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**Submissions from entities in the United Nations system, international
organizations and other stakeholders on their efforts in 2019 to
implement the outcomes of the WSIS**

Submission by

World Meteorological Organization

This submission was prepared as an input to the report of the UN Secretary-General on "Progress made in the implementation of and follow-up to the outcomes of the World Summit on the Information Society at the regional and international levels" (to the 23rd session of the CSTD), in response to the request by the Economic and Social Council, in its resolution 2006/46, to the UN Secretary-General to inform the Commission on Science and Technology for Development on the implementation of the outcomes of the WSIS as part of his annual reporting to the Commission.

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World Meteorological Organization (WMO) Submission to WSIS Report 2019

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Part 1: Executive Summary

1. The World Meteorological Organization (WMO) is committed to promoting and supporting the implementation of Information and Communication Technologies (ICTs) for improving the global, regional and national production, exchange and distribution of information, forecasts and warnings on weather, climate, and water. In this way, WMO contributes to the World Summit on the Information Society (WSIS) action line on e-environment and its call "to establish monitoring systems, using ICTs, to forecast and monitor the impact of natural and man-made disasters, particularly in developing countries, Least Developed Countries) (LDCs) and small economies."
2. ICT systems that collect weather, climate and water information from around the globe underpin the delivery of information to the public, businesses and governments. They also support the production of analyses, forecasts and warnings. WMO continues to develop its WMO Information System (WIS) to allow and facilitate wider accessibility to this information.
3. In addition to improving climate change monitoring and related applications, WMO seeks to link WIS and ICTs with the data needs of the five priority areas of the Global Framework for Climate Services (GFCS): Agriculture and food security, Water, Disaster Risk Reduction, Health and Energy.
4. The successful development of the Severe Weather Forecasting Demonstration Project continues to evolve in eight geographical regions. Arrangements and techniques developed through this project allow decision makers in countries with less developed infrastructure to take advantage of high-value meteorological analyses and predictions generated around the world, thereby reducing the impact on life and property of severe weather events.
5. WMO uses geospatial systems, the OSCAR tool suite, in support of more efficient global and regional network planning. The OSCAR/Surface and OSCAR/Space databases, maintained by National Meteorological and Hydrological Services (NMHSs) as well as regional partners, contain the current observing systems capabilities, represented in a WMO Standard for observing capabilities, the WMO Integrated Global Observing System Metadata Standard. Another database, OSCAR/Requirements, contains internationally agreed requirements of observing systems, for different application areas, such as climate monitoring or global numerical weather prediction. By contrasting the capabilities and requirements, the OSCAR tool suite can help in identifying gaps in network capabilities and therefore contribute to a more rational, integration and efficient evolution of the different WMO observing systems.
6. ICTs are being harnessed by national weather services around the world to improve the services they offer to citizens. The demand for accessible and accurate services will continue to grow in the years ahead. To respond effectively to the new human vulnerabilities and socio-economic trends of the 21st century, national weather services need greater recognition from policymakers and to be further integrated into

national development plans. This will help ensure that all countries reduce the risks and maximize the opportunities linked to weather, climate and water, towards implementation of the 2030 Agenda for Sustainable Development and Sendai Framework for Disaster Risk Reduction.

Part 2: Analytical overview

1. WMO achieves its objectives by facilitating international agreement among NMHSs around the world. Challenges to the use of ICT collaboration tools for this purpose include great variability in the quality of ICT infrastructure available to various countries, low uptake of tools that are not a part of the daily working environment of the collaborators, and security constraints that restrict some organizations' access to collaboration web sites. The most effective techniques for collaboration remain email lists, wikis and, where time zone differences permit, telephone and video conferences.
2. The WMO Information System (WIS) provides a major upgrade to the way weather services and their partners manage and share weather, climate, water, marine and related environmental information. WIS exploits the most recent advances in information and communication technologies and reduces the costs of exchanging information. WIS gives users outside the meteorological community free access to an expanded range of information. As a result, WMO can now collaborate more fully with United Nations and other international partners on implementing common programmes and activities, such as the Global Framework for Climate Services.
3. Climate information and services rely on data to conduct analytical studies, feed model predictions and calibrate other types of data, such as data from remote-sensing platforms. This requires longer term observations and data of higher quality than data used for ordinary weather forecasting systems. WMO seeks to ensure that these criteria are met at global and national levels, using best-available technologies, standards and tools. WMO is currently leveraging WIS by developing the functional architecture of the GFCS/Climate Service Information System (CSIS). CSIS functions include managing historical data and providing climate forecasts, long-term change predictions and projections.
4. To provide clarity for Members in navigating the rapidly changing world of data and data technologies, and especially to provide some insight regarding trends and emerging issues in data and its use, the WMO Commission for Basic Systems led a review and prepared a report on emerging data issues. The review focused on the impact (both positive and negative) of emerging data issues on WMO and its Members, and how they might respond collectively and individually, at global, regional and/or national levels. The review converged around the important reminder that data is a means to an end, not an end in itself. It is only through its intelligent use in engaging with users and in the development and uptake of services and associated outcomes that meet societal needs that data delivers its full value, be it over the long term required for historical climate insight and impact management, the medium term for effective water and natural resource management and disaster preparedness, or over the shorter term to warn of, and support response to, impending severe weather events and disasters. The review provided a response framework featuring concrete actions centred on thinking global, acting local and reaching forward.

