster Alert and Coordination System (GDACS) and Copernicus, WMO links weather and climate services to international humanitarian agencies in order to improve humanitarian contingency planning, preparedness and response.

Activities suggested by Members in support of, especially, this Sendai Framework Priority for Action include:

- Identify a sample of WMO- and nationally-supported initiatives addressing the establishment of (multi-hazard) EWS and develop a MHEWS service delivery 'blueprint';
- Identify potential needs, develop and deliver pilot project in collaboration with local or national level humanitarian agencies or other sectoral risk management organization, with the aim to ensure collaboration and exchange of relevant weather, water and climate information to these users (e.g. in SWFDP);
- Use identified learning opportunities, whether from the WMO community or partners, to outreach, build capacity and awareness of populations and adopt practices with the aim of reducing the impacts of hazards.

4.6 Potential future and cross-cutting activities in the long-term

There are a number of cross cutting activities that could be considered in the longer term, such as:

- Build complementary delivery platforms with (potential) partner organizations to support the mandated role of NMHSs while at the same time providing the required level of information to global and regional humanitarian agencies;
- Establish a MHEWS research and development programme in partnership with NMHSs and academia;
- Conduct workshops to validate/implement approaches/lessons learned over the previous four years;
- Further WMO cross-TC symposia on DRR; and,
- Strengthen platforms for engagement focusing attention on long-term preventative measures, such as those dealing with floods and droughts (e.g., IDMP and APFM).

5 Implementation arrangements

5.1 WMO DRR governance, implementation and user-interface mechanisms

The WMO DRR Programme will be the primary implementing agent for the Roadmap and will provide a support and coordination function. The DRR Programme was established as a cross-cutting programme to help focus activities of WMO under its DRR priority. The expected benefits of the Roadmap to WMO Members and corresponding NMHSs are in alignment with the WMO DRR Programme's goals, approved by the Sixteenth World Meteorological Congress (Cg-XVI) in 2011 (Resolution 52 (Cg-XVI))⁵³, and include:

- Development, improvement and sustainability of early warning systems (EWS) in particular related to scientific and technical infrastructures, systems and capabilities for research, observing, detecting, forecasting and warnings of weather-, water- and climate-related hazards;
- Development, improvement and sustainability of standardized hazard databases and metadata, systems, methods, tools and applications of modern technologies such as geographical information systems for recording, analysing and providing hazard information for risk assessment, sectoral planning, risk transfer and other informed decision-making;
- Development and delivery of warnings, specialized forecasts and other products and services that are timely, understandable to those at risk and driven by requirements of DRR decision processes and operations engaging socioeconomic sectors;
- Stimulate a culture of resilience and prevention through strengthening of capacities for better integration of meteorological, hydrological and climate products and services in DRR across all socioeconomic sectors, such as land use planning and infrastructure design and continued public education and outreach campaigns; and,
- 5. Strengthening cooperation and partnerships of WMO and NMHSs in national, regional and international user forums, mechanisms and structures for implementation of DRR.

The Roadmap implementation plan (Section 5.3) will describe the implementation mechanisms in further details, the phasing, scheduling and milestones associated with the delivery of the Roadmap. The implementation plan will also describe the roles and responsibilities of the key actors and stakeholders. As mentioned earlier, a key principle of the Roadmap is to utilize existing WMO mechanisms to leverage WMO activities and projects to realize the DRR Vision. The Roadmap will also seek to maintain and enhance existing partnerships, to establish new ones where necessary, and if appropriate forge links to external projects, programmes and initiatives.

Ultimate oversight of the DRR Programme is provided by Congress and the Executive Council. Specific guidance is given by the Executive Council Working Group on Disaster Risk Reduction. Furthermore, DRR focal points of the RAs, TCs and relevant programmes ensure coordination with these constituent bodies. The Programme is guided by User-Interface Working Groups (UI-WGs) on topics such as hazard and risk assessment, multi-hazard early warning systems, humanitarian assistance and disaster risk financing.

