

WMO STRATEGIC PLAN 2016-2019

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Executive Summary

Context

Weather, climate, water and related environmental conditions have significant impacts on society, the environment and our prosperity. A global analysis of the statistics of disasters associated with weather-, water- and climate-related hazards indicates a significant increase in the total number of disasters, an increase in the impact on the economy, but a significant decrease in the associated total number of deaths.

Nations and their economies are becoming increasingly at risk to extremes of weather and climate due, in part, to ageing or inadequate infrastructure as well as the migration of people to higher risk areas near coastlines and floodplains. Data reveals that developing countries, in particular Least Developed Countries (LDCs) and Small Island Developing States (SIDS) suffer greater loss of life and larger economic losses as compared to their GDP from extreme events. Science informs us that due to climate change these extreme events are likely to occur with greater frequency and intensity increasing the threat to life and economic progress.

The role of WMO Members' National Meteorological and Hydrological Services

Weather-, climate- and water-related hazards need not translate into natural disasters. Warnings issued by National Meteorological and Hydrological Services (NMHS) through their Early Warning Services and formulated from skilful daily, monthly, seasonal, decadal forecasts and projections, can contribute significantly to a reduction in losses of life and property associated with these phenomena. Statistics from high impact weather events show there were lower losses of lives from storms and floods in the period 2001-2010 compared to 1991-2000. This was partly due to improvements in early warning systems and preparedness of nations. However, tropical cyclones, floods, and droughts and, most recently heat waves, are still leading to high losses of lives and property in developing and least developed countries.

Information from NMHSs can also lead to enhanced productivity in economic sectors and more efficient management of institutions sensitive to extremes of weather, climate and water. These services, rendered by NMHSs, can be of enormous value for decision-makers to address global societal needs (GSNs). NMHS services provide early warning of high impact weather, contribute to food security strategies, improve the resilience of communities, assist in managing water resources, enable society to adapt to climate variability and change, help improve environmental quality and are integral to safe transportation systems.

The importance of sustained infrastructure

In order to deliver effective weather and climate services, NMHSs must have a strong understanding of the needs of government, the public and other key customers. To then meet these requirements, NMHSs have to implement continuous development and improvement of service delivery. The growth in value to the users hinges on essential components needed for modelling the atmospheric processes which form the basis for all weather, water and climate forecasts and projections. To maximize economic benefits, NMHSs must sustain core infrastructure including robust and coordinated global observation systems, high performance computing capacity, sophisticated technology and skilled human resources. The information and warnings provided are an essential part of efforts to enhance the safety and well-being of society, economic growth and, environmental quality to the benefit of societies world-wide.

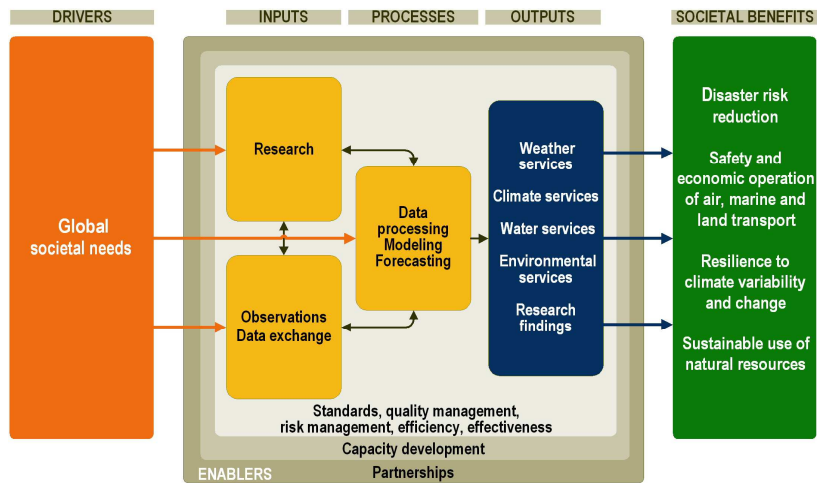


Figure 1: Schematic representation of the processes involved in delivering effective weather, climate and water services.

The observations and data needed by an NMHS to provide services for its country go beyond those gathered in the country. Similarly, some essential components needed to provide valuable services to the users, such as high performance computing, are not available at all NMHSs. This requirement is overcome by using the collective resources gathered and shared through the World Meteorological Organization (WMO). This collaborative way of working results in more efficient use of global resources.

The role of WMO

The WMO, a Specialized Agency of the United Nations, is the UN system's authoritative voice on the state and behaviour of the Earth's atmosphere, its interaction with the oceans, the weather and climate it produces and the resulting distribution of water resources. Since its establishment in 1950, WMO has played a unique and powerful role in building effective capacity in the National Meteorological and Hydrological Services of its 191 Member States and Territories. Under the WMO framework, NMHSs deploy and sustain essential infrastructure that contributes to the socio-economic well-being of citizens and supports the roles of governments in safeguarding the environment and protecting life and property.

The WMO facilitates the collaboration amongst its Members to deliver a wide range of services supporting decision-making on current and emerging challenges. Our mandate responds to the need for society to be warned and informed of high impact weather events, adapt to climate variability and change, and other environmental threats. WMO programmes facilitate the sharing of information, expertise and technology to create cost-effective solutions for the provision of weather, climate, water and related environmental services delivered by Members' NMHSs.

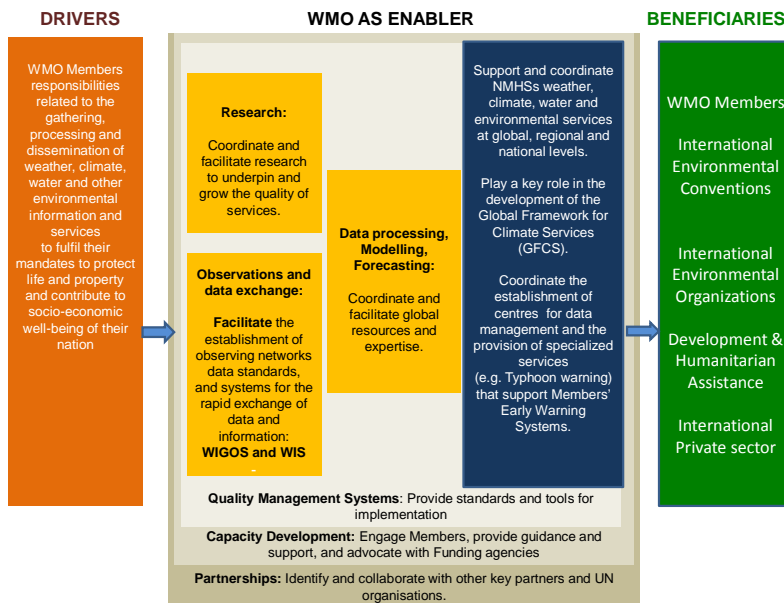


Figure 2: The role of the World Meteorological Organization.

