

# WORLD METEOROLOGICAL ORGANIZATION

## 60 YEARS OF SERVICE FOR YOUR SAFETY AND WELL-BEING

# SIXTY WAYS WMO MAKES A DIFFERENCE

### CONTRIBUTING TO PEACE AND SECURITY

#### 1 Contributing to peace

---

In 2007, the United Nations Security Council discussed climate change as a potential threat to peace and security. Other potential causes of conflict could arise from inequitable sharing of water from transboundary rivers and the damage resulting from pollutants travelling across frontiers. Weather, climate and water information from WMO ensures transparency and contributes to building mutual trust and maintaining peace. The 2007 Nobel Peace Prize was awarded to the WMO/UNEP-sponsored Intergovernmental Panel on Climate Change in recognition of its work related to climate change over two decades.

#### 2 Safety from radioactive fallout

---

WMO, in close collaboration with the International Atomic Energy Agency, monitors and exchanges

information on the transboundary movement and intensity of radionuclides in air and water, including those arising from nuclear accidents. This information is also used in preventive diplomacy and other forms of pre-emptive actions that defuse potential conflicts.

### TAKING THE PULSE OF EARTH SYSTEMS

#### 3 Observing our planet for a better future

---

WMO and its predecessor have ensured the systematic monitoring of weather, climate, surface and groundwater, the oceans, and constituents in the atmosphere for over 150 years. These data are standardized and quality controlled and serve as authoritative information for numerous applications worldwide. Satellite measurements of the parameters of the Earth's weather systems, ocean and land surface, radiation balance and composition of the atmosphere are an integral part of the WMO Global Observing System.

## **PRESERVING HUMAN HERITAGE**

### **4 Preserving data**

---

Weather, climate, water and environmental data, some generated for over a century, are compiled and archived nationally and internationally according to international standards and agreements established by WMO. The information is complemented by proxy and paleoclimate data and is stored in WMO World Data Centres.

## **IMPROVING WEATHER AND CLIMATE FORECASTS**

### **5 Improving weather forecasts**

---

A major achievement has been the continued improvement in weather forecasts through models that represent more accurately the physical and chemical processes that underlie the evolution of weather. Cooperative efforts have made it possible for a five-day forecast to be as reliable as a two-day forecast was 20 years ago.

### **6 Improving climate predictions for a season to a year**

---

Over the past 30 years, scientific research sponsored by WMO and its partners has led to considerable improvement in understanding the climate system and in providing predictions for a season to a year ahead, accompanied by a projection of impacts. The most successful effort has been the prediction of El Niño and La Niña phenomena.

### **7 Predicting climate at the regional scale**

---

While considerable progress has been made in global climate projections, climate change requires society to have reliable regional climate predictions to plan efficiently and adapt in areas such as food production, water resources, coastal protection, energy, environment and health. WMO is addressing regional-scale prediction as a priority.

### **8 Knowing our future climate**

---

In 1976, WMO issued the first authoritative statement on global climate change as a result

of the observed increase in greenhouse gases. Considerable progress in climate modelling, with the aid of the most powerful computers, means that it is possible to make climate projections several decades to a century ahead and to predict the potential implications for Earth systems. This has led to the recognition that humans are contributing to global climate change.

## **ACCESSING VITAL INFORMATION**

### **9 Providing local access to a global network**

---

WMO provides a unique system for the real-time exchange and availability to all nations of weather data and products, including information from satellites over its dedicated telecommunications network. These products are used in daily forecasts and warnings, and in numerous socio-economic activities and environmental monitoring. This operational system enables all nations to access information related to other hazards such as tsunamis, seismic activity and transport of radioactive or chemical pollutants.

### **10 Free and unrestricted exchange of data and products**

---

A major contribution to the safety and well-being of humanity is the increasing availability of weather, climate, water and related environmental and other data and products at global and national levels. This arrangement has been at the core of real-time weather services, increasingly accurate warning systems with longer lead time, climate projections on timescales of a season to a year to a decade, climate change detection and attribution, and a wide spectrum of environmental programmes.

## **USING CLIMATE INFORMATION**

### **11 Applying climate information to sustainable development**

---

Climate information aids in planning and decision-making related to socio-economic activities, environmental protection and disaster mitigation. In particular, this information is used in the management of health, energy, urban development, water, agriculture and food security, and tourism.

WMO facilitates the development and sharing of guidance on the use of such data.

