Enhanced monitoring and cataloguing of hazard/extreme events and slow onset climatic indicators in support of the UNFCCC Warsaw Mechanism for Loss and Damage, the SDGs and the post-2015 Framework for DRR

28 November 2014

1. SCOPE AND OBJECTIVES

1.1 This is paper addresses the subject of loss and damage in the context of the UN Framework Convention on Climate Change (UNFCCC). It is intended to advise delegates to the UNFCCC COP 20, particularly those from National Meteorological and Hydrological Services (NMHSs), on particular aspects of the implementation of Warsaw International Mechanism for Loss and Damage associated with Climate Change Impacts and the role of WMO. It also highlights an important linkage between the Warsaw Mechanism and other high-level post-2015 policy frameworks.

2. INTRODUCTION

2.1 The year 2015 will mark a significant milestone in the global development agenda. High-level international development cooperation frameworks in place or in the process of being formulated include:

(a) A set of Sustainable Development Goals (SDGs) as an intended outcome of the 2012 United Nations Conference on Sustainable Development,
(b) A framework for disaster risk reduction as a successor to the Hyogo Framework for Action (HFA) 2005-2015, coordinated by the International Strategy for Disaster Reduction, and
(c) Initial implementation of the UNFCCC Warsaw International Mechanism for Loss and Damage associated with Climate Change Impacts, among other related or relevant upcoming COP decisions.

2.2 Weather, water and climate data and services, and NMHSs generally, have a major role to play in the implementation and monitoring of these frameworks as currently formulated. Contributions include:

(a) improving collection, management, exchange, access to and use of observational data and other relevant information on current and historical climate and its impacts

(b) developing and enhancing the use of modern Climate Data Management Systems and 'rescuing' historical records that are at risk of deterioration
(c) promoting development and dissemination of methodologies and tools for risk and impact assessments, and
(d) mainstreaming technical capacities such as hydro-meteorological risk assessment and early warning systems into national disaster risk management plans, legislation and development planning.

2.3 This paper focuses on one particularly relevant and cross-cutting policy-support output: *the systematic characterization and cataloguing of hazard events, extreme climate events, and indicators of slow-onset climatic changes in a form that allows data on losses and damage to be cross-referenced with the environmental phenomena with which they are associated*. For reasons elaborated below, the combined data set on events and associated losses and damage is a likely to be a requirement not only for implementation of the Warsaw Mechanism but also for tracking progress towards achievement of selected SDGs and the successor framework to the HFA, the latter two of which will be considered for approval in 2015.

2.4 NMHSs are national services that have been assigned specific duties for the collection, processing and archiving of systematic climate data, including providing access to the resulting data and related information. They are responsible for a network of observing systems whose data are exchanged among the international community using a well-coordinated and standardized communication system. NMHSs have a long history of recording weather and hydrological observations. Compiled over a long period of time, these observations provide the climatology of the concerned locations. They are also an integral input to the Global Observing System, which consists of a global network of observations over land, sea and in the atmosphere. Data archived by NMHSs are used in the publication of the WMO Statement on the Status of the Global Climate and underpin a wide variety of climate diagnostics providing a deeper understanding of climate variability and change and associated processes.

2.5 One specific activity relevant to the Warsaw Mechanism, the draft SDGs and the proposed successor to the HFA involves continuously updating the historical record of hazard events, extreme climate events and indicators of slow-onset climatic change along with associated levels of loss and damage. Because they are a common requirement of all three frameworks, these data have particular potential to influence the post-2015 agenda by providing an evidence base for implementation and monitoring.

2.6 Furthermore, in the UNFCCC context, in addition to the Warsaw Mechanism, data on extreme events and associated loss and damage are highly relevant for monitoring adaptation outcomes and specifically for supporting implementation of National Adaptation Plans (NAPs).[1] Through these related UNFCCC processes it is likely that in coming years major funding for NAP implementation will become available from the Green Climate Fund and other sources[2].

[1] Additional Key Messages of the WMO Community for COP 20, referencing the Adaptation Committee report and NAP preparation guidelines, can be found at https://www.wmo.int/pages/meetings/documents/Keymessages_COP-20.pdf .

