WMO VISION AND STRATEGY FOR HYDROLOGY

February 2019

1. Foreword

1.1 The Seventieth session of the Executive Council (EC-70), through Resolutions 16, 17 and 18, called for a further strengthening of the essential role of hydrology in WMO and for the enhancing of the critical contribution of WMO to the global water agenda. It recommended enhancing Members' capacity to deliver hydrological services, strengthening the promotion of and assistance to hydrological data exchange, focusing hydrological service delivery on decision-makers, defining and implementing hydrology (and/or hydrological centres) in the Global Data-processing and Forecasting System (GDPFS), strengthening the representation of the hydrological community in the governance of WMO, and implementing the recommendations of the WMO HydroConference: Global Conference for Prosperity through Hydrological Services, held in May 2018.

1.2 It also established the EC Task Force on Water. Between EC-70 in June 2018 and CHy-Ext. in February 2019, this group met twice to provide guidance on WMO's grand challenges in hydrology and the embedding of hydrology within the Earth System's approach. Two major guiding questions for the Task Force were:

- What major external changes and dynamics demand a response from National Hydrological Services (NHSs) and the hydrological community in WMO?
- What is needed to strengthen the capacity of NHSs, particularly in the area of cooperation?

1.3 Furthermore, EC-70 recommended to Cg-18, through Recommendation 15, the approval of the Implementation Plan for the Future Seamless Global Data-processing Forecasting System (S/GDPFS) which outlines the Earth System modelling capability of the integrated Earth System and its components, i.e. weather, water, climate, ice, the land surface and environment including human impact. S/GDPFS is backed by the research, operations and services sections of WMO in a value chain framework, and the S/GDPFS Steering Group for the implementation plan is co-chaired by P-CBS and P-CAS.

2. Background

2.1 This section sets out the major hydrological challenges in operational hydrology in respect of the following three considerations:

- Water is increasingly being identified as one of the highest global risks in terms of impact by the World Economic Forum. Whereas in the past water-related risks were largely considered environmental, they are now recognized as societal and geopolitical;
- Addressing water issues involves consideration of both risks and opportunities: WMO is committed to taking a programmatic approach that will maximize benefits to Members while minimizing risks;

- Water-related actions must consider three distinct types of uncertainty: unknown or poorly understood and inadequately measured natural processes associated with the hydrological cycle; diverse and often competing water uses and users; and the diversity of services and service providers.

2.2 With respect to water use and users, specific requirements include:

- Real-time management of flood and drought events, integrated flood management including inundation mapping;
- Integrated water management in national and transboundary catchments;
- Information on water quality, sediments and other elements;
- Civil engineering for design of infrastructure;
- Agriculture, drainage and irrigation schemes and management;
- Ecosystem management including wetlands;
- Design and management of hydropower systems;
- Design and management of fluvial transport;
- Academic support for climate studies, trend analysis, decision support systems.

2.3 In terms of service provision, there is considerable fragmentation among water sector players. This is true for administration/science/research/operations on a national level, and is mirrored in a multifaceted community of regional and international entities including NGOs, research associations/programmes and UN Organizations. In order to coordinate work on water management and hydrology more effectively, and to ensure more coherence on regional and global scales, WMO, together with 7 partners, organized a global hydroconference in May 2018, attended by 219 participants from 85 countries and 34 organizations, where it:

- Recommended that the WMO Commission for Hydrology take a leading role in organizing follow-up efforts to advance the complete hydrological value chain, in particular those related to operational hydrology;
- Stressed the importance of fora for intergovernmental cooperation in operational hydrology to support Member States in building and enhancing hydrological data, products and services, and recommended strengthening hydrological representation in WMO Constituent Bodies;
- Recognized the important role of weather and climate communities in supporting the development of hydrological services and called for increased cooperation at national, regional and global levels;
- Resolved to form a partnership and develop a framework and guidance for reinforcing hydrological services based on user needs in order to:
  - (a) Foster collaboration for sustainable, improved, tailored and affordable hydrological services;
  - (b) Strengthen the capacities of National Hydrological and Hydrometeorological Services;
  - (c) Support regional and transboundary initiatives and approaches that optimize basin-wide water management, including hydrological data exchange;
  - (d) Improve the general understanding of the societal benefits of hydrological services;

(e) Assist in responding to the requirements of international processes; and

(f) Develop and maintain an online "Matrix of Engagements", updated as necessary.