Part 3: Innovation and Progress, plans

1. The Eighteenth World Meteorological Congress of June 2019, adopted two resolutions related to emerging data issues. In Resolution 55, it requested the 'WMO Guidelines on Emerging Data Issues' be published in all WMO languages, and a WMO Data Conference be convened in 2020. It invited Members to participate in exploring the potential to harness innovation and emerging technical opportunities and applications for the benefit of all. In Resolution 56, it requested its Executive Council to review the WMO data policies and practices expressed in Resolution 40 (Cg-12), Resolution 25 (Cg-13) and Resolution 60 (Cg-17); and to report back to Cg with proposals of corrective measures.

With regard to further development of WIS, Congress adopted Resolution 57, in which it endorsed "The WMO Information System 2.0 Implementation Approach". It urged Members to participate proactively in the WIS 2.0 development and implementation process. WIS 2.0 will be a collaborative system of systems using Web-architecture and open standards to provide simple, timely and seamless sharing of trusted weather, water and climate data and information through services. It will provide a "virtual one-stop-shop" for weather, water and climate information and services by providing an environment in which data can be managed, documented, discoverable, accessible and easy to use. It will also standardize information management, so data can be relied upon.

2. A specification document on Climate Data Management Systems (CDMS) was developed to help Member States use standard and the most up-to-date systems for organizing, managing and analyzing climate data from all sources. These specifications are now included as part of the WMO/WIS regulatory material, hence constituting a new reference for managing climate data and developing its supporting technology and systems. A strategy and implementation plan for a reference Open source CDMS tool sets has been developed. An expert developers meeting on climate data management systems took place in 2019 to agree on the next steps, including the open source platform for OpenCDMS development . WMO has adopted a new framework for promoting standards and best practices for managing data in support of climate change policy and services. An internationally agreed data maturity model has been developed which serves to assess the degree of maturity of earth system data to be used for climate analysis, prediction and projections. A High Quality Global Data Management Framework for Climate (HQ-GDMFC) has been setup under the WMO auspices with involvement of data managers from disciplines such as meteorology, climatology, oceanography and hydrology. The framework is also open for other communities such as socio-economic data managers.

3. A tremendous success for WMO, the Severe Weather Forecasting Demonstration Project (SWFDP) is providing most developing countries across the globe with information needed to make better decisions on mitigating the impacts of severe weather. It has also delivered improved ways of working between national, regional and global operational centres and experts, and it has established partnerships among these experts and the people responsible for planning for and managing the response to severe weather events. The SWFDP is currently active in Southern and Eastern Africa, South Asia, Southeast Asia, Central Asia, the Eastern Caribbean and West Africa. Its implementation in Central Africa has begun while plans are being discussed for South America. The project is expanding its scope by establishing synergies and integrating, for

example, with Flash Flood Guidance System (FFGS) in Southern Africa. ICT is crucial to the success of the project: global observations of the weather need to be made available, and numerical weather forecasts produced by the most advanced NMHSs, need to be accessible by forecasters in participating nations. ICTs also facilitate forecasters training in the interpretation of Numerical Weather Prediction products and in how to perform verifications (as part of the NMHSs' quality management framework). ICTs are instrumental in facilitating communication between forecasters and decision makers, helping to build long-lasting relationships. A full review of the SWFDP, FFGS and Coastal Inundation Forecasting Demonstration Project (CIFDP) have been conducted, demonstrating the value of these initiatives in terms of providing accurate warnings for severe hydro-meteorological hazards with significant lead time to take actions to save lives and properties.

4. Being developed as a cloud platform, the OSCAR tool suite exploits economies of scale, as it can be used in all WMO Member countries. This means that those WMO Member states, especially developing countries, that do not currently have a national repository of observing capabilities, can use the OSCAR platform without the need to implement a costly national database. Since OSCAR is built around international standards for the representation of geospatial information, such as the Observations and Measurements Standard of the Open Geospatial Consortium, the information uploaded to OSCAR can also be used by different systems, including those of WMO partners. Likewise, the use of a web application programming interface (API) allows the OSCAR databases to be developed as a distributed system and for other systems, such as national databases and WMO environmental monitoring systems, to exchange real-time information with the OSCAR tool suite.

5. Providing an agreed authoritative source of weather information and warnings is crucial to the successful management of weather-related events. The Eighteenth World Meteorological Congress passed Resolution 13 (Cg-18) on the development of the Global Multihazard Alert System (GMAS) framework and Resolution 15 (Cg-18) on strengthening multi-hazard early warning services in areas prone to all flooding types and severe weather. ICTs will play a crucial role in these endeavours that will help Members share their authoritative warnings with the wider global community. They will leverage the existing WIS and Global Data Processing and Forecasting System (GDPFS) as well as the Flash Flood Guidance System and Coastal Inundation Forecasting Demonstration Projects and include the adoption and wide use of the Common Alerting Protocol (CAP) as the key standard for the achievement of the goal of all-hazards, all-media public alerting.

WMO continues to work via the Public Weather Service (PWS) Programme, with the International Telecommunication Union (ITU) in promoting CAP implementation worldwide by organizing international workshops and in-country implementation projects, as well.

31 October 2019