[2] As of 26 November 2014 pledges to the Green Climate Fund stand at USD 9.3 billion towards an annual target of USD 100 billion.

2.7 Although they are not the source of loss and damage information, NMHSs nonetheless have a vital role to play in enhancing the quantity and quality of these data. The sections below: 1) highlight core common data identified in policy documents related to the highlighted frameworks, 2) summarize the current status of available data and selected key issues affecting its quality and usability, 3) suggest entry points for NMHS engagement, and 4) identify WMO technical and scientific resources to support data improvement and use.

3. POST-2015 DEVELOPMENT AGENDA REQUIREMENTS FOR CLIMATE/HAZARD-RELATED LOSS AND DAMAGE DATA

3.1 Although the draft SDGs, HFA successor and Warsaw International Mechanism differ from one another in scope and emphasis, they share an inherent requirement for data on loss and damage including that associated with climate and weather. The SDGs and HFA successor are still in draft. Nonetheless in their current form a clear cross-cutting pattern emerges:

3.2 Sustainable Development Goals

3.2.1 Draft SDG targets and indicators proposed by the Open Working Group on Sustainable Development Goals (SDGs) in its 12 August 2014 report to the UN General Assembly (http://www.un.org/ga/search/view_doc.asp?symbol=A/68/970&Lang=E) include:

> "1.5 By 2030, build the resilience of the poor and those in vulnerable situations and reduce their exposure and vulnerability to climate-related extreme events and other economic, social and environmental shocks and disasters"
>
> "11.5 By 2030, significantly reduce the number of deaths and the number of people affected and decrease by [x] per cent the economic losses relative to gross domestic product caused by disasters, including water-related disasters, with a focus on protecting the poor and people in vulnerable situations"
>
> ''13 Take urgent action to combat climate change and its impacts *(Acknowledging that the UNFCCC is the primary international, intergovernmental forum for negotiating the global response to climate change)" and
>
> ''13.1 Strengthen resilience and adaptive capacity to climate hazards and natural disasters in all countries".

3.2.2 The Open Working Group report further states that, "To monitor the implementation of the sustainable development goals, it will be important to improve the availability of and access to data and statistics disaggregated by income, gender, age, race, ethnicity, migratory status, disability, geographic location and other characteristics relevant in national contexts."

3.3 Post-2015 Framework for Disaster Risk Reduction (HFA successor framework)

3.3.1 Similarly, the zero draft of the successor framework to the Hyogo Framework for Action (http://www.wcdrr.org/uploads/1419081E.pdf) released on 20 October 2014 states that, "Building on the HFA, the present framework aims to achieve the following outcome over the next 20 years: The substantial reduction of disaster losses, in lives, and in the social, economic and environmental assets of persons, communities and countries." Draft targets and indicators

for assessing progress in achieving this expected outcome include reduced disaster mortality and the number of affected people, economic loss, and damage to health and educational facilities "by [a given percentage in function of number of hazardous events] by 20[xx]".

3.3.2 The draft framework's first priority, understanding disaster risk, includes: "

1. Establish baselines and periodically assess disaster risks, including vulnerability, exposure and hazard characteristics […]
2. Systematically survey, record and publically account for all disaster losses and the economic, social and health impacts
3. Make non-sensitive risk, disasters and loss information free, openly available and accessible, and ensure its dissemination at all levels".

Thus, as with the draft SDGs, systematically collected and catalogued data on hazard event occurrence is a likely requirement for the HFA successor framework's implementation and monitoring of its targets and expected outcome.

3.4 UNFCCC Warsaw International Mechanism for Loss and Damage associated with Climate Change Impacts

3.4.1 The Warsaw International Mechanism for Loss and Damage associated with Climate Change Impacts was framed at the UNFCCC 18th meeting of the Conference of Parties (COP 18) (http://unfccc.int/resource/docs/2012/cop18/eng/08a01.pdf#page=21). The COP 18 decision was followed the following year by a decision to establish a formal mechanism at COP 19 (http://unfccc.int/resource/docs/2013/cop19/eng/10a01.pdf#page=6).