2.4 This background and the recommendations of the Special Dialogue on Water at EC-70, which endorsed the HydroConference's outcome and the request to include the World Water Data Initiative (a strategic activity initiated by the UN High Level Panel on Water that was transferred to WMO by the Australian government on the same occasion) in the CHy work programme, call for solutions that would amend the classical CHy remit. New features and functionalities should aim at:

- Strengthening integrated scientific foundations of operational hydrology, as the hydrological service provision needs to be science-driven in order to exploit the opportunities in the framework of seamless Earth System modelling and the growing interoperability of observations in the Earth System's components (weather, water, climate, soil, ice and biogeochemistry including human activities). The S/GDPFS, under evolution in WMO, forms an appropriate framework as it embraces weather, water, climate and environmental systems, and all time and space scales as well as interfaces with societal needs and societal economics. With the support of hydrological and Earth System research communities, coupled with the hydrological service provision in a value chain, the prospects can grow for significant societal benefits and risk reduction in the field of hydrology;
- Organizing an efficient and sustainable coordination of the value chain for hydrological service provision across hydrology, climatology and meteorology, but also across WMO Members, other UN Organizations and other international bodies, the private sector and the many NGOs that work to link sustainable development with water management;
- Generating high level political impact, e.g. mitigating humanitarian crises, providing data for sustainable development and climate change adaptation and mitigation, building peaceful and trusting relationships, particularly through transboundary water management mechanisms.

3. Assessment of the relevance of hydrology in WMO with respect to the global water agenda

3.1 Currently, there are a number of important agendas addressing various aspects of hydrology within the context of sustainable development, climate change adaptation and regional cooperation/peace. This section reviews the principal international agendas, with reference to the WMO hydrological activities/strategic objectives that relate to them.

A. Water in the Sustainable Development Agenda

SDG 6 of the Agenda 2030 specifically addresses water. At the same time, water is linked to a considerable number of other SDGs. The achievement of SDG 6 is critical to the success of several other SDGs, namely, 2, 8, 11, 12, 13 and 15. The relationship between the WMO hydrology and water resources areas of activity and its strategic goals and the specific SDGs and relevant indicators is listed in brackets below:

SDG 2 End hunger, achieve food security and improved nutrition and promote sustainable agriculture

2.4 By 2030, ensure sustainable food production systems and implement resilient agricultural practices that increase productivity and production, that help maintain ecosystems, that strengthen capacity for adaptation to climate change, extreme weather, drought, flooding and other disasters and that progressively improve land and soil quality. [Integrated water management, floods, droughts, water availability, water storage capacity, irrigation potential, hydrometry]

SDG 6 Ensure availability and sustainable management of water and sanitation for all

6.3 By 2030, improve water quality by reducing pollution, eliminating dumping and minimizing release of hazardous chemicals and materials, halving the proportion of untreated wastewater and substantially increasing recycling and safe reuse globally. [Hydrometry, water information systems]

6.4 By 2030, substantially increase water-use efficiency across all sectors and ensure sustainable withdrawal and supply of freshwater to address water scarcity and substantially reduce the number of people suffering from water scarcity. [Integrated water management, droughts, water availability, hydrometry]

6.5 By 2030, implement integrated water resources management at all levels, including through transboundary cooperation as appropriate. [Integrated water management, water availability, hydrometry, capacity-building, hydrological status and outlook, integration of hydro and met service components]

6.6 By 2020, protect and restore water-related ecosystems, including mountains, forests, wetlands, rivers, aquifers and lakes. [Water availability, hydrological status and outlook]

