

**ANNEX II**

**Annex to paragraphs 3.1.0.1, 3.2.23, 3.3.45, 3.4.1.5, 3.5.8.3, 3.6.13, 3.7.14, 4.1.1, 4.2.25, 4.3.1, 4.4.2, 4.5.1, 5.2.16, 5.4.1, 6.1.8, 6.2.6, 6.3.14, 6.4.1, 6.4.16, 11.5.1, 11.5.21 and 11.6.1 of the general summary**

**WMO PROGRAMME DESCRIPTIONS****WORLD WEATHER WATCH PROGRAMME****1. Purpose and scope of the World Weather Watch (WWW) Programme**

**1.1** The World Weather Watch (WWW) Programme facilitates the development, operation and enhancement of worldwide systems for observing and exchanging meteorological and related observations, and for the generation and dissemination of analyses and forecast products, as well as severe weather advisories and warnings, and related operational information. The activities carried out under this Programme collectively ensure that Members have access to the required information to enable them to provide data, prediction and information services and products to users. WWW is organized as an international cooperative programme, under which the infrastructure, systems and facilities needed for the provision of these services are owned, implemented and operated by the Member countries. This is based on the fundamental understanding that the weather systems and patterns do not recognize national boundaries and are always evolving on varying temporal and spatial scales, and that international cooperation is paramount, as no one country can be fully self-sufficient in the provision of all weather, water and climate related services.

**1.2** The Programme's main functions are planning, organization and coordination of the facilities, procedures and arrangements at the global and regional levels, related to the design of observing and communications networks, the standardization of observing and measuring practices and techniques, the use of data management principles, the application of scientific and technical means for assuring, analysing and predicting weather systems, and the presentation of the information in a form and format that is understood by all, regardless of language. WWW is the key Programme of WMO in providing basic data, analyses, forecasts, and warnings to Members and other WMO and co-sponsored Programmes, such as the Global Climate Observing System and Global Ocean Observing System, and relevant international organizations.

**1.3** WWW puts priority on capacity-building activities to avail of technological advances to enhance the WWW components, especially in developing countries, and on cost-effective, systematic monitoring and improvements to the operations of WWW that can be derived thereof. Thus, it allows Members to obtain maximum benefits from the WWW.

**1.4** The WWW Programme effectively contributes to the implementation of all the WMO Expected Results of the WMO Strategic Plan. Many of the activities are strongly linked with all other WMO Programmes and it will provide direct support to the future WMO high priority areas, namely GFCS, DRR, WIGOS and WIS, Capacity-building and Aeronautical Meteorology.

**2. Programme structure**

**2.1** The World Weather Watch Programme comprises the design, implementation, operation and further development of the following three interconnected, and increasingly integrated, core components:

- (a) Global Observing System (GOS), consisting of facilities and arrangements for making meteorological observations (including climatological observations) and other related environmental observations at stations on land and at sea, and from aircraft, meteorological environmental satellites and other platforms;

- (b) Global Telecommunication System (GTS), consisting of integrated networks of telecommunications facilities and services for the rapid, reliable collection and distribution of observational data and processed information;
- (c) Global Data-processing and Forecasting System (GDPFS), consisting of World, Regional Specialized, and National Meteorological Centres that provide quality-assured, processed data, analyses, and forecast products on a wide range of temporal and spatial scales.

**2.2** Coordination, integration and efficient operation of the three core components are achieved through support programmes as follows:

- (a) The WWW Data Management (WWWDM) support programme monitors and manages the information flow within the World Weather Watch system to assure quality and timely availability of data and products and the use of standard representation formats;
- (b) The WWW System Support Activity (WWWSSA) support programme provides specific technical guidance, training and implementation support, the WWW Operational Information Services, and supports cooperative initiatives.

**2.3** In addition, the WWW Programme incorporates three programmes that complement and enhance the core components of the WWW, as well as provide significant input and support to other WMO and co-sponsored Programmes:

- (a) The Instruments and Methods of Observation Programme (IMOP) improves the quality and long-term stability of observations and measurements of meteorological and related environmental variables through the standardization activities and coordination and promotion of the use of efficient methods and technology to meet the requirements of operational and research applications;
- (b) The Emergency Response Activities (ERA) programme assists NMHSs to respond effectively to large-scale atmospheric pollution and environmental emergencies in close collaboration with other relevant international organizations;
- (c) The WMO Antarctic Activities (WMOAA) programme coordinates the WWW basic systems implementation and operation in Antarctica to meet the requirements for meteorological services as well as for environmental monitoring and climate research.

**2.4** The World Weather Watch component systems are primarily managed under the technical responsibility of the Commission for Basic Systems (CBS) with the exception of the IMOP that is managed under the technical responsibility of the Commission for Instruments and Methods of Observation (CIMO).

**2.5** The WWW Programme works closely with other related programmes, in particular:

- (a) The Tropical Cyclone Programme (TCP), which assists Members in establishing national and regionally coordinated systems to ensure that the loss of life and damage caused by tropical cyclones are reduced to a minimum, and to achieve sustainable development;
- (b) The WMO Space Programme (WMO SP) which promotes wide availability and utilization of satellite data and products for weather, climate, water and related applications of WMO Members, and coordinates environmental satellite matters and activities throughout all WMO Programmes;

- (c) The WMO Public Weather Services Programme (PWSP) whose principal aim is to strengthen the capabilities of WMO Members to meet the needs of society through provision and delivery of comprehensive weather and related environmental services, with particular emphasis on public safety and welfare, and to foster a better understanding by the public of the capabilities of their respective National Meteorological and Hydrological Services (NMHSs), and of how best to use the services that NMHSs deliver.

### **3. Global Observing System (GOS)**

#### **3.1 Purpose and scope**

- (a) The GOS provides, from the Earth and from outer space, observations of the state of the atmosphere and ocean surface for the preparation of weather analyses, forecasts, advisories and warnings, and for climate and environmental studies and activities carried out under programmes implemented by WMO and by other relevant international organizations. It is operated by National Meteorological Services (NMSs), national or international satellite agencies, and involves several consortia<sup>1</sup> dealing with specific observing systems or specific geographic regions;
- (b) GOS systematically evolves, through the Rolling Review of Requirements process, into a composite cost-effective system with its subsystems providing interoperable data and information based on the agreed upon standard practices. GOS is services driven observing system in support of the NMSs mandates;
- (c) GOS put special emphasis on meeting the requirements of monitoring the climate and the environment, in collaboration with partner organizations, to improve understanding of climate processes and to enable increasingly beneficial climate and environmental studies and services;
- (d) Areas of emphasis in the implementation of GOS may differ in individual countries, but common standards, cost-effectiveness, data interoperability, long-term sustainability and innovative collaborative arrangements among Members are the key aspects of the future design and operation of the observing networks.

#### **3.2 Main long-term objectives:**

- (a) Improve and optimize global systems for observing the state of the atmosphere and the ocean surface to meet the requirements, in the most effective and efficient manner, for the preparation of increasingly accurate weather analyses, forecasts and warnings, and for climate and environmental monitoring studies and activities carried out under programmes implemented by WMO and by other relevant international organizations;
- (b) Provide for the necessary standardization of observing practices, including the planning of networks on a regional basis to meet the requirements of users with respect to quality, spatial and temporal resolution and long-term stability, particularly with a view to its further evolution as the key component of the WMO Integrated Global Observing System (WIGOS).

### **4. Global Telecommunication System (GTS)**

#### **4.1 Purpose and scope**

**4.1.1** The Global Telecommunication System (GTS) is an integrated system of managed data communication networks, point-to-point circuits and satellite-based data collection and broadcast systems, which interconnect meteorological centres through agreed procedures and services. It provides the telecommunication services for the collection, and exchange of observational data

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<sup>1</sup> Examples are EUMETNET, AMDAR, ASAP, DBCP, EUMETSAT.

(particularly GOS data) and the distribution of processed information from the Global Data-processing and Forecasting System (GDPFS) and other related centres. The GTS is operated by National Meteorological Services, national or international satellite agencies or contracted commercial telecommunication service providers. The Internet complements the GTS where technical or economic conditions limit the scope of the GTS. Maintenance and enhancement of systems to exchange data, products and information thus facilitate access to information needed for the preparation of analyses, forecasts and warnings, research activities and other environment-related applications.

**4.1.2** The main goal will be the further development of structure and operational principles of the GTS and other components of the WMO Information System (WIS). As a core network of WIS, the GTS will respond to growing data communication needs of all WMO Programmes and exploit new technical and economic opportunities. The priority activity will be focused on achieving cost-effectiveness, enhanced data transmission capacity and a greater variety and flexibility of services. The WIS will continue to evolve jointly supported by the GTS and WWDM programmes, and including input from other relevant programmes.

Main long-term objectives:

- (a) Improve and optimize the WIS and its operational procedures to provide effective and efficient telecommunication services for the collection and communication of observational data, processed information, advisories, warnings, and others, within established time limits;
- (b) Maintain and further develop the GTS as the core network of the WMO Information System (WIS) that will provide the information systems and services for the exchange of and access to data, which will meet the requirements for such services of all WMO Programmes.

## **5. Global Data-processing and Forecasting System (GDPFS)**

### **5.1 Purpose and scope**

**5.1.1** The WMO Global Data-processing and Forecasting System (GDPFS) represents the function of weather forecasting including the production of weather and climate analyses, forecasts, specialized forecast products, and alerts, advisories and warnings of severe weather for the protection of life and property. The GDPFS includes the network of operational meteorological centres that produce a wide range of numerical weather prediction (NWP) products, forecasts, and warnings, and is a part of a global early warning system for meteorological and environmental hazards. The outputs of the GDPFS are required by NMHSs and other Members' agencies to meet diverse requirements that range from immediate support to emergency response, to routine weather forecasts and warnings for the general public and for air traffic control, to environmental predictions such as sea-state or air quality, to products that create economic advantage for Members, tailored products and services to different economic sectors, and therefore represent the means for Members to deliver many meteorological services, especially those requiring predictions. The GDPFS aims at the provision of increasingly more relevant, reliable, and quality assured NWP products spanning forecast ranges from instantaneous to long-term, and from local to global scales, improved early warning services for the mitigation of meteorological disasters and effective advice for emergency response to environmental catastrophes.

**5.1.2** The GDPFS contributes to several WMO high priorities: the GDPFS' network of Global Producing Centres and Lead Centres for Long-Range Forecasts and Regional Climate Centres is foundational in the development of a Global Framework for Climate Services. As well, the GDPFS contributes to Disaster Risk Reduction through the implementation of new scientific and technological means to improve severe weather forecasting, for example in the use of Ensemble Prediction Systems (EPS), and in particular contributes to building capacity through improved access to and use of advanced NWP/EPS products and post-processing methods in NMHSs of developing countries through the Severe Weather Forecasting Demonstration Project (SWFDP).

**5.2** Main long-term objectives:

- (a) Provide relevant, reliable, and quality assured NWP products spanning all forecast ranges, and from local to global scales, especially in support of improved early warning services;
- (b) Develop capacity in weather and environmental predictions, especially in developing countries.