3.4.2 The COP 18 decision takes note of "the relevant knowledge and ongoing work outside of the Convention, including the Special Report of the Intergovernmental Panel on Climate Change, *Managing the Risks of Extreme Events and Disasters to Advance Climate Change Adaptation*, the *Global Assessment Report on Disaster Risk Reduction*, the Hyogo Framework for Action, and the Global Framework for Climate Services of the World Meteorological Organization". It invites all Parties to the Convention to enhance action on addressing loss and damage including through, "the systematic observation of, and data collection on, the impacts of climate change, in particular slow onset impacts, and accounting for losses" and "enhancing access to, sharing and the use of data, at the regional, national and subnational levels, on a voluntary basis, to facilitate the assessment and management of climate-related risk".

3.4.3 The COP 19 decision stipulates, "that the Warsaw International Mechanism shall fulfil the role under the Convention of promoting the implementation of approaches to address loss and damage associated with the adverse effects of climate change, pursuant to decision 3/CP.18, in a comprehensive, integrated and coherent manner" including through "collection, sharing, management and use of relevant data and information". As one of its six primary functions the Warsaw Mechanism is expected to "promote the development of, and compile, analyse, synthesize and review information". The decision, "Also invites Parties to work through the United Nations and other relevant institutions, specialized agencies and processes, as appropriate, to promote coherence at all levels in approaches relevant to addressing loss and damage associated with the adverse effects of climate change, including extreme events and slow onset events".

3.4.4 Systematically collected and catalogued data on extreme events and on-going changes in slow-onset climatic indicators is a pre-requisite for tracking associated losses and damage.

These data and data on associated losses and damages provide a fundamental evidence base for Warsaw Mechanism implementation.

4. CURRENT STATUS OF LOSS AND DAMAGE ACCOUNTING SYSTEMS

4.1 Systems for recording loss and damage information at different levels are already in place and their number has grown rapidly in recent years. A recent study by UNDP documents such systems in approximately 60 countries and regions[3]. The actual number of databases may be considerably larger, especially when local-level systems are taken into account.

4.2 Loss and damage databases track impacts of extreme events over time. Although they differ in their particulars, these systems share a set of common core characteristics. Losses and damages are recorded across a number of parameters typically including deaths, economic losses, and physical damages and losses in each affected sector (housing, infrastructure, etc.). The geographic area affected and the hazard types involved are also typically recorded. Over time, the accumulated data provides information on cumulative loss and damage, its geographic distribution, the main hazards, the types of loss and damage that occur, and temporal trends.

4.3 Given the increased importance of this data in the context of the post-2015 policy agenda, several further developments may be expected in the coming years, including:

(a) significantly increased emphasis on national systems for supporting policy implementation at country level, maintained by appropriately mandated authorities
(b) continuing emphasis on standardization and inter-operability so that country-level data can be aggregated to track policy implementation globally, and
(c) significantly increased scrutiny of data quality.

5. WMO AND NMHS ENGAGEMENT IN THE WARSAW MECHANISM DECISION

5.1 Delegates from NMHSs at the UNFCCC Subsidiary Body for Technological and Scientific Advice (SBSTA), Subsidiary Body for Implementation (SBI) and COP sessions have closely been involved in the negotiation process for formulating the components and details of the approaches to address loss and damage associated with the adverse effects of climate change, including impacts related to extreme weather events and slow onset climatic changes. These delegates continue providing technical knowledge and expertise to the work of the Warsaw Mechanism.[4] Furthermore, WMO has been participating and contributing to the UNFCCC regional expert meetings for Latin America, Asia, Eastern Europe and Small Island Developing States (SIDS) in support of this initiative.

---

[3] UNDP (2013) *A Comparative Review of Country-Level and Regional Disaster Loss and Damage Databases.* New York: UNDP.