6.A By 2030, expand international cooperation and capacity-building support to developing countries in water- and sanitation-related activities and programmes, including water harvesting, desalination, water efficiency, wastewater treatment, recycling and reuse technologies [Water availability, hydro-met development and cooperation, water resource assessment, education and training, capacity building]

6.B Support and strengthen the participation of local communities in improving water and sanitation management. [Water availability, citizen hydrological observations, integrated flood and drought management]

SDG 8. Promote sustained, inclusive and sustainable economic growth, full and productive employment and decent work for all

8.4 Improve progressively, through 2030, global resource efficiency in consumption and production and endeavour to decouple economic growth from environmental degradation, in accordance with the 10-year framework of programmes on sustainable consumption and production, with developed countries taking the lead. [Integrated water management, water availability, water monitoring]

SDG 11. Make cities and human settlements inclusive, safe, resilient and sustainable

11.5 By 2030, significantly reduce the number of deaths and the number of people affected and substantially decrease the direct economic losses relative to global gross domestic product caused by disasters, including water-related disasters, with a focus on protecting the poor and people in vulnerable situations. [Integrated water management, floods, droughts, early warning systems]

11.6 By 2030, reduce, per capita, the adverse environmental impact of cities, including by paying special attention to air quality and municipal and other waste management. [Water availability]

SDG 12. Ensure sustainable consumption and production patterns

12.2 By 2030, achieve the sustainable management and efficient use of natural resources [Integrated water management, water availability, hydrological status and outlook, integrated flood and drought management]

SDG 13. Take urgent action to combat climate change and its impacts[1]

13.1 Strengthen resilience and adaptive capacity to climate-related hazards and natural disasters in all countries. [Integrated water management, floods, droughts]

13.2 Integrate climate change measures into national policies, strategies and planning. [Integrated water management, water availability, water resources assessment, integrated flood and drought management]

13.3 Improve education, awareness-raising and human and institutional capacity on climate change mitigation, adaptation, impact reduction and early warning. [Integrated water management, floods, droughts, water availability, capacity building]

13.b Promote mechanisms for raising capacity for effective climate change-related planning and management in least developed countries and small island developing states, including focusing on women, youth and local and marginalized communities. [Integrated water management, floods, droughts, water availability, capacity building]

SDG 15. Protect, restore and promote sustainable use of terrestrial ecosystems, sustainably manage forests, combat desertification, and halt and reverse land degradation and halt biodiversity loss

15.1 By 2020, ensure the conservation, restoration and sustainable use of terrestrial and inland freshwater ecosystems and their services, in particular forests, wetlands, mountains and drylands, in line with obligations under international agreements. [Integrated water management, water availability, Earth System modelling]

15.3 By 2030, combat desertification, restore degraded land and soil, including land affected by desertification, drought and floods, and strive to achieve a land degradation-neutral world. [Integrated water management, floods, droughts, integrated modelling]

15.4 By 2030, ensure the conservation of mountain ecosystems, including their biodiversity, in order to enhance their capacity to provide benefits that are essential for sustainable development. [Integrated water management, water availability]

B. Water and the Paris Agreement

At COP21 in Paris, on 12 December 2015, Parties to the UNFCCC reached a landmark agreement to combat climate change and to accelerate and intensify the actions and investments needed for a sustainable low carbon future.

The Paris Agreement's central aim is to strengthen the global response to the threat of climate change by keeping a global temperature rise this century well below 2 degrees Celsius above pre-industrial levels and to pursue efforts to limit the temperature increase even further to 1.5 degrees Celsius. Additionally, the agreement is aimed at increasing the ability of countries to deal with the impacts of climate change, and at catalysing finance flows consistent with a low GHG emissions and climate-resilient pathway. To reach these ambitious goals, appropriate mobilization and provision of financial resources, a new technology framework and enhanced

[1] Acknowledging that the United Nations Framework Convention on Climate Change is the primary international, intergovernmental forum for negotiating the global response to climate change.

capacity-building is to be put in place, thus supporting action by developing countries and the most vulnerable countries, in line with their own national objectives.