**6. WWW Data Management (WWWDM)****6.1** Purpose and scope

The World Weather Watch Data Management (WWWDM) support programme will continue to develop and coordinate the support functions including data formats and codes, metadata standards, needed for an orderly and efficient overall management of meteorological data and products within the framework of WIS. It will also coordinate the monitoring of the operations of the WWW to improve the availability and quality of data and products.

**6.2** Main long-term objectives:

- (a) Implement modern standardized data handling and archiving models, procedures, practices, interfaces and formats required for efficient exchange, archive and retrieval of all information used in the World Weather Watch and other related WMO Programmes;
- (b) Define and coordinate implementation of metadata standards for the WIS so that it meets the data exchange and access requirements of all WMO Programmes.

**7. WWW System Support Activity, including the Operational Information Service (OIS)****7.1** Purpose and scope

**7.1.1** The WWW System Support Activity (WWWSSA) support programme provides technical advice and support, especially to developing NMHSs, in order to assist in achieving the most effective and efficient implementation and sustainable operation of the World Weather Watch. The programme promotes the development of standard solutions to common operational problems and their implementation through coordinated projects.

**7.1.2** The Operational Information Service (OIS) collects from and distributes to WMO Members detailed and up-to-date information, in a timely and efficient manner, on facilities, services and products made available through the operation of the World Weather Watch.

**7.2** Main long-term objectives:

- (a) Assist developing NMHSs, particularly through technical advice and training activities, in obtaining the necessary self-reliance for providing weather forecasting and warning services in their country and to allow them to fulfil agreed responsibilities within the WWW system and other related WMO or international programmes;
- (b) Promote development and implementation of innovative arrangements for cooperation and funding within the WWW system to strengthen the long-term and cost-effective operation of the basic infrastructure;
- (c) Provide the information services on the operation of the World Weather Watch and related systems and improve their utility for the users.

## **8. Instruments and Methods of Observation Programme (IMOP)**

### **8.1 Purpose and scope**

IMOP organizes the necessary studies, as well as instrument intercomparisons and calibration campaigns to ensure required accuracy and guarantee the long-term stability and interoperability of the observing systems used within WIGOS, with particular focus on the GOS. It promotes traceability of measurements done by Members to recognized international standards and supports Members' efforts to establish calibration laboratories, including collaboration with Regional Instrument Centres and relevant international organizations. This responsibility also extends to supporting the requirement of WMO cross-cutting activities such as the Global Framework for Climate Services, Disaster Risk Reduction and capacity-building. The programme develops and supports publication of technical guidance, observation practices, standards and performance characteristics, and implements related capacity-building activities. The programme effectively contributes to the implementation of all Expected Results, with the main emphasis on the implementation of Expected Result 4, in particular with respect to providing improved technical standards and guidance on instruments and methods of observations to ensure the improvement of observation quality.

### **8.2 Main long-term objectives:**

- (a) Improve the quality and long-term stability of observations and measurements of meteorological and related environmental variables through the coordination and promotion of the use of efficient methods and technology to meet the requirements of operational and research applications;
- (b) Enhance the effective and economic use of observing technology/systems through training and technology transfer in developing countries.

## **9. Emergency Response Activities (ERA)**

### **9.1 Purpose and scope**

**9.1.1** The Emergency Response Activities (ERA) programme, implemented in close conjunction with the Global Data-processing and Forecasting System (GDPFS), assists NMHSs and other relevant agencies of Members, as well as relevant international organizations, to respond effectively to environmental emergencies associated with airborne hazards, for example, caused by nuclear accidents or events, volcanic eruptions, chemical accidents, smoke from large fires, and other events, which require emergency atmospheric transport and dispersion modelling (ATM) support. This programme is carried out through the provision of specialized GDPFS products by designated Regional Specialized Meteorological Centres (RSMC); the development and implementation of efficient emergency procedures for the provision and exchange of specific data, information, and products related to the environmental emergency; regular exercises; and training for users.

**9.1.2** Activities related to airborne radionuclide hazards fall under two categories. First, nuclear accidents or radiological incidents fall under two International Conventions, one on Early Notification, and the second on Assistance, to which WMO is a Party along with other international organizations concerned under the overall coordination of the IAEA. Secondly, WMO collaborates with the Comprehensive Nuclear-Test-Ban Treaty Organization and provides specialized operational modelling support to the Treaty's Verification regime.

### **9.2 Main long-term objectives:**

- (a) Provide effective meteorological support in the response to environmental emergencies related to airborne hazards;

- (b) Collaborate with relevant international organizations in meteorological aspects of mitigating the impacts of environmental emergencies related to airborne hazards.

## **10. WMO Antarctic Activities (WMOAA)**

### **10.1 Purpose and scope**

**10.1.1** The WMOAA programme coordinates operational meteorological activities in Antarctica carried out by nations and groups of nations and under the auspices of the WMO Executive Council. Within the framework of the Antarctic Treaty, it focuses on the interfaces between these activities and relevant WMO Programmes to ensure continuity of weather, climate, water and related environmental programmes in the Antarctic in meeting the requirements for meteorological services as well as for environmental monitoring and climate research. Important stakeholders in this engagement include the WMO technical commissions, regional associations, the IOC, Antarctic Treaty Consultative Meeting (ATCM), and key science groups such as the ICSU, SCAR, IASC and WCRP.

**10.1.2** The WMOAA programme, as a component of the WWW Programme, effectively contributes to the implementation of all the WMO Expected Results of the WMO Strategic Plan. Many of the activities are strongly linked with all other WMO Programmes. It will provide direct support to all WMO high priority areas, namely GFCS, DRR, WIGOS and WIS, Capacity-building and Aeronautical Meteorology.

### **10.2 Main long-term objectives:**

- (a) Coordinate implementation and operation of the basic systems of the WWW to meet the requirements for meteorological services and research activities in the Antarctic, including climate and environment monitoring;
- (b) Collaborate with other international organizations and programmes in Antarctica in order to ensure a coordinated and cost-effective scientific and technical programme.

## **GLOBAL ATMOSPHERE WATCH PROGRAMME**

**(Based on the *WMO Global Atmosphere Watch (GAW) Strategic Plan: 2008–2015 (WMO/TD-No. 1384<sup>1</sup>)*)**

### **1. Mission and overall objective**

The **rationale** for the Global Atmosphere Watch (GAW) Programme is to meet the need to better understand and control the increasing influence of human activity on the global atmosphere. Among the main challenges addressed in the Programme are:

- Stratospheric ozone depletion and the increase of ultraviolet (UV) radiation;
- Changes in weather and climate related to human influence on atmospheric composition, particularly, greenhouse gases, ozone and aerosols;
- Risk reduction of air pollution on human health and issues involving long-range transport and deposition of air pollution.

<sup>1</sup> Available at <ftp://ftp.wmo.int/Documents/PublicWeb/arep/gaw/gaw172-26sept07.pdf>.

Many of these have socio-economic consequences affecting weather, climate, human and ecosystem health, water supply and quality, and agricultural production.

The **mission** of GAW, taking into account the Integrated Global Atmospheric Chemistry Observations (IGACO) strategy, is to:

- Identify environmental risks to society and meet the requirements of environmental conventions;
- Strengthen capabilities of Members to predict climate, weather and air quality;
- Contribute to scientific assessments in support of environmental policy.

Through:

- Maintaining and applying global, long-term observations of the chemical composition and selected physical characteristics of the atmosphere;
- Emphasizing quality assurance and quality control;
- Delivering integrated products and services of relevance to users.

## 2. Purpose and scope

GAW contributes mainly to the implementation of the Expected Result 5 in the WMO Strategic Plan “Enhanced capabilities of Members to contribute to and draw benefits from the global research capacity for weather, climate, water and the related environmental science and technology development” under the Strategic Thrust of “Advancing scientific research and application, as well as development and implementation of technology” (*in the Strategic Plan 2012–2015*).

GAW also fulfils a mandate from WMO Members by responding to the needs and clearly linking to the plans of national, regional, and international observing projects, programmes, systems and strategies, e.g.:

- As a core component of WIGOS and contributing to its implementation;
  - By contributing to the European Programme Global Monitoring for Environment and Security (GMES);
  - As a WMO contribution to the Global Earth Observation System of Systems (GEOSS);
  - In supporting the Subsidiary Body for Scientific and Technological Advice (SBSTA) of the United Nations Framework Convention on Climate Change (UNFCCC), especially by contributing to the implementation plan for the Global Climate Observing System (GCOS);
  - In observing the Vienna Convention on the Protection of the Stratospheric Ozone Layer and follow-up protocols;
  - In supporting the Convention on Long-range Transboundary Air Pollution (CLRTAP);
  - In providing a comprehensive set of observations of atmospheric composition in support of the Intergovernmental Panel on Climate Change (IPCC) process.
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**WORLD WEATHER RESEARCH PROGRAMME INCLUDING THORPEX**  
**(Based on the *Strategic Plan for the Implementation of WMO's***  
***World Weather Research Programme (WWRP): 2009–2017 (WMO/TD-No. 1505<sup>1</sup>)***)

**1. Overall objective**

WWRP is a comprehensive programme which contributes to improving public safety, the quality of life, economic prosperity and environmental quality by serving as an international mechanism for:

- Advancing the science of weather-related research with a particular focus on advancing our knowledge of high-impact weather, improving the prediction of these events and measuring the improvements in prediction;
- Advancing our understanding of how society is impacted by and reacts to high-impact weather and forecasts of these events in order to improve the utilization of and response to weather information;
- Contributing to the advancement of the science of broader environmental prediction through partnerships and collaborative multidisciplinary research;
- Promoting and facilitating the transfer of these research advances into the operational practice at NMHSs and among their end-users;
- Serving as the weather research underpinning for WMO efforts related to the WMO Natural Disaster Reduction and Mitigation Programme, operational weather prediction, use applications, and thereby contributing to relevant UN Millennium Goals.

**2. Purpose and scope**

The WWRP, including THORPEX, contributes primarily to Expected Result 5 of the WMO Strategic Plan, “5. Enhanced capabilities of Members to contribute to and draw benefits from the global research capacity for weather, climate, water, and the related environmental science and technology development”.

The WWRP, including THORPEX, promotes the development and application of improved weather forecasting techniques, with emphasis on high-impact weather events. The programme projects emphasize a comprehensive approach involving all timescales associated with weather prediction, and ensure that the benefits of research advances are widely shared among Members.

**3. WWRP governance**

The policy and technical guidance for the WWRP is provided by the Commission for Atmospheric Sciences (CAS). The CAS interacts closely with the Commission for Basic Systems (CBS) and the WMO co-sponsored World Climate Research Programme (WCRP).

**HYDROLOGY AND WATER RESOURCES PROGRAMME**

**1. Overall objective**

The overall objective of HWRP is to apply hydrology in meeting the needs for sustainable water resources development through integration of hydrological, meteorological and climatological

<sup>1</sup> Available at [http://www.wmo.int/pages/prog/arep/wwrp/new/documents/final\\_WWRP\\_SP\\_6\\_Oct.pdf](http://www.wmo.int/pages/prog/arep/wwrp/new/documents/final_WWRP_SP_6_Oct.pdf).

information and forecasts for use in water resources management; prevention and mitigation of water-related disasters; and in climate change adaptation in the water sector at national, regional and international levels.

