

WMO STRATEGIC PLAN

2016–2019



**World
Meteorological
Organization**

Weather · Climate · Water

WMO-No. 1161

WMO-No. 1161

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ISBN 978-92-63-11161-6

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FOREWORD

This Strategic Plan for 2016–2019 reflects the decisions and directions of the Seventeenth World Meteorological Congress, held in Geneva from 25 May to 12 June 2015. It sets the directions and priorities to guide the activities of the World Meteorological Organization (WMO) to enable all Members to improve their information, products and services. It anticipates increased demand for high-quality weather, hydrological and climate services to enhance community resilience, contribute to economic growth and protect life and property from extreme weather, climate and water events.

The Plan outlines our collective efforts to sustain hydrometeorological infrastructure and advance our knowledge of the Earth system through science and technology. Our goal is to provide the citizens that we serve with fit-for-purpose, high-quality weather, climate and hydrological services. Furthermore, it illustrates the contribution of the National Meteorological and Hydrological Services (NMHSs) of Members in achieving the United Nations Sustainable Development Goals and the desired outcomes of the Sendai Framework for Disaster Risk Reduction 2015–2030.

Congress recognized that, although all societies and national economies are affected by extreme events, the Intergovernmental Panel on Climate Change made note that droughts, floods and sea-level rise pose increasing risk particularly to developing and least developed countries and

small island developing States. This Strategic Plan recognizes that capacity development is fundamental to reduce vulnerability; it is a pillar of the Global Framework for Climate Services (GFCS).

The Strategic Plan's three global societal needs, seven priorities and eight expected results describe, at a high level, the "why" and "how" Members intend to derive benefits from their investments in the global weather, climate and water enterprise. It forms the basis for the Operating Plans of the Secretariat, the six regional associations and the eight technical commissions that comprise the "who", "what" and "when" for the activities to be undertaken. The investments that will be required are described in the results-based budget of the Organization.

We share in the confidence expressed by Congress that the ability of NMHSs to meet their national mandates will be aided through the implementation of this Plan. Our collective efforts will enable our citizens to make informed decisions and be better prepared to withstand weather, water, climate and environmental extremes.



(D. Grimes)
President



(M. Jarraud)
Secretary-General

EXECUTIVE SUMMARY

CONTEXT

Weather, marine weather, climate, hydrological and environmental monitoring and prediction services are recognized for their essential contributions to the protection of life and property from meteorological and hydrological hazards including severe storms, excessive heat, droughts and floods. Furthermore, they also underpin economic growth in sectors including agriculture and food production, transportation, energy and water resources. High-impact weather and climate extremes are likely to occur with greater frequency and intensity due to climate variability and change. Today, these changes in weather, climate, water, the chemical composition of the atmosphere, as well as other related environmental conditions, such as those caused by space weather effects, have compelling consequences for the environment and for the prosperity of nations. Investments to strengthen monitoring infrastructure and improve the quality of weather, marine weather, climate and hydrological predictions can result in effective disaster prevention and socioeconomic planning. Future investments are also required to optimize socioeconomic benefits to mitigate and adapt to high-impact weather, marine weather, climate and hydrological extremes.

The implications of changing weather, climate, water and related environmental conditions are escalating the demand from governments, institutions and citizens for more useful and reliable information, products and services. WMO and the National Meteorological and Hydrological Services of its Members play a foundational and authoritative role in the provision of these products and services. This demand is also fuelling growth in value-added private-sector service providers.

WMO and NMHSs are exploring methods to improve efficiencies through regional collaboration and cooperation, forming cost-effective partnerships amongst themselves, other institutions and private-sector service providers. This will improve the capacity of NMHSs to meet the expectations of governments for saving lives, reducing damages,

contributing to economic growth and supporting environmental stewardship.

THE ROLE OF NATIONAL METEOROLOGICAL AND HYDROLOGICAL SERVICES

Weather-, marine weather-, climate- and water-related hazards do not necessarily need to become natural disasters. National Meteorological and Hydrological Services strive to provide early warnings of high-impact events. Likewise, they provide information on climate extremes and variability, enabling society to better adapt to a changing climate through improved community resilience, water resource management and food security strategies.

