

# **WORLD METEOROLOGICAL ORGANIZATION**



**Role of National Meteorological and Hydrological Services in  
MAINSTREAMING CLIMATE SERVICES FOR  
CLIMATE RISK MANAGEMENT**

**WMO POSITION PAPER PREPARED TO SUPPORT  
NATIONAL METEOROLOGICAL AND HYDROLOGICAL SERVICES FOR  
UNFCCC SIXTEENTH CONFERENCE OF PARTIES (COP 16)  
*(Cancún, Mexico, 29 November–10 December 2010)***

## WMO POSITION PAPER

### UNFCCC SIXTEENTH CONFERENCE OF PARTIES (COP 16) (Cancún, Mexico, 29 November-10 December 2010)

#### Role of NMHSs in MAINSTREAMING CLIMATE SERVICES FOR CLIMATE RISK MANAGEMENT

##### SUMMARY

*Learning to adapt to present weather and climate variability helps develop capacity to adapt to future climate change. Authoritative and credible climate services based on the latest scientific knowledge at various levels from global to regional, national and local at various time-scales are fundamental to the design of effective adaptation policies and climate risk management.*

*Implementation of the Global Framework for Climate Services will help generate better understanding of the climate system; fill information gaps at global, regional national, and local scales; enable use of such information in various socio-economic sectors and help in climate risk assessment and develop mitigation and adaptation measures. Implementation of the Framework will reinforce and further develop, existing institutions, their infrastructure and mechanisms to generate and deliver climate information.*

*At the national level, climate risk management strategies, plans and programmes have to be built using the dispersed institutional and administrative mechanisms, projects, human and financial resources. There is a need to clearly define the roles of various institutions involved and set up a mechanism for effective coordination in the development of the climate information and products and translating them into a suite of climate services. Various sectoral users at national and local level, along with universities, research institutions and civil society, should be effectively engaged through such a mechanism.*

*Accelerated weather and climate research through advanced global/regional modelling has provided improved understanding of current and future patterns of climate risks. The National Hydrological and Meteorological Services (NMHSs), through a system of observation networks, have participated and supported this research, while meeting the requirements of the UNFCCC. The Bali Action Plan that recognizes adaptation as one of the pillars of the UNFCCC process makes the role of NMHSs critical in providing climate information. To enable generation of local level climate information governments should make use of the existing strengths of NMHSs, and enhance them, where necessary, to ensure that relevant climate information from global and regional institutions is available to various users at a local scale and for sectoral users in all parts of the world. Governments need to urgently consider strategic support for the NMHSs, research institutions and environmental agencies to strengthen various observation systems.*

*The infrastructure for weather and climate observation and research built over the years through established global programmes such as the World Climate Programme and its various elements should be used to synthesize information streaming from the observation, research and modelling through a network of global, regional and national institutions and to ensure the development and delivery of user-oriented climate information and prediction services. NMHSs will play a crucial role in this delivery mechanism and there is an urgent need to strengthen human resources and develop new skills in the NMHSs.*

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## **1. Introduction**

1.1 The impact of climate change is an unprecedented and increasing global threat to life, livelihoods, and life-supporting systems. Even if the most stringent mitigation measures were put in place today, the impacts of climate change would continue for centuries. There is an urgent need for immediate and adequate actions to adapt to climate change before its impacts become unmanageable. The Bali Action Plan includes adaptation as one of the four pillars of the post-2012 UNFCCC regime. The other three areas identified under the Action Plan include streamlining and scaling-up resources, knowledge sharing, and institutional frameworks. Greater focus on climate risk management including adaptation and mitigation is required in order to reduce vulnerability to climate risks.

1.2 Climate information at various time scales, and projections of future climate at regional, national and local scales, form the essential knowledge base for adaptation and disaster risk management. Availability of climate information and its effective use by converting information into applicable knowledge helps prevent disasters that can result from climate extremes and support wise long term adaptation and mitigation strategies. It plays a crucial role in national development planning, for managing development opportunities and risks and for mitigation and adaptation. Recent advances in science and technology offer the prospect of further improvements in quality of climate information and prediction.