At COP24, the foundations for a regulatory framework to report on climate change and related efforts were agreed. Water is at the frontline of climate change adaptation as we face the new reality of having both too much and too little water in many places. Water is, together with soil, the limiting factor for CO2 uptake in biosystems on the landmass and will play a crucial role for the transition of energy systems away from fossil fuel. Water ranks highest overall in terms of the activities that countries want to prioritize through their Nationally Determined Contributions to the Paris Agreement.

The Paris Agreement addresses crucial areas necessary to combat climate change. Some of the key aspects of the agreement that WMO activities in water and hydrology should address are set out below, brackets relate to the specific topics in operational hydrology that WMO currently focuses on:

- **Sinks and reservoirs** (Art. 5) – The Paris Agreement also encourages Parties to conserve and enhance, as appropriate, sinks and reservoirs of GHGs including forests. [Integrated water management, water availability, hydrological status and outlook]

- **Adaptation** (Art. 7) – The Paris Agreement establishes a global goal on adaptation – of enhancing adaptive capacity, strengthening resilience and reducing vulnerability to climate change in the context of the temperature goal of the Agreement. It aims to significantly strengthen national adaptation efforts, including through support and international cooperation. It recognizes that adaptation is a global challenge faced by all. All Parties should engage in adaptation, including by formulating and implementing National Adaptation Plans, and should submit and periodically update an adaptation communication describing their priorities, needs, plans and actions. The adaptation efforts of developing countries should be recognized. [Integrated water management, floods, droughts, water availability]

- **Loss and damage** (Art. 8) – The Paris Agreement recognizes the importance of averting, minimizing and addressing loss and damage associated with the adverse effects of climate change, including extreme weather events and slow onset events, and the role of sustainable development in reducing the risk of loss and damage. Parties are to enhance understanding, action and support on a cooperative and facilitative basis with respect to loss and damage associated with the adverse effects of climate change. [Integrated water management, floods, droughts]

- **Climate change education, training, public awareness, public participation and public access to information** (Art. 12) is also to be enhanced under the Agreement. [Integrated water management, floods, droughts, water availability, capacity building]

C. The Sendai Framework for Disaster Risk Reduction

The Sendai Framework is a 15-year, voluntary, non-binding agreement which recognizes that the State has the primary role to reduce disaster risk but that responsibility should be shared with other stakeholders including local government, the private sector and other stakeholders. Its objective is: The substantial reduction of disaster risk and loss of life, livelihoods and health and in the economic, physical, social, cultural and environmental assets of persons, businesses, communities and countries.

The Sendai Framework for Disaster Risk Reduction charts the global course over the next 15 years. During the consultations and negotiations that led to its finalization,

strong calls were made to develop practical guidance to support implementation, ensure engagement and ownership of action by all stakeholders, and strengthen accountability in disaster risk reduction.

WMO activities in flood and drought forecasting, early warning, preparedness, vulnerability and resilience are crucial to all 7 global goals of the framework as listed below:

(a) Substantially reduce global disaster mortality by 2030, aiming at a lower average per 100 000 global mortality rate in the decade 2020-2030 compared to the period 2005-2015;

(b) Substantially reduce the number of affected people globally by 2030, aiming at a lower average global figure per 100 000 in the decade 2020-2030 compared to the period 2005-2015;

(c) Reduce direct disaster economic loss in relation to global gross domestic product (GDP) by 2030;

(d) Substantially reduce disaster-related damage to critical infrastructure and the disruption of basic services, such as health and educational facilities, including through developing their resilience by 2030;

(e) Substantially increase the number of countries with national and local disaster risk reduction strategies by 2020;

(f) Substantially enhance international cooperation targeting developing countries through adequate and sustainable support to complement their national action plans for implementation of this framework by 2030;

(g) Substantially increase the availability of and access to multi-hazard early warning systems and disaster risk information and assessments to the people by 2030.