[4] See Key Messages of the WMO Community for COP 20 (https://www.wmo.int/pages/meetings/documents/Keymessages_COP-20.pdf)

5.2 In 2013, in preparation for COP 19, WMO contributed to the UNFCCC effort on mapping of existing institutional arrangements that address loss and damage. WMO's submission highlighted NMHSs and the associated networks' engagement on a range of actions to address loss and damage in the context of the Warsaw Mechanism. Following WMO guidance and standards NMHSs are expected to continue to vigorously contribute to enhancing access to, sharing, and use of weather-, water-, and climate-related data at the regional, national, and subnational levels, such as hydrometeorological data and metadata, on a voluntary basis, to facilitate the assessment and management of climate-related risk.

5.3 In June 2013 WMO convened the First Technical Workshop on Standards for Hazard Monitoring, Databases, Metadata and Analysis Techniques to Support Risk Assessment.[5] In November 2013, WMO held the First Coordination Meeting of Disaster Risk Reduction Focal Points of Technical Commissions and Programmes to explore information needs for risk identification including loss and damage accounting.[6] Input from this consultation is being used to explore the role of the relevant technical commissions in formulating guidance in this area. This consultation also resulted in the definition of a number of specific areas related to the overall needs for improving data quality and usability. In July WMO organized a workshop on Requirements for Weather, Climate and Hydrological Services to Support Loss and Damage Data Collection and Risk Modelling at the 2014 Understanding Risk Forum.[7]

6. DATA STRENGTHENING NEEDS

6.1 Through the above consultative processes a number of continuing needs have emerged. UNDP (2013) summarized overall issues affecting data quality and usability focusing on currently accessible country-level and sub-national data. Among the needs identified, NMHSs have a crucial role to play in addressing two particularly important challenges: 1) the correct and consistent attribution of losses to the specific events or environmental indicators with which they are associated, and 2) a standardized referencing system for identifying specific extreme events with which a given set of losses and damages are associated.

6.2 Correct and consistent attribution of losses to specific hazard events or environmental indictors with which they are associated

6.2.1 Assigning loss and damage to a particular extreme event, such as a drought, flood, or cyclone, entails precise characterization of the event in terms of duration, magnitude, location, and timing. Internationally-accepted standards exist for characterizing some hazards in these terms, but not for all of them. Furthermore, specific events are sometimes difficult to isolate, e.g. three weeks of widespread, intermittent but heavy rainfall associated with a spatially- and temporally-extensive low-pressure system. And one hazard event can trigger another, e.g. heavy rainfall leading to a landslide. These considerations make hazard event definition for the purpose of identifying associated losses genuinely challenging. A number of guidelines for hazard-event standardization are in use or have been proposed but these are not universally applied nor do they enjoy official international standard status.[8]

---

[5] http://www.wmo.int/pages/prog/drr/projects/Thematic/HazardRisk/2013-04-TechWks/index_en.html
[6] http://www.wmo.int/pages/prog/drr/projects/Thematic/HazardRisk/2013-10-TC-Prog-FP-Meeting/index_en.html
[7] http://www.wmo.int/pages/prog/drr/events/WMOatUR2014/workshop_en.html
[8] See: - http://www.publicsafety.gc.ca/cnt/rsrcs/cndn-dsstr-dtbs/rfrnc-tbl-smbls-dfntns-eng.aspx

6.2.2 Furthermore, climate change-related losses and damages associated with long-term, incremental processes (referred to as "slow-onset" in the Warsaw International Mechanism context) – such as coral bleaching associated with increased ocean acidity and temperature, or coastal erosion associated with sea-level rise – represent an additional set of complications. Such losses and damages would be expected to be reported on a unit-time, as opposed to event-by-event, basis. Correct and consistent association of "slow onset" losses and damages with the corresponding climatic or oceanographic indicators would be essential in light of the priority placed on such losses and damages in the UNFCCC context. Such attribution is also complex, however, given that the influences of climatic variables may be difficult to isolate from other causal factors (e.g. the effects of marine pollution versus climate change-related pressures on marine life, or land-use pressures versus temperature and rainfall-induced changes in forest cover or composition or in species diversity). In most countries NMHSs would be the relevant national authority for characterizing extreme events and in many cases for maintaining the data necessary for tracking relevant incremental climatic changes as well.