The WMO Strategic Plan

The WMO Strategic Plan is designed to enable all Members to improve and sustain the essential infrastructure necessary to monitor and predict changes in our weather patterns, the climate system and water resources to provide beneficial services to users. These all lead to a continued support for disaster risk reduction, as well as allowing potential economic and societal benefits to be maximized, through sustainable services.

Summary of the WMO's Strategic Plan for the period 2016-2019:

- Support WMO Members in developing their **Quality Management Systems**, improving the quality, timeliness and usefulness of the services provided by their NMHSs;
- Play a key role in the development of climate services under the **Global Framework for Climate Services (GFCS)**;
- Continue improvements and investment into sustainable global weather, climate and water **data exchange**: WMO Integrated Global Observing System (WIGOS) and the WMO Information System (WIS);
- Engage Members and advocate with funding agencies for **Capacity Development**, especially for Members in greatest need of support.

This Strategic Plan is the consolidation of the work of experts, policy-makers, WMO Secretariat and heads of NMHSs from all WMO regions. Our collective efforts to achieve these ends are reflected in the eight Expected Results outlined in this Plan. To ensure the Plan is sustainable, we will develop capacity in WMO Members, particularly those in greatest need, to train and retain skilled personnel and secure partnerships to advance scientific understanding and assist in the delivery of timely, accurate, user-defined products and services while exercising effective and efficient governance of the Organization.

Societal benefits of weather, climate, water and related environmental services

Context

All life depends on a healthy planet, an interwoven system of atmosphere, oceans, watercourses, land, ice cover and biosphere, which form the natural environment. High impact weather and climate events (storms, floods, droughts etc.) result in lost lives and injuries, families displaced from their homes, and towns that are devastated throughout the world. The personal and social costs of these losses are tremendous; the financial impacts enormous as insured losses from natural catastrophes have ranged between \$10B and \$50B a year internationally over the past decade. Significant increases in economic losses during the period 1970–2009 are evident from Figure 3. These increases in economic losses may be attributed to increasing sensitivity of national economies to climate variability and change.

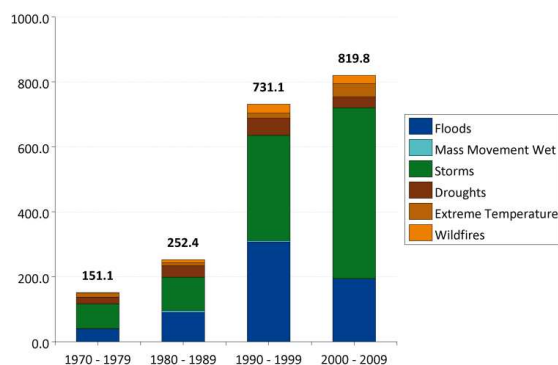


Figure 3: The global total economic losses by decade and by hazard type in USD billions adjusted to 2011 (during the period 1970-2009 (Source: WMO and CRED, 2013)

Weather, climate and water conditions influence the environment, economy and human well-being. Increased frequency of extremes in temperature, heavy precipitation and tropical cyclone intensity are likely to increase in the 21st century over many areas of the globe. The Intergovernmental Panel on Climate Change (IPCC) uses these data for its assessment reports and nations use these same data to develop options for climate change adaptation and mitigation strategies. Air pollution is responsible for 3.1 million premature deaths worldwide every year and 3.2% of the global burden of disease and our partners employ NMHSs information on ultraviolet radiation, aerosols and ozone to assess their consequent effects on people and ecosystems. These and other data and services provided by NMHSs provide essential, tactical information for decision-makers.

Over the last four years, the WMO Members have made remarkable progress on their priorities. The WMO convened the first Intergovernmental Board on Climate Services under the Global Framework for Climate Services (GFCS) bringing operational climate services a step closer to their full potential. Significant advances were made in implementing quality management systems and competency standards to improve the efficiency and safety of civil aviation. Regional plans are under preparation for implementing the WMO Integrated Global Observing System (WIGOS) and 360 centres have enhanced their capabilities to support the WMO Information System (WIS). The WMO has expanded techniques to monitor space weather and inform of changes that may be detrimental to satellite communication systems and air

transportation. These initiatives are foundational for the delivery of effective services, by NMHSs, for the safety of life and property and the achievement of sustainable development. The WMO Strategic Plan for 2016-2019 builds on these achievements to further its contribution to sustainable development.

NMHSs contribution to Sustainable Development

The UN broadly recognizes sustainable development as an organizing principle that ties together concern for the carrying capacity of natural systems with the social and economic challenges faced by humanity. The services rendered by NMHSs are fundamental to sustainable development. The societal benefits of weather, climate, water and related environmental services are derived from their integration in decision-making under the three pillars of sustainable development: (i.e. social; economic, and environmental). The value of these services tends to increase with the quality, accuracy, timeliness, location specificity and user-friendliness of the information, and the level of integration in decision-making.

Social

NMHSs contribute to the safety and well-being of society through their efforts to mitigate the impacts of natural hazards, improving the safety of transport on land, at sea, and in the air and contributing to health. Further improvements are needed to enhance the resilience of society to climate variability and change. WMO is focussed on the successor to the Hyogo Framework for Action (HFA) and our collective efforts to expose the contributions of NMHSs to warn and inform citizens of natural hazards to reduce disaster losses.

Effective disaster risk reduction is founded on actions informed by science-based weather, climate and water information and products. Seasonal climate forecasts can be useful for strategic and tactical planning in climate-sensitive activities, while the analysis of multi-year hazard patterns and trends, combined with climate change scenarios, can underpin longer-term strategic and investment planning. With climate-related risk knowledge on month to decadal timescales, institutions and organizations at global, regional and national levels can develop risk management using:

- (a) Early warning systems and preparedness;
- (b) Medium- and long-term sectoral planning (e.g., land zoning, infrastructure development and agricultural management); and
- (c) Utilization of weather-indexed insurance and financing mechanisms to reduce the impacts of disasters at various levels.

Economic

Accurate and timely weather and climate services from NMHSs are a significant contribution to economic stability and growth in many sectors (e.g. water resource management, food production and energy especially hydro-, solar- and wind-power. WMO Members also monitor the conditions and processes occurring in space referred to as space weather and the atmospheric and water transport of dangerous particles in the wake of volcanic eruptions or an industrial accident. WMO, in close collaboration with the International Atomic Energy Agency, also monitors and exchanges information on transboundary movement and intensity of radionuclides in air and water, including those arising from nuclear accidents. The economic impacts on, inter alia, communication systems, civil aviation and human health are enormous.

Environmental

WMO Members design weather, climate, water and related environmental services to achieve sustainable use of our natural capital and improved environmental quality. Societal benefits related to the environment are derived from the use of these services to monitor and predict the health of ecosystems, to inform decisions to protect and prevent further degradation of the environment, to mitigate and adapt to climate change, and for sustainable use of natural resources.