D. UNECE Water Convention

The Convention on the Protection and Use of Transboundary Watercourses and International Lakes (Water Convention) was adopted in Helsinki in 1992 and entered into force in 1996. Almost all countries sharing transboundary waters in the region of the United Nations Economic Commission for Europe (UNECE) are Parties to the Convention. In 2003, the Water Convention was amended to allow accession by countries outside the UNECE region. The amendment entered into force on 6 February 2013, turning the Water Convention into a legal framework for transboundary water cooperation worldwide. As of 1 March 2016, all United Nations Member States can accede to the Convention. Two African countries were granted membership in 2018.

The Water Convention strengthens transboundary water cooperation and measures for ecologically sound management and protection of transboundary surface waters and ground waters. The Convention fosters the implementation of integrated water resources management, using the basin approach in particular. The Water Convention requires Parties to prevent, control and reduce transboundary impact, use transboundary waters in a reasonable and equitable way and ensure their sustainable management. Parties bordering the same transboundary waters have to cooperate by entering into specific agreements and establishing joint bodies.

Specifically, Article 4 of the Water Convention states that "the Parties shall establish programmes for monitoring the conditions of transboundary waters". Here, WMO can support the convention with knowledge, technical expertise, training and technology.

3.2 Although there is a growing awareness that water is one of the key elements for future development, in practice there is still a lack of proper attention given to the topic at both national and UN level. The UN High Level Political Forum on Sustainable Development (HLPF) is reviewing the SDGs in a 4-year cycle. The water goal was reviewed in 2018 against the backdrop provided by the UN-Water SDG 6 Synthesis Report 2018 on Water and Sanitation, which clearly highlights that the world is currently off-track to solve the global water crisis. Results were disappointing both in terms of the process (not all countries were able to take the floor), as well as the content (nobody really knows how to interpret single targets or indicators in relation to overall mid to long-term development pathways).

3.3 From an analysis of all goals, targets and indicators and their interconnectedness, it is clear that there is no readily available, transparent, objective and consistent background information in terms of the hydrological cycle, i.e. how much water is really available where and when, and of what quality is that water. To address this issue, CHy launched an initiative to develop the Hydrological Status and Outlook System at its 15th session in Rome.

3.4 In September 2018, a WMO co-led UN-Water team formulated a proposal to the UN Secretary-General on how to put in place a UN-level water analysis or stocktaking process to address the issues described in sections 3.2 and 3.3 above in an integrated manner.

3.5 Generally, WMO's existing and potential role amongst UN agencies is highly valued by some partners, but mostly unknown by the majority of national level players, as well as those involved with the global water agenda. Therefore, WMO Members' involvement in the water agenda must be strengthened in order to guarantee that NHSs are able (in terms of capacity, structure and equipment) and willing (considered trusted partners at national and international level) to support national to global water stocktaking. This, in turn, will allow them to increase their visibility at the national level and strengthen their financial situation.

3.6 In conclusion, WMO is uniquely positioned within the UN system as a technical agency that is recognized and appreciated by all partners for its expertise and neutrality. This allows it to play an increasingly important role in assisting Members in increasing their capabilities and in supporting the national to global stocktaking efforts.

4. Long-term ambitions, principles and conditions for guiding operational hydrology[2] in WMO into the medium and long-term future

4.1 This section summarizes the deliberations of the EC Task Force on Water: Sub-section 4.1.1 has been updated by CHy-Ext.(2019).

4.1.1 The **long-term ambitions** for the hydrological community in WMO on the impact scale are:

(1) **No one is surprised by a flood** – Risk assessment, proper planning and mitigation is the cornerstone of any NMHS measures to reduce flood risks. Timely forecasts/warnings must be produced at regional/national/local levels and communicated through appropriate authorities. Current tools for prevention, mitigation and forecasting must incorporate important ancillary data and thorough understanding of water management and dynamics of land use. Data and products relevant for flood risk assessment and management are provided to relevant stakeholders. Achieving this ambition will build on integrating the End-to-End Early Warning Systems (E2E EWS) for flood forecasting, the Flash Flood Guidance

[2] The definition of Operational Hydrology will be approved by Cg-18 based on the recommendation of CHy-Ext.(2019).