1.3 This position paper presents the role that the weather, climate and hydrological communities can play in effectively addressing the objectives of the United Nations Framework Convention on Climate Change (UNFCCC). This note should help National Meteorological and Hydrological Services (NMHSs) and their national partners to provide the scientific underpinning to the negotiations and enable them to play their expected role within their national delegations.

## **2. Climate Change Adaptation**

2.1 Climate change poses considerable challenges for the human society. Increasing climate variability is already significantly impacting socio-economic development and the environment. The sharp rise in economic, social and environmental damage in recent decades due to weather and climate extremes is, in part, a testimony to our current limited ability to prepare for adaptation to climate change. The way society is able to adapt, or not, to the extreme weather and climate conditions, determines the sustainability of human and societal development.

2.2 Many socio-economic sectors, including water, agriculture, fisheries, health, forestry, transport, tourism and energy, are highly sensitive to weather and climate extremes such as droughts, floods, cyclones and storms, heat waves, etc. Decision-makers in these sectors are increasingly concerned by the adverse impacts of climate variability and change, but often do not have access to climate services to make effective use of climate information to manage current and future climate risks. Ability to manage weather- and climate-sensitive enterprises depends on access to critical climate information from the past and the present, and through anticipation of future climate.

2.3 Successful adaptation will depend on individual communities assisted by government and others national, regional, multilateral and international organizations, the non-governmental organizations (NGO) and other relevant stakeholders and requires adequate and sustained funding. Parties to the UNFCCC have emphasized that adaptation and mitigation needs to be accorded the same level of importance. Adaptation does not replace mitigation of greenhouse gas emissions. Parties were encouraged to ensure access to relevant climate information<sup>1</sup>, to develop regional climate change mitigation and adaptation framework and

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<sup>1</sup> FCCC/AWGLCA/2008/16/Rev. 1, 15 January 2009

identify win-win options for the socio-economic sectors, to recommend policy and financial innovations to enable smooth implementation of the regional frameworks, and to explore appropriate options for strengthening information exchange on climate change impacts.

2.4 The current efforts under the UNFCCC have been successful in bringing adaptation forward on policy agendas. Adaptation was identified to be one of the five key building blocks (shared vision, mitigation, adaptation, finance and technology) of a future climate change deal. Parties have made progress in defining a comprehensive framework for strengthened action on adaptation. There is a growing convergence on the following elements of such a framework, including: vulnerability assessments; national adaptation plans; enabling policy environments; arrangements for sharing knowledge (e.g. through regional centers and the UNFCCC's Nairobi Work Programme (NWP)); and tools for risk reduction and sharing, such as insurance.

### **3. Climate Services for Climate Risk Management**

3.1 Given the increasing impact of hydro-meteorological disasters on society and the inability of the majority of countries to cope with their aftermath, the management of climate-related risks is one of the issues that is central to socio-economic development.

3.2 Climate change adaptation under the current state of knowledge has to be carried out using the risk management principles. The UNFCCC Subsidiary Body for Implementation (SBI) at its 28<sup>th</sup> session agreed on the further implementation of decision 1/CP.10, *inter alia*, enhancing national planning for adaptation, through integrating adaptation into the planning process, promoting risk management approaches and other appropriate responses to the adverse effects of climate change.

3.3 Integrating climate information into decision-making in all socio-economic sectors, through an effective two-way dialogue between providers and users on the range, timing, quality and content of climate products and services, will ensure that decisions relating to managing climate risks are well informed.

3.4 Various development sectors, sections of society, countries, communities, enterprises and civil society need to adapt to the present climate variability and associated extremes well before the effects of climate change are fully visible. However, informed decisions cannot be made without reliable and actionable climate and other related information and services.

3.5 From global to local levels, public and private sector institutions are seeking the tools and the knowledge for climate risk management. Many of the world's leading development institutions are reviewing their programmes from the perspective of climate-related risk assessment and climate risk management. Similarly, national governments and decision/policy-makers at regional and local levels are asking how they can better manage climate-related risks and opportunities.