National Meteorological and Hydrological Services play an active role in the International Strategy for Disaster Reduction national, regional and global platforms to bring together elements of science, operational services and relationships with both the public and private sectors in disaster risk management in a holistic way. Information products and services provided by NMHSs have a positive impact on critical decisions made in economic sectors sensitive to the extremes of weather, climate and water. These services provided by NMHSs also help to improve environmental quality, enable safe and efficient transportation and support positive health outcomes through warnings of health impacts of poor air quality or vector-borne disease outbreaks. Therefore, the services provided by NMHSs are of enormous benefit for decision-makers addressing global, regional and national challenges.

THE VALUE OF SUSTAINED METEOROLOGICAL AND HYDROLOGICAL INFRASTRUCTURE

To deliver effective value-added weather, marine weather, climate and hydrological services, NMHSs must have a strong understanding of the needs of government, the public and other key stakeholders. To deliver high-quality services that meet the needs of decision-makers, NMHSs must develop,

maintain and improve scientific and technological infrastructure and attract and retain skilled personnel to operate and manage sophisticated meteorological, hydrological and related environmental networks. The benefits of these services to governments, institutions and citizens hinge on real-time monitoring and modelling of atmospheric and related ocean processes and the water cycle, which form the basis for all weather, marine weather, climate and hydrological forecasts and projections.

To be sustainable, NMHSs require investment in their core infrastructure, including robust and globally coordinated observation systems, information and computing technologies, and human resource development. Some essential infrastructure components needed to support service delivery, such as high-performance computing, are not available at all NMHSs. WMO has an essential and unique role in providing the frameworks for the required global and regional coordination and cooperation that supports all Members, for example, Global and Regional Specialized Centres and Regional Training Centres.

THE ROLE OF WMO

WMO is a specialized agency of the United Nations, with 191 Member States and Territories. It is the United Nations system's authoritative voice on the state and behaviour of the Earth's atmosphere, its interaction with the land and oceans, the weather and climate it produces and the resulting distribution of water resources. Since its establishment in 1950, WMO has been central in facilitating international collaboration and cooperation for observations, data and knowledge exchange, setting standards, coordinating scientific and technical methods and capacity development for the benefit of its Members and their NMHSs. WMO Programmes such as the World Weather Watch facilitate the gathering, processing and sharing of information, expertise and technology to create cost-effective solutions for the provision of weather, marine weather, climate, hydrological and related environmental services delivered by its Members.

Under the WMO framework, NMHSs deploy, operate and sustain essential infrastructure in a coordinated manner to deliver a wide range of services that support decision-making on current and emerging issues. They benefit from strengthened partnerships with United Nations bodies active in the field of climate adaptation, such as the Adaptation Committee, and in relation with climate mitigation, such as the Climate Technology Centre and Network, both established by the Conference of the Parties to the United Nations Framework Convention on Climate Change at its sixteenth session. WMO supports the work of the broader international community and international conventions or treaties, such as the United Nations Framework Convention on Climate Change and the United Nations Convention to Combat Desertification. This collaborative framework results in a much more efficient use of global resources.

THE WMO STRATEGIC PLAN

The WMO Strategic Plan sets the directions and priorities to guide the activities of Members and all WMO constituent bodies to enable all Members to improve their core information, products and services, maintain necessary infrastructure, and to directly benefit from advancements in science and technology. This Plan emphasizes the following key priorities to advance the realization of the eight expected results, which outline the benefits and improvements to the capacity of all Members:

1. Improve the accuracy and effectiveness of impact-based forecasts and multi-hazard early warnings of high-impact meteorological, hydrological and related environmental hazards from the tropics to the poles;
2. Implement climate services under the Global Framework for Climate Services;
3. Strengthen the global observing systems through the implementation of the WMO Integrated Global Observing System (WIGOS) and the WMO Information System (WIS);
4. Improve the ability of NMHSs to provide sustainable high-quality services to support

the safety, efficiency and regularity of air traffic management worldwide;

5. Improve operational meteorological and hydrological monitoring, prediction and services in polar and high-mountain regions;
6. Enhance the capacity of NMHSs to deliver on their mission;
7. Improve efficiency and effectiveness of WMO by adopting continuous improvement measures and recommendations based on a strategic review of WMO structures, operating arrangements and budgeting practices.