Outline of the WMO Strategic Planning Process

Context

The WMO Strategic Plan 2016-2019 builds upon an Organization-wide integrated planning process that enables the mission while responding to the changing needs of WMO Members and society in general. It is a reflection of a global enterprise in partnership with relevant UN entities, scientific institutions, development partners, and professionals from universities and the private sector. It is achieved through national contributions to provide the scientific, programmatic and infrastructure support necessary to implement a cost-effective international cooperation system. The Plan is forward looking in the medium- and long-term, anticipating emerging challenges and opportunities as well as expected technological advances. It is designed to realize the WMO vision

“to provide world leadership in expertise and international cooperation to enable the delivery and use of high quality authoritative weather, climate, water and related environmental services for the improvement of the well-being of societies of all nations”

WMO is dedicated to its core values of commitment and loyalty in international service; professionalism, objectivity, impartiality, excellence and team spirit; integrity and mutual respect, cultural sensitivity and non-discrimination by fulfilling WMO's core mission as presented in the WMO Convention:

- (a) To facilitate worldwide cooperation in the establishment of networks of stations for the making of meteorological observations as well as hydrological and other geophysical observations related to meteorology, and to promote the establishment and maintenance of centres charged with the provision of meteorological and related services;
- (b) To promote the establishment and maintenance of systems for the rapid exchange of meteorological and related information;
- (c) To promote standardization of meteorological and related observations and to ensure the uniform publication of observations and statistics;
- (d) To further the application of meteorology to aviation, shipping, water problems, agriculture and other human activities;
- (e) To promote activities in operational hydrology and to further close cooperation between meteorological and hydrological services; and
- (f) To encourage research and training in meteorology and, as appropriate, in related fields, and to assist in coordinating international aspects such as research and training.

Global Societal Needs

In order to achieve these broad goals, WMO Members have developed the Plan to focus attention on growing concerns about the socio-economic impacts of climate variability, climate change and high impact weather events under three fundamental *Global Societal Needs (GSN)* highlighted below:

- **Improved protection of life and property** by mitigating the impacts of hazardous weather, climate, water and other environmental events and addressing the need for increased safety of transport on land, at sea, and in the air;
- **Poverty eradication, sustainable livelihoods, food security, access to water and energy, and economic growth** by making available weather, climate, water and related environmental services to support the Post-2015 sustainable development agenda, climate risk management, climate resilience, green economy, disaster risk reduction, food security, improved health and social well-being of citizens, water management, and tapping renewable energy resources such as hydro-, solar- and wind-power; and
- **Sustainable use of natural resources and improved environmental quality** by designing weather, climate, water and related environmental services to manage atmospheric, terrestrial and water resources at all time-scales, and the development and management of the other natural resources.

Strategic Thrusts

With the escalation of global societal needs especially related to climate change and increasing experiences of severe flooding and drought conditions with devastating socio-economic impacts, future weather, climate, water and related environmental products and services will require significant targeted improvements. To achieve such improvements, the WMO is focusing its attention on the *five Strategic Thrusts* outlined below:

1. **Improving service quality and service delivery** by developing high quality, user-oriented, timely, accurate and cost-effective products and services;
2. **Advancing scientific research and application, as well as development and implementation of technology** by addressing the challenges of managing climate risks and adapting to climate variability and change;
3. **Strengthening capacity development** through effective resource mobilization and promoting national, regional and international cooperation;
4. **Building and enhancing partnerships and cooperation**, Enhance the visibility of WMO Members' NMHSs and their activities through broader participation in relevant international programmes and conventions; and
5. **Strengthening good governance** by ensuring international commitments, agreed within the framework of global conferences, summits and international conventions, are addressed through effective and practical measures.

Priorities for 2016-2019

Effective use of limited resources requires the Organization to identify *priority areas* within the Strategic Trusts on which to focus the combined efforts of WMO Members' NMHSs and partners to realize maximum benefits to Members.

Disaster Risk Reduction (DRR) will capitalize on achievements over the past four years on the provision of weather, climate and water services needed for disaster prevention, preparedness, response and recovery by strengthening institutional capacities of WMO global operational network involving all Member's NMHSs.

Service Delivery focusing on effective, timely and efficient services to the public, civil aviation, and marine transportation with increased attention on coastal zones and the needs of Least Developed Countries and Small Island Developing States (SIDS).

Global Framework for Climate Services (GFCS) to continue WMO's leadership role in developing essential climate services to support decision-making that reduces the impacts of climate-related disasters, improves food security and health outcomes, and enhances water resource management by contributing to the 2, 6 and 10 year milestones outlined in the Implementation Plan.

Scientific research to improve sub-seasonal to seasonal predictions, polar weather prediction, climate projections and on advancing megacity services.

WMO Integrated Observing System (WIGOS) to reach full implementation of the WIGOS Plan for robust, standardized, accurate and quality assured observations of the Earth System to meet the needs of WMO Members coupled with the operational WMO Information System (WIS).

Capacity development is advance the WMO Capacity Development Strategy targeted on the priorities above particularly in developing, least developed countries and SIDS to address deficiencies (e.g. infrastructure and human resources) to enhance the capability of the NMHSs to fulfill their mandates.

The strategic thrusts and priorities described above are translated into *8 Expected Results* that outline how WMO Members will work together to advance our understanding of weather, climate, water and other environmental issues through their concerted efforts (see Table 1 and following section for greater detail).

Other Components of the Strategic Planning Process

WMO Operating Plan - The WMO Operating Plan is a comprehensive treatment of programmes and activities which are designed to address the global societal needs and achieve the expected results. The Operating Plan integrates the contribution of technical commissions, Regional Associations, the Secretariat and Members and considers the contribution of partner organizations. It includes performance metrics to assess progress in achievement of the expected results and forms the basis for resource allocation and monitoring and evaluation.

WMO Results-Based Budget - The WMO results-based budget identifies regular and voluntary resources that are needed to implement the WMO Operating Plan containing the following:

- (a) A logical framework for the identification of required resources;
- (b) Justification of required resources to help optimize their use; and
- (c) Performance metrics to gauge progress towards key performance targets against allocated resources.

Monitoring and Evaluation - Successful implementation of this strategic plan will be measured on how well we have advanced the ability of NMHSs to improve service quality and service delivery into socio-economic benefits. Monitoring and evaluation are tools to measure the performance of the Organization in the timely implementation of its Strategic Plan. They provide information for ensuring the continuing effectiveness and relevance of the WMO Programmes and to adjust strategic direction and priorities if required. While monitoring is an on-going function, evaluations are conducted bi-annually through impact assessment or when the results from the monitoring require validation.

The level of integration of this Plan into the national and international development agenda together with the coherent and coordinated action at national and international levels is amongst the risks that will influence the achievement of expected results. The fluid global financial situation will have a significant impact on voluntary contributions, which provide some of the resources for implementing these strategic priorities, particularly to enhance capacities of NMHSs in developing and least developed countries, and SIDS.