3.6 The concept of risk management recognizes the foundation of knowledge of risks based on data and information. Knowledge of past climate variability and long-term trends and its translation into climate risk information is essential for decision making. Data and information have to be converted into knowledge to develop options for decision making at various levels - from political leadership to government through to the community levels and within climate sensitive sectors. For the assessment of climate risks across a wide spectrum and for the development of improved management decisions to cope with short- and long-term climate risks, multi-disciplinary and multi-institutional collaboration is essential.

3.7 It is important to recognize that decisions related to climate risk management have to be based on reliable, relevant, usable and timely climate information which needs to be translated into knowledge in the form of decision support tools for sector specific applications. Mainstreaming these climate services into decision-making would foster effective climate risk management strategies in support of the achievement of the Millennium Development Goals, eradicating extreme poverty and hunger and ensuring environmental sustainability. As socio-economic consequences of hydrometeorological hazards (and consequently, impacts of climate change) are manifested at the local level, climate risk management requires decision making at the local level based on climate services at local level.

3.8 International efforts have to be directed towards strengthening capacities at and local national levels by creating an enabling mechanism to make development decisions that address not only the response requirements but are preventive in nature and build resilience towards climate risks. A core responsibility of the international community as a whole and each government in particular should, therefore, be able to ensure access to scientifically credible and adequate information on climate.

#### **4. WMO Strategy in Support of Adaptation and Climate Risk Management**

4.1 WMO, consisting of a network of the National Meteorological and Hydrological Services (NMHSs) of its 189 Members, with its partners in international organizations and national institutions promotes the generation, delivery and use of climate information. For climate risk management, WMO supports a comprehensive approach by furthering close interaction between its three essential pillars of governance: the science, the policy and the society. Accordingly, the First World Climate Conference (1979) initiated the globally coordinated pursuit of scientific knowledge that laid the foundation for building climate research to understand the nature of the climate challenges. The Second World Climate Conference (1990) triggered political awareness in the face of climate variability and change and initiated an international policy dialogue.

4.2 Through its network of NMHSs and other national, regional, and global partners, WMO has been coordinating programmes that organize research, observations and assessments. WMO fosters and furthers collaboration among members of the UN system and with other international organizations in observations, climate research and application of climate information in various sectors. WMO co-sponsors the World Climate Research Programme (WCRP), the Global Climate Observing System (GCOS), and, the Intergovernmental Panel on Climate Change (IPCC).

4.3 With its vision to contribute to the safety and well being of people throughout the world and economic benefit of all nations, WMO, through its global network of NMHSs, has acquired good observational records over extended periods through various observation networks under the World Weather Watch and more recently under the WMO Integrated Global Observation System, to make possible an understanding of both the frequency and occurrence of extreme events.

4.4 The essential building blocks for development and delivery of climate information and services have been put in place over the years and tested by WMO on pilot scales. The World Climate Programme, particularly through its Climate Information and Prediction Services (CLIPS) project, has demonstrated the value of climate information and prediction services and helped build the capability to predict climate on monthly, seasonal and inter-annual timescales by exploiting the existing skills. Through its Members, WMO has designated Global Producing Centres for long-range forecasts (GPCs) and made efforts to establish a world-wide network of Regional Climate Centres (RCCs) to provide real-time inputs to National Meteorological Services (NMSs) to generate climate information are in the early stages of implementation. The Regional Climate Outlook Forums (RCOFs), organized over the last decade in different parts of the world, through their user networks provide scientific inputs for decision making based on seasonal climate predictions and products.

4.5 WMO through its network of NMHSs, with research institutions, satellite operators and many other regional and national institutions, collaborates with the scientific community on climate research. Some of the regional institutions, particularly in developing countries are being strengthened and supported. WMO provides active support by tapping a vast network of expertise and knowledge among its Members, Programmes, Technical Commissions, partner institutions, and partner organizations thereby supporting the implementation of environmental conventions and multilateral environmental agreements.