## **PROTECTING OUR ENVIRONMENT**

### **12 Observing our climate**

---

WMO systematically monitors concentrations of atmospheric gases, including carbon dioxide, methane and nitrous oxide. The First World Climate Conference, convened by WMO, led to alerts about climate change and resulted in the creation of the World Climate Programme, the World Climate Research Programme and IPCC, which was given responsibility for assessment activities. The Second World Climate Conference led to the UNFCCC and the Kyoto Protocol. WCC-3 is leading to the establishment of the Global Framework for Climate Services.

### **13 Timely advisories and early warnings on air quality**

---

The World Health Organization estimates that about 2.3 million people die each year from air pollution. To address this problem, WMO Members monitor air quality by measuring oxides of sulphur, nitrogen and carbon, surface ozone, volatile organic compounds, and particulates, as well as levels of pollen and dust. These measurements are used in issuing timely warnings about the nature and concentration of pollutants that can cause asthma, other respiratory illnesses, and heart problems.

### **14 Preserving the ozone layer**

---

By monitoring the protective ozone layer some 20 to 30 kilometres above the Earth's surface, since 1975 WMO has been instrumental in alerting the global community to the danger of an 'ozone hole'. As a result, the Vienna Convention on the Protection of the Ozone Layer (1985) and its Montreal Protocol on Substances that Deplete the Ozone Layer (1987) were adopted and nations have been phasing out ozone-depleting chemicals.

### **15 Safeguarding life from ultraviolet light exposure**

---

As a result of the continuous monitoring of the thickness of the ozone layer by WMO, its Members

are able to issue UV Index information around the globe for the protection of citizens. Ultraviolet radiation has harmful effects on human, plant and aquatic life. Prolonged exposure may cause skin cancer and cataracts and may adversely affect the human immune system.

### **16 Protecting from sand- and duststorms**

---

Early warnings of sand- and duststorms are helpful in mitigating their health impacts, as well as damage to property, ecosystems, agriculture and transport. The WMO Sand and Dust Storm Warning and Assessment System is being implemented through collaborative efforts in the regions concerned.

### **17 Dealing with acid rain**

---

Acid rain due to chemicals from fossil fuel burning has negative consequences for plants, freshwater fish populations and the built environment. WMO maintains a constant watch on the components that cause acid rain. The Convention on Long-range Transboundary Pollution in Europe, initiated by WMO, has been effective in decreasing emissions of sulphur dioxide. The problem of acid deposition is increasing in the developing world.

## **PROVIDING ENVIRONMENTAL WARNINGS**

### **18 Issuing volcanic ash alerts**

---

WMO issues advisories regarding volcanic ash and its movements in the atmosphere following eruptions that spew voluminous amounts of ash. The ash poses a threat to aircraft operations and human health, and may cause a temporary drop in global temperatures.

### **19 Warning of the movement of oil spills at sea**

---

In the event of oil spills, the WMO system provides warnings of their movement with projections of landfall. Suitable mitigating measures may thus be undertaken ahead of time in the threatened regions.

### **20 Warning of forest and wildfires**

---

Devastating fires are often triggered by lightning or human actions, especially under dry conditions.

They may destroy not only forests, grasslands, crops and wildlife, but also settlements, and they may put human lives at risk. The WMO system monitors drought conditions and provides advance warnings of areas at risk. WMO also develops wildfire warning systems in the regions concerned.

### **21 Underpinning international laws on environment**

---

A number of environmental laws, including those on the thinning of the ozone layer, transboundary transport of pollutants and the increase in greenhouse gases, were promulgated on the basis of observations made by the WMO systems. Compliance, control and further refinements of these laws require constant monitoring and the availability of authoritative data provided by WMO.

## **STRENGTHENING INTEGRATED WATER MANAGEMENT**

### **22 Assessing water resources**

---

Freshwater resources are diminishing and deteriorating under demographic and climate pressures. Knowledge of available water resources at the national level is essential for the management of domestic and industrial water use, irrigation, and hydropower generation. WMO provides for the monitoring of surface and groundwater, data exchange, and the application of data to water resources management.

### **23 Integrated water resources management**

---

WMO ensures the preparation of suitable forecasts needed to plan water storage, agricultural activities, urban development, the prevention of flood-related disasters, and public health measures involving water quality. This effort contributes to an integrated, multidisciplinary approach to managing water resources.