Global Societal Needs	Strategic Thrusts	Expected Results
Protection of life and property and safety of transport on land, sea and in the air	Improving service quality and service delivery Priority: DRR, GFCS Important areas: public weather services, services for aviation, marine navigation and coastal areas	1 Service delivery <i>Enhanced capabilities of Members to deliver and improve access to high-quality weather, climate, water and related environmental predictions, information, warnings and services in response to users' needs and to enable their use in decision-making by relevant societal sectors</i>
		2 Disaster risk reduction <i>Enhanced capabilities of Members to reduce risks and potential impacts of hazards caused by weather, climate, water and related environmental elements</i>
Poverty eradication, sustained livelihoods, health, food security, access to water and energy, and economic growth	Advancing scientific research, its application, and the development and implementation of technology Priority: GFCS, WIGOS, Research Important areas: research in climate predictions (seasonal, sub-seasonal), polar predictions, and megacity services	3 Data processing and forecasting <i>Enhanced capabilities of Members to produce better weather, climate, water and related environmental information, predictions and warnings to support in particular disaster risk reduction and climate impact and adaptation strategies</i>
		4 Observations and data management <i>Enhanced capabilities of Members to access, develop, implement and use integrated and interoperable surface- and space-based observation systems for weather, climate and hydrological observations, as well as related environmental and space weather observations, based on world standards set by WMO</i>
		5 Research <i>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</i>
Sustainable use of natural resources and improved environmental quality	Strengthening capacity development Priority: capacity development	6 Capacity Development <i>Enhanced capabilities of NMHSs, in particular in developing and least developed countries, to fulfill their mandates</i>
	Building and enhancing partnerships and cooperation Important areas: partnerships for GFCS and DRR	7 Partnerships <i>New and strengthened partnerships and cooperation activities to improve NMHSs' performance in delivering services and to increase the value of the contributions of WMO within the United Nations system, relevant international conventions and national strategic issues</i>
	Strengthening good governance	8 An effective and efficient Organization

Table 1: Schematic representation of the structure and scope of the WMO Strategic Plan

STRATEGIC THRUSTS TO ACHIEVE EXPECTED RESULTS

Strategic Thrust 1: Improving Service Quality and Service Delivery

It is through effective and timely delivery of services that nations derive a high level of return on their investments in NMHSs (observing systems, modeling, communications and human resources). This thrust is aimed at improving the operational, end-to-end framework for NMHSs to translate leading-edge science into information that is actionable and easy to interpret by different sectors of society.

WMO will continue to advance its service-oriented culture and raise standards of service-quality and service-delivery. Service providers will improve their competencies to understand:

- (a) How the information is used so that it can be tailored to the users' needs, for example through effective rolling reviews of client needs for products and services;
- (b) How weather, climate, water and environmental information and products are integrated into decision-making; and
- (c) The challenges associated with understanding the impacts of hazards, and the interpretation, communication, delivery and application of weather, water, climate and related environmental services.

The two expected results under this Strategic Thrust focus on the provision of weather, climate, water and related environmental services for disaster risk reduction, aviation, marine and the general public. There is a recognized need for engagement with partners in service delivery including other national institutions, the media and private sector.

The risks to achievement of the following two Expected Results hinge on unique and specific contributions of many partners and improvements in a number of WMO programmes. For example, the lack of improvement in the availability of surface or space-based observations, production and dissemination systems essential for the provision of services have negative consequences on service delivery. Furthermore, common to many NMHSs, is the weakness in succession planning, an aging workforce, loss of skilled personnel due to natural attrition coupled with inadequate resources to enhance human capacities and infrastructure of the NMHS. This results in potential limitations in the ability of NMHSs to develop user-oriented products.

ER 1: Service Delivery

Enhanced capabilities of Members to deliver and improve access to high-quality weather, climate, water and related environmental predictions, information, warnings and services in response to users' needs and to enable their use in decision-making by relevant societal sectors

Expected Result 1: Service Delivery will be achieved through the implementation of the Organization-wide Implementation Plan of the Strategy for Service Delivery applied to a number of sectors. Air and marine transport are critical enablers of global trade and economic development. Increasing density in air and marine transport with reduced tolerance for error require continuous improvement. WMO will continue to highlight the necessity to ensure compliance with international standards and promote coherent, seamless and accurate warnings of hazardous weather in collaboration with relevant national organizations (e.g. Civil Aviation Authorities) and international organizations (i.e. the International Civil Aviation Organization - ICAO and International Maritime Organization - IMO).

Public Weather Services: As a core function of all NMHSs tailored nationally to specific requirements defined by governments, the WMO will continue to facilitate the sharing of techniques and procedures in support of civil protection, the media and weather-sensitive economic sectors.

Aviation Services: The WMO will continue its assistance to the NMHSs to review, develop and demonstrate their compliance with WMO and ICAO regulations. The focus will be on guiding and assisting Members in maintaining their Quality Management Systems (QMS), ensuring the competence of aeronautical meteorological personnel by enhancing the current assessment methodologies, increasing the available on-line training modules mapped to the competence requirements, and proper documentation personnel assessments.

Marine Meteorological Services: Improved services will focus on the monitoring and issuance of warnings on storm surges and coastal inundation. WMO will proactively collaborate with International Maritime Organization (IMO) to prepare the regulatory basis and methodological support for NMHSs for establishing Quality Management System and competencies for personnel serving marine transportation in anticipation of a formal requirement by the IMO.

ER 2: Disaster Risk Reduction

Enhanced capabilities of Members to reduce risks and potential impacts of hazards caused by weather, climate, water and related environmental elements

Expected Result 2: Disaster risk reduction is a key priority of all governments. NMHSs are an integral component of multi-hazard national emergency management systems and work with relevant sectors to develop products and information to support decision-making related to environmental threats.

WMO will focus on strengthening institutional capacities of NMHSs and networks of specialized centres designed to mitigate the threat of natural disasters such as Regional Specialized Meteorological Centres (RSMCs) and Regional Climate Centres (RCCs). WMO will facilitate disaster risk analysis and the development of national multi-hazard early warning systems through institutional partnerships to ensure that services are provided and used in a cost effective, systematic and sustainable manner.

Strategic Thrust 2: Advancing Scientific Research, its Application, and the Development and Implementation of Technology

Future research will continue to pursue an Earth system, seamless approach. WMO will advance efforts to focus research efforts beyond traditional weather and climate to address complex issues (e.g. air quality, sand and dust storms, human health, food security, Polar Regions); to address the urgent need demand to reduce vulnerability. WMO Research efforts will:

- (a) Entail a unified approach over multiple time and spatial scales from minutes to centuries including a requirement for the downscaling of climate information;
- (b) Respond to the growing demand for increased accuracy and utility of sub-seasonal to seasonal forecasts;
- (c) Invest in high-performance computing to accommodate the growing complexity and detail of models; and
- (d) Develop closer linkages among researchers, service providers and users to enable Members to rapidly operationalize research outputs for service delivery and to allow users to see rapid results from informed decision-making.