4.6 Despite very significant advances made by NMHSs and their partners in providing climate information, much work remains to be done to strengthen the capacity to generate climate information and further reduce the uncertainty in global, regional and local climate predictions. Following the legacy of the first and the second World Climate Conferences, the World Meteorological Organization (WMO), in partnership with other UN Agencies organized the the World Climate Conference-3 (WCC-3), from 31 August to 4 September 2009 in Geneva with the theme "Climate prediction and information for decision-making". The Heads of State and Government, Ministers and Heads of Delegations present at the WCC-3, through the Conference declaration, decided to establish a Global Framework for Climate Services (GFCS) to strengthen the production, availability, delivery and application of climate monitoring and prediction services.

4.7 Indeed the decision of WCC-3 to establish a Global Framework for Climate Services defined the directions towards "better climate information for a better future" in order to accelerate global action on adaptation and management of climate-related risks while capitalizing on the associated opportunities. The Framework is being designed by the High-level Taskforce established through an Inter-governmental mechanism in January 2010 to mainstream climate science into decision-making at all levels and help ensure that every country and every climate-sensitive sector of society is well equipped to access and apply the relevant climate information. The High-level Taskforce is expected to submit its report in January 2011.

The GFCS, conceived, as a stepping stone to improve operational climate services is a contribution to the international shared effort to cope with the effects of climate variability and change.

## 5. Global Framework for Climate Services

5.1 Climate change is a global phenomenon, and understanding of climate systems requires partnership across geographical, political and disciplinary boundaries. Given the complexity of, and requirements for, climate services, addressing the immense variety of user needs is beyond the capacity of any single country. Accordingly, the GFCS is proposed as a long-term cooperative arrangement through which the international community will work together to facilitate generation and access to operational climate services at all levels.

5.2 The Framework is conceived to have five major components: Observation and Monitoring; Research, Modelling and Prediction; a Climate Services Information System; a User Interface Programme and Capacity Building, with the objective to:

***“Enable better management of climate risks due to climate variability and change and adaptation to climate change at all levels, through development and incorporation of science based climate information and prediction into planning, policy and practice.”***

5.3 The Framework is being designed to be an effective, efficient and economically viable mechanism for the generation, delivery and application of climate services. It will build on and strengthen existing local, national, regional and global networks of climate observation, monitoring, research, modelling as well as operational structures and service programmes, and is conceived as an integrating set of international arrangements into an end-to-end product generation, service provision and application system. Many of these elements (systems, programmes, projects, institutions, etc.) are either already in place or are in the process of being established.

5.4 To meet its objectives, the Framework would require extensive collaboration among national and local governments, agencies, non-governmental organizations, civil society, the private sector, as well as universities and research institutions around the world and outreach to communities in all socio-economic sectors benefiting from the application of climate services in planning, policy and practice. Implementing and operating the Framework will therefore require continuation and enhancement of the broad collaboration and partnerships, centred around these entities, which underpin and improve on its technical strengths. As such the Framework will be supported by the entire United Nations system and other organizations.

5.5 Development of knowledge and tools for making decisions related to adaptation to climate change can be best achieved through close collaboration among the climate service providers and users in these sectors. These partnerships need to be extended to other sectors to build capacity of NMSs to provide sector specific climate services in close partnerships with various UN Agencies and Programmes.