## **2. Purpose and scope**

**2.1** HWRP fulfils one of the major purposes of WMO, namely to promote application of hydrology and to further close cooperation between Meteorological and Hydrological Services (paragraph (e) of Article 2 of the Organization's Convention).

**2.2** HWRP promotes improvements in the capabilities of Members, particularly in developing countries and those in transition, through technology transfer and capacity-building, so as to enable them to assess their water resources on a continuous basis, and respond, through risk management strategies, to the threats of floods and droughts; and thus to meet the requirements for water and its use and management for a range of purposes. The Programme aims at providing hydrologic information to various national development agencies, the civil society and the general public so that they can effectively use water resources for various development activities. At the same time the Programme endeavors to underscore the importance of hydrology and the role of National Hydrological Services (NHSs) in the development activities of various sectors through water resources management.

**2.3** The Programme takes into consideration the existence of climate variability and change and its hydrological impacts. It promotes increased collaboration between NHSs and NMSs, particularly in the provision of timely and accurate hydrological forecasts, ranging from flash floods guidance to seasonal predictions as a contribution to the protection of life and property and overall climate risk management.

**2.4** The Programme supports activities that contribute to the improved accuracy and usefulness of hydrological forecasts, resulting in the protection of life and property, and increased information and knowledge in support of sustainable socio-economic and environmental development and use of water. The activities of HWRP encompass the following broad areas:

- (a) Measurement of basic hydrological elements from networks of hydrological, climatological and meteorological stations;
- (b) Collection, processing, storage, retrieval and publication of hydrological data, including data on the quantity and quality of both surface water and groundwater;
- (c) Implementation of a quality management framework in hydrologic activities;
- (d) Provision of hydrologic data and related information for use in planning and operation of water resources projects and for monitoring the state of the freshwater resources;
- (e) Installation and operation of hydrological forecasting systems;
- (f) Development of flood management policies and strategies;
- (g) Integration of meteorological and climatological information and forecasts into water resources management;
- (h) Climate change adaptation in water resources management;
- (i) Evaluation of hydrological research outcomes for their potential benefits for application by NMHSs.

**2.5** The Programme effectively contributes to the implementation of all the Expected Results in the WMO Strategic Plan and particularly to ER 3 along with ER 2 and ER 4 (2012–2015). Many of the activities under HWRP are strongly linked with other Programmes, in particular the World Weather Watch Programme, the World Climate Programme, the Tropical Cyclone Programme, the Education and Training Programme, and contributes to the overall objectives of the Disaster Risk Reduction Programme, the Regional Programme and the Least Developed Countries Programme. The Programme will act as an interlocutor and conduit to provide climate services under GFCS for use in the water sector.

### **3. HWRP governance**

The technical guidance for the HWRP is provided by the Commission for Hydrology (CHy). The Commission interacts closely with the Commission for Climatology and Commission for Agrometeorology on GFCS and the Commission for Basic Systems on WIGOS.

### **4. HWRP structure**

The HWRP is implemented through three mutually supporting components:

- (a) Basic Systems in Hydrology;
- (b) Forecasting and Applications in Hydrology;
- (c) Capacity-building in Hydrology and Water Resources Management.

### **5. Basic Systems in Hydrology (BSH)**

#### **Long-term objective**

**5.1** The long-term objective of the component is to provide guidance to, and support for, NHTs in hydrometry and its application for monitoring freshwater resources, with an emphasis on quality assurance.

#### **Purpose and scope**

**5.2** BSH provides the basic building blocks and framework for the hydrometric support for hydrology and water resources management. It covers the collection, transmission and storage of data, implementation of Quality Management Framework within Hydrology, the further development of WHYCOS including its internal and external coordination, establishment of hydrologic information systems, assessment of water resources, applications of hydrologic information and socio-economic benefit analysis of hydrologic networks. The component will contribute to the implementation of ER 3, and support meeting the objectives of ER 4 through enhancing integration (WIGOS) and communication systems for delivering information (WIS); the BSH component, through WHYCOS activities, assists the LDCs by enhancing capacity of NMHTs, thus contributing to ER 6.

### **6. Forecasting and Applications in Hydrology (FAH)**

#### **Long-term objective**

**6.1** The long-term objective of the component is to apply hydrometric observations for hydrological forecasting, flood risk assessment and management, prevention and mitigation of water-related disasters, and to better understand the implications of climate variability and change for water management.

### **Purpose and scope**

**6.2** The purpose of FAH is to support NHSs in the application of hydrological analysis through hydrologic modelling, development of flood forecasts, provision of flash flood guidance, studies on low season flows, storm surge coastal flooding, and design flood, in order to meet water resources management objectives. The component will undertake regular review of operational requirements for flood forecasts and warnings and keep up to date with new technological developments. The component organizes activities in support of integrated flood management and provides support to countries through a HelpDesk on flood management. Through its activities closely linked to flood prevention, mitigation and response, it contributes to the implementation of ER 2. The component will support climate change adaptation and environmental protection, and serve as the provider of climate information to the water sector users, and, as envisaged under GFCS, serve as an arm of the User Interface Programme and thus contribute to ER 3. The component works through increased collaboration between NMSs and NHSs, which is promoted and facilitated. The component will continue to closely link its activities with WCP, TCP and MMP.

## **7. Capacity-building in Hydrology and Water Resources Management (CBH)**

### **Long-term objective**

**7.1** The long-term objective of the component is to assist the rational development, management and operation of NHSs, including the education and training of their staff, strengthening institutional coordination with NMSs and increasing general awareness of the importance of hydrological work.

### **Purpose and scope**

**7.2** The purpose of CBH is to provide guidance to NHSs on the institutional management within the hydrological and water resources development context and to build their capacities to serve their respective countries, through the implementation of the Hydrological Operational Multipurpose System (HOMS) for technology transfer and staff education and training. The component supports informing and educating the public, stakeholders and other government institutions about the socio-economic benefits of hydrologic services. The component also supports the technical cooperation activities in the developing and least developed countries and thus contributes to ER 6. This is a cross-cutting component that has strong linkages to other components within HWRP and will contribute to their implementation.

## **WORLD CLIMATE PROGRAMME**

### **1. Overall scope of WCP**

The World Climate Programme (WCP) primarily aims at enhancing climate services with adequate focus on user interaction, to facilitate evermore useful applications of climate information to derive optimal socio-economic benefits and thereby underpins the Global Framework for Climate Services (GFCS). The scope of WCP is to determine the physical basis of the climate system that would allow increasingly skilful climate predictions and projections, develop operational structures to provide climate services and to develop and maintain an essential global observing system fully capable of meeting the climate information needs.

### **2. Overall objectives of WCP**

Given the growing awareness about the climate sensitivity of the society across a wide range of socio-economic sectors, and increased focus on the need for adaptation and risk management that

is implemented at local level and requires climate information and services available at global to regional, national and local scales, the objectives of the refocused WCP are:

- (a) To improve the understanding of climate processes for determining the predictability of climate, including its variability and change, identifying the extent of human influence on climate and developing the capability for climate prediction and projection;
- (b) To promote comprehensive observation of the global climate system and facilitate the effective collection and management of climate data and the monitoring, including the detection and assessment of climate variability and changes from global to local scales;
- (c) To enhance and promote the availability of and access to user-targeted climate services, especially prediction, by providing an international framework and establishing the operational elements of production and delivery systems for climate services;
- (d) To foster the effective application of climate knowledge and information for the better management of the risks of climate variability and change into planning, policy and practice and the provision of the required climate services;
- (e) To promote capacity development, particularly in developing and least developed countries, to enable them to contribute to the operation of GFCS and at the same time benefit from it.

### **3. WCP structure**

The new refocused WCP will consist of:

- (i) World Climate Research Programme (WCRP);
- (ii) Global Climate Observing System (GCOS);
- (iii) World Climate Services Programme (WCSP).

#### **3.1 WORLD CLIMATE RESEARCH PROGRAMME**

##### **3.1.1 Mission and objectives**

The mission of WCRP is to facilitate analysis and prediction of Earth system variability and change for use in an increasing range of practical applications of direct relevance, benefit and value to society.

The overall objectives of the World Climate Research Programme are to determine:

- To what extent climate can be predicted;
- The extent of human influence on climate.

##### **3.1.2 Scope of the Programme**

The main foci of WCRP research are:

- Observing changes in the components of the Earth system (atmosphere, oceans, land and cryosphere) and at the interfaces among these components;
- Improving knowledge and understanding of global and regional climate variability and change, and of the mechanisms responsible for this change;
- Assessing and attributing significant trends in global and regional climates;

- Developing and improving numerical models and predictive techniques that are capable of simulating, predicting, and assessing the climate system for a wide range of space and timescales;
- Investigating the sensitivity of the climate system to natural and human-induced forcing and estimating the changes resulting from specific disturbing influences;
- Facilitating the translation of climate research results to useful information and knowledge for practical applications in sustainable development and climate services.

In addition to these primary tasks, the WCRP cooperates, as appropriate, with other cognate programmes in the field of Earth system science. In particular, the WCRP will continue to develop its cooperation with its partners in the Earth System Science Partnership, namely the International Geosphere-Biosphere Programme (IGBP), the International Human Dimensions Programme (IHDP) and DIVERSITAS, in order to introduce the chemical, biological, ecological and socio-economic dimensions into models and field studies of the environment, thus promoting further advances in the knowledge of the total Earth system and the understanding of global change in support of sustainable development and global climate services.

## **3.2 GLOBAL CLIMATE OBSERVING SYSTEM**

### **3.2.1 The scope of GCOS**

The Global Climate Observing System (GCOS) is a WMO-led co-sponsored programme of WMO, the IOC of UNESCO, UNEP and ICSU. The GCOS is built on existing operational and scientific observing, data management and information distribution systems. It is based upon an improved World Weather Watch Global Observing System, the Global Ocean Observing System, the Global Terrestrial Observing System, the WMO global observing systems and the maintenance and enhancement of programmes monitoring other key components of the climate system, such as the distribution of important atmospheric constituents (including the Global Atmosphere Watch).

The vision of the GCOS programme is that all users have access to the climate observations, data records and information which they require to address pressing climate-related concerns. GCOS users include individuals, national and international organizations, institutions and agencies. The role of GCOS is to work with partners to ensure the sustained provision of reliable physical, chemical and biological observations and data records for the total climate system – across the atmospheric, oceanic and terrestrial domains, including hydrological and carbon cycles and the cryosphere.

### **3.2.2 Objectives of GCOS**

The objectives of GCOS are to ensure that observations are provided that meet the needs for:

- Characterizing the state of the global climate system and its variability;
- Monitoring the forcing of the climate system, including both natural and anthropogenic contributions;
- Supporting the attribution of the causes of climate change;
- Supporting the prediction of global climate change;
- Enabling projection of global climate change information down to regional and local scales;
- Ensuring the availability of information important in impact assessment and adaptation, and for the assessment of risk and vulnerability, including the characterisation of extreme events.

### **3.2.3 GCOS Steering Committee**

GCOS is directed by a Steering Committee constituted by the four sponsoring partners of the programme and provides guidance, coordination and oversight to the programme. The Steering Committee is supported in its work by its science panels that have been established to define the observational needs required in the domains of the atmosphere, ocean and land.