WMO STRATEGIC PRIORITIES	
1.	Disaster risk reduction
2.	Global Framework for Climate Services
3.	WMO Integrated Global Observing System
4.	Aviation meteorological services
5.	Polar and high-mountain regions
6.	Capacity development
7.	Governance

These priorities reflect the inputs from all WMO Members and constituent bodies and guide decisions for the upcoming financial period 2016–2019 to ensure that the Plan brings the greatest benefits to Members. These priorities as well as expected results (see Annex I) are reflected in the integrated WMO results-based budget and are detailed in the WMO Operating Plan, which presents time-bound programme activities and projects. The Operating Plan forms the basis for resource allocation, and defines the risks and performance matrices against which to assess progress to achieve expected results through the WMO Monitoring and Evaluation System.

GLOBAL SOCIETAL NEEDS

CONTEXT

High-impact weather, marine weather, climate and hydrological events (storms, floods, droughts and so forth) have devastating effects throughout the world, resulting in injury and loss of life, displacement of people, work disruption and destruction of communities. Furthermore, air pollution is responsible for 7 million premature deaths worldwide every year. The personal and social costs of these losses are tremendous; the financial impacts alone are enormous – insured losses from natural catastrophes have ranged between US\$ 10 billion and US\$ 50 billion a year internationally over the past decade (Figure 1).

This rise in economic losses can be partly attributed to the increasing vulnerability of people and infrastructure to the impact of weather and climate extremes due to growing human settlements – particularly in flood plains and coastal regions – urbanization, the rise of megacities, economic interdependencies and obsolescence of infrastructure. Weather, marine weather, climate and hydrological extremes are contributing to ever-larger economic losses and, in some cases, slower economic post-disaster recovery, particularly in developing and least developed countries and small island developing States.

A global analysis of the statistics of disasters as a consequence of environmental hazards indicates a significant increase in the total number of disasters having larger impacts on the economy, but conversely, a notable decrease in the associated number of total deaths. There is strong evidence that increasingly accurate early warnings and their integration into disaster risk reduction approaches have contributed to significant saving of lives. Nevertheless, high-impact weather events, such as tropical storms, continue to pose elevated risks to the safety of lives and property, particularly in developing and least developed countries. Typhoon Haiyan that devastated the Philippines in 2013 is a stark reminder of this ongoing reality.

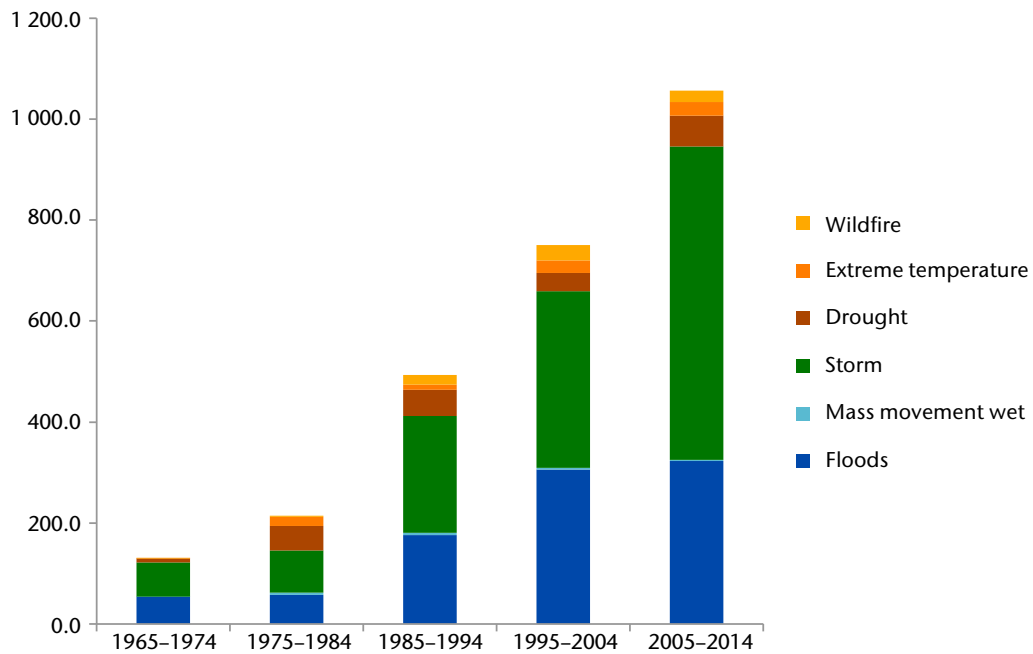


Figure 1. Global total economic losses by decade and by hazard type in billions of United States dollars adjusted to 2012 for the period 1965–2014 (Sources: WMO and CRED, 2015)