Systems (FFGS), the Associated Programme on Flood Management (APFM), the Coastal Inundation Forecasting Demonstration Project (CIFDP), together with the Severe Weather Forecasting Demonstration Project (SWFDP) and the Global Data-processing and Forecasting Systems (GDPFS) further;

(2) **Everyone is prepared for drought** – Drought risk management is supported by WMO members and through regional centres. The Integrated Drought Management Programme (IDMP) can serve as a nucleus to further develop necessary alliances and capabilities to support this ambition. This must include a detailed understanding of hydrological drought mitigation through reservoir operations, natural systems, and conservation and location/regional/national water. It will be supported by climatological and hydrological prediction capabilities, water resources management, the Global Hydrological Status and Outlook System (HydroSOS), the Regional Climate Centers (RCCs) and GDPFS;

(3) **Hydro-climate and meteorological data support the food security agenda** – WMO supports resolving the equation of water demand for human consumption, irrigation, water availability and potential water storage and provides advice to optimize rain-fed and irrigated agriculture. Water-Energy-Food Nexus will be considered as well. This ambition will be supported by integrating agrometeorological, climatological and hydrological expertise in WMO with socioeconomic, geophysical data and water resources management practices;

(4) **High quality data supports science, operational hydrology and their products** – WMO supports Members in technology and the generation of high-quality hydrological data and corresponding information products and services. This ambition is supported and maintained by the Global Water Data Centres and will benefit from further integration and development of the Global Hydrometry Support Facility (HydroHub), the World Hydrological Cycle Observing System (WHYCOS), the Meteorological, Climatological and Hydrological Database Management System (MCH), the WMO Hydrological Observing System (WHOS), the Innovation Hub and the Quality Management Framework - Hydrology (QMF-H), and it is mandatory for wise management of water resources. The future GDPFS and the upcoming operational phase of WIGOS and the next generation of WIS 2.0 are expected to fully integrate and support this ambition;

(5) **Science provides a sound basis for operational hydrology** - Strengthen science in support of operational hydrological prediction and modelling as part of an integrated earth systems approach. This ambition would benefit from an improved understanding of the impacts of various stressors on the hydrological cycle, in support of closing the water balance;

(6) **We know the water resources of our world** – An appropriate monitoring system, addressing all key variables associated with operational hydrology, including the cryosphere, spans the globe and produces information that can be used to optimize the efficiency of existing services, future policies and services and political decision-making from local to global scale. Further development of WMO initiatives like WHOS, HydroSOS and the Global Cryosphere Watch (GCW), matched with other international efforts will support a fully operational World Water Data Initiative and enable local to global assessments of the availability of water resources;

(7) **Sustainable development is supported by hydrological information** – Hydrological information is available at all appropriate scales in space and time to support all water dependent sectors for optimal operational water resources management as well as for planning and adaptation to transient environmental conditions, particularly those associated with climate change. The future GDPFS will lend itself to be merged with those WMO activities related to the Global Expanded Monitoring Initiative (GEMI). This Goal also offers a great opportunity to include private partners and research in the provision of future services. Changes to hydrological regimes are tracked and attributed adequately to support water resources management;

(8) **Water quality is known** – Surface and groundwater quality is permanently monitored as a necessary step to ensure its quality in accordance with different requirements for society and ecosystems and corrective actions are applied when necessary. A new partnership will be needed to support this goal, including existing links to the Global Environment Monitoring System-Water (GEMS-Water) (UN Environment Programme), the United Nations Educational, Scientific and Cultural Organization (UNESCO) and other relevant stakeholders;

4.1.2 The **core principles** necessary to achieve the above are:

(1) **Hydrological data and products are a global public good**

Free and unrestricted access to public and private high-quality hydrological data and products for all.

(2) **Interoperability is key to improved services**

Related disciplines, data, models, and risk management systems across all scales need to be interoperable and connected wherever it improves our analysis and optimization capabilities.