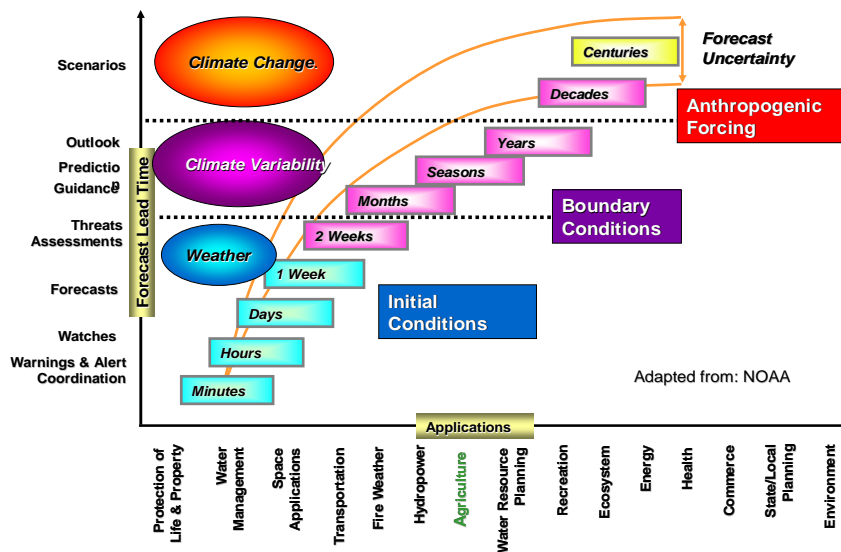


Figure 4: Schematic diagram depicting 'seamless' prediction.

There are a number of risks associated with co-sponsored global observing systems (e.g. Global Climate Observing System, Global Cryosphere Watch) that are an aggregation of investments by NMHSs. The expense of modernizing, optimizing and sustaining these systems, the underlying data processing, data management and high performance computing capacity are a daunting challenge to many Members. Research hinges on a framework of collaboration amongst WMO's NMHSs, other UN entities, national institutions, the International Council for Science (ICSU), academia and the private sector. Leveraging investment is highly competitive. The often long timelines associated with achieving research outcomes may cause difficulties in attracting sustained investment. Sharing of best practices and collaboration with partners on investment strategies is required to mitigate risks to achieving the following three Expected Results.

ER 3: Data Processing and Forecasting

Enhanced capabilities of Members to produce better weather, climate, water and related environmental information, predictions and warnings to support in particular disaster risk reduction and climate impact and adaptation strategies

Expected Result 3: Data Processing and Forecasting emphasizes the need to effectively translate the benefits derived from research into operational products and services toward the needs of, inter alia, agriculture, water and health, and disaster risk reduction. Investments in high performance computing, and data assimilation will allow for more accurate, effective and timely predictions from NMHSs and existing specialized centres.

Weather prediction will continue to benefit from improved numerical weather prediction models, including Ensemble Prediction Systems, leading to higher accuracy in forecasts and warnings of high impact weather such as tropical storms, heavy precipitation events or strong winds. WMO will continue to support Severe Weather Forecast Demonstration Projects as a cost-effective means for testing high resolution models and a practical approach for strengthening capacities through technology transfer.

Improved climate projections will be supported by the Global Framework for Climate Services (GFCS) in particular through the Climate Services Information System and the User Interface Platform. Products and services will be designed to promote accurate, timely and effective information about climate (past, present and future) to serve complex decision-making across a

wide range of climate-sensitive activities and enterprises.

Improved services related to hydrology and water resources will focus on supporting improvements in water management, by promoting open access to high quality hydrological data, raising awareness of the range of available hydrological techniques by practitioners and promoting the deployment of effective improved in-situ instrumentation and remote sensing capabilities, such as radar installations and satellites. Ensuring that Members have sufficient numbers of competent, capable and skilled human resources to undertake the work required in hydrology and water resources into the future is a significant factor in planning.

ER 4: Observations and Data Management

Enhanced capabilities of Members to access, develop, implement and use integrated and interoperable Earth (surface) and space-based observation systems for weather, climate and hydrological observations, as well as related environmental and space weather observations, based on world standards set by WMO

Expected Result 4: Observations and Data management addresses development and improvements in three systems: the **WMO Integrated Global Observing System, WMO Information System** and WMO’s contribution to the Global Climate Observing System. These programmes support the observational requirements of all WMO Programmes, the GFCS, GEOSS, the IPCC and Members’ obligations under a number of international conventions such as, inter alia, the UNFCCC, the UNCCD and the Vienna Convention for the Protection of the Ozone Layer.

The WMO Integrated Global Observing System (WIGOS) Framework Implementation Plan, regulatory material and operational information resource are now in place. WIGOS core metadata standards and specifications are agreed upon and a Communication and Outreach Strategy has been developed. WMO will further the implementation of WIGOS in the most cost-effective manner to address the observational requirements of all WMO Programmes and partners.

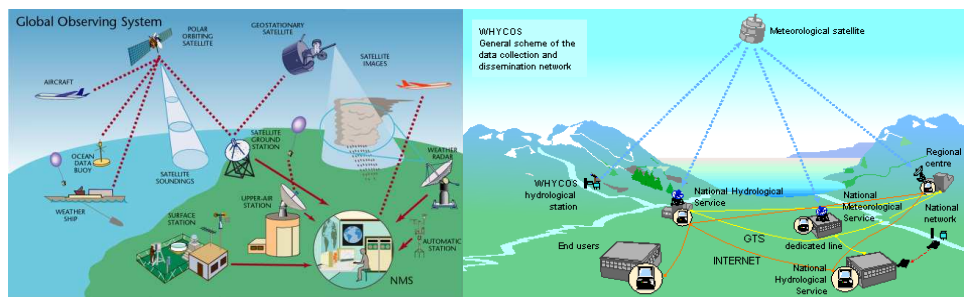


Figure 5: The WMO Global Observing System (left), the World Hydrological Cycle Observing System (right) and the Global Atmosphere Watch form the foundation for establishing the WMO Integrated Global Observing System.

Sound data management underpins the transformation of observational data into useful products and services. The global and regional infrastructure of WMO Information System is already fulfilling the requirements for routine collection and automated dissemination of observed data and products. Data discovery, access and retrieval services for all weather, climate, water and related data produced by centres and Members will be further developed.

ER 5: Research

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

Expected Result: 5 Research underpins improvements in the prediction of weather, climate, water and related environmental conditions by enhancing our understanding of changes in weather, climate, the hydrological cycle and the chemical composition of the troposphere and stratosphere. This expected result will be pursued through partnerships with national scientific institutions and international organizations such as ICSU and UNESCO, amongst others. The achievements will have a significant contribution to developing user-relevant and user-friendly services for the public, disaster management, economic (marine, aviation) and support the GFCS Pillar on Research, Modelling and Prediction. **The specific areas of focus in research** will be to:

Advance megacity services to assist societies in urban areas to improve their quality of life, their effective use of resources and to reduce vulnerabilities to impacts of high impact events. Research will focus on improvements in the early detection and warning of, inter alia, tropical cyclones, coastal inundation, heat waves, disease outbreaks, poor air quality.