ENABLING SUSTAINABLE DEVELOPMENT

Recognizing the growing socioeconomic and environmental risks and the benefits that meteorological and hydrological services bring, WMO Programmes are being designed to improve the capabilities of all NMHSs, especially those in developing and least developed countries and small island developing States, to meet their mandates and benefit the governments, institutions and citizens of their countries. WMO, through its Members, constituencies and Secretariat, implements programmes and project initiatives to meet the following broad global societal needs of fundamental importance to every Member of the Organization and contribute to the post-2015 sustainable development agenda:

- Improved protection of life and property to reduce disaster risks by mitigating the impacts of hazardous weather, climate, water and other environmental events, and addressing the need for improved safety of transport on land, at sea and in the air;
- End poverty, ensure sustainable resilient livelihoods, food security, access to water

and energy, healthy lives, gender equality, and economic growth, and combat climate change by making available weather, climate, hydrological and related environmental services to support climate risk management, climate resilience, green economy, disaster risk reduction, food security and agriculture, improved health and social well-being of citizens, water management, and tapping renewable energy resources such as hydro-, solar and wind power;

- Sustainable use of natural resources and improved environmental quality by designing weather, climate, hydrological and related environmental services to manage atmospheric, terrestrial and water resources at all timescales, and the development and management of other natural resources.

The weather, marine weather, climate and hydrological services provided by NMHSs are fundamental to support the three interdependent pillars of sustainable development: social, economic and environmental. The contribution of WMO and its Members to each of these pillars is described in

Annex II. The value of these services increases with the quality, accuracy, timeliness, location specificity and utility of the information applied in the decision-making process to reduce risks and to optimize benefits.

Weather and hydrological services enable shorter-term preparedness and response to events, whereas longer-term climate information at the seasonal and decadal timescales is essential for long-term planning purposes. WMO has spearheaded the establishment of the Global Framework for Climate Services to guide the development and application of science-based climate information and services in support of decision-making. The vision of the Framework is to enable society to better manage the risks and opportunities arising from climate variability and change, especially for those who are most vulnerable to such risks. Together with the shorter-term information NMHSs provide, this will allow seamless information to be provided across all timescales in support of sustainable development.

THE ROLE OF NATIONAL METEOROLOGICAL AND HYDROLOGICAL SERVICES

Figure 2 below illustrates the role of a National Meteorological and Hydrological Service in

responding to the global societal needs. National Meteorological and Hydrological Services are built upon a foundation of observations and data that, together with research activities, are used to produce relevant, timely and quality information and services. Such information and services can have a positive impact on the critical decisions of those who are sensitive to the extremes of weather, climate and water, as well as help decision-makers address societal needs. Early warnings of high-impact weather, marine weather, climate and hydrological events can contribute to improved food security strategies, community resilience and water resource management, enabling society to adapt to climate change, to prevent loss of life and property and to limit the disastrous effects of high-impact weather events. These services also help to improve environmental quality, enable safe and efficient transportation and support positive health outcomes through warnings of health impacts from poor air quality or vector-borne disease outbreaks.

WMO plays an essential role in coordinating global meteorological data and in setting service delivery quality standards for NMHSs. The efficiency and effectiveness of NMHSs is enhanced through improved data interoperability and quality management systems, enabling them to better fulfil their mandates, demonstrate their relevance and