## **3.3 WORLD CLIMATE SERVICES PROGRAMME**

### **3.3.1 Scope of WCSP**

The scope of WCSP spans across four inter-related areas: (i) climate data and analysis; (ii) climate monitoring, watch and prediction; (iii) climate system operation and infrastructure; and (iv) climate adaptation and risk management; thereby serving as the Climate Services Information System and a part of the User Interface Platform components of the GFCS.

WCSP contributes to improve the availability and access to reliable data, advancement of the knowledge in the area of climate data management and climate analysis, definition of the technical and scientific standards, and development of activities to support them in countries. Climate data management will include data rescue, development and coordination of a global climate data management system compatible with the WMO Information System (WIS).

WCSP defines the associated products and their contents, develop prediction methodologies, including their requirements and standards. It will facilitate provision of regular global and regional consensus statements on the climate monitoring and prediction and tailoring and assessments of the reliability of climate products. The programme would establish and maintain research operations linkages to expedite the implementation of research advances in operational climate services and to ensure ongoing improvement to the operational practices and outcomes.

WCSP will put in place appropriate institutional mechanisms to generate, exchange and disseminate quality information at global, regional and national levels on an operational basis. In particular, it would facilitate the establishment of a network of global, regional and national entities, including Global Producing Centres of Long-Range Forecasts (GPCs), global data and monitoring centres, Regional Climate Centres (RCCs) and climate operations within NMHSs that would serve as key elements that develop and provide the climate information. WCSP will essentially coordinate, define, develop, strengthen and sustain this operational mechanism to produce and disseminate climate products and services and provide guidance on the requirements and best practices for establishing climate service programmes.

WCSP covers the near future to the long-term climate risks by promoting the use of reliable and available climate information, methods, tools and systems through interdisciplinary activities, initially focusing on the agriculture/food security, water resources and disaster risk reduction sectors. Over time, the methods, tools and systems will evolve to cover the requirements of other key social and economic sectors in collaboration with other UN agencies and other international entities.

### **3.3.2 Objectives of WCSP**

- (a) To facilitate the development and implementation of methods to enable rescue, preservation and management of climate data by Members, especially developing countries, and to promote international exchange of climate data and related products;
- (b) To coordinate the development of global and regional climate databases including metadata, in both national and international repositories and facilitate their exchange;
- (c) To develop methods and tools for analysing trends, anomalies, frequencies and extreme values;
- (d) To develop climate indices for assessment and analysis of their occurrence and attribution;

- (e) To coordinate development of a well-coordinated global system for monitoring, analysis, diagnosing and disseminating information on climate variability and change;
- (f) To identify state-of-the-art climate prediction methodologies up to decadal timescales;
- (g) To develop and support consensus-based climate updates and climate watches including both monitoring and prediction aspects;
- (h) To facilitate close interactions between operational and research communities to identify their needs and requirements;
- (i) To support development of methods and tools for operational climate predictions (seasonal, annual and decadal) and climate watch systems, assessment of their socio-economic value and incorporation of user feedback;
- (j) To build an effective infrastructure for seasonal to inter-annual climate predictions by facilitating the development of a network of regional and national climate centres and facilitate global to regional to national flow of operational climate information;
- (k) To facilitate definition, development and standardization of operational climate prediction products and promote standards and quality management;
- (l) To support development and implementation of climate services at the national level;
- (m) To support the interdisciplinary efforts to develop methods and tools for generating sector-specific climate information and products;
- (n) To help Members in developing climate application services based on the climate information and knowledge;
- (o) To raise awareness of climate as a risk and as a resource, and to better communicate climate information to specialists with limited climate background;
- (p) To identify and share best practices for the application of climate information, in order to develop user-oriented climate information, products and services through carrying out a number of showcase projects.

### **3.3.3 Technical guidance for WCSP**

The technical guidance for the WCSP is provided by the Commission for Climatology (CCI). It interacts closely with the Commission for Basic Systems, the Commission for Agricultural Meteorology and the Commission for Hydrology.

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## **WORLD CLIMATE RESEARCH PROGRAMME**

### **1. Mission and objectives**

The mission of WCRP is to facilitate analysis and prediction of Earth system variability and change for use in an increasing range of practical applications of direct relevance, benefit and value to society.



The overall objectives of the World Climate Research Programme are to determine:

- To what extent climate can be predicted;
- The extent of human influence on climate.

## **2. Scope of the Programme**

The main foci of WCRP research are:

- Observing changes in the components of the Earth system (atmosphere, oceans, land and cryosphere) and at the interfaces among these components;
- Improving knowledge and understanding of global and regional climate variability and change, and of the mechanisms responsible for this change;
- Assessing and attributing significant trends in global and regional climates;
- Developing and improving numerical models and predictive techniques that are capable of simulating, predicting, and assessing the climate system for a wide range of space and timescales;
- Investigating the sensitivity of the climate system to natural and human-induced forcing and estimating the changes resulting from specific disturbing influences;
- Facilitating the translation of climate research results to useful information and knowledge for practical applications in sustainable development and climate services.

In addition to these primary tasks, the WCRP cooperates, as appropriate, with other cognate programmes in the field of Earth system science. In particular, the WCRP will continue to develop its cooperation with its partners in the Earth System Science Partnership, namely the International Geosphere-Biosphere Programme (IGBP), the International Human Dimensions Programme (IHDP) and DIVERSITAS, in order to introduce the chemical, biological, ecological and socio-economic dimensions into models and field studies of the environment, thus promoting further advances in the knowledge of the total Earth system and the understanding of global change in support of sustainable development and global climate services.

## **3. Current Programme**

The research priorities of the WCRP are pursued through four major internationally coordinated core projects:

### **Climate and Cryosphere (CLIC)**

Mission:

To assess and quantify the impacts of climatic variability and change on components of the cryosphere and their consequences for the climate system, and to determine the stability of the global cryosphere.

### **Climate Variability and Predictability (CLIVAR)**

Mission:

To observe, simulate, and predict the Earth's climate system with a focus on ocean-atmosphere interactions in order to better understand climate variability, predictability and change.

### **Global Energy and Water Cycle Experiment (GEWEX)**

Mission:

To measure and predict global and regional energy and water variations, trends, and extremes (such as heat waves, floods, and droughts), through improved observations and modelling of land, atmosphere, and their interactions.

### Stratospheric Processes And their Role in Climate (SPARC)

Mission:

To determine the role of stratospheric processes in the Earth's climate, with a particular emphasis on the interaction between chemistry and climate.

WCRP also collaborates with IGBP on the **Surface Ocean-Lower Atmosphere Study (SOLAS)**, the goal of which is to achieve quantitative understanding of the key biogeochemical-physical interactions and feedbacks between the ocean and atmosphere, and of how this coupled system affects and is affected by climate and environmental change.

The activities in support of WCRP Integrating themes are carried out by the following groups:

**Working Group on Coupled Modelling (WGCM)** coordinates WCRP modelling activities and organizing numerical experimentation for the global environmental assessments such as IPCC.

**Working Group on Numerical Experimentation (WGNE)** co-sponsored with the WMO Commission for Atmospheric Sciences (CAS) with a focus on improvement of accuracy and range of numerical weather predictions globally, and to foster the development of atmospheric circulation models for use in weather, climate, water and environmental prediction on all timescales.

**WCRP Observation and Assimilation Panel (WOAP)** coordinates research on climate observations supported by **GCOS** and other international observation programmes (e.g., GEOSS, CEOS, etc.) and promotes the development of climate system reanalysis and greater use of observations in conjunction with climate system models.

WCRP also co-sponsors, with the WMO Commission for Climatology (**CCI**) and the Joint Commission for Marine Meteorology, the **Expert Team on Climate Change Detection and Indices (ETCCDI)** that provides international coordination and organizes collaboration on climate change detection and indices and indicators of climate variability and change and related methodologies, from the surface and subsurface ocean to the stratosphere.

At its most recent session in February 2010, the JSC decided to form two coordinating groups, namely a **Modelling Council** and a **Data Council**. These Councils would report to the JSC and would include representatives from the Core Projects and relevant external organizations to enable activities to be coordinated across the entire WCRP. The JSC also decided to establish a Working Group on regional climate science and information that would facilitate transitioning climate research outcomes to climate services. Terms of Reference for these groups are currently being developed.

WCRP engages the international climate research community in a number of **cross-cutting initiatives** through the implementation of task forces, in coordination and active engagement by its Projects, and working groups in areas such as:

- Anthropogenic Climate Change (**ACC**), including Regional Climate Downscaling (**TFRC**);
- **Seasonal Climate Prediction**;
- **Decadal Variability, Predictability and Prediction**;
- **Sea-Level Variability and Change**;
- **Climate Extremes**;
- **Atmospheric Chemistry and Dynamics (AC&C)**;
- **Monsoon and Climate**.

#### **4. Functions of the Programme**

Recognizing that diagnostic, theoretical and experimental research activities relevant to the climate system are carried out by scientific research establishments within nations, the broad aim of the WCRP is to coordinate and enhance these national efforts, in order to constitute a comprehensive international research programme implemented through concerted actions of participating institutions. The principal functions of the WCRP are then:

- To initiate specific regional or global experiments for the study of particular phenomena or processes;
- To identify research priorities for recommendation to national scientific institutes and funding agencies;
- To propose and facilitate the implementation of relevant international research activities as required;
- To arrange for the rapid and effective dissemination of information on current results and new developments in climate research;
- To facilitate translation and interpretation of scientifically complex information into useful information and knowledge for practical applications in sustainable development and climate services;
- To support training and development of next generation of climate experts, especially in developing regions of the world.

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### **WMO SPACE PROGRAMME**

#### **1. Overall objective and scope**

The overall objective of the WMO Space Programme (WMO SP) is to promote wide availability and utilization of satellite data and products for weather, climate, water and related applications of WMO Members.

Its scope is to coordinate environmental satellite matters and activities throughout all WMO Programmes; to give guidance to these programmes on the potential of remote-sensing techniques in meteorology, hydrology and related disciplines and applications; and to ensure effective cooperation with and among international partners and organizations dealing with satellite systems.

#### **2. Programme structure**

The WMO SP has four main components:

- (a) Integrated space-based observing system;
- (b) Availability and use of satellite data and products;
- (c) Information and training;
- (d) Space Weather coordination.

#### **3. Programme governance**

The lead technical responsibility for the WMO SP is assigned to CBS. The WMO Consultative Meetings on High-level Policy on Satellite Matters (CM) maintain a broad policy overview of the Programme.

Space Weather activities are jointly overseen by CBS and CAeM.

#### **4. Programme activities**

##### **4.1 Integrated Space-based Observing System**

###### **Long-term objective**

The long-term objective is to develop an integrated space-based observing system involving operational and R&D environmental satellites and their associated ground segments. This observing system should support the WWW, as the space-based component of its GOS; and ultimately all the other WMO Programmes and WMO-supported programmes, as the space-based component of WMO Integrated Global Observing System (WIGOS).

###### **Activities**

The space components of the various observing systems are reviewed, and the gaps with respect to requirements are analysed, in order to optimize the effectiveness of each component while striving for cross-cutting integration in the context of WIGOS.

