World Meteorological Organization

The World Meteorological Organization (WMO) is the UN specialized agency which promotes the effective exchange and use worldwide of meteorological and hydrological information, notably in weather forecasting, water-resource assessment, and climatology. WMO's Secretary General is Prof. Godwin Olu Patrick Obasi of Nigeria. He will be succeeded by Dr. Michel Jarraud of France on January 1, 2004.

WMO coordinates international efforts to improve the accuracy of information on weather, the atmosphere, climate and water and to ensure that such information is widely available. International cooperation in this area is critical since weather and climate systems do not recognize national borders and are constantly interacting. WMO provides a framework for the free and unrestricted exchange of data and promotes the establishment of international observation networks.

At WMO's new headquarters a combination of specially coated windows and high tech ventilation were used to create an energy efficient interior environment.

WMO seeks to further the application of meteorology to aviation, shipping, water problems, agriculture and other human activities. Its work contributes to the safety of communities, the smooth flow of transportation, efficient agricultural practices and the protection of property and the environment.

WMO is also a lead UN agency responsible for studying the impact of human activity on climate and global warming. It is concerned with environmental problems, such as pollution, which affect the atmosphere and water, and how to deal with and warn of emergencies that might arise from accidental release of dangerous pollutants. WMO's Global Atmosphere Watch (see below) monitors changes in atmospheric concentrations of pollutants, ozone and other gases.

WMO supports the dissemination of results of research and technical information, and the transfer of technology in the fields of weather and climate services. WMO's education and training program, which focuses mainly on the developing world, aims to help countries improve their National Meteorological and Hydrological Services, and thereby improve global data collection and weather and climate prediction systems.

The governing body of the WMO is the World Meteorological Congress which convenes every four years to oversee WMO's work, set its budget, and plan its future programs. The Fourteenth WMO Congress was held May 5-24, 2003. An Executive

Council of the WMO meets annually between Congresses to take stock of and provide guidance on WMO's work. WMO has eight technical commissions responsible for: aeronautical meteorology; agricultural meteorology; atmospheric sciences; basic systems; climatology; hydrology; instruments and methods of observation; and marine meteorology. WMO has six regional associations for Africa, Asia, South America, North and Central America, South-West Pacific and Europe.

Weather

The backbone of WMO's activies is the World Weather Watch (WWW), the world's weather observation, processing and exchange network. Launched in the early 1960s, this highly complex global observing and forecasting system, which is administered by National Meteorological and Hydrological Services, involves the use of satellites, ships, ocean data buoys, commercial aircraft and computers, as well as traditional earth-based observation methods to gather data on temperature, atmospheric pressure, wind, rainfall and other meteorological parameters. The WWW aims to improve the quality of shorter-range weather forecasting, and to extend the period for which weather and climate trends can be accurately forecast — from the current six days, to a season or even a year ahead. As in most of WMO's projects, the U.S. National Weather Service and other parts of NOAA (National Oceanic and Atmospheric Administration) play a major role in the WWW, providing data from geostationary and polar-orbiting weather satellites, plus some of the hundreds of different ground and upper-air observation platforms.

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The WWW has three basic components: 1) the Global Observing System (GOS), which comprises facilities on land, at sea, in the air and in outer space for the observation and measurement of meteorological elements; 2) the Global Telecommunications System (GTS), which receives and transmits weather data around the world in internationally agreed codes to avoid language problems; and 3) the Global Data-Processing System (GDPS), which is a network of world and regional data-processing and analyzing centers.

The WWW system also includes WMO's satellite and emergency response activities, and the Tropical Cyclone Program (TCP) which is designed to assist more than 50 countries in areas vulnerable to tropical cyclones. By improving forecasting, warning systems and disaster preparedness, the TCP aims to minimize the destruction and loss of life caused by tropical storms.

Hydrology and Water Resources

WMO carries out much work in the field of hydrology (movement of water on, over and under the earth's surface) and water resources. This includes designing water-resource systems in the developing world and studying how to deal with water-related disasters: extreme floods and droughts, the hydrological consequences of earth-

quakes, avalanches and volcanic eruptions (lava- and mudflows, melting of ice caps and glaciers), the hydrological problems of dam ruptures, and the consequences of accidental water pollution (spillages). The WMO encourages countries to collect and analyze basic data on rainfall, streamflows, groundwater levels, etc. which are essential to understanding how, when and where water-related disasters may occur. Through its program called "HOMS" (Hydrological Operational Multipurpose System), WMO helps National Hydrological Services and other national water resources agencies in their operational activities through the exchange of technology (instruments, manuals, computer programs, etc.) and other expertise between WMO members. For example, the U.S. National Weather Service (NWS) has developed models to aid flash-flood hydrologists in forecasting dam-breaching flooding.

A new approach on how to bridge the gap in meteorological and hydrometeorological services between developed and developing countries is addressed in WMO's Sixth Long-term Plan (2004-2011). It presents a consideration of the basic levels of weather and hydrological services needed in every country to support its economy and to provide warnings for the safety of populations, and an analysis of the present shortfalls in developing countries in meeting these basic levels.