## **PROTECTING THE OCEANS**

### **24 Keeping coastal communities safe**

---

Over half of the world's population lives near the coast. WMO advisories and warnings of tropical

cyclones, high waves, storm surges and coastal flooding contribute to the safety of people living in coastal communities. In many countries, tsunami warnings are provided by NMHSs.

### **25 Contributing to safe ocean drilling and mining**

---

The efficient and safe operation of offshore oil and gas installations relies on knowledge of marine forecasts of extreme weather events. Ocean mining requires similar information to ensure safety. The WMO network allows for the delivery of such information.

### **26 Ensuring secure pollution clean-up and search-and-rescue operations**

---

An increase in the pollution of oceans and coastal waters has been observed recently. Sound information about the weather and the state of the sea from the WMO system is vital for safe clean-up operations. Search-and-rescue efforts also rely on the ready availability of such information.

## **TOWARDS A SAFER WORLD**

### **27 Vulnerability and risk reduction**

---

An important dimension in building risk-resilient communities is the assessment of their vulnerability and ensuring their preparedness. WMO contributes to this effort by making the relevant data on hazards available. WMO is a major pillar of the United Nations International Strategy for Disaster Reduction and the Hyogo Framework for Action 2005–2015.

### **28 Cyclone preparedness and damage prevention**

---

Natural hazards of hydrometeorological origin such as tropical cyclones, droughts, floods and tornadoes are a constant threat to human security, economic development and well-being. A major contribution of WMO has been its system of early warnings as a key for preparedness and damage prevention. The WMO Tropical Cyclone Warning Centres have proved their effectiveness in significantly reducing the loss of life.

### **29 Early warning against drought**

---

Drought is an insidious natural hazard that has implications for human activities and the environment. In addition, more than 250 million people are directly affected by desertification. Some 1 billion people in over 100 countries are at risk. WMO takes the lead in monitoring the phenomena through the timely collection of climatological and hydrological data and by issuing early warnings. It also actively supports the United Nations Convention to Combat Desertification (UNCCD). Several specialized regional drought monitoring centres have been established by WMO in collaboration with UNCCD.

### **30 Warnings of floods**

---

Floods threaten human life and property worldwide. Some 1.5 billion people were affected by flooding in the last decade of the twentieth century. Climate change may lead to more frequent occurrences of catastrophic flooding. The WMO system allows for the prediction and monitoring of potential flood conditions and the delivery of advance warnings.

### **31 Warning of other hazards**

---

Specialized centres operated by WMO provide early and timely warnings of all other weather- and climate-related hazards, such as forest fires, heatwaves and cold spells, land- and mudslides, storm surges, lightning, fog, flash floods, blizzards and avalanches.

### **32 Protecting from heatwaves**

---

Heatwaves, higher maximum temperatures and an increase in the number of hot days have become common occurrences. They are associated with significant risks to health from pollution and heatstroke, which kills or affects more people than tornadoes, earthquakes or tropical cyclones. The prediction of heatwaves and their intensity and duration by WMO enables health authorities to take suitable preventive measures.

### **33 Providing tsunami warnings**

---

WMO has been contributing to tsunami warnings by making its Global Telecommunications System

available for the dissemination of warnings to countries likely to be affected by tsunamis. This process was facilitated by the lead role played by many of the NMHSs in issuing tsunami warnings. In other countries, NMHSs were assigned this responsibility because of their 24-hour operational capability.

## **CONTRIBUTING TO FOOD SECURITY**

### **34 Providing agrometeorological services**

---

Timely and accurate weather and climate information is critical to the agricultural community to sustain agricultural production and increase crop and livestock yields, to plan and manage planting and harvest time, and to control pests and diseases. Such information is essential for insurance against crop failure and for stock market derivatives. WMO also helps developing countries to modernize and improve agriculture and forestry in ways that conserve natural resources and improve nutrition.

### **35 Contributing to sustainability of fisheries**

---

Fish are a major source of nutrition around the world. Information on weather, including temperature, wind, and ocean waves and currents, provided through WMO, is routinely used in commercial fishing operations.

### **36 Early warning and control of locust swarms**

---

Every year, desert locusts in Africa, Asia and the Middle East inflict immense damage on agriculture. Between 2003 and 2005, the damage was estimated at US\$ 400 million and affected 8.4 million people. On the basis of weather information provided by WMO, such as precipitation, temperature, humidity and wind, locust swarms are controlled thanks to prior knowledge of favourable sites for breeding and the subsequent directions of their movement.