⁵³ Sixteenth World Meteorological Congress, 2011:Abridged final report with resolutions, available at: <u>https://googledrive.com/host/0BwdvoC9AeWjUazhkNTdXRXUzOEU/wmo_1077_en.pdf</u>

At the Secretariat, the Disaster Risk Reduction Services Division is under the Weather and Disaster Risk Reduction Services (WDS) Department (Table 6).

Table 6:WMO DRR governance, implementation and user-interface mechanisms (as of
June 2016)

1. Members and their individual NMHSs

- 2. World Meteorological Congress (Cg)
- 3. WMO Executive Council (EC) and the EC Working Group on DRR
- 4. RAs and their DRR-related expert teams and working groups
- 5. TCs and other WMO Programmes and activities related to DRR and their DRRrelated expert teams and working groups
- 6. DRR Focal Points of RAs, TCs and technical programmes (DRR FP RA-TC-TP)
- 7. DRR User-Interface Working Groups (UI-EAGs) on:
 - Hazard and Risk Assessment (HRA);
 - o MHEWS;
 - Disaster Risk Financing (DRFI); and,
 - the CBS (DPFS-PWS) Task Team on the Provision of Operational Meteorological Assistance to Humanitarian Agencies (Humanitarian TT).

8. WMO Secretariat

- DRR Services Division;
- o DRR-related task teams and working groups in the Secretariat.

5.2 Partnerships

Working in partnership with stakeholders, such as international agencies, national and local governments, non-governmental organizations, academia, the private sector and the media, and engaging in networks and other collaborative efforts is essential for meeting the objectives of WMO. The complexity of the Earth system and the interconnections of weather, water, climate and related environmental processes are increasingly challenging the scientific and financial capacities of NMHSs to improve the quality and delivery of information, products and services. No single government or agency has the necessary resources to address all these challenges on its own.

The implementing partners are defined through the WMO external relations⁵⁴ (cooperation with external partners through agreements (IAEA, AU, CERN, etc.) – working arrangements (WHO, FAO, UNESCO, IMO, ECMWF, CMO, ICSU, ISO, etc.), consultative status (IABM, ICL, IUCN), and memorandums of understanding (IDB, ACMAD, ICL, UNESCAP, EC, IRI, UNDP, ADRC, NOAA, WFP, SPREP, UK Met Office, IFRC, TWAS, UNITAR, etc.); and cooperation without formal agreement (GWP, WWC, UNFCCC, UNCCD, etc.)).

5.3 The WMO Disaster Risk Reduction Roadmap Implementation Plan

It will be important to place a timeline around the activities and provide details as to how each activity will be implemented. The Roadmap will work with current implementation mechanisms (managed through the WMO DRR Programme) to identify existing activities which could be either modified, phased differently, or combined to produce a greater impact. The implementation framework aims to ensure that national, regional, and global level DRR issues and opportunities are addressed and that relations to the external side,

⁵⁴ <u>http://www.wmo.int/pages/partners/index_en.html</u>

e.g. interactions with governments through the Permanent Representatives with WMO, are better coordinated with United Nations country teams, and between WMO RAs and regional intergovernmental organizations, are fully included in the implementation phase.

The implementation of the Roadmap will be divided into specific building blocks grouping complementary activities. As the Roadmap will cover four intersessional periods of WMO (see Section 3.3), some activities will span across these intersessional periods, and therefore need to be planned to ensure budget continuity. An overall timeline for the key activities and expected results will be developed. However, the timescales involved require the Roadmap to be a "living" document. The Implementation Plan which then defines specific activities, key milestones and clear deadlines for each financial (intersessional) period. Over the course of time, framework conditions will change and necessitate regular updates and therefore further endorsement of the Roadmap and the Implementation Plan from the WMO decision-making bodies. Each financial period may have different phases (as detailed in two-year or four-year DRR Work Plans), e.g. from development, implementation, operation and evaluation.