WMO SP leads the revision of the baseline for the space-based observing system to achieve full implementation of the “Vision for the GOS in 2025”. It promotes intercalibration of satellite instruments and harmonization of their specifications. It encourages operational and R&D space agencies to contribute to the GOS and pursue system harmonization with best practices.

The transition of mature research systems to operational status is encouraged when appropriate, with a view to improve operational capabilities in line with evolving requirements, while ensuring the long-term sustainability required for operational applications and climate monitoring.

##### **4.2 Availability and use of satellite data and products**

###### **Long-term objective**

In view of the exponential increase in satellite data which is anticipated from upcoming satellite systems, a major challenge for the WMO SP in the next decade is to make these improved data and derived products available while increasing the number and geographical spread of users.

The objective is to enhance timely accessibility of satellite data and products as required by users in all WMO Regions, in particular in developing countries, to promote data interoperability through WMO Information System (WIS) standards and practices, and to stimulate coordinated processing of observations to derived products with traceable quality.

###### **Activities**

The WMO SP serves as a catalyst for improving dissemination and exchange of satellite observation data and products, and for standardizing data and metadata management consistent with WIS practices.

The Integrated Global Data Dissemination Service (IGDDS) project focuses on: (i) establishing regional requirements for access to data and products; (ii) implementing sustainable regional Digital Video Broadcast by Satellite (DVB-S) dissemination systems offering cost efficient access to satellite data in every region; (iii) integrating all relevant data types in such broadcast services, including inter-regionally exchanged data; and (iv) supporting harmonization of future Direct Broadcast systems as well as complementary data access and distribution services via the Internet, recognizing different user needs.

Building on international science groups and projects, the WMO SP stimulates the coordinated processing of satellite data to products, and the traceable quality of these data and products. Particular attention is given to climate applications, e.g. through the Sustained Coordinated Processing of Environmental Satellite Data for Climate Monitoring (SCOPE-CM) and to Disaster Risk Reduction.

Cooperation is encouraged to develop common basic tools for utilization of remote-sensing data, and on the assimilation of R&D and new operational data streams in NWP systems and climate models.

### **4.3 Information and Training**

#### **Long-term objective**

The long-term objective is to raise awareness on satellite capabilities and promote satellite-related education to keep Members' operational and scientific staff up to date with the latest technological innovations, with a focus on developing countries.

#### **Activities**

The WMO SP implements the Five-year Strategy for the Virtual Laboratory for Training and Education in Satellite Meteorology and Environmental Applications (VLab), relying on the network of Centres of Excellence sponsored by satellite operators. Close links are maintained with relevant national and international education and training initiatives.

WMO SP ensures that appropriate websites and portals provide guidance on the availability and usability of satellite data, products and services. Information material is to be provided, and translated into the official WMO languages as resources allow. Participation of WMO Members from developing countries in satellite users' conferences is encouraged.

### **4.4 Space Weather coordination**

#### **Long-term objective**

The long-term objective is to support international operational coordination for Space Weather, which has a severe impact on space assets and relies to a large extent on space-borne observations, and improve Space Weather warnings to major application areas including aviation.

#### **Activities**

Within available resources, through the Inter-Programme Coordination Team on Space Weather (ICTSW), the WMO SP supports coordination activities focusing on:

- (a) Standardization and enhancement of Space Weather data exchange and delivery through the WIS;
- (b) Harmonized definition of end-products and services, including e.g. quality assurance guidelines and emergency warning procedures, in interaction with aviation and other major application sectors;
- (c) Integration of Space Weather observations, through review of space- and surface-based observation requirements, harmonization of sensor specifications, monitoring plans for Space Weather observation;
- (d) Encouraging the dialogue between the research and operational Space Weather communities.

## **5. Coordination and partnership**

WMO SP is conducted in partnership with space agencies of WMO Members and their coordination bodies: the Coordination Group for Meteorological Satellites (CGMS) and the Committee on Earth Observation Satellites (CEOS).

Participation in the WMO Consultative Meetings on High-level Policy on Satellite Matters (CM) provides space agencies with visibility on the WMO SP and related WMO strategy and expectations.

Through the WMO SP, WMO actively participates in CGMS, the main technical coordination body of space agencies for operational missions for weather or climate on such matters as orbit coordination, contingency planning, data dissemination formats, or data collection services. WMO and CGMS have jointly initiated and are supporting a number of projects (related, for example, to satellite calibration, data dissemination, product generation, or training).

The WMO SP represents WMO as an Associate of CEOS, and interacts with its relevant entities such as the Working Group on Calibration and Validation, and the CEOS Working Group on Climate. Some WMO SP activities, such as maintaining the Dossier on the Space-based GOS, are conducted in collaboration with CEOS.

WMO SP supports expert groups that play a key role in providing expert advice and feedback, and stimulating developments within the user community. These groups include the International Winds Working Group, the International TOVS Working Group, the International Precipitation Working Group, the International Radio-occultation Working Group, and the Space Frequency Coordination Group.

Through its participation in international bodies, WMO SP promotes an integrated, global, space-based observing system, encourages cooperation whilst discouraging unnecessary duplication.

## **PUBLIC WEATHER SERVICES PROGRAMME**

### **1. Main long-term objectives**

The main long-term objectives of the PWS Programme (PWSP) are to:

- (a) Strengthen the capabilities of WMO Members to meet the needs of the community through the provision of comprehensive weather and related environmental services with particular emphasis on public safety and welfare;
- (b) Foster a better understanding by the public of the capabilities of NMHSs and how best to use their services.

### **2. Purpose and scope**

The purpose of the PWS Programme is to assist Members to provide and deliver reliable and effective weather and related services to the public and other user communities in support of safety of life, livelihood and property. To respond to the wide spectrum of requirements of the public, weather-sensitive user groups and national and governmental decision-makers, the following PWS Guiding Principles, which were developed at the inception of the Programme, define the scope of the PWS Programme and form a management framework for the development of a national public weather services programme.

- (a) The **population's right** to weather services for safety, convenience and well-being;
- (b) A single official **source** for severe weather warnings;
- (c) **Focus** on meaningful phenomena that significantly affect the population's safety and well-being;
- (d) Issuing warnings **in time** to allow protective action;
- (e) Use of clear, concise, unambiguous and understandable **language**;
- (f) **Dissemination methods** that ensure widespread, timely and accurate distribution;
- (g) **Educating** the public in the providers' role and services, and how to use their products;
- (h) Seeking **regular input** from public and other users on desirable improvements in services;
- (i) Continuous **monitoring** of the products' accuracy, usefulness and timeliness to improve services;
- (j) **Collaborative arrangements** with media and other organizations for most efficient and cost-effective delivery of services and for minimizing conflict.

Based on these Guiding Principles, the PWS Programme contributes to the WMO Strategic Plan by assisting Members to build capability to develop, improve and deliver user focused services, through regional and national Learning-Through-Doing (LTD) Projects, demonstration projects, training activities, publication of best practices and guidance, and engagement of experts in collaboration with the relevant WMO technical programmes, United Nations (UN) and international agencies, and regional bodies. The outcome is developing, strengthening and sustaining dialogue with users, understanding their needs and delivering products and services to meet those needs.

### 3. Governance

The technical guidance for the PWSP is provided by the Commission for Basic Systems (CBS). In addition, the Executive Council, through its Working Group on Disaster Risk Reduction and Service Delivery (EC WG DRR & SD), provides specific oversight and guidance in matters related to Service Delivery.

### 4. Programme structure

The PWSP activities are implemented through the following components aimed at improving overall service delivery capacities of Members:

- (a) Services and products improvement;
  - (b) Dissemination and communication of products;
  - (c) Support to disaster prevention and mitigation;
  - (d) Socio-economic applications;
  - (e) Public education and outreach;
  - (f) Education and training.
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## AGRICULTURAL METEOROLOGY PROGRAMME

### 1. Overall objective

1.1 The overall objective of the Agricultural Meteorology Programme (AgMP) is to assist Members in the provision of meteorological and related services to the agricultural community to help develop sustainable and economically viable agricultural systems. It keeps WMO Members abreast of technological advances in the domain of agrometeorology and ensures that they find practical use in the work carried out by agrometeorological services.

1.2 The main long-term objectives of the AgMP are:

- (i) To promote Members' indigenous capabilities to provide relevant agricultural meteorological services and technologies for sustainable, environment-friendly, and economically viable agricultural production;
- (ii) To foster a better understanding by farmers and other end-users in the agricultural, forestry and related sectors of the value and use of meteorological (including climatological) information in planning and operational activities.

### 2. Purpose and scope

2.1 AgMP fulfils one of the main purposes of WMO, namely to further the application of meteorology to agriculture, water problems, and other human activities (paragraph (d) of Article 2 of the Organization's Convention). It also facilitates the application of meteorology to the protection of livelihoods and property, the health and well-being of citizens, economic growth and the protection of the environment.

2.2 The scope of the AgMP is broad since agriculture as defined by CAgM includes agriculture, forestry, livestock and fisheries. Therefore, the AgMP tries to facilitate of application of meteorology to all of these sectors. Also, AgMP and CAgM have a unique responsibility since they are the only United Nations based entities that represent the scientific discipline of agricultural meteorology.

2.3 The purpose of the AgMP is to support food and agricultural production and activities. The Programme assists Members in provision of meteorological and related services to the agricultural community to help develop sustainable and economically viable agricultural systems, improve production and quality, reduce losses and risks, decrease costs, increase efficiency in the use of water, labour and energy, conserve natural resources and decrease pollution by agricultural chemicals or other agents that contribute to the degradation of the environment. Although sometimes combined, climate information is used mainly for planning purposes, while recent weather data and weather forecasts are used mostly in current agricultural operations.

2.4 Specific efforts ensure that improvements in knowledge, methodologies and skill are made available to developing and Least Developed Countries (LDCs). It also addresses a number of important issues related to disaster risk reduction which includes drought within the framework of an integrated, multi-hazard approach to disaster risk reduction, including early warnings.

2.5 AgMP promotes the planning and use of agricultural technologies for sustainable food production through the provision of improved agricultural weather and climate data systems that are necessary to expedite generation of products, analyses and forecasts that facilitate agricultural cropping and management decisions, irrigation scheduling, commodity trading and markets, fire weather management and other preparedness for calamities, and ecosystem conservation and management. One goal is to enhance the quality of agrometeorological advisories and products and the bulletins that are routinely issued by Members by developing and disseminating improved tools and methods for their preparation through the World Agrometeorological Information Service (WAMIS-[www.wamis.org](http://www.wamis.org)).



2.6 AgMP provides capacity-building in agrometeorology at the national and regional levels. It promotes technological advances in the field of agrometeorology through conferences, workshop and symposia and the publication of the proceedings from these events.

2.7 AgMP contributes to the implementation of the WMO Strategic Plan, mainly to Expected Results 1, 2 and 6 (2012–2015). It also will contribute to the Global Framework on Climate Services by enhancing the contribution of climate information to land management, agriculture and food security including risk evaluation and information delivery, cooperation and partnerships, adaptation strategies for resilient agricultural systems, and climate change mitigation. This will be primarily done through the activities of the Commission for Agricultural Meteorology (CAgM) Open Programme Area Group 3 on Climate Change/Variability and Natural Disasters in Agriculture. The activities of the Commission will provide a major contribution to the development of the Climate User Interface Programme (CUIP) of GFCS.

