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The World Meteorological Organization – An Essential Partner in a Future Comprehensive, Integrated Earth Observing System

by

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1. INTRODUCTION

The initiative to establish a "Comprehensive, Integrated Earth Observing System" (CIEOS) represents another landmark commitment of the United States, along with other nations, to respond to the evolving challenges for improved understanding of the Earth system and for the prediction of its future state for enhanced stewardship and sustainability. A major thrust was heralded by President J.F.Kennedy, when in 1961 at the United Nations General Assembly, he stated that "…*Here new scientific tools have become available. … the time is ripe for a concerted attack … the atmospheric sciences require world-wide observation and hence, international cooperation…*"

As a result, the United Nations (UN) invited the World Meteorological Organization (WMO) whose mandate included the responsibility of facilitating worldwide cooperation in the making of standardized meteorological, hydrological and other related geophysical observations, and of promoting their rapid exchange, to take the lead in reinforcing and maintaining an integrated international system. This evolved into the unique WMO's World Weather Watch (WWW) which incorporates the only real-time global operational observing system. WWW has kept pace with scientific and technological advances and the evolving requirements of Member countries. Today, WMO as a UN specialized agency, with its 187 Members operate an integrated system which derives from the spirit of international cooperation engendered by its predecessor the non-governmental International Meteorological Organization, established in 1873. WMO is recognized as the '*original networker'* and the UN system's authoritative voice on the state of the Earth's atmosphere, its interaction with the Earth's surface including the oceans, the resulting climate and water distribution.

2. WMO'S SYSTEM FOR EARTH OBSERVATION

WMO's Global Observing System (GOS) operated by National Meteorological and Hydrological Services (NMHSs) and partners comprises some 10 000 surface weather stations, 1 000 upper-air stations, over 1000 buoys and hundreds of weather radars. Some 7 000 ships provide observational data on a voluntary basis, while

some 3 000 commercial aircraft provide more than 150 000 observations daily. In addition, 16 operational meteorological polar-orbiting and geostationary satellites, and environmental Research and Development satellites ensure the continued monitoring of the Earth. WMO's Consultative Meeting on High-level Policy on Satellite Matters aims at integrating the efforts of satellite operators and provides advice and guidance on WMO's Space Programme. Another partner of WMO is the Committee on Earth Observation Satellites (CEOS) that coordinates the planning of related satellite missions. Taking these initiatives into consideration, WMO has initiated the redesign and modernization of its GOS, as a composite observing system, aimed at meeting the operational, research and training needs.

As WMO's mission includes atmospheric chemistry, its Global Atmosphere Watch (GAW) ensures integrated monitoring of greenhouse gases, ozone, aerosols, acid deposition, radioactivity and trace gases. Eighty countries operate about 300 global and regional stations.

As regards WMO's mandate in water resources, about 475 000 hydrological stations provide data, but the quality is not uniform. In some of the regions, WMO's World Hydrological Cycle Observing System (WHYCOS) supports National Hydrological Services in providing high quality, real-time hydrological data and information.

In the 1970s, the recognition of the role of oceans in climate and the need for ocean services led WMO and UNESCO's Intergovernmental Oceanographic Commission (IOC) to establish an Integrated Global Ocean Services System (IGOSS) for real-time collection, exchange and processing of sub-surface ocean temperature and salinity data. The Global Ocean Observing System (GOOS) will build on IGOSS and include, by 2005, some 3 000 Array for Real-time Geostrophic Oceanography (Argo) profiling floats to observe the oceans down to a depth of 2000 m. WMO also co-sponsors special observing programmes such as the World Ocean Circulation Experiment (1990-1998) and several observing systems which includes the Global Climate Observing System (GCOS). The GCOS integrates observations of the atmosphere, ocean and land, for specific needs related to climate, climate variability and climate change and has developed related observing requirements in collaboration with the United Nations Framework Convention on Climate Change for the support of the Parties. The Global Terrestrial Observing System (GTOS) contributes to observing networks of glaciers and permafrost and will eventually encompass land observations, forestry, and snow and ice cover. Also, the Integrated Global Observing Strategy (IGOS) aims at integrated monitoring of the atmosphere, ocean and land.