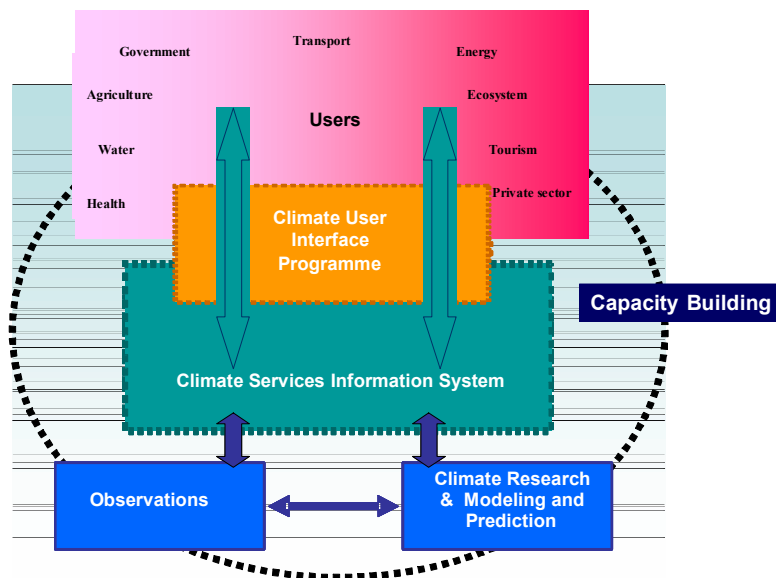


Fig. 1 Components of Global Framework for Climate Services

5.6 Significant advances have been made over time in understanding of the climate systems, in modelling, prediction, and projections and earth system sciences. However, the complexities of climate system processes and their interactions are yet to be fully unravelled. Increasing the prediction skills and reducing uncertainties both at the global and regional levels requires extensive scientific research. It would require comprehensive understanding and representation of Earth System processes through integrated approaches by, for example, inclusion of greater biological and chemical details in fully coupled Earth-System models.

5.7 The accuracy and reliability of regional climate models depends to a large extent on the availability and quality of the observations that are used to validate them. To date, the focus has been on the importance of properly functioning global-scale networks. Under the adaptation imperative, regional- and national-scale networks within the Framework should be given higher priority in order to provide the required detail for understanding regional and local impacts of climate change and for adaptation planning.

5.8 Under the Climate Services Information System component of the Framework, WMO will expand this network of global and regional institutions and facilitate the development of infrastructure and human capacity in these centres. A focus, in particular, would be on standardization, exchange and quality assurance of information and delivering them to decision-makers at all levels on an operational basis. It is imperative that these GPCs are supported by the respective national governments while the RCCs as regional entities are supported as regional collaborative institutions by both the national governments and the international development agencies.

5.9 Implementation of the Framework will require capacity building through: strengthening and aligning institutional arrangements; strengthening of existing and, where required, establishment of new infrastructure and systems; and development of human skills and training. At the same time it will require an improvement in the infrastructure within countries to ensure the systematic collection of high-quality climate observations, undertake research and establish the operational elements. Maintaining the observation networks over long periods is critical, and developing countries need financial and technical support to undertake this responsibility. SBSTA has stressed<sup>2</sup> the need for involvement of experts from developing countries in improving data collection and information gathering relating to climate change, as well as in the analysis, interpretation and dissemination of such data and information.

5.10 New skills need to be developed, at a much larger scale, as climate service provision is made operational in countries. Countries would have to develop clear human resources development plans to address these needs. There is need for institutional strengthening in governance, management and funding as well as human resources development.

## **6. Provision of Climate Service at the National Level**

6.1 At the national level, climate risk management strategies, plans and programmes have to be built on the dispersed institutional and administrative mechanisms, projects, human and financial resources currently engaged in national development planning, disaster risk reduction as well as mitigation of and adaptation to climate change. Since addressing the immense variety of user needs for climate services within a country is beyond the capacity of any single institution, it therefore, calls for collaboration among various sectoral institutions across administrative, functional, and disciplinary boundaries.

6.2 It is important for Parties to work towards local ownership of capacities to package and interpret climate information and its impending impacts both by the climate providers and users for risk management and sustainable development purposes. In this sense, access to locally relevant climate data and information will be crucial. In many countries, absence of clear mandates among various institutions and lack of legislative frameworks on climate related issues may adversely impact the provision of climate services. A clear definition of mandates (roles and responsibilities) for all stakeholders in the form of model laws and management practices to address all aspects of climate risk management would be required as part of institutional strengthening and streamlining. An ideal model that would centre around the operational climate information and products would have the NMHS, as a repository of baseline data on climate risks as the nucleus, or core of the collaborative group.