### **3. AgMP governance**

The technical guidance for the AgMP is provided by CAgM. The Commission interacts closely with the Commission for Climatology (CCI) and the Commission for Hydrology (CHy) through the CCI–CAgM–CHy Working Group on Climate, Food and Water and on issues related to drought and the user interactions with GFCS. CAgM interacts with the Joint WMO-IOC Commission for Oceanography and Marine Meteorology (JCOMM) on climate and fisheries issues. It also is involved in reaching out to the agricultural community with regards to the Sand and Dust Storm Warning and Advisory System (SDS-WAS) which is under the direction of the Commission for Atmospheric Sciences (CAS). CAgM also provides linkages between weather forecast products from NWP products and the applications for agricultural decision-makers with the Severe Weather Forecast Demonstration Project (SWFDP) which is a Commission for Basic Systems (CBS) activity.

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## **TROPICAL CYCLONE PROGRAMME**

### **1. Main long-term objectives**

The main long-term objectives of the Tropical Cyclone Programme are:

- (1) To strengthen the capabilities of WMO Members to provide reliable and timely forecasts of tropical cyclone tracks and intensities, and related forecasts of strong winds, heavy rainfall, and storm surges, covering all tropical cyclone-prone areas;
- (2) To promote the establishment of national disaster risk management and reduction mechanism of the Members with regard to tropical cyclones with multi-hazard configuration.

### **2. Purpose and scope**

The purpose of the Programme is to assist the Members to establish national and regionally coordinated institutional systems to ensure that the loss of life and damage caused by tropical cyclones are reduced to a minimum. This includes facilitating WMO's role in the implementation of follow-on activities to the International Strategy for Disaster Reduction and helping Members to obtain the humanitarian, social and economic benefits of effective tropical cyclone disaster mitigation and to achieve sustainable development. The Programme therefore makes its main contribution to the implementation of the WMO Strategic Plan by enhancing the forecasts of tropical cyclones and associated hazards and strengthening the NMHSs capacity to deliver the services in full compliance with the users' demand. To this end, the Programme places its emphasis on building capacity of the Members especially SIDSs and LDCs, developing assistance tools for forecasters, facilitating application of Research and Development outcomes, promoting

cooperative activities of regional TC bodies, enhancing coordination among the regional services, and taking a multi-hazard approach inclusive of flooding and storm surge. It also makes a closer link with relevant WMO Programmes and international agencies which are concerned with tropical cyclone disaster mitigation.

### **3. Governance**

The technical guidance for the Programme is provided by WMO Regional Associations concerned, regional tropical cyclone bodies and the Commission for Basic Systems, with regard to RSMC with activity specialization in tropical cyclones. In addition, the Executive Council Working Group on DRR and Service Delivery also provides overall guidance in matters related to tropical cyclone disaster risk reduction and service delivery.

### **4. Programme structure**

The activities of the Programme are implemented mainly through the two major components of the Programme:

- (1) The general component which is focused on capacity-building and transfer of technology, information and expertise to the Members towards meeting the objectives of the Programme. It also encompasses the broader training requirements of the Members;
- (2) The regional component which comprises the planning and implementation of the programmes of the regional TC bodies. Each of the five regional bodies has an operational plan or manual which aims to provide the best possible forecasting and warning services through regional agreements and cooperation. These plans are regularly updated to incorporate new facilities, advances and developments.

## **MARINE METEOROLOGY AND OCEANOGRAPHY PROGRAMME**

### **1. Main long-term objectives**

The long-term objectives of MMOP are:

- (i) To enhance the provision of marine meteorological and oceanographic services by Members in support of the safety of life and property at sea and in coastal areas. Based on an integrated observing and data management system, the MMOP is to contribute to sustainable marine environment and coastal area management including risk management for ocean-based economic, commercial and industrial activities; and to coordinate and enhance the provision of the data, information, products and services required to support climate research and the detection and prediction of climate variability;
- (ii) To manage the evolution of an effective and efficient programme through the selective incorporation of advances in meteorological and oceanographic science and technology; and to work to ensure that all countries have the capacity to benefit from and contribute to these advances, and to contribute to the implementation of the programme in general.

### **2. Purpose and scope**

The MMOP seeks to coordinate, and develop and recommend standards and procedures, for a fully integrated marine observing, data management and services system that uses state-of-the-art technologies and capabilities. The Programme aims to maximize the benefits to Members in the projects, programmes and activities that it coordinates in their interest and that of the global marine

community in general. Thus the scope of MMOP is defined in responding to the evolving needs of all users of marine data and products, and includes an outreach programme to enhance the national capacity of all maritime countries –safety at sea has remained the priority, while other applications such as coastal area management, disaster risk reduction, and climate services has become increasingly important.

### **3. Governance**

The overall technical guidance and governance for MMOP is provided by the Joint WMO-IOC Technical Commission for Oceanography and Marine Meteorology (JCOMM), jointly sponsored by WMO and the Intergovernmental Oceanographic Commission (IOC) of UNESCO.

### **4. Programme structure**

The MMOP is implemented primarily through JCOMM, which is structured into three Programme Areas and a number of cross-cutting activities, aimed at improving overall marine and ocean service delivery capacities of Members:

1. Services and Forecasting Systems Programme Area, including maritime safety services, marine pollution emergency response, sea ice, waves and storm surges, ocean forecasting systems, and a range of marine climate services;
2. Observations Programme Area, involving an integrated global marine meteorological and oceanographic observing system;
3. Data Management Programme Area, coordinating and providing standards and best practices in the management of marine meteorological and oceanographic data, as a contribution to WIGOS/WIS;
4. Capacity Development and Outreach, to enhance the capacity of all Members to contribute to and benefit from the data and services delivered under MMOP;
5. Satellite Data Requirements, to determine the detailed requirements for satellite and other remote sensing ocean data in the delivery of marine and ocean services;
6. International coordination, within the UN system, with other intergovernmental and non-governmental organizations, with the marine user community, and with the private sector in general.

## **WMO QUALITY MANAGEMENT FRAMEWORK**

### **1. Purpose and scope**

WMO has encouraged Member NMHSs to implement an end-to-end Quality Management System (QMS) covering all activities from raw measurements and observations to services delivered to end users. To this end, the WMO Secretariat has developed a Quality Management Framework (QMF) and has tasked an Inter-Commission Task Team (ICTT) with the development and implementation of this Framework for National Meteorological Services (NMSs) to address:

- (a) WMO technical standards;
- (b) Quality management system(s) including quality control;
- (c) Certification procedure(s).

The **WMO Quality Management Framework** is an appropriate holistic approach to the delivery of meteorological, climatological, hydrological, marine and related environmental data, products and services.

The **aim** of the WMO Quality Management Framework is to ensure the development, use and maintenance of the WMO technical documentation, supporting quality management systems for meteorological, climatological, hydrological, marine and related environmental data, products and services.

It consists of the following **key elements**:

- (a) A WMO quality policy;
- (b) Objectives aligned with the WMO Strategic Plan;
- (c) Technical documentation and the procedures relevant to their development, review and adoption.

## **2. Structure and governance**

The Inter-Commission Task Team on QMF (ICTT-QMF) reports to the Executive Council and is currently chaired by Mr Yap Kok Seng (Malaysia). Within the WMO Secretariat, the Chief of the Aeronautical Meteorology Division (C/AEM) is the officer in charge of QMS, whereas the Director of the Observing and Information Systems Department (D/OBS) is in charge of the relationship to ISO and matters of Technical Standards.

## **3. Cooperation with and implementation by technical commissions**

All technical commissions have nominated experts as a minimum, or expert/working groups to interact with the ICTT-QMF. In particular, the following technical commissions are active in implementing QMS for data, products and services:

- (a) CAeM has successfully completed a Pilot Project for the implementation of QMS in a developing country (United Republic of Tanzania) for services to aviation);
  - (b) JCOMM is actively taking steps to implement a QMS for MET-OCEAN data, products and services (Recommendation 8 (JCOMM-III) refers). It was noted that the Australian Bureau of Meteorology has commenced the development and implementation of a QMS for the delivery of Marine Weather and Ocean Services as a pilot project on behalf of JCOMM;
  - (c) CBS has decided that QMS must be an integral part of the WIGOS, and that it would form a core component of the service-oriented parts of the Commission such as PWS or GDPFS;
  - (d) CHy has chosen both standardization of measurements and observations and the status of regulatory documents as priority areas of their QMS initiatives;
  - (e) CIMO has taken a lead in developing new Technical Standards in cooperation with ISO. The instruments and methods of observation used form the essential basis for QMS on the data input for all WMO Programmes and activities;
  - (f) CCI has taken the decision to apply QMS to climate observations, data exchange, database and service delivery, publications, capacity-building and research;
  - (g) CAS has chosen its GAW Programme as a lead for QMS;
  - (h) CAgM has nominated a Rapporteur for QMS.
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## INFORMATION AND PUBLIC AFFAIRS PROGRAMME

### 1. Overall objective

The over-arching goal of the WMO Information and Public Affairs Programme is to win political and public support for the Organization and its Members to enable them to better serve society. In the pursuance of that goal, corporate communications mirror the evolving priorities and mandates set by Members for the Organization.

### 2. Message

Strategic core message:

*WMO fosters user-friendly science to help provide services vital for the everyday lives of people*

Derived messages:

- *WMO facilitates solutions to protect lives and livelihoods and to improve the quality of life for people everywhere, through better science in weather, climate and water domains.*
- *The activities of WMO and the NMHSs are vital investments in human, social and economic development, with big returns for society.*
- *The WMO is a responsive organization dedicated to serving the people, by working together with governments, business and civil society.*

### 3. Purpose and scope

The preamble of the WMO Convention as amended by Cg-XV reflects the growing social and economic role of WMO and NMHSs in managing issues connected with weather, climate and water. WMO is named as a principal actor in saving and protecting lives and property as well as helping to safeguard future generations. The vital importance of NMHSs is reaffirmed in providing services in support of the protection of life and property, the environment, and sustainable development, among other national needs.

The increase in extreme weather events (floods, droughts, storms and other hazards) caused by climate change has generated unprecedented curiosity of the public in the causes of such events and broadens possibilities of creating a better understanding of the weather and climate system. This context fosters people's interest in science-based services for the protection of lives and livelihoods.

The IPCC controversy and the hacking of climate data bear witness to the need for more dynamic communications to educate the media and help the public distinguish "good science" from "bad science." The WMO scientific community should coalesce in reacting to manipulations of science by enhancing climate literacy of the public through explanations in layman's language and playful tools.

Unlike campaigners, WMO's advocacy does not aim at preventing or promoting specific attitudes. Instead it highlights the value-added to the quality of people's lives by the work of WMO and NMHSs. It is intent based rather than campaign based.

### 4. Governance

The IPA Programme supports all WMO and NMHS activities by providing timely, relevant and science-based information in the appropriate format and style to decision-makers and the public at

large. It reports to the Executive Council, which provides guidance as part of its oversight of WMO strategy implementation.