5.4 Financial and resource considerations

Based on the WMO Strategic and Operating Plans for the next financial period (2016-2019), the WMO results-based budget will identify regular resources to implement these plans and, hence, this Roadmap. Implementing this Roadmap will require routine and extrabudgetary contributions by Member governments to their NMHSs and to WMO, but also from overseas development agencies, NMHSs in developed countries, development banks, stakeholder organizations and the United Nations system.

The WMO Office for Resource Mobilization and Development Partnerships (RMDP) focuses on securing development assistance for NMHSs in Member countries and territories in the form of financing (either direct or through the WMO Secretariat), transfer of technology and expertise, and leveraging strategic partnerships. This work is undertaken in close cooperation with the WMO Regional Offices and WMO technical programmes, as detailed in the WMO Resource Mobilization Strategy.

5.5 Communication and outreach

In order to achieve the objectives of the Roadmap, it will be necessary to develop adequate, up-to-date and regular information for and communication with WMO Members and external partners, stakeholders, and users. All these entities need to know that there is a framework available to develop and deliver hydrometeorological products and services for DRR, in line with a number of other frameworks such as the Sendai Framework and GFCS. They need to understand the benefits of such an approach and related collaboration. It is furthermore necessary to describe (in non-technical terms) what is available, and what is possible. Providers of DRR services, above all NMHSs, need a willingness to take time to understand users' information requirements and what these users use the hydrometeorological information and products for.

The WMO DRR Programme website serves as a primary communication channel for this purpose. It will include regular updates on the Roadmap, and progress reports on the implementation of the Roadmap will be sent to all Members for comments. Relevant events, activities, documents (work plans, deliverables, etc.) as well as general information material (factsheets, DRR Programme leaflets, posters, etc.) will be made available on this website.

5.6 Monitoring and evaluation

Monitoring and evaluating the progress with the Roadmap will need to be carried out at two levels:

- At the Secretariat (Department / Division) and programme level with routine progress reports and assessments of the performance on achieving the agreed targets and milestones, utilizing routine quality assurance techniques in line with QMS⁵⁵ standards;
- At the strategic level, by Cg and EC (including the EC WG DRR), based on progress reports by the Secretariat and with the help of key performance indicators (KPIs) within the WMO Operating Plan. Eventually it will be necessary to ensure that all DRR measures and initiatives supported by NMHSs and WMO are monitored and measured to ensure their effectiveness in reducing risks and loss and damage.

Further bodies involved in the monitoring and evaluation of the Roadmap will therefore include the EC Working Group on Strategic and Operational Planning; the External Auditor, Financial Advisory Committee, and Audit Committee; and the Strategic Planning Office (SPO) which coordinates the continuous strategic planning process of WMO (including the development of WMO Strategic and Operating Plans, Programme Performance Monitoring and Evaluation Plan, and related reports).

Lastly, every major disaster triggered by hydrometeorological hazards together with the response and assistance provided by the NMHS/WMO and whether the performance of the NMHS was affected, should be systematically evaluated for the purposes of continuous learning and the continuous improvement of products and services.

Efforts should also be made to examine what specific preventative measures had been undertaken (for example on droughts and floods), how they performed, and in conjunction with partner agencies, what additional preventative measures might most contribute to reduction of future losses by reducing overall societal exposure to the risk.

⁵⁵ WMO 2013: Guide to the Implementation of a Quality Management System for National Meteorological and Hydrological Services (WMO-No 1100) https://googledrivecom/host/0BwdvoC9AeWjUazhkNTdXRXUzOEU/wmo 1100 en.pdf

Annex

Annex I: Provisions in the Sendai Framework for Disaster Risk Reduction 2015-2030 with immediate relevance to WMO