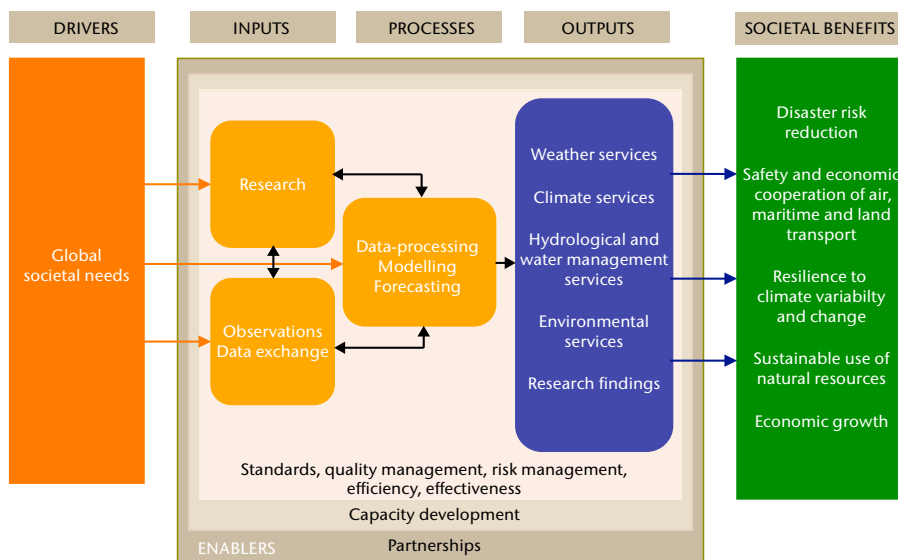


Figure 2. Schematic representation of the processes involved in delivering effective weather, climate and hydrological services, and processes to achieve them linked with the WMO mandate

raise their visibility within national governments and with other stakeholder organizations.

THE ROLE OF WMO

Under its collaborative framework, WMO provides world leadership and expertise in international cooperation in the delivery and use of high-quality, authoritative weather, climate, hydrological and related environmental services by its Members, for the improvement of the well-being of societies of all nations. It does so through the coordination of standards and practices among its Members, based on core values of professionalism, excellence, impartiality, cultural sensitivity, non-discrimination and team spirit in international service. The mission of WMO, as described in its Convention, is:

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

- (g) To provide guidance to national regulations on provision of official meteorological information and advice, through the Common Alerting Protocol and Register of Alerting Authorities.

The mandate of WMO directly supports the delivery of effective services by NMHSs for the safety of life, the protection of property and support for sustainable development.

BUILDING ON ACHIEVEMENTS

For decades, WMO Members and their NMHSs have made remarkable progress delivering on WMO priorities. The following are recent examples over the last four years:

- (a) WMO has played a key role in the establishment of the Global Framework for Climate Services, bringing operational climate services a step closer to realizing their full potential;
- (b) Significant advances among the NMHSs in implementing quality management systems and personnel competency standards to further improve the efficiency and safety of international aviation;
- (c) Coordination of international scientific developments in support of new and evolving environmental hazard services and associated monitoring systems, for example, for space weather, air pollution, sandstorms and duststorms, and volcanic ash;
- (d) Global and regional plans have been developed for implementing WIGOS and 360 national, regional and global centres have enhanced their capabilities in support of WIS;
- (e) The provision by NMHSs, and use by disaster and civil protection agencies, of severe weather forecasts and warnings has improved in many regions through the implementation of severe weather forecasting demonstration projects.

This WMO Strategic Plan builds upon these achievements.

EMERGING CHALLENGES

INTERNAL FACTORS INFLUENCING WMO PRIORITIES 2016–2019

Many challenges confront WMO Members, especially those that face significant development and capability gaps in serving the weather-, climate- and water-related needs of their governments, institutions and citizens. Reliable, high-quality services that help prevent the loss of life and property, contribute to economic growth and support environmental stewardship worldwide depend upon the following:

- (a) Understanding and integrating the needs of various user communities, including disaster and civil protection agencies, into forecasts and warning programmes, taking into account gender-specific aspects;
- (b) Availability of modern meteorological, climatological and hydrological infrastructure and availability of well-trained, motivated and competent personnel to gather, process, archive and facilitate the rapid exchange of data and products;
- (c) Capability to maintain high standards of observations, data and metadata;
- (d) Participation in, and access to, research that leads to improved monitoring, prediction and understanding of the atmosphere and hydrosphere at all spatial and temporal scales;
- (e) Capability to prepare and deliver high-quality understandable, relevant and gender-sensitive early warnings and forecasts of weather-, climate- and water-related hazards, with an increased emphasis on impact-based forecasts and risk-based warnings;

- (f) Effective mobilization of resources, efficiency in their use and effective modern governance and decision-making nationally, regionally and globally.