### **37 Soil**

---

The health of the soil is crucial to life as it supports organisms at the bottom of the terrestrial food

chain – worms, insects, fungi and vegetation. It plays an essential role in the hydrological cycle and in the biogeochemical cycle. Deforestation, erosion, pollution and acidification are causing catastrophic damage and degradation affecting some 2 billion hectares of land. WMO monitors several of the parameters essential in maintaining healthy soils.

### **38 Biodiversity**

---

Biodiversity plays a vital role in regulating the composition of the atmosphere, the hydrological cycle, and soils, as well as the pollination of crops and absorption of pollutants. WMO provides data for several of the parameters that are essential in monitoring and in reversing biodiversity loss and it supports many of the actions called for under the Convention on Biological Diversity.

### **39 Protecting natural resources**

---

Natural resources are essential for meeting human needs and for human survival. Better management of these resources contributes to human security, including sustainable livelihoods, resilience to disasters, disease prevention, and conflict avoidance and peacebuilding. WMO provides information on weather, climate and environmental conditions that helps to optimize the use and protection of these resources.

## **PROMOTING CLEAN ENERGY**

### **40 Using energy economically**

---

Energy availability determines to a large extent the economic well-being of a population. Information on current and forecast weather, the climate, and water resources helps to optimize energy consumption. WMO facilitates the generation and exchange of such information, which aids in planning and meeting energy demands, in developing energy systems, and in ensuring compliance with environmental requirements.

### **41 Assisting in the generation of clean energy**

---

The optimal development of renewable energy resources, such as hydropower and wind, solar and biological energy sources, requires regular

and reliable information on weather, climate and water. WMO ensures that such information is readily available to all nations involved in developing renewable energy sources.

## **PROTECTING HEALTH**

### **42 Protecting health**

---

WMO provides weather and climate services in support of human health. Early warnings of disease epidemics, disaster prevention and mitigation, and air quality services contribute to the protection of public health. Malaria surveillance in Africa, heat health advisories and warnings, and the UV Index are a few of the information services available routinely to international, regional and national health partners.

## **ENSURING SAFE AND SECURE TRANSPORT**

### **43 Ensuring the safety of air transport**

---

The aviation sector requires a range of information on weather conditions, including wind and wind shear, visibility, turbulence, fog, precipitation, and icing conditions. WMO ensures the worldwide provision of cost-effective meteorological services in support of safe, regular and efficient aviation operations, as well as for the launch and landing of spacecraft.

### **44 Ensuring the safety of marine transport**

---

Over 95 per cent of goods by tonnage are shipped over the oceans efficiently. Safety of such transport is assured by the provision of up-to-date information on adverse weather conditions and the state of the sea, a specialized service made possible by the WMO network of weather monitoring and dissemination systems.

### **45 Safety of road and rail transport**

---

The economic well-being of a nation relies to a significant extent on the safe and economical transport of people and goods by road and rail. Weather and climate are determining factors in the efficiency and security of such transport. WMO devotes special attention to providing

suitable and timely information to all operators and users of ground transport.

#### **46 Pipeline transport**

---

WMO provides information about conditions in the surrounding environment, including permafrost and groundwater drainage, which is essential for the safe operation of land-based pipelines, and it also supplies information on marine conditions for underwater pipelines.

### **ENSURING THE SAFETY OF THE URBAN ENVIRONMENT**

#### **47 Safety of the urban environment**

---

Half of humanity now lives in cities, and within two decades nearly 60 per cent of the world's people will be urban-dwellers. Environmental aspects are of paramount importance given this scenario. Increased incidence of pollutants, such as surface ozone, nitrous oxide, carbon monoxide and pollen, poses a growing threat. By providing timely warnings on air pollution, natural hazards and weather conditions, WMO makes it possible for suitable safety measures to be taken.

### **SUPPORTING LEISURE**

#### **48 Supporting leisure and tourism**

---

Leisure and tourism are among the largest economic activities in the world, and as such they are a major source of income and employment. Tourism is the most significant element in the sustainable development of Small Island Developing States. By supporting the delivery of relevant information about weather and climate conditions, WMO actively supports the development of tourism.