(3) **Capabilities are catalysed through digital revolution**

Using the full potential of the digital revolution to improve science and operations.

(4) **Innovation and technology improve established systems**

Benefitting from new sources of information.

(5) **Hydrological services are sustainable**

Hydrological services are recognized as being of high priority and of public interest having clearly defined roles and responsibilities and sustainable financing.

(6) **New actors are incorporated along the hydrological value chain from data to product/service**

4.1.3 The **conditions** that need to be met/created to achieve the strategic goals are:

(1) **The capabilities of national and regional entities need to be known**

A comprehensive monitoring of capabilities needs to be agreed and put into routine operation.

(2) **The value chains from hydrological data to products/services must be clear**

The products and services needed must be defined at local, national and regional level and examples championed by WMO can serve as starting points to design the necessary links in the value chains.

(3) **Capacity issues are expressed and addressed**

Capacity gaps with regard to data and products are analysed and activities linked to developing the necessary value chains are harmonized with those linked to capacity building.

(4) **Cooperation is wanted and supported**

Cooperation must be focused and based on a common understanding so that the entire system benefits equally.

(5) **Policies reflect the fact that economic development is predicated on adequate hydrological infrastructure**

The actions of national policymakers demonstrate that hydrological data and products are essential to economic prosperity and societal well-being.

(6) **Free and unrestricted data policy is promoted among Members**

(7) **Users of water resources monitor and report the real usage of the resource**

5. Hydrology as a core mandate of WMO

5.1 The WMO main hydrological activities should focus on increasing the capability of Members to collect data and produce tangible and high quality products. Thanks to its unique expertise in operational hydrology within the UN in conjunction with well-recognized regulations, WMO has an important role to play in rationalizing the global stocktaking process with its international partners. A solid collaboration and coordination of these efforts will lead to more effective and more sustainable achievements.

5.2 The core value of what WMO contributes to the development and implementation of globally coordinated systems includes acquiring, processing, transmitting and disseminating Earth System observations, and related standards and the development and implementation of globally harmonized weather, climate, water, ocean and environment related services and applications to enable informed decision making and thus the realization of socioeconomic benefits by all user communities and society as a whole.

5.3 A closer collaboration with all WMO domains will reinforce the following specific issues:

- Regulation and normalization, with a unified approach wherever possible;
- Development of end-to-end multi-hazard early warning systems;
- Improved understanding and ability in disaster risk reduction and water management processes;
- Building a value chain that links global, regional and national climate services and hydrological services;
- Information on the current and future status of the Earth System considering the whole hydrological cycle;
- Improving synergies in applied research activities;
- Coordinating capacity building and training activities.

5.4 Stronger WMO internal coordination and gains in efficiency will help reach the very diverse and lesser-known public and private users of hydrological services, in addition to the well-known users of the meteorological and climatological communities.

5.5 WMO must strengthen its partnerships with relevant UN agencies and other international players, beyond its traditional links with UNESCO-IHP, IAHS and IAHR, such as UN Environment, UNDP, UNICEF, FAO, UNECE, international basin commissions, the World Economic Forum to name but a few. Key indicators of success will be the measureable improvement in capabilities of NHSs to address the challenges of the global water agenda and the increased visibility of hydrological activities in WMO contributing to this on global, regional and national scales. These efforts will enhance the overall recognition of WMO as a trusted and solid partner, providing unique and concrete contributions to societal, economic and environmental challenges.

6. Aspiration and impact

- WMO provides guidance for investment in hydrometeorological and water development;
- WMO provides methodology and builds the capacity of its Members to provide hydrological services to all relevant stakeholders;
- WMO is seen as an objective, trusted advisor in hydrological disputes with respect to quantity and quality;
- WMO is contributing to sustainable development and peace;
- WMO is the link between hydrological scientific research and operations;
- WMO is the platform for regional cooperation in integrated water resource management;
- WMO is the lead agency for the appraisal of hydrological conditions, i.e. status and outlook, on a global and regional level.