- Promoting the collection, analysis, management and use of relevant data and practical information in line with national circumstances and making use of space and in situ information that results from maintained and strengthened in situ and remotely-sensed Earth and climate observations;
- Ensuring dissemination of reliable data in an appropriate format and accessibility of non-sensitive information, taking into account the needs of different categories of users (including social and cultural requirements, in particular, gender);
- Strengthening disaster risk modelling, assessment, mapping, monitoring and multihazard early warning systems (MHEWS) through the strengthening of technical and scientific capacity to capitalize on and consolidate existing knowledge and through developing and applying methodologies and tools;
- Promoting and improving dialogue and cooperation among scientific and technological communities, the private sector, other relevant stakeholders and policymakers in order to facilitate a science/policy interface for effective decisionmaking in disaster risk management and for sharing good practices internationally;
- Strengthening disaster-resilient public and private investments in structural, nonstructural and functional disaster risk prevention and reduction measures;
- Investing in, developing, maintaining and strengthening people-centred, multisectoral MHEWS, including telecommunications systems for hazard monitoring and emergencies, simple and low-cost early warning equipment and facilities, and broadened release channels for warning information that is tailored to different user needs;
- Promoting the further development of and investment in effective, nationally compatible, regional multi-hazard early warning mechanisms, where relevant, contributing to the Global Framework for Climate Services (GFCS), and facilitate the sharing and exchange of information across all countries;
- Supporting relevant UN entities to strengthen and implement global mechanisms on hydrometeorological issues in order to raise awareness and improve the understanding of water-related disaster risks; and,
- Promoting international cooperation for DRR and enhanced coordination of respective strategies of UN entities and other international and regional organizations, especially in developing countries, in particular, the least developed countries, Small Island Developing States (SIDS), landlocked developing countries and African countries.

Annex II: The seven global targets of the Sendai Framework for Disaster Risk Reduction 2015-2030

- 1. Substantially reduce global disaster mortality by 2030, aiming to lower average per 100,000 global mortality between 2020-2030 compared to 2005-2015;
- Substantially reduce the number of affected people globally by 2030, aiming to lower the average global figure per 100,000 between 2020-2030 compared to 2005-2015 (Categories of affected people will be elaborated in the process for post Sendai work decided by the Conference);
- Reduce direct disaster economic loss in relation to global gross domestic product (GDP) by 2030;
- Substantially reduce disaster damage to critical infrastructure and disruption of basic services, among them health and educational facilities, including through developing their resilience by 2030;
- 5. Substantially increase the number of countries with national and local disaster risk reduction strategies by 2020;
- Substantially enhance international cooperation to developing countries through adequate and sustainable support to complement their national actions for implementation of this framework by 2030;
- 7. Substantially increase the availability of and access to multi-hazard early warning systems and disaster risk information and assessments to the people by 2030.

Annex III: WMO constituent bodies and other WMO Programmes and activities with their working groups and task teams related to DRR and respective strategies, plans and agreements

Regional associations, technical commissions and other WMO Programmes and activities

• Working group, task team, or other entity related to DRR⁵⁶

RA I Africa

- Working Group on Improved Weather Forecasting, Natural Disaster Reduction, Service Delivery and Communication
- Working Group on Climate Services and Applications
- Working Group on Hydrology and Water Resources
- Tropical Cyclone Committee for the South-West Indian Ocean

RA II Asia

- Management Group for RA II, Implementation Coordination Team on Disaster Risk Reduction
- Working Group on Weather Services (WGWS), Expert Group on Public Weather Services Delivery (EG-PWS)
- Working Group on Climate Services (WGCS)
- Working Group on Hydrological Services (WGHS),

RA III South America

- Working Group on Hydrology and Water Resources
- Working Group on Climate

RA IV North America, Central America and the Caribbean

- Management Group for RA IV, Task Team on Disaster Risk Reduction
- Working Group on Hydrology and Water Resources
- Hurricane Committee

RA V South-West Pacific

- Working Group on Hydrological Services (WG-HYS), Task Team on DRR Waterrelated Disasters (TT-DRR-W)
- Working Group on Weather Services (WG-WS)
- Working Group on Climate Services (WG-CS)
- Tropical Cyclone Committee, Task Team on the Severe Weather Forecast and Disaster Risk Reduction & Task Team on Coastal Inundation