Improving user-oriented sub-seasonal to seasonal predictions will continue as a joint initiative of the World Weather Research Programme (WWRP), and the World Climate Research Programme (WCRP) to increase forecast skill on the sub-seasonal to seasonal timescale where many management decisions in agriculture and food security, water, disaster risk reduction, energy and health fall. Specific attention will be paid to the risk of severe weather and extreme climate events, including tropical cyclones, droughts, floods, heat waves and the waxing and waning of monsoon precipitation.

Advancing polar weather and climate prediction will focus on achieving the aims of the Global Integrated Polar Prediction System through its sub-components, the WWRP Polar Prediction Project and WCRP Polar Climate Predictability Initiative (PCPI) through cooperative international research enabling development of improved weather, climate, water and related environmental services for the Polar Regions and understanding the influence of Polar weather and climate on the Earth system as a whole.

Strategic Thrust 3: Strengthening Capacity Development

The health of the global weather, climate and water enterprise is a reflection of the investment in human resources and infrastructure by Members' NMHS; the quality of services hinges on our people and technology. This strategic thrust focuses on strengthening capacities of NMHSs by improving institutions, infrastructure, operational systems and human resources to implement and operate the basic systems for providing weather, climate, water and related environmental services. Our focus will be on Least Developed Countries (LDCs) and Small Island Developing States (SIDS) through knowledge and technology transfer.

The main risks associated with this Strategic Thrust stem from the institutional capacity of NMHS to convince their governments to support essential infrastructure and the capacity of the WMO and its Member NMHSs to mobilize resources from funding agencies to invest in weather, water and climate infrastructure.

ER 6: Capacity Development

Enhanced capabilities of NMHSs, in particular in developing and least developed countries, to fulfill their mandates

Expected Result 6: Capacity Development encompasses the need to improve infrastructure operated by NMHS and develop their institutional and human capacity. By achieving this result, the WMO is able to enhance capabilities in the provision of improved weather, water and climate services to toward disaster risk reduction, water resource management, sustainable agriculture, better health outcomes. A major emphasis will be on establishing climate services in those countries and territories in which basic climate services are lacking.

Through programmes and projects, the WMO Strategy on Capacity Development will seek to empower NMHS institutions and assist them in building effective communication with governments, policy- and decision-makers, and development partners to expand the number of strategic partnerships. Scientific, technical and project management training are major component of activities to promote a culture of compliance with international standards and recommended practices.

Strategic Thrust 4: Building and Enhancing Partnerships and Cooperation

To meet Members' expectations, WMO leverage technical, scientific and financial resources by partnering with other organizations and communities. This strategic thrust therefore seeks to:

- (a) Heighten the understanding and use by the United Nations system, WMO Members and international and national organizations of weather, climate, water and environmental information and services
- (b) Enhance partnerships with regional and international institutions, including ICSU, UNESCO, WHO, FAO, UNISDR and UNEP, in order to better collaborate on complex and multi-disciplinary initiatives;
- (c) Enhance the ability of WMO to expand the scope of its information and products and to develop and sustain service improvements by leveraging the capabilities of partners;
- (d) Broaden partnerships among and within developed and developing countries, LDCs and SIDS by engaging emergency management authorities and other relevant national agencies; and
- (e) Maintain a proactive role in ensuring a coherent, science-based approach within the United Nations system and among other stakeholders to support the implementation of environmental conventions, including agreements arising from World Summits and follow-up activities related to all relevant United Nations Conventions.

There are risks associated with targeting the UN system and the business; by missing opportunities to engage partners actively, the full range of its information and services would not used by decision-makers and experts thus diminishing their societal benefit.

ER 7: Partnerships

New and strengthened partnerships and cooperation activities to improve NMHSs' performance in delivering services and to increase the value of the contributions of WMO within the United Nations system, relevant international conventions and national strategic issues

Expected Result 7: Partnerships will focus on opportunities for cooperation on the priorities outlined in this plan (i.e. DRR, Services, Research, GFCS, WIGOS and capacity development) without compromising relationships that support other areas of WMO's mandate. WMO will foster enhanced partnerships with co-sponsors of WCRP, GCOS and the IPCC. WMO will strengthen and increase recognition of the value of its contribution to the broader agenda of the

United Nations, particularly to sustainable development, climate change mitigation and adaptation, gender equality, human rights and rule of law.

Strategic Thrust 5: Strengthening Good Governance

Good governance promotes open and transparent processes and efficient and effective use of resources. It also increases accountability for resource expenditure linked to the achievement of expected results. The WMO aims to continuously improve governance and management by:

- (a) Improving the efficiency and effectiveness of its governing and constituent bodies;
- (b) Promoting open and transparent business processes, efficient and effective use of resources, and equitable treatment of all parties;
- (c) Enhancing the efficiency of the WMO Secretariat and fostering climate-friendly operations;
- (d) Ensuring the integrity of WMO management systems;
- (e) Improving the connection between the Organization's strategic priorities and initiatives, programmes and budget, through results-based management systems and practices;
- (f) Conducting a comprehensive review of structures, programmes and priorities and implementing the relevant findings;
- (g) Promoting gender equality and empowerment of women across the Organization;
- (h) Promoting the culture of compliance with WMO regulations and Standards, and fostering the rule of law; and
- (i) Managing risks based on the WMO Risk Management Policy and Framework.

The WMO Business Continuity Plan addresses risks that may interrupt operations but must be strengthened to minimize their impact. Other risks relate to any weaknesses in internal control systems that may compromise the reputation of the Organization. WMO's commitment and ability to the delivery of multilingual conference and publishing services hinges on Members' investments in these services.

ER 8: An effective and efficient Organization

Expected Result 8: An Effective and Efficient Organization seeks to ensure robust oversight of the programmes and financial management of the Organization and accountability to Members. This includes developing a coherent Strategic Plan, Operating Plan, Results-based Budget and a Monitoring and Evaluation system that integrate activities of all parts of the Organization, including governing and constituent bodies, and the Secretariat. High quality, affordable language, conference and publishing services will be provided to WMO Members through the production of publications and the delivery of conference services in an appropriate number of working languages as defined by Congress to facilitate decision-making.