## **5. Implementation activities 2012–2015**

During the period, a project proposal, including the consolidation of the WMO web presence, will be developed and resources mobilized to build awareness on weather, climate and water issues and WMO and its Members contribution to the sustainable development of nations, with a special focus on:

- (a) Illustrate how people in their everyday lives benefit from the work of National Meteorological and Hydrological Services (NMHSs) and cooperation among them;
- (b) Build awareness of and support for the Global Framework for Climate Services among media, decision-makers and civil society;
- (c) Demonstrate how early warning systems and risk reduction management protect people against weather and climate related disasters, with a focus on reaching the most vulnerable nations and communities;
- (d) Attract investments in weather, climate and water observations, research and applications, using new communication tools to establish interactive relationships with clients in order to encourage effective and beneficial use of WMO services.

The main focus will be to ensure that WMO and the NMHSs take advantage of the raising awareness and interest in weather, climate and water issues to consolidate leadership at all levels and across disciplines, especially in connection with the development and implementation of the GFCS, by:

- (a) Encouraging direct interaction with the public, in particular through climate information and services that inspire interest in specific areas of work;
- (b) Building upon WMO science which brings added value to ordinary lives, which helps identify best choices in the face of a changing climate, thanks to WMO's singular strength of its 189 Members acting in a coherent and collaborative manner;
- (c) Developing a communication product that provides concrete examples of the socio-economic returns of the work of NMHSs and encouraging the integration of meteorological, hydrological and climate information in planning and decision-making;
- (d) Tying together the WMO (Secretariat, Members, Regional offices and the NMHSs), partners within the United Nations system, other international and regional entities, both intergovernmental and non-governmental, private sector and grassroots associations and civil society at large (including schools and other social groups) to promote the benefits of integrating climate information in planning and decision-making;
- (e) Responding to the least developed country (LDC) special needs centred on communication capacity-building in NMHSs and the media.

In accordance with the Strategic and Operating Plan, activities of the Information and Public Affairs Programme include, inter alia, the following:

- (a) Provision of strategic advice, initiatives and programmes to influence decision-makers, and improve public awareness on weather, water and climate-related issues;
- (b) Building alliances with media and improving outreach through media campaigns, press conferences, and supporting print and audiovisual materials;

- (c) Enhanced knowledge management and promotion of WMO issues through its Web site, including: consolidation of the existing overall WMO web presence; strengthening of the Media centre component; development of initiatives incorporating social media, youth and outreach to developing countries;
  - (d) Editorial development, production and promotion of the WMO Bulletin, MeteoWorld and brochures for the public, so that this information targets audiences appropriately, and supports strategic communications needs of WMO and Members;
  - (e) Fostering a communications culture within WMO and NMHSs, including through provision of training for media, web and social media initiatives;
  - (f) Celebration of the annual World Meteorological Day in a way that supports NMHSs and furthers strategic goals,
  - (g) Development, implementation and/or participation in promotional events and exhibitions. Creation of supporting materials such as calendars, displays, audio-visual presentations, etc.
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## **VOLUNTARY COOPERATION PROGRAMME**

### **1. Long-term objective**

The main long-term objective of the WMO Voluntary Cooperation Programme (VCP) is to provide timely and effective technical assistance to Members by ensuring and furthering:

- (a) Coordinated support to high-priority VCP projects by donors;
- (b) Members' participation in the VCP Programme;
- (c) Effective management and operation of the VCP Programme.

### **2. Purpose and scope**

The main purpose of the WMO Voluntary Cooperation Programme (VCP) is to assist Member countries through cooperative efforts of Members to complement implementation activities for WMO scientific and technical Programmes under national programmes, bilateral or multilateral programmes, Trust Fund arrangements and the United Nations Development Programme (UNDP).

The VCP provides, inter alia, for support to be given to Member countries at their request either in the form of equipment and services, including training, contributed on a voluntary basis by Member countries or by direct financing, using financial contributions obtained on the same basis.

### **3. VCP governance**

The technical guidance for the VCP is provided by the Executive Council and its subsidiary bodies. The EC collaborates closely with the presidents of regional associations and technical commissions as well as contributors to the VCP on technical cooperation activities.

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## **EDUCATION AND TRAINING PROGRAMME**

### **1. Overall objective**

The overall objective of ETRP is to assist the National Meteorological and Hydrological Services (NMHS) of Member States develop staff with the competencies (knowledge, skills and behaviors) required to deliver the meteorological, hydrological and related services mandated by their Government and that help meet their international obligations.

### **2. Purpose and scope**

To assist Members develop and utilize education and training resources in meteorology and hydrology, and to assist in coordinating the setting of international standards for this education and training.

Assist Members, particularly Least Developed Countries (LDCs) and Small Island Developing States (SIDSs), facing difficulties in providing national initial and ongoing meteorological and hydrological education and training of their staff through bi- and multi-lateral activities. The institutions in which the education and training activities are carried out include WMO Regional Training Centres (RTCs), national meteorological training institutions, the training units of Meteorological Services, universities and research centres.

The activities of the ETRP encompass the following broad approaches:

- (a) Develop and review the standards required for education and training of Meteorologists, Meteorological Technicians, Hydrologists or Hydrological Technicians in line with changing international regulations, technical and educational and societal demands;
- (b) Liaise with the WMO Technical Commissions in the development of the competencies (knowledge, skills and behaviors) required for the specialist areas overseen by each of the Commissions;
- (c) Assist NMHSs develop adequately trained staff to provide meteorological, climatological and hydrological related information and services;
- (d) Promote capacity development by assisting NMHSs become self-sufficient in meeting their education and training needs and developing their human resources;
- (e) Promote and strengthen the development and exchange of education and training knowledge, resources and expertise between Members, making particular use of relevant technologies and techniques such as e-learning;
- (f) Promote high-quality continuing education in meteorology, climatology, hydrology and related disciplines to update the knowledge and skill of NMHS staff in line with scientific, technological and educational advances and innovations;
- (g) Assist in the education of the public, governments and other interested parties regarding the societal socio-economic benefits of meteorological, hydrological, oceanographic and related services.



These approaches will ensure that the high priority activities of aviation services, WIS and WIGOS, GFCs and Disaster Risk Reduction are supported by the development and execution of appropriate education and training programmes.

### 3. ETRP governance

Oversight for the ETRP is provided by the WMO Executive Council.

### 4. ETRP structure

ETRP consists of four interdependent components:

- (a) Human resources development;
- (b) Training activities;
- (c) Education and training fellowships;
- (d) Support to training events under other WMO Programmes.

#### 4.1 Human resources development

**Purpose and scope:** To provide a framework for assessing the present and future needs of Members for educated and trained personnel. This framework provides an objective basis for planning and setting priorities, as well as assisting and providing advice to Members. The activities under this component will contribute to the implementation of Expected Result 6 through an enhancement of the management capabilities of personnel in Member States, particularly those from NMHSs.

**Long-term objective:** Human resource development in NMHSs is supported through a coordinated, priority driven, approach.

#### 4.2 Training activities

**Purpose and scope:** To contribute to the education and training process with respect to training centres, in particular RTCs, through provision of training materials, instructors and management of training events, and by acting as the interface between Meteorological and Hydrological Services and the international meteorological and hydrological education and training community. The activities under this component will contribute to the implementation of Expected Result 6 by an enhancement of the capabilities of education and training personnel in Member States, particularly those from NMHSs.

**Long-term objectives:**

- (a) More effective use of training materials and technologies, including distance learning techniques is made by Members;
- (b) RTC training activities meet more Member demands;
- (c) More effective, and wider, utilization by user sectors of meteorological and hydrological information and services.

### 4.3 Education and training fellowships

**Purpose and scope:** To assist Members educate and train meteorological and hydrological personnel through funding and organization of specially tailored individual and group study training programmes, including management and familiarization visits/study tours for senior personnel. This component focuses on the provision of long-term and short-term fellowships to NMHS personnel. The activities under this component will contribute to the implementation of Expected Result 6 by an enhancement of the number of qualified personnel in Member States, particularly those from NMHSs. Education and training is mainly provided in subject areas and technologies for which the facilities and teaching expertise are not available at home. Emphasis continues to be placed on using, as a first priority, the training facilities within the regions concerned, in particular those of the RTCs.

**Long-term objective:** Human resources in NMHSs are strengthened through the implementation of short- and long-term fellowships.

### 4.4 Support to training events under other WMO Programmes

**Purpose and scope:** To monitor, coordinate and assist the planning of training events implemented by Members or the Secretariat under other WMO Programmes which include specific training responsibilities. The scope of the component therefore extends to collaboration and interaction with the other major Programmes of the Organization. The activities under this component will contribute to the implementation of Expected Results 1 to 6 by an enhancement of the capabilities of personnel in Member States in specialized areas, particularly those from NMHSs.

**Long-term objective:** Education and training activities are coordinated across all WMO Programmes.

## WMO PROGRAMME FOR THE LEAST DEVELOPED COUNTRIES

### 1. Overall objective

The overall objective of the Programme is to enhance the capacities of the NMHSs of the LDCs including those which are SIDS, so that they can contribute efficiently and in a timely manner to the socio-economic development efforts of the countries concerned through the production, delivery and effective use of relevant weather, water and climate information and services in order to eradicate poverty, achieve internationally agreed development goals and enable graduation from the least developed country category.

### 2. Purpose and scope

In support to the Istanbul Programme of Action for the LDCs for the decade 2011–2020, adopted by the Fourth United Nations Conference on the LDCs, the WMO Programme for the LDCs will contribute to the following strategic and specific areas:

- (a) Building viable national productive capacity in all sectors, particularly infrastructure, energy, transport and other weather and climate sensitive sectors;

- (b) Promote agriculture, food security and rural development strategies that strengthen support for smallholder farmers and contribute to poverty eradication;
- (c) Invest in basic services for health, education, water and sanitation;
- (d) Strengthen the resilience of LDCs by reducing their vulnerability to economic, natural and environmental shocks and disasters, as well as climate change and, enhancing their ability to meet these challenges, particularly climate change adaptation and mitigation;
- (e) Promote science and technology for peaceful and development purposes including strengthening national and regional institutions, as appropriate and in line with LDCs' national development priorities;
- (f) Strengthen the global partnership and public-private partnerships for inclusive economic growth and sustainable development of LDCs.

The resources mobilized within the framework of this Programme, including those available from the Trust Fund for the NMHSs of Least Developed Countries (established by Cg-XIV), will be used to support the NMHSs of the LDCs to enhance their capabilities to participate and contribute actively to priority areas such as agriculture, food security and rural development, disaster risk reduction, health, water resources management and climate change adaptation and mitigation. Specific projects will be developed for individual LDCs and on a subregional basis for countries in Africa, Asia and the Pacific.

### **3. Governance**

**Overall** guidance for the LDC Programme is provided by the Executive Council as part of its oversight of capacity-building activities.

### **4. Implementation activities 2012–2015**

During the period, project proposals will be developed and resources mobilized to assist the LDCs to:

- (a) Raise the profile of NMHSs with the national development outcome and increase government and stakeholders support to the NMHSs, through advocacy and institutional capacity-building, among others;
- (b) Improve the infrastructure and operational facilities of NMHSs in LDCs;
- (c) Enhance regional cooperation in the countries concerned, especially in areas such as training and the production, delivery and effective use of weather and essential climate services;
- (d) Share good practices and experiences.