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<sup>2</sup> *FCCC/Decision 1/CP10/2004*

6.3 At the national level, there is a need for effective coordination in the development of the climate information and products and translating them into a suite of climate services required by various sectoral users at national and local level. Some larger countries are in the process of establishing "National Framework for Climate Services (NFCS)" as the coordination platform that would serve the purpose of close collaboration between the national institutions making climate observations; universities and institutions engaged in research; sectoral institutions engaged in long-term planning for development and climate change adaptations; and disaster risk management institutions.

6.4 NMHSs with the long experience in operational forecasting and warning in weather, water and climate risks associated with hazards such as droughts, floods, and extreme temperature, have the infrastructure and operational capacity to deal with climate related risks. Forecasting infrastructure of Member countries based on collaborative arrangements through their NMHSs, along with its core scientific capabilities and expertise, supports risk management with identification and assessment of climate risks for sectoral planning, early warning systems, and financial risk transfer mechanisms. The financial efficiency imperatives would require that the existing facilities in the countries, at the disposal of NMHSs, in terms of observation and forecasting and early warning infrastructure, are fully utilized in the development and provision of climate services at the national level.

6.5 Within such a national framework for climate services, each NMHS has to play its role depending on its strengths, capacities and capabilities and given mandates. The competence/capability of a NMHS to engage in climate risk management will depend on their capacity to provide climate data, converting them into reasonable and usable information, developing decision support and decision making tools to convert the information into usable knowledge for decision making. While all efforts have to be made to improve the level of services provided by NMHS in a country, guided by the constraints of human, technical and financial resources, NMHS is privileged through the WMO network to make use of the global or regional centres of excellence for getting services beyond its own capacity.

6.6 The NMHSs have the responsibility to assist sectoral users in their respective countries in integrating climate risk information into their activities and also help them understand the existing uncertainties. It is therefore essential that NMHSs are supported by the governments in establishing the National Climate Outlooks Forums for closer interaction with the users in various sectors. WMO plans to help build capacity of the NMHSs to enable them to engage all user sectors in this process.

6.7 In many places around the world, particularly the developing countries, climate observing networks are inadequate to document regional and local climate change and are on the decline since the 1990s. Given the adaptation imperative to be implemented at local scale, it is essential and urgent that the decline in observational networks be addressed<sup>3</sup>.

## **7. Conclusions and Recommendations**

7.1 Improved climate information is required to support decision making for climate change adaptation and mitigation strategies. Parties are encouraged to support the further development and operational implementation of the Global Framework for Climate Services.

7.2 The Global Framework for Climate Services would facilitate further understanding of current climate, enable predictions of future climate change, and help improve the capacity to use such information to design effective adaptation strategies. The Framework would enhance closer collaboration between service providers and users, address the needs of climate observations, climate services, and climate modelling and support the smooth flow of the required climate information from global to local levels and their applications in various sectors.

7.3 Appropriate legal framework and institutional arrangements clearly defining the role of various institutions in the provision of climate services for climate risk management based on the principles of effective use of existing infrastructure and capabilities and strengths of various institutions need to be established.

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<sup>3</sup> GCOS in its report to the SBSTA (29) at COP 14, Poznan.



7.4 Accelerated weather and climate research including advanced computational modelling is required both at national and international levels in order to develop better tools for adaptation through advanced regional modelling, and improved understanding of future patterns of sector-specific climate risks.

7.5 Governments should make full use of the infrastructure, capacity and capabilities of NMHSs and further strengthen them to enable NMHSs to deliver climate services to all user sectors. NMHSs need to develop partnership with different sectoral users for improved decision making for climate change adaptation.

7.6 It is extremely important to maintain and improve climate observation networks and share climate related data. Many developing countries have difficulty maintaining regional- and national-scale networks. Continued assistance to developing countries by the developed countries is needed for improvements in climate observing networks, and it is important that the Conference of the Parties to the UNFCCC continues to draw attention to this fact.

7.7 Developing countries would require international support to attain a desirable level of capability to help generate climate services and thereby participate in the implementation of the Framework and optimally make use of the climate services.

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