APPENDIX 1

EXPECTED RESULTS, KEY OUTCOMES AND KEY PERFORMANCE INDICATORS

Expected Result 1: Enhanced capabilities of Members to deliver and improve access to high-quality weather, climate, water and related environmental predictions, information, warnings and services in response to users' needs, and to enable their use in decision-making by relevant societal sectors				
KO 1.1	Improved access to <u>high quality</u> weather, climate, water, and related environmental products and services (e.g. warnings, forecasts and supporting information)	KPI 1.1.1	<u>Number of NMHSs</u> with regular access to products provided by global and regional centres	Deleted: seamless
		KPI 1.1.2		Deleted: Number of Members demonstrating quantitative measurements of the socio-economic benefits of their products and services
KO 1.2	Delivery of weather, climate, water and related environmental products and services to users' communities is improved	KPI 1.2.1	Number of NMHSs <u>satisfied</u> with the (a) availability, (b) reliability and (c) range of products that are (d) received in time and (e) are an essential contribution to decision making	Comment [A1]: NMHS or Member?
				Deleted: Percentage
			<u>Number of Members implementing studies of the socio-economic benefits of their products and services</u>	Deleted: expressing user satisfaction
<u>KO 1.3</u>	<u>Progress in the national implementation of GFCS</u>			Comment [MH2]: KPIs to be formulated
Expected Result 2: Enhanced capabilities of Members to reduce risks and potential impacts of hazards caused by weather, climate, water and related environmental elements				
KO 2.1	Multi-hazard early warning <u>systems</u> are implemented	KPI 2.1.1	Number of NMHSs contributing to the implementation of multi-hazard early warning systems	Comment [A3]: A reference to a definition what a Multi-hazard early warning system is
KO 2.2	National integrated flood management plans are developed	KPI 2.2.1	Number of Members establishing flood management plans	
		KPI 2.2.2	Number of NMHSs participating in regional hydrological forecasting systems for transboundary river basins	
KO 2.3	Drought early warning systems are improved	KPI 2.3.1	NMHSs and Regional Centres that issue drought early warnings	
Expected Result 3: Enhanced capabilities of Members to produce better weather, climate, water and related environmental information, predictions and warnings to support in particular disaster risk reduction and climate impact and adaptation <u>strategies</u>				
KO 3.1	Improved climate monitoring, long range forecasts and long-term projections <u>for climate adaptation and risk assessment</u>	KPI 3.1.1	Number of Members issuing: (a) monthly predictions; (b) seasonal predictions; (c) climate watch bulletins; and (d) long-term projections	Comment [A4]: This ER is too inward looking, the ER should express the impact on the customers and decision-makers understanding of the risks.
		KPI 3.1.2	Perceived quality of the issued: (a) monthly predictions; (b) seasonal predictions; (c) climate watch bulletins; and (d) long-term projections	
		KPI 3.1.3	Perceived timeliness of the issued (a) monthly predictions; (b) seasonal predictions; (c)	

			climate watch bulletins; and (d) long-term projections
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		KPI 3.2.1	Perceived quality of the products of WMO Regional Climate Centres used at the national level	Deleted: KO 3.2
		KPI 3.2.2	Number of Members operationally developing and disseminating climate products and information for national needs at basic, intermediate and advanced levels	Deleted: Climate information and prediction products for climate adaptation and risk management are improved
		KPI 3.2.3	Perceived quality of the national climate information and products available in Member countries	
		KPI 3.2.4	Number of Members providing targeted/tailored climate information, products and services, through formal mechanisms including National Climate Outlook Forums, to support user requirements in their countries for adaptation and climate risk management in key socio-economic sectors	
KO 3.2	Hydrological information and products, including water resources, are improved	KPI 3.3.1	Number of Members using a Quality Management Framework for Hydrology based on current guidance materials	Deleted: 3
		KPI 3.3.2	Number of regional hydrological databases developed in transboundary river basins	
	Drought information and prediction for risk management is improved	KPI 3.4.1	NMHSs and Regional Centres issuing drought information and prediction	Deleted: KO 3.4
<u>KO3.3</u>	<u>Implementation of national GFCS User Interface platforms</u>			Comment [A5]: This KO could well be under the KO 3.1

<i>Expected Result 4: Enhanced capabilities of Members to access, develop, implement and use integrated and interoperable surface- and space-based observation systems for weather, climate and hydrological observations, as well as related environmental and space weather observations, based on world standards set by WMO</i>			
KO 4.1	WMO Integrated Global Observing System implementation phase is completed	KPI 4.1.1	Percentage of progress in achieving the key implementation tasks, milestones and deliverables specified by the WIGOS Implementation Plan (WIP)
		KPI 4.1.2	Increased availability of observations for users (as measured by several ratios)
KO 4.2	WMO information System is developed and implemented	KPI 4.2.1	Progress in the implementation of WIS by NMHSs as measured by: (a) percentage of registered WIS centres that have been endorsed as WIS compliant; and (b) Number of NMHSs with improved observational data and products as a result of implementation of WIS functions
		KPI 4.2.2	Number of NMHSs whose data processing and management capabilities have enhanced as a result of implementation of WIS functions
KO 4.3	Progress in implementing the Global Climate Observing	KPI 4.3.1	Percentage of progress in achieving the GCOS implementation plan

	System		
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KO 4.4	Data rescue and data management systems improved	KPI 4.4.1	Number of Members that have undertaken data rescue or being involved in regional collaborative data rescue initiatives such as MEDARE	Deleted: NMHSs
		KPI 4.4.2	Number of Members implementing modern climate data management systems	Deleted: ing
Expected Result 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				Deleted: and/or climate monitoring systems
KO 5.1	Research in climate prediction/projection to improve the skills of seasonal, decadal and longer timescales is enhanced	KPI 5.1.1	Number of new activities advancing climate research capacity at the global and regional level, especially for early career scientists and scientists from developing and LDC countries	Comment [A6]:
		KPI 5.1.2	Number of early career scientists and scientists from developing and least developed countries that WCRP funded to participate in activities to advance climate research	
		KPI 5.1.3	Degree of satisfaction among NMHSs with the skill of climate predictions	
KO 5.2	Research in the prediction of high-impact weather on time scales of hours to seasons is enhanced	KPI 5.2.1	Number of total research projects (new, ongoing and completed) on operational products and services	Comment [A7]: Technology developments are not covered in the KOs.
		KPI 5.2.2	Number of Members whose operational products and services have improved as a result of WMO research projects	
		KPI 5.2.3	Number of NMHSs in developing and least developed countries participating in regional and international research initiatives on high impact weather or severe weather forecasting demonstration projects	
KO 5.3	Enhance the atmospheric chemistry observations, research and assessment meet needs of environmental conventions and policy assessments	KPI 5.3.1	Degree of Member satisfaction with the (a) usefulness and (b) timeliness of Global Atmospheric Chemistry Bulletins	Deleted: A
		KPI 5.3.2	Degree of Member satisfaction with the usefulness of: (a) GAW measurement guidelines and reports; (b) Sand-and-Dust storm forecasting; (c) the chemical weather activities of GURME	
KO 5.4	Seamless forecasts of weather, climate, water and the environment at all timescales are developed in support of the GFCS and other WMO priorities	KPI 5.4.1	Number of NMHSs participating in the integration of observations, research, modelling and analysis results to improve sub-seasonal to seasonal weather/climate projections and predictions	Deleted: from days to seasons
				Deleted:

Expected Result 6: Enhanced capabilities of NMHSs, in particular in developing and least developed countries, to fulfill their mandates