6.3 A standardized referencing system for identifying specific extreme events with which a given set of losses and damages are associated

6.3.1 A unique event identifier provides an unambiguous reference for each event for such purposes as:

(a) comparing loss and damage values for the same event in different databases (e.g. a country-level database and a global one),
(b) attributing loss and damage unambiguously to hazards in a standardized manner (e.g. all loss and damage associated with Hurricane Mitch),
(c) linking loss and damage data to hazard data for quality control and verification for risk modelling, and
(d) research on the relative contributions of hazards, exposure and vulnerability to loss and damage causality.

One case in which a universally applied referencing system for hazard events currently exists is that of named cyclones. Expansion of this hazard-specific convention into a more generic scheme encompassing other types of hydro-meteorological extremes would be a natural role for WMO and its Members.

7. KEY MESSAGES

7.1 Going forward there are three broad areas that would benefit from further standardization. These include: 1) improved standards for identifying and characterizing different types of hazard events, 2) procedures for more systematic official designation of hazard events in real-time and archiving them subsequently, and 3) the integration of hazard-related standards with loss and damage-related standards, such as standardization of core loss data parameters, economic valuation methodologies, etc.

- R. Below, A. Wirtz, and D. Guha-Sapir (2009), Disaster Category Classification and peril Terminology for Operational Purposes, CRED and Munich Re.
- P. Low and A. Wirtz (2010), Structure and needs of global loss databases of natural disasters, Munich Re., and

7.2 Standardization of hazard event identification and characterization -- The start and end dates of disasters and areas affected for many disaster loss database entries are arbitrarily determined by database operators. This leads to inconsistency and lack of comparability and inter-operability of data from different sources. A set of standards for hazard event characterization in terms of magnitude, duration, location and timing for all major hydro-meteorological hazards would help fill this important gap.

7.3 Official real-time hazard event designation and archiving of hazard event data -- With the exception of named tropical cyclones, many hazard events are not routinely accorded official recognition. Thus loss and damage database operators – at local, national and international levels – may all draw different conclusions as to the hazard or hazards to which to assign the associated losses. There is a need for guidelines concerning the official designation of hazard events in near real-time. Such guidelines would address such issues as who the designated authority is in a country, how the designations are to be framed (i.e. hazard names, numbers or other conventions), how the information is made public, how discrepancies are retroactively corrected, reconciliation of designations across borders during hazard events affecting multiple countries, etc. Once an event has been documented, it is necessary to record its characteristics in a historical catalogue. Following the model already in place for earthquakes on a global scale, guidelines on the preparation of historical hydro-meteorological hazard databases at country level would address this need.

7.4 Integration of hazard-related standards with loss and damage-related standards – In addition to the above there are a number of issues affecting disaster data quality and usability that are beyond the scope of hazard standardization. These include, but are not limited to:

(a) Standardization of the number and definitions of core parameters, such as sex- and age-disaggregated mortality, physical asset losses and damages and their economic equivalencies, etc.
(b) Standards for loss assessment (i.e. primary data collection) (e.g. ground-truthing, cross-referencing with remote sensing data) and reporting
(c) Standardized methods for the conversion of physical damage and losses to their economic equivalencies
(d) Standards governing loss and damage data access, and
(e) Quality control standards.

Unfortunately there is no parallel for WMO – a duly constituted authority for global regulation and standard setting in the area of hydro-meteorological information – for standard setting across this broader set of issues. Given the policy-support requirements, a consultative process will be needed to identify a mechanism or mechanisms through which such standards could be developed and applied. NMHSs and WMO engagement in this process will be needed to harmonize efforts to link enhanced data on hazard and extreme event and slow-onset trends to loss and damage data improvement efforts by other stakeholders.

8. SELECTED IMPLEMENTATION RESOURCES

8.1 WMO is the unique UN body which coordinates the systematic observation of the atmosphere and data collection on climate. The post-2015 policy agenda is likely to exert a strong demand for strengthened documentation of the impacts of climate variability and change including specifically the accounting of losses and damage. And as argued above, a critical aspect of collection of damage and loss data is the ability to cross-reference impacts with the corresponding hazard and climatic event or indicator information. WMO technical commissions

and on-going programmes include resources that can be drawn upon to address needs for climate-data enhancement for loss and damage accounting. The following is a set of brief synopses of programmes and initiatives that can provide assistance to NMHSs in this area.