RA VI Europe

- Working Group on Service Delivery and Partnership (WG-SDP)
- Working Group on Climate and Hydrology (WG-CH)
- Task Team on Regional Operating Plan (TT ROP)

Commission for Agricultural Meteorology (CAgM)⁵⁷

 Focus Area (OPCAME) 3 - Natural hazards and Climate Variability/Change in Agriculture

Commission for Basic Systems (CBS)⁵⁸

• OPAG on Data-Processing and Forecasting System (OPAG-DPFS) with five relevant

 $^{^{\}rm 56}$ Based on the information available on their respective websites in June 2016

⁵⁷ http://www.wmo.int/pages/prog/wcp/agm/cagm/cagm_en.php

⁵⁸ http://www.wmo.int/pages/prog/www/BAS/CBS-info.html

Regional associations,	technical	commissions	and other	WMO P	rogrammes and
activities					

• Working group, task team, or other entity related to DRR⁵⁶

expert/task teams

 The Expert Team on Meeting User Needs in Reducing the Impacts of Hydrometeorological Hazards (CBS/OPAG-PWS ET/DPM) (also referred to as the ET/DPM)

Commission for Climatology (CCI)⁵⁹

- OPACE 2 Climate Monitoring and Assessment and its expert and task teams
- OPACE 3 Climate Prediction, Projection, and Delivery Mechanisms and its expert and task teams
- OPACE 4 User Interface for Climate Adaptation and Risk Management and its expert and task teams

Commission for Hydrology (CHy)

• Open Panels of CHy Experts (OPACHE) with e.g. Theme Area 5 Water, Climate and Risk Management

Joint WMO-IOC Technical Commission for Oceanography and Marine Meteorology (JCOMM)⁶⁰

- Services and Forecasting Systems Program Area (SFSPA)
- Expert Team on Waves and Coastal Hazards Forecasting Systems (ETWCH)

Tropical Cyclone Programme (TPC)⁶¹

- ESCAP/WMO Typhoon Committee⁶²
- WMO/ESCAP Panel on Tropical Cyclones, Working Group on DRR⁶³

⁵⁹ http://www.wmo.int/pages/prog/wcp/ccl/index_en.php

⁶⁰ http://www.jcomm.info/index.php?option=com_content&view=featured&Itemid=100001

⁶¹ <u>http://www.wmo.int/pages/prog/www/tcp/organization.html</u>

⁶² http://www.typhooncommittee.org/

⁶³ http://www.ptc-wmoescap.org/

Annex IV: Acronyms

APFM	Associated Programme on Flood Management
CCA	Climate Change Adaptation
Cg	World Meteorological Congress
CIFDP	Coastal Inundation Forecasting Demonstration Project
СОР	Conference of the Parties
DRM	Disaster Risk Management
DRR	Disaster Risk Reduction
EC	WMO Executive Council
GDACS	Global Disaster Alert and Coordination System
GFCS	Global Framework for Climate Services
HFA	Hyogo Framework for Action
IBCS	Intergovernmental Board on Climate Services
IDMP	Integrated Drought Management Programme
IPCC	Intergovernmental Panel on Climate Change
MDGs	Millennium Development Goals
NGO	Non-Governmental Organization
NMHS	National Meteorological and Hydrological Services
RA	WMO Regional Association
SDGs	Sustainable Development Goals
SWFDP	Severe Weather Forecasting Demonstration Project
ТС	WMO Technical Commission
ТР	Technical Programmes
UNFCCC	United Nations Framework Convention on Climate Change
UNISDR	United Nations Office for Disaster Risk Reduction
WCDRR	Third United Nations World Conference on Disaster Risk Reduction
WMO	World Meteorological Organization
WHO	World Health Organization
IAEA	International Atomic Energy Agency
GAR	Global Assessment Report on Disaster Risk Reduction
MHEWS	Multi-Hazard Early Warning Systems
EWS	Early Warning Systems
SIDS	Small Island Developing States
IRDR	Integrated Research on Disaster Risk