The main focus will be to ensure that NMHSs are able to address adequately such issues as the relevant priority areas for action in the Istanbul Programme of Action for the LDCs, particularly productive capacity sectors, agriculture, food security and rural development, disaster risk reduction, water resources management and climate change and environmental sustainability.

In accordance with the Strategic and Operating Plan, activities of the Programme include, inter alia, the following:

- (a) Assistance to all the LDCs in the preparation and implementation of development plans of their NMHSs based on the priority needs of countries;
  - (b) Development of technical cooperation projects and programmes on infrastructure development and socio-economic benefit valuation, climate change issues, including fast track projects;
  - (c) Provision of support in the area of human resources development through special training of selected staff;
  - (d) Development of capacity-building activities, including planning, management and resource mobilization;
  - (e) Resource mobilization and technical assistance for the development of NMHSs activities.
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## **REGIONAL PROGRAMME**

### **1. Background**

The WMO First Congress (1951) established six WMO Regions with related Regional Associations (RAs). The Regional Programme (RP) aimed at facilitating a regional approach to the implementation of WMO Programmes and activities, was first introduced by Seventh Congress (1975). As a cross-cutting programme, the RP contributes to all Expected Results of the WMO Strategic Plan, with its main focus on ER 6 of the WMO Strategic Plan 2012–2015.

### **2. Overall objective**

The overall objective of the RP is to ensure the efficient and effective functioning of the six RAs of the Organization in coordinating meteorological, hydrological, climatological and related activities of their Members. The RP provides a framework for regional cooperation in the implementation of the WMO strategies, policies and programmes taking into account regional requirements, capacities and priorities.

### **3. Purpose and scope**

**3.1** The RP provides support to the six RAs. The regional associations play a key role in planning and coordinating the regional activities, aligning them with the WMO Strategic Plan and the other WMO technical and scientific programmes, ensuring a harmonized and synchronous implementation effort by Members. RAs should play an important role in monitoring and evaluation of the implementation activities of their Members, establishing suitable baselines and measuring performance.

**3.2** The RP ensures that in the planning, implementation and evaluation of the scientific and technical programmes of the Organization, the particular needs and capabilities of Regions are recognized and considered, taking into account the best interests of the Organization as a whole. The activities under the RP provide significant assistance in addressing regional aspects and

integrating them within the entire scope of the work of WMO, particularly in strengthening the role and operation of NMHSs at the national and regional levels to enable them to fulfil their mandates and provide adequate response to emerging challenges.

**3.3** The RP is a cross-cutting programme involving all Members, RAs and TCs. It provides a two-way interface between the Members and the WMO Secretariat to allow for streamlined expert assistance to Members, particularly developing and Least Developed Countries, and for feedback on best practices and lessons learned. The RP identifies the need for and fosters the establishment of Regional Centres to serve Members in different fields, such as, numerical weather prediction, climate, instruments, education and training. The regional basic observing networks (RBSN/RBCN) are also coordinated through the RP mechanisms in coordination with CBS and the WMO Secretariat, taking into account the Global Framework for Climate Services (GFCS).

**3.4** Through the RP, WMO establishes and maintains links and partnerships with relevant regional and subregional organizations, inter-governmental and economic groupings in the Regions. In this way it promotes WMO activities, contributes to the implementation of the WMO strategic objectives, and provides tools needed to effectively address regional, subregional and national issues of importance to society.

**3.5** The RP accounts for the wide range in development levels of the countries in the various WMO Regions resulting in large differences in the capacities of the respective NMHSs. In this regard, RP, as part of the WMO capacity development effort, focuses on the assistance given at regional level that is needed to bridge gaps in the capabilities of all Members, especially LDCs, SIDS and countries in transition to produce, utilize and benefit from hydrometeorological information, products and services, as called for by WMO strategies, standards and recommended practices.

#### **4. Governance**

The overall guidance and direction of the RP is provided by the regional associations and, during the intersessional periods, the oversight of the regional activities is carried out by the presidents of the regional associations, assisted by their respective management groups. The regular meetings of the presidents of RAs allow for the inter-regional coordination of the Programme.

#### **5. Programme structure**

**5.1** The RP consists of two interdependent functional areas, as follows:

(a) Regional associations activities:

- Institutional support to RAs;
- Regional events;

(b) Regional cooperation and partnership:

- Coordination of capacity development activities in the Regions;
- Cooperation with regional partners.

**5.2** The RP supports the organization and conduct of the RA sessions which decide on ways of coordinated implementation of the WMO Programmes and strategies in the respective Regions and develop regional operating/action plans to address priority tasks through coordinated implementation efforts of its Members. The RAs have emphasized the need for capacity

development of its Members, including activities taken by individual or groups of Members on behalf of the Region, coordinated through the RP. In order to pursue the tasks during their intersessional periods, RAs develop appropriate work structures for its subsidiary bodies such as working groups, task teams, networks and forums, engaging the available expertise of its Members based on the principle of volunteerism. The RP supports the activities of RA's subsidiary bodies and plays an important role in ensuring consistency between the WMO Strategic Plan, technical programmes and respective regional activities. The RP provides technical and logistics support to the related RA activities in order to ensure achievement of planned key outcomes.

**5.3** In each WMO Region there are a number of international organizations, inter-governmental agreements, regional economic groupings, development agencies, and NGOs, whose objectives and activities are related to those of WMO. The RP works towards establishment of close cooperation and partnership with those organizations in order to find synergies, possibilities for financing projects and provision of technical assistance to Members in the Region. The RP accounts for the representation of WMO in different inter-agency and inter-governmental meetings at regional and subregional level, thus, contributing to a better visibility of WMO and the NMHSs and emphasizing their role in the development agenda.

**5.4** WMO Regional Offices support the RP and other Programmes as appropriate. The Regional Offices include a number of offices located in Sub-Regions for closer coordination of regional activities with Members and development partners. The RP contributes to capacity development efforts, through the Regional Offices and WMO Offices in the Regions, by maintaining close relations with all Members, by acting as point-of-contact between Members and the WMO Secretariat. One of the main tasks of these Offices is to advocate the role of the NMHSs and the need for support from the governments to sustain and enhance their operations. A major task in the advocacy effort is to demonstrate the socio-economic benefits of the weather, climate and water services and promote the need to invest in necessary infrastructure, as well as in related research and development. The RP puts emphasis on strengthening the national and regional institutional frameworks, legislation and regulations, in order to ensure sustainability of NMHSs and their continuous improvement.

## **DISASTER RISK REDUCTION PROGRAMME**

### **1. Long-term objective**

The main long-term objective of the WMO DRR Programme is to contribute to the strengthening of institutional capacities with respect to the provision of meteorological, hydrological and climate services and cooperation in supporting disaster risk management for the protection of lives and property and contributing to sustainable development of Members.

### **2. Purpose and scope**

The purpose of the WMO DRR Programme is to assist Members to provide and deliver services that are directed towards the protection of lives, livelihoods and property, in a cost-effective, systematic and sustainable manner.

The scope of the Programme is defined through its five strategic goals underpinned by the Hyogo Framework for Action 2005–2015 and approved by Cg-XV:

- (a) Development, improvement and sustainability of early warning systems 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;
- (b) 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;
- (c) 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 disaster risk reduction decision processes and operations engaging socio-economic sectors;
- (d) Stimulate a culture of resilience and prevention through strengthening of capacities for better integration of meteorological, hydrological and climate' products and services in disaster risk reduction across all socio economic sectors, such as land use planning and infrastructure design and continued public education and outreach campaigns;
- (e) Strengthening cooperation and partnerships of WMO and NMHSs in national, regional and international user forums, mechanisms and structures for implementation of disaster risk reduction.

### **3. Governance**

The guidance and oversight to the DRR Programme is provided by the Executive Council Working Group on Service Delivery (EC WG SD). The implementation of the Programme engaged a number of inter-commission task teams, with experts drawn from CBS, CHy, CCI, JCOMM and CAgM.

### **4. Programme structure**

The DRR Programme is cross-cutting and is implemented through coordination among WMO Members, regional associations, WMO Technical Programmes and Commissions, WMO global operational components (GDPFS, WIS, WIGOS), other UN international and regional humanitarian and development partners and the regional inter-governmental disaster risk management agencies linked to the UN-ISDR System. Specifically, the implementation of the DRR Programme is built upon strong cooperation across a number of programmes such as WWW, HWR, WCP, TCP, PWS, MMOP, and AgM. The Programme is implemented through regional and national projects based on a project management framework and set of criteria approved by the WMO EC-LXII.

Implementation of resource mobilization in support of the crosscutting DRR Programme is coordinated through the WMO resource mobilization office, with consideration for:

- (a) The development of DRR Programme implementation priorities based upon the WMO's Strategic and Operating Plans;
  - (b) Identification of strategic donors, understanding of their priorities and interests in investing in DRR projects in different regions and their engagement in the projects from early stages of assessments and project identification;
  - (c) Realization of post-disaster funding opportunities such as the UN Flash Appeal led by UN-OCHA and the Post Disaster Needs Assessment (PDNA) and reconstruction planning, led by UNDP–World Bank–European Union.
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## AERONAUTICAL METEOROLOGY PROGRAMME

### 1. Main long-term objective

The Aeronautical Meteorology Programme has the objective of furthering the application of meteorology to aviation by providing aviation stakeholders with operational meteorological information required for a safe, regular and efficient air navigation considering also the mutual impact of aviation, the global environment and, in particular, climate change.

### 2. Purpose and scope

The AeMP promotes improvements in the capabilities of Members, particularly in developing countries and those in transition, through technology transfer and capacity-building, so as to enable them to serve international and national civil air navigation and to meet the requirements for such services as defined by the relevant bodies of ICAO, national meteorological authorities and civil aviation authorities. The education and training component of the programme, in close cooperation with the relevant programmes of WMO and the ICAO, continually reviews the changing competency requirements of personnel in aeronautical meteorology, and maintains a competency assessment toolkit to enable Members to monitor, verify and document the competency of their personnel. The governance and partnership element of the programme provides guidance material, exchange of best practice models, documentation and training to Members encountering difficulties in providing services to the required standards. These activities include guidance on verification and evaluation of products, individual assistance in difficult cases, and fostering of regional cooperative agreements through relevant Task Teams of regional associations. Close liaison is maintained with ICAO, regulators and Air Navigation Service Providers to translate scientific progress into operational benefits. Areas of work will include new net-centric information systems, up-linking ground- and space-based observations as well as nowcast products to aircraft and ATM units, and issues of Volcanic Ash and Space weather. Estimating impacts of climate change on aviation operations with services helping to adapt to such changes are another area of future priorities.

### 3. Governance

The constituent body providing technical guidance to the programme is the Commission for Aeronautical Meteorology which meets every four years, and holds conjoint meetings with the relevant ICAO body typically every 12 years.

### 4. Programme structure

The programme is implemented by expert teams or experts in the following areas:

1. Education and Training;
  2. Development of an Aeronautical Forecaster Competency Assessment Toolkit;
  3. User Needs for Meteorological Services in the Terminal Area;
  4. Governance and Partnership;
  5. Coordination of Implementation Activities;
  6. Space Weather;
  7. Operational Meteorological Data Exchange;
  8. Aviation and the Environment.
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