8.2 WMO Disaster Risk Reduction (DRR) Priority -- The WMO DRR Work Plan (2012-2015) includes developing standards, guidelines, and recommended practices for monitoring, detection, archiving of data, metadata and tools for statistical and forward-looking analysis of weather-, climate-, and water-related hazards to support loss and damage accounting and risk analysis.

8.3 Commission for Climatology (CCl) – The CCl work programme for the sixteenth intersessional period includes (a) Climate data management; (b) Global and regional climate monitoring and assessment; (c) Climate prediction, projection and delivery mechanisms; (d) User Interface for climate adaptation and risk management; and (e) Capacity development. Work in these areas encompasses data rescue and Climate Data Management Systems, National Climate Monitoring Products, definition of extreme events, sector-specific climate indices, a user-interface for climate risk management with disaster risk reduction focal points, education and training. An Expert Team on Extreme Events will develop guidance to Members on the methodologies and standards for defining extreme weather and climate events and assessing their attribution and return periods, and advice on adequate computational tools for the assessment. This team will further guide the implementation of an inter-operable Web Portal holding and a database for regional extreme weather and climate events. Through CCl WMO has established a global network of rapporteurs on World Weather and Climate Extreme Records who are involved in creating, verifying, and maintaining a database of national, regional and global extreme records, and in documenting such events. These reports contribute to WMO's Annual Statement of the Status of the Global Climate.

8.4 CCl along with the World Climate Research Programme (WCRP) and the WMO-IOC Joint Technical Commission for Oceanography and Marine Meteorology (JCOMM) coordinates, organizes, and collaborates on climate extremes, indices, and climate change detection, including the WCRP "Grand Challenge on Extremes" activities and contributions to the development of extremes-related climate services in support of the Global Framework for Climate Services (GFCS).

8.5 The World Weather Research Program (WWRP) under the WMO Commission for Atmospheric Sciences promotes research to advance both the prediction of high-impact weather and the utilization of weather products for the benefit of society, the economy and the environment. Among other programmes, WWRP coordinates the High Impact Weather (HIW) project. The HIW project will contribute to the development of a stress testing tool for natural hazards covering a wide range of applications and actors. These activities will help to detect crucial thresholds — for specific sectors and society as a whole — beyond which environmental, social or economic stability would be endangered and to integrate impact indicators and socio-economic consequences, defining the risk levels (for example, from low to critical) associated with the probability of exceeding thresholds. The resulting climate tool will provide a base-line to perform stress tests for future climatic conditions and to propose new adaptation pathways to stay within bounds of tolerable risk levels.

8.6 The Commission for Agricultural Meteorology and Integrated Drought Management Programme (IDMP) include in their work programmes initiatives to improve the characterization of drought hazard events including through the Standardized Precipitation Index (SPI). The SPI,

for example, provides a reference for characterization of this particularly important and destructive hazard.

8.7 Work within the Commission for Hydrology on hydrological forecasting and prediction includes a focus on large-scale flood inundation analysis and flood risk mapping (including of flood hazards. The Associated Programme on Flood Management offers an extensive set of tools and guidelines for characterizing and managing a variety of different types of floods.

8.8 The Commission for Basic Systems includes a focus on climate aspects of disaster risk reduction requiring climatologies of extreme events that lead to disasters. The Commission includes mechanisms to promote standardized approaches by NMHSs to the analysis and recording of extreme hydrometeorological events in national databases and the international exchange and validation of these data.

8.9 The Global Climate Observing System (GCOS) defines a set of atmospheric, oceanic and terrestrial Essential Climate Variables. A number of these are relevant particularly for monitoring “slow onset” processes leading to losses and damage.

8.10 The Global Framework for Climate Services (GFCS) includes disaster risk reduction as one of four priority areas. The GFCS Implementation Plan exemplar on Disaster Risk Reduction explicitly includes guidance for supporting systems to track climate-related loss and damage at country level.