EXTERNAL FACTORS INFLUENCING WMO PRIORITIES 2016–2019

High-impact weather, marine weather, climate and hydrological extremes continue to have significant consequences around the globe and have caught the attention of world leaders. Concerns are mounting about the increasing socioeconomic vulnerabilities, risks and severity of these events due to climate variability and change, coupled with increased urbanization especially in densely populated coastal areas and the importance of shipping for commerce. The rapidly increasing scale of environmental change being observed in the Polar Regions is already having significant implications on weather and climate patterns worldwide. Demands are escalating for improved monitoring, more accurate and reliable data, better forecasts and advanced impact-based warnings, which inform decision-making that mitigates and adapts to these risks and minimizes disastrous consequences. Continuing economic pressures around the world mean that there is an increasing drive to deliver these service improvements as efficiently as possible.

Significant changes in the socioeconomic sectors that are addressed by WMO Programmes, including health, agriculture and food production, transportation, water resource management and energy sectors, are also shaping the demands for services from NMHSs now and will continue in the future:

- (a) The implementation of the Global Air Navigation Plan of the International Civil Aviation Organization (ICAO) will have significant implications on the way meteorological services for aviation will be delivered, due to further globalization and regionalization, a shift from a product-centric to a data-centric approach, and a strong demand for research and innovation to support future global air traffic management;

- (b) Expansion of maritime transportation into sparsely monitored and less skillful predicted Polar Regions comes with elevated risks associated with increased variability of weather, climate and sea-ice conditions;
- (c) Real-time operational climate services at the national, regional and global levels are needed urgently to support the GFCS priorities of agricultural production and food security, reduced disaster risk, human health and sustainable water resources. Such services will also have significant relevance for the energy sector, urban infrastructure and transportation;
- (d) Shifts in the intensity and distribution of precipitation patterns worldwide and continued declines of snow and ice conditions especially in the high-mountain regions will further implicate water resource and flood management and related decision-making;
- (e) New Sendai Framework for Disaster Risk Reduction 2015–2030 and post-2015 sustainable development agenda emphasize the importance of weather and climate resilience and risk reduction, and the need for associated scientific information and services;
- (f) Increasing urbanization and population, which is expected to grow by a further 1 billion by 2025, will increase the vulnerability and exposure of people to natural hazards; moreover, these hazards are not always gender-neutral;
- (g) The burgeoning use of new technologies, such as wireless and social media, and citizens' expectations for tailored understandable information and "just-in-time" delivery, require NMHSs to use these new technologies to remain effective and relevant;
- (h) Slow economic global growth may have a negative impact on resource mobilization; NMHSs need to demonstrate resource efficiencies, cost-benefit and value;
- (i) Increased activity in the value-added, third-party meteorological and hydrological sector, while offering benefits to business and consumers, may have an impact on NMHSs; it is imperative for NMHSs to remain highly visible and relevant to communities and governments so that they receive appropriate support for their critical roles, particularly as the official and authoritative national voice for early warnings.

THE WORLD IS CHANGING

- ✓ Global population 9 billion in 2050
- ✓ 700 million persons living in extreme poverty
- ✓ More than 50% of the population living in urban areas, 72% by 2050
- ✓ 23 megacities today, 37 by 2050
- ✓ 232 million international migrants
- ✓ 780 million persons have no access to clean water
- ✓ 1.3 billion persons lack electricity
- ✓ 7 million premature deaths every year due to air pollution

WMO PRIORITIES 2016–2019

WMO priorities for 2016–2019 reflect the inputs from all WMO constituent bodies and in particular the six regional associations, which gathered the collective views of all 191 Members. All bodies recognize the significance of the WMO research priorities in the area of high-impact weather forecasting, seasonal to sub-seasonal prediction, polar prediction and urban meteorology as the means of enabling improvements to operational service delivery. This is also the case for advancements in monitoring and information technologies, in particular the need to keep WIS aligned with WIGOS developments.