World Climate Program

The World Climate Program (WCP), WMO's program to study the climate and its variations, was established in 1979 as a result of the First World Climate Conference. It was the first attempt to improve humankind's knowledge of the natural variability of climate and of climatic changes due to natural phenomena or human activity. The idea of a possible "global warming" was in its infancy at the time, and the WCP's objective was to make human activities, especially in arid, semi-arid, or high-rainfall regions of the world, less vulnerable to climatic change and variations. It encouraged a greater application of climate data (increasingly available in computer software packages) in a broad range of human activities such as in health services, and in urban and agricultural planning. In order to develop an authoritative consensus view on the potential for climate change, including a possible trend towards global warming, the WMO and UNEP jointly created in 1988 the Intergovernmental Panel on Climate Change (IPCC — see also seperate chapter). IPCC assessments of the impact of greenhouse gases were used to support negotiations for the UN Framework Convention for Climate Change (UNFCCC). The IPCC Second Assessment report, issued in 1995, found "a discernible human influence" on global climate and the Third Assessment Report (TAR), issued in 2001, has had a significant impact on attitudes to global warming. Some of the more important of its findings were:

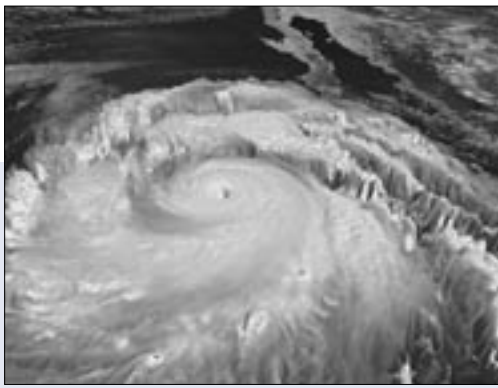
1) Human activities have increased the atmospheric concentrations of greenhouse gases and aerosols since the pre-industrial era. The atmospheric concentrations of key anthropogenic greenhouse gases (CO_2, CH_4, N_2O and O_3) reached their highest levels in the 1990s, primarily due to the combustion of fossil fuels, agriculture, and land use changes.

2) Globally it is very likely that the 1990s was the warmest decade, and 1998 the warmest year, in the instrumental record (1861-2000). The increase in surface temperature over the 20th century in the Northern hemisphere is likely to have been greater than for any century in the last thousand years.

3) There is new and stronger evidence that most of the warming over the last 50 years is attributable to human activities.

The Global Climate Observing System

Another major component of WMO's climate agenda is the Global Climate Observing System (GCOS). GCOS was established in 1992 to ensure that the observations and information needed to address climate-related issues are obtained and made available to all potential users. It is co-sponsored by the WMO, the Intergovernmental Oceanographic Commission (IOC) of UNESCO, the United Nations Environment Program (UNEP) and the International Council for Science (ICSU). GCOS is intended to provide the comprehensive observations required for monitoring the climate system, for detecting and attributing climate change, for assessing the impacts of climate variability and change, and for supporting research toward improved understanding, modeling and prediction of the climate system. The United States Clear Skies and Global Climate Change Initiatives announced in February 2002 called for the U.S. to provide funding for, inter alia, high priority areas of climate change research. The U.S. Climate Change Research Initiative proposed under that program included $4 million in support of global climate observing networks which would strengthen and enhance those being coordinated through GCOS.



Satellite photo of a hurricane. WMO's regional commissions are responsible for proposing names for tropical storms.

El Niño/Southern Oscillation

Much of today's scientific understanding of the El Niño/Southern Oscillation (ENSO) effect, the phenomenon which caused devastating floods and droughts in many areas of the world in 1997 and 1998, derives from international research conducted under WMO auspices. The 1985-1994 Tropical Ocean Global Atmosphere (TOGA) research program was designed to increase the understanding of ocean currents and countercurrents such as the El Niño/Southern Oscillation (ENSO) effect that produces changes in the atmospheric circulation and consequently the climate. The El Niño phenomenon occurs irregularly and includes temperature changes in the central and eastern Pacific ocean, caused as the warm water of the western Pacific moves east and then cools again. This oscillation back and forth reaches a third of the way around the earth and the changes in Pacific temperatures and winds affect the atmosphere, resulting in an atmospheric pressure pattern known as the Southern Oscillation.

The ENSO ocean-atmosphere coupling has a significant effect on atmospheric circulation over other parts of the globe. Variability in patterns of heating in the tropics changes the patterns of heating in the atmosphere as a whole, thereby determining major aspects of the variability of the earth's climate. TOGA's subproject

TOGA COARE (Coupled Ocean-Atmosphere Response Experiment for the Warm Pool Regions of the Western Pacific) sought to study the way ENSO interacts with the atmosphere, to make detailed observations of the changes produced, and to thereby learn to predict El Niño and calculate its oscillations. Scientists now believe they can predict El Niño a year in advance using data from the TOGA and TOGA COARE projects and new computer modeling techniques. Economists in the United States estimate that improved El Niño forecasts are worth $300 million annually.

Climate Information and Prediction Services (CLIPS)

CLIPS was launched in June 1995 to build on the findings of the Tropical Ocean Global Atmosphere (TOGA) project and to develop the capacity to improve climate prediction using advanced communications and information technology.

Global Atmosphere Watch (GAW)

Set up in 1989, the WMO's Global Atmosphere Watch integrates the many individual monitoring and research activities involving the measurement of atmospheric composition, and serves as an early warning system to detect further changes in atmospheric concentrations of greenhouse gases, changes in the ozone layer and in the long-range transport of pollutants. As part of this program, WMO issues regular bulletins on the state of the ozone layer over the Antarctic.

Membership

In mid-2003, WMO had 187 members, comprising 181 member states and six member territories.

Budget

The greatest proportion of WMO funding comes from members' own resources committed to the operation of national observing, communication and data-processing systems which are planned and implemented within the WMO framework. The maximum expenditure for the financial period 2004-2007 as approved by the Fourteenth World Meteorological Congress in 2003 is 253.8 million Swiss francs.

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