KO 6.1	Visibility and relevance of NMHSs in national and regional development agendas is improved, particularly in developing and least developed countries	KPI 6.1.1	Number of NMHSs with: (a) increased contribution to national policy setting; (b) improved awareness by users on types of services NMHSs can deliver; (c) improved user accessibility to forecasts and warnings; (d) improved timeliness of forecasts and warnings; and (e) increased accuracy of forecasts and warnings
		KPI 6.1.2	Number of NMHSs with: (a) increased contribution to regional policy setting; (b) improved awareness by regional users on types of services that can be provided by the centre; (c) improved regional user accessibility to forecasts and warnings; (d) improved timeliness of forecasts and warnings delivered from the Regional Centre; and (e) increased accuracy of forecasts and warnings delivered from the Regional Centre
KO 6.2	Infrastructure and operational facilities of NMHSs and Regional Centres are improved, particularly in developing and least developed countries	KPI 6.2.1	Number of NMHSs with improved infrastructure and operational facilities
KO 6.3	Education and training development facilities to further respond to the needs of the Members are improved, especially in developing and least developed countries	KPI 6.3.1	Opportunities for accessing , education and training requirements fulfilling the needs of the Members
		KPI 6.3.2	Number of people benefitting from the WMO Fellowship Programme
		KPI 6.3.3	Users satisfaction with the courses at the Regional Training Centres (RTCs) is increased
KO 6.4	Capacities of NMHSs are enhanced through cooperation and partnerships with other national and regional organizations	KPI 6.4.1	Development projects and activities funded through voluntary contributions

Comment [A8]: In RAVI it refers to the less developed part of the region

Comment [A9]: Capacity Development Strategy, also for KPI 6.1.2

Deleted: Number of institutions providing

Deleted: support for GFCS related activities

Deleted: at national and regional levels are improved

Deleted: Degree to which

Deleted: Members are getting value for money from the

Deleted: Degree of Member s

Deleted: in use

Expected Result 7: New and strengthened partnerships and cooperation activities to improve NMHSs' performance in delivering services and to increase the value of the contributions of WMO within the United Nations system, relevant international conventions and national strategic issues			
KO 7.1	Partnership on the sub-regional, regional and inter-regional scale is enhanced.	KPI 7.1.1	has to be changed
		KPI 7.1.2	has to be changed
		KPI 7.1.3	has to be changed
KO 7.2	Public, decision-makers and other stakeholders are increasingly aware of key WMO and NMHSs benefits, activities and priorities through enhanced communication	KPI 7.2.1	has to be changed
		KPI 7.2.2	has to be changed
		KPI 7.2.3	has to be changed

Comment [MH10]: The KPIs should be rewritten

Deleted: WMO leadership and contribution in relevant UN system and other international partners' initiatives and programmes is improved

Deleted: Number of reports of WMO and its co-sponsored programmes submitted to UN and other international conventions, particularly the UNFCCC, UNCCD and UNCBD

Deleted: Number of contracts/cooperation agreements within which WMO is engaged with partners

Deleted: Number of NMHSs implementing projects with the UN and other international and/or regional organizations

Deleted: Uptake of WMO public information outputs as measured by: (a) number of unique visitors on the WMO website; (b) number of times WMO was mentioned in press articles; (c) number of Facebook fans; and (d) number of Twitter followers

Deleted: Degree to which NMHSs make use of WMO public information outputs

Deleted: Number of NMHSs that have provided training to senior managers and/or communication officers in media relations, social media or other aspects of communication

Deleted: issues

Comment [A11]: The KPIs should be changed

Deleted: Degree of Member satisfaction with constituent body documentation

Deleted: Degree of Member satisfaction with constituent body supporting services (interpretation, conference services and facilities)

Expected Result 8: An effective and efficient Organization			
KO 8.1	Effective and efficient WMO Congress and EC	KPI 8.1.1	Degree of Member satisfaction with documentation for Cg, EC and its working groups
		KPI 8.1.2	Degree of Member satisfaction with supporting services for Cg and EC (interpretation, conference activities and facilities)
		KPI 8.1.3	Decrease in the total cost of sessions held under similar conditions
KO 8.2	An effective and efficient Organization	KPI 8.2.1	Percentage of implemented accepted oversight recommendations for improved business effectiveness on the agreed deadline
		KPI 8.2.2	Unqualified opinion of the external auditor in the financial period
		KPI 8.2.3	Increase in the efficiency of fulfilling requirements for linguistic and publishing services
		KPI 8.2.4	Issuance of statements of internal control in the financial period
KO 8.3	Effective and efficient constituent bodies (RAs and TCs)	KPI 8.3.1	Should be changed
		KPI 8.3.2	should be changed
		KPI 8.3.3	Decrease in the total cost of constituent body sessions held under similar conditions
8.4	Gender equity across WMO	8.4.1	Proportion of men/women in WMO constituent bodies
		8.4.2	Number of men/women granted WMO fellowship / Number of total candidates

APPENDIX 2

Programmes, constituent bodies and departments contributing to each expected result

Expected Results	WMO Programmes	Constituent Bodies	Responsible Departments
1. Enhanced capabilities of Members to deliver and improve access to high-quality weather, climate, water and related environmental predictions, information, warnings and services in response to users' needs and to enable their use in decision-making by relevant societal sectors	AeMP, AgMP, ERA, MMOP, PWSP, WWW/GDPFS, GFCS	CAeM CAgM CBS JCOMM EC RAs	WDS, CLW
2. Enhanced capabilities of Members to reduce risks and potential impacts of hazards caused by weather, climate, water and related environmental elements	DRR, TCP, WWW/GDPFS, HWRP, AgMP	CBS, EC/WG DRR, CHy, CAgM, EC	WDS, CLW
3. Enhanced capabilities of Members to produce better weather, climate, water and related environmental information, predictions and warnings to support in particular disaster risk reduction and climate impact and adaptation strategies	WCP/WCDMP, WWW/GDPFS, AgMP, WCP, HWRP,	CBS, CAgM, CCI, CHy	OBS, WDS, CLW,
4. Enhanced capabilities of Members to access, develop, implement and use integrated and interoperable surface- and space-based observation systems for weather, climate and hydrological observations, as well as related environmental and space weather observations, based on world standards set by WMO	SAT, WCP, WWW/GOS, WWW/IMO, WWW/WIGOS, WWW/WIS, GCOS	JCOMM, CBS, CIMO, CCI, EC	OBS, GCOS
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.	WCRP, WWRP, GAW	CAS, EC Polar Panel	WCRP, RES
6. Enhanced capabilities of NMHSs, in particular in developing and least developed countries, to fulfill their mandates	RP, LDCP, TCP, AgMP, AeMP, ETRP, HWRP, WCP, WCP/WCDMP, WWW/GDPFS	CAgM, CCI, CAeM, EC Panel on ET, CHy, CBS, EC Panels on Gender and ETR, RAs	DRA, CLW, WDS, OBS,
7. New and strengthened partnerships and cooperation activities to improve NMHSs' performance in delivering services and to increase the value of the contributions of WMO within the United Nations system, relevant international conventions and national strategic issues	AeMP, AgMP, WCP, HWRP, OC, RP, IPA	CAeM, CAgM, CHy, CCI, EC	WDS, CLW, EM, IPCC, DRA, CER
8. An effective and efficient Organization	PMO, OC, LCP		EM, LCP, IOO, REM