The following key priorities will be given additional emphasis in the WMO Programmes and results-based budget for 2016–2019:

- (a) **Disaster risk reduction:** Improve the accuracy and effectiveness of impact-based forecasts and multi-hazard early warnings of high-impact meteorological, hydrological and related environmental hazards from the tropics to the poles, thereby contributing to international efforts on disaster risk reduction, resilience and prevention, in particular in response to the risks associated with increasing population exposure;
- (b) **Global Framework for Climate Services:** Implement climate services under the GFCS particularly for countries that lack them by: (i) establishing regional climate centres; (ii) identifying user requirements for climate products; (iii) developing the Climate Services Information System; (iv) advancing the sub-seasonal to seasonal prediction skill;
- (c) **WMO Integrated Global Observing System:** Strengthen the global observing systems through full implementation of WIGOS and WIS for robust, standardized, integrated, accurate and quality assured relevant observations of the Earth system to support all WMO priorities and expected results;
- (d) **Aviation meteorological services:** Improve the ability of NMHSs to provide sustainable high-quality services in support of safety, efficiency and regularity of air traffic management worldwide, with due account to environmental factors by: (i) accelerating the implementation of ICAO/WMO competency and qualification standards and quality management systems; (ii) addressing emerging requirements and challenges related to the 2013–2028 Global Air Navigation Plan, in particular concerning ICAO Block 1 Upgrades; and (iii) strengthening the sustainability and competitiveness of aeronautical meteorological service provision through improved cost recovery mechanisms and suitable business models for service delivery frameworks;
- (e) **Polar and high-mountain regions:** Improve operational meteorological and hydrological monitoring, prediction and services in polar and high-mountain regions and beyond by: (i) operationalizing the Global Cryosphere Watch; (ii) better understanding the implications of changes in these regions on the global weather and climate patterns; and (iii) advancing the polar prediction under the Global Integrated Polar Prediction System;
- (f) **Capacity development:** Enhance the capacity of NMHSs to deliver on their mission by developing and improving competent human resource, technical and institutional capacities and infrastructure, particularly in developing and least developed countries and small island developing States;
- (g) **WMO governance:** Improve efficiency and effectiveness of WMO by adopting continuous improvement measures and recommendations based on a strategic review of WMO structures, operating arrangements and budgeting practices.

EXPECTED RESULTS

To achieve significant, targeted improvement of services to address the escalating needs, WMO will focus its endeavours on the following Expected Results:

1. **Improved service quality and service delivery:** Enhanced capabilities of Members to deliver and improve access to high-quality weather, climate, hydrological 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.
2. **Reduced disaster risk:** Enhanced capabilities of Members to reduce risks and potential impacts of hazards caused by weather, climate, water and related environmental elements.

3. **Improved data-processing, modelling and forecasting:** Enhanced capabilities of Members to produce better weather, climate, water and related environmental information, predictions and warnings to support, in particular, reduced disaster risk and climate impact and adaptation strategies.
4. **Improved observations and data exchange:** Enhanced capabilities of Members to access, develop, implement and use integrated and interoperable Earth- 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.
5. **Advance targeted research:** Enhanced capabilities of Members to contribute to and draw benefits from the global research capability for weather, climate, water and related environmental science and technology development.
6. **Strengthened capacity development:** Enhanced capabilities of Members' NMHSs, in particular in developing and least developed countries and small island developing States, to fulfil their mandates.
7. **Strengthened partnerships:** New and strengthened partnerships and cooperation activities to improve NMHSs' performance in delivering services and to demonstrate the value of WMO contributions within the United Nations system, relevant regional organizations, international conventions and national strategies.
8. **Improved efficiency and effectiveness:** Ensured effective functioning of policymaking and constituent bodies and oversight of the Organization.

The degree to which this Plan is factored into the national, regional and international development agenda is amongst the risks that will influence the achievement of Expected Results. The fluid global financial situation is having a significant impact on voluntary contributions, which provides some of the resources for implementing the strategic priorities, particularly to enhance capacities of NMHSs in developing and least developed countries and small islands developing States.

