



WMO FEATURE

WORLD METEOROLOGICAL ORGANIZATION
A SPECIALIZED AGENCY OF THE UNITED NATIONS

No. 14

August 1991

LIFELINE TO EARTH SUMMIT

CLIMATE CHANGE AND ENVIRONMENT: WMO'S RESPONSE

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CLIMATE CHANGE AND ENVIRONMENT— WMO'S RESPONSE

The year 1990 marked the fortieth anniversary of the World Meteorological Organization, a UN Specialized Agency with a current membership of 160 States and territories. In 1990, a particularly notable feature was the high level of interest in climate-change and related environmental issues of world-wide concern (for instance, agriculture, water management, non-polluting energy resources, environmentally sound and sustainable development).

The changing conditions of the atmosphere, hydrosphere, biosphere, and cryosphere (ice) touch all forms of life on planet Earth. As the delicate balance of nature is upset by human activity, decisions made about climate, water and other resources more than ever effect everyone's daily life. The future of the biosphere and life on earth as we know it, are at stake.

These issues were taken up by the United Nations General Assembly and by the Economic and Social Council (ECOSOC). This feature focuses on steps taken in 1990 by WMO within its areas of competence, in response to action requested by the United Nations General Assembly and ECOSOC further to UNGA and ECOSOC recommendations. The main recommendations of the United Nations General Assembly relevant to the functions of the World Meteorological Organization (WMO) are:

- United Nations Conference on Environment and Development (UNCED) (Resolution 45/211)
- Protection of global climate for present and future generations of mankind (UNGA Resolution 45/272)
- The International Decade for Natural Disaster Reduction (IDNDR) (UNGA Resolution 45/185).

WMO activities during 1990 and major developments through to May 1990 relating to these issues are summarised here (reference base: WMO Annual Report for 1990).

These activities cover:

— **PROTECTION OF GLOBAL CLIMATE FOR PRESENT AND FUTURE GENERATIONS OF MANKIND/UNITED NATIONS CONFERENCE ON ENVIRONMENT AND DEVELOPMENT**

Decisions of the Eleventh World Meteorological Congress

WMO's recent activities

— **OCEANS**

— **WATER**

— **THE INTERNATIONAL DECADE FOR NATURAL DISASTER REDUCTION (IDNDR)**

Tropical Cyclone Programme (TCP)

WMO projects relating to the IDNDR

— **OTHER RELEVANT ACTIVITIES**

WMO Technical Conference on the Economic and Social Benefits of Meteorological and Hydrological Services

Technical Co-operation

PROTECTION OF GLOBAL CLIMATE FOR PRESENT AND FUTURE GENERATIONS OF MANKIND/UNITED NATIONS CONFERENCE ON ENVIRONMENT AND DEVELOPMENT

Decisions of the Eleventh World Meteorological Congress

Eleventh Congress (1991) decided that a Co-ordinating Committee for the World Climate Programme (CCWCP) should be established to provide overall co-ordination between the four components of the World Climate Programme, and effective communication and co-ordination with other related international climate activities. The committee would advise the meetings of the Executive Heads of participating agencies and report to the Executive or Governing bodies of those organizations as requested.

Eleventh Congress also recommended that an intergovernmental meeting should be held before the end of 1992 to review co-ordination of the World Climate Programme and to consider appropriate means for the provision of adequate resources for the World Climate Programme and associated activities such as GCOS. WMO will continue to provide overall co-ordination in the implementation of the WCP in co-operation with partner organizations like UNEP, UNESCO and its IOC, FAO, WHO, IAEA, UNDP, WB and ICSU.

Congress established the Global Climate Observing System (GCOS) to provide observations to monitor the climate system and detect climate change, to support climatological applications for national economic development and research for improved understanding and prediction of the climate system.

Numerous organizations will be called upon to contribute to GCOS. Support from the Intergovernmental Oceanographic Commission of UNESCO and the International Council of Scientific Unions (ICSU) is already assured.

Congress confirmed that the World Weather Watch (WWW) has the highest priority as the basic WMO programme. Its co-ordinated observation, telecommunication and data-processing facilities for meteorological and operational hydrological purposes form a global network without parallel. This network enables Members to provide day-to-day forecasts for the general public, specialized information for users such as aviation, agriculture, and energy utilities in support of economic development, as well as warnings of severe weather events that are vital for the safety of life and property.

Congress agreed that the WWW Global Observing and Telecommunications Systems should be strengthened, especially in regard to the timely exchange of global access to GCOS data. The development of atmospheric circulation and climate models for interpretation of such data was given high priority.

Increasing the number of Global Atmosphere Watch stations was considered of prime importance by Congress. There is also a particular need for extra atmospheric observations in the immediate and downwind regions of the Kuwaiti oil well fires. Efforts are underway, under the auspices of WMO, to help Members increase monitoring of the meteorological and chemical composition parameters of the atmosphere in the Gulf Region.

In view of WMO's additional responsibilities in environmental issues, Congress established a Special Fund for Climate and Atmospheric Environment Activities to provide essential support to priority activities. Congress noted that the scientific participation of developing countries, and therefore development of their intellectual resources, is essential to the understanding of the state of the atmosphere and climate change for the world as a whole. Meeting this requirement will be one of the important objectives of the Special Fund.

WMO's recent activities

WMO has been actively involved in promoting the protection of the global climate as the following activities indicate.

World Climate Programme (WCP)

The purpose of the World Climate Programme is to aid countries in the application of climatic knowledge to benefit the planning and management of many aspects of human endeavour, and to develop the capability to warn

governments and people of possible future variations and changes in climate (either natural or man-made) which may significantly affect mankind.

To accomplish its purpose, the WCP must embrace the study and monitoring of the entire climate system, which is composed of the global atmosphere, oceans, cryosphere and land surface. The WCP acts as an integrating and catalytic agent to co-ordinate current activities and to stimulate new ones in order to achieve its objectives. The overall objectives of this programme are:

- To facilitate the effective collection and management of climate data and the monitoring of the global climate system including the detection and assessment of climate variability and changes;
- To foster the effective application of climate knowledge and information for the benefit of society and the provision of climate services including the prediction of significant climate variations both natural and as a result of human activity;
- To assess and advise governments on the impacts of climate variability and changes that could markedly affect economic or social activities and to contribute to the development of a range of socio-economic response strategies that could be used by governments and the community;
- To improve the understanding of climate processes for determining the predictability of climate, including its variability and change, identifying the extent of human influence on climate and developing the capability for climate prediction.

The Eleventh World Meteorological Congress (1991) decided that the World Climate Programme should be reconstituted to provide an interagency interdisciplinary framework to address the full range of climate and climate change issues including research into the economic and social consequences of climate and climate change.

The Eleventh Congress approved an enhanced World Climate Programme (WCP) which includes the following components

- (a) The World Climate Data Monitoring Programme (WCDMP)
- (b) The World