In order to ensure accessibility, quality control, archiving, sustainability and wider use of WMO's observing system, the Organization monitors its operation, organizes special observing programmes, coordinates World Data Centres and calibration centres, provides referral services and promotes data rescue. WMO's policy commits Members to exchange meteorological and hydrological data and products in a free and unrestricted manner. These initiatives and commitments could be the basis for a cost-effective, comprehensive and integrated observing system based on WWW as a model.

3. THE NEED FOR A COMPREHENSIVE AND INTEGRATED EARTH OBSERVATION SYSTEM

WMO's unique system of observation has evolved gradually and its cost-effectiveness and sustainability is assured as all nations contribute to and benefit from it. The system enabled WMO to alert the world community of major environmental changes relating to climate change, ozone layer depletion, increase in natural disasters and pollution and dwindling water resources. Indeed, every major enhancement in data availability and accompanying research has resulted in improved products and services. For example, systematic observation of the chemical composition of the atmosphere initiated by the International Geophysical Year (1957-58) led to the detection of the 'ozone hole', the adoption of the convention on ozone, and the knowledge of greenhouse gases increase and their impacts on climate. Systematic monitoring of the Pacific Ocean through the Tropical Ocean and Global Atmosphere (TOGA) project has contributed to the understanding of El Niño phenomena and atmospheric teleconnections and resulting in breakthrough in monthly to seasonal and inter-annual forecasts. The Global Weather Experiment (1978-79) resulted in improved numerical weather prediction, with 5-day forecast skill in 1980 being about the same as that of 7-day in 2001. Some related advances comprise improved skilful forecasts, with longer lead time, of extreme events which include tropical cyclones and hurricanes and seasonal and climate change predictions.

Today, the remarks of President Kennedy may apply to the Earth system, as benefits obtained so far from WMO's system point to further opportunities which a comprehensive and integrated Earth Observation system may provide. This includes effective global monitoring of the totality of the Earth system with rehabilitation of weak infrastructure in developing countries and over oceans, improved understanding of the components of the Earth system and the links between them, and improved warnings of weather and environmental hazards. This was recognized by the IPCC which called for additional systematic and sustained observations in support of its

fourth Assessment Report planned for 2007. The World Summit on Sustainable Development (Johannesburg, 2002), and various conventions and action plans have made similar pleas.

4. ADDRESSING SOME OF THE CHALLENGES IN DEVELOPING A COMPREHENSIVE, INTEGRATED EARTH's OBSERVING SYSTEM

Some of the challenges to be addressed in ensuring a comprehensive and integrated observation system include those related to:

(a) Long-term commitment and concerted action by national governments, international organizations and private sector to strengthen and maintain systematic observation for various parameters for national and regional development programmes and global initiatives, conventions and strategies;

(b) Improvement in standards and coverage for observing systems, data and products, especially for the terrestrial domain as well as monitoring, archiving, availability and accessibility at an affordable cost;

(c) Adequacy assessments for other identified parameters, as has been done for weather, climate and water;

(d) The ability of all countries to maintain and operate their national components of the system and benefit from it in a sustainable and self-reliant manner. New technology should be available at affordable costs;

(e) Adherence to WMO's principle of free and unrestricted exchange of data and products; and

(f) Capacity building including human resource development and system improvements in developing countries are essential, if the system is to be truly global. For this purpose, a coordinated agreement on donor funding and support from nations with the ability to do so and partnership should be put in place.

5. CONCLUSION

As outlined in the draft Declaration, the goal of this Summit is desirable. In view of its mandate and long-standing experience in maintaining a successful operational system, WMO has the international authority in dealing with all aspects of working toward a comprehensive and integrated system of observation, data and products standardization, service provision, research and training in areas related to weather, climate and water. It is committed to furthering its cooperation with countries, institutions and partners in building a stronger and more comprehensive and integrated observing system in these areas and others of critical importance at global and regional levels for the well-being of humanity.