ANNEX I. SCHEMATIC REPRESENTATION OF THE RELATIONSHIPS BETWEEN GLOBAL SOCIETAL NEEDS, WMO PRIORITIES 2016–2019 AND EXPECTED RESULTS

Global Societal Needs	Priorities	Expected Results
Improved protection of life and property	Disaster risk reduction	<p>Improved service quality and service delivery</p> <p><i>Enhanced capabilities of Members to deliver and improve access to high-quality weather, climate, hydrological 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></p> <p>1</p>
		<p>Reduced disaster risk</p> <p><i>Enhanced capabilities of Members to reduce risks and potential impacts of hazards caused by weather, climate, water and related environmental elements</i></p> <p>2</p>
End poverty, ensure sustainable resilient livelihoods, food security, sustainable access to water and energy, healthy lives, gender equality and economic growth, and combat climate change	Global Framework for Climate Services	<p>Improved data-processing, modelling and forecasting</p> <p><i>Enhanced capabilities of Members to produce better weather, climate, water and related environmental information, predictions and warnings to support, in particular, reduced disaster risk and climate impact and adaptation strategies</i></p> <p>3</p>
	WMO Integrated Global Observing System	<p>Improved observations and data exchange</p> <p><i>Enhanced capabilities of Members to access, develop, implement and use integrated and interoperable Earth- 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></p> <p>4</p>
	Aviation meteorological services	<p>Advance targeted research</p> <p><i>Enhanced capabilities of Members to contribute to and draw benefits from the global research capacity for weather, climate, water and related environmental science and technology development</i></p> <p>5</p>
	Polar and high-mountain regions monitoring, prediction and services	<p>Strengthened capacity development</p> <p><i>Enhanced capabilities of Members' NMHSs, in particular in developing and least developed countries and small island developing States, to fulfil their mandates</i></p> <p>6</p>
Sustainable use of natural resources and improved environmental quality	Capacity development	<p>Strengthened partnerships</p> <p><i>New and strengthened partnerships and cooperation activities to improve NMHSs' performance in delivering services and to demonstrate the value of WMO contributions within the United Nations system, relevant regional organizations, international conventions and national strategies</i></p> <p>7</p>
	WMO governance	<p>Improved efficiency and effectiveness</p> <p><i>Ensured effective functioning of policymaking and constituent bodies and oversight of the Organization</i></p> <p>8</p>

ANNEX II. BENEFITS OF WEATHER, MARINE WEATHER, CLIMATE, HYDROLOGICAL AND RELATED ENVIRONMENTAL SERVICES

SOCIAL BENEFITS

National Meteorological and Hydrological Services and other institutions of Members contribute to the safety and well-being of society through their efforts to provide information on the impacts on lives and livelihoods of natural hazards, to improve the safety of transport on land, at sea and in the air, and to contribute to human and environmental health outcomes. Improving operational climate services through GFCS implementation will enhance national capabilities to support climate-smart decision-making. This will further increase the resilience of society to longer-term climate variability and change. Critical to success are the service delivery interactions with the community of users, including open access to global weather, hydrological, climate and related data, knowledge and impact-relevant products and services.

The Sendai Framework for Disaster Risk Reduction 2015–2030, the successor to the Hyogo Framework for Action 2005–2015: Building the Resilience of Nations and Communities to Disasters, was established in 2015. WMO and its Members will be guided by its objectives, particularly in support of disaster prevention and community resilience through improved ability of NMHSs to warn and inform citizens of natural hazards. Effective disaster risk reduction is founded on actions that are informed by science-based weather, climate, water and related environmental information about the potential hazards. Seasonal climate forecasts are useful for strategic and tactical planning of climate-sensitive activities, while the analysis of multi-year hazard patterns and trends, combined with climate change scenarios, can underpin longer-term strategic planning.

Climate-related risk knowledge on month to decadal timescales helps institutions and organizations at the global, regional and national levels to develop risk management plans based upon:

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

ECONOMIC BENEFITS

Accurate, timely and impact-oriented weather, marine weather, climate, hydrological and related environmental services from Members, in particular from their NMHSs, make a significant contribution to economic stability, efficiency and growth in many sectors. Examples include water resource management, food production, aviation and marine transportation, and energy, especially hydro-, solar and wind power. Early warning services and forecasts inform economically driven decisions that mitigate the effects of meteorological and hydrological hazards. Improved climate products and services offer significant economic benefits.

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

ENVIRONMENTAL BENEFITS

WMO and its Members monitor the environment over time, providing insight into possible impacts on our climate, food and water security, natural ecosystems and human health. Changes are occurring in rainfall and temperature, the

chemical composition of our atmosphere, surface and groundwater availability, land cover and soil condition, the temperature and chemical balance of our oceans, and pollutants in our air, water, soil and oceans. Subtle changes in these parameters can have profound consequences for ecosystems, biodiversity and our food production systems.

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