### **CONTRIBUTING TO DEVELOPMENT**

#### **49 Promoting development**

---

WMO has devoted considerable attention and resources to promoting security, living standards and human skills. It established a technical assistance programme in 1952 and a unique system of self-help among its Members known as the Voluntary Assistance Programme in 1967, which was renamed the Voluntary Cooperation Programme

in 1979. It has been a significant source of support for maintaining many of the essential services in developing countries.

#### **50 Focusing on African development**

---

Since the 1960s and 1970s, when a large number of African countries became independent, WMO has paid special attention to the needs of Africa, targeting projects on the development of NMHSs and human resources. A number of regional institutions dealing with drought, water and related activities were established. The 2002 New Partnership for Africa's Development is the main framework for channelling international support to Africa.

#### **51 Meeting the specific needs of developing countries**

---

WMO established a special programme for the 49 Least Developed Countries in 2003. WMO also gives special attention to the vulnerable countries, such as landlocked or low-lying ones, as well as to the needs of Small Island Developing States, which are highly vulnerable to natural hazards, long-term climatic variations, impacts of sea-level rise and environmental degradation.

#### **52 Supporting regional initiatives**

---

WMO's six Regional Associations cater for the special needs of the regions. WMO supports regional economic organizations in the formulation and implementation of sustainable development strategies that relate to warnings against tropical cyclones, drought and other weather extremes, management of water resources, food security, and transport. It also collaborates with regional banks, research institutions and United Nations regional commissions.

#### **53 Supporting international programmes**

---

WMO has close working relationships with most of the agencies, funds and programmes of the United Nations System and many other international organizations, and it contributes to the formulation and implementation of the relevant initiatives and policies in the areas of weather, water, climate and related environmental issues.

## SUPPORTING CAPACITY-BUILDING

### 54 Building capacity to cope and sharing expertise

WMO contributes to human resources development through training, provision of training materials, and fellowships. Its network of 30 Regional Training Centres, along with a network of universities and training institutions, contributes to this global effort. WMO promotes technology transfer and exchange of experts among NMHSs and institutions in related disciplines and in academia.

### 55 Promoting science and technology

Through its scientific and technical commissions, WMO ensures that developments in science and technology, such as sensors, computers, communication and information technology, satellites and new numerical methods, contribute to the monitoring, collection, processing and distribution of geophysical data and products for sustainable development and research activities. It also undertakes to make these accessible to developing countries as effectively as possible.

## FOSTERING RESEARCH

### 56 Assessing the Arctic and the Antarctic

The Arctic is experiencing some of the most rapid climate change currently under way across the globe. Changes are also occurring in the Antarctic. The changes will have implications for climate the world over. WMO monitors the meteorological conditions and alerts the global community to the rapid changes. WMO and its predecessor the IMO sponsored three International Polar Years: 1882–1883, 1932–1933, and 1957–1958. In partnership with the International Council for Science, it sponsored the most recent International Polar Year 2007–2008, which contributed to major advances in polar knowledge and understanding and in assessing the implications of polar changes for the rest of the planet. This effort also left a legacy of enhanced observing systems, facilities and infrastructure.

### 57 Advising on weather modification

Nearly 70 countries perform various kinds of weather modification, such as rain enhancement, fog dispersal and hail suppression. In 1979, WMO undertook the first international weather modification experiment in Spain. WMO issued its authoritative Statement on Weather Modification and its Guidelines for the Planning of Weather Modification Activities.

### 58 Improving the understanding of weather, water and climate processes and advancing their prediction

WMO organizes and supports international research that has enabled improvements in weather, climate, water and environmental observations, in the prediction of weather and seasonal and interannual climate variations (such as droughts and El Niño), and in climate change predictions. WMO research also supports scientific assessments of regional and global environmental conditions and relevant international environmental conventions.

## PLANNING FOR THE FUTURE

### 59 Supporting economic and financial services

The insurance sector takes into account climate change scenarios in risk assessment. Financial and development institutions need the weather, climate and water data provided by WMO, as well as short- and long-term projections, when investing in infrastructure-building.

### 60 Long-term strategic planning

In 1981 WMO formally introduced a long-term planning process based on those of national services and developed through its regional bodies and scientific and technical commissions. The plans enable not only the Organization but also the NMHSs to chart their future course in the light of evolving national requirements and regional and international commitments for weather, water, climate and environmental information. The new Strategic Plan recognizes the importance of results-based management for focusing WMO activities on issues with major societal benefits.



[www.wmo.int](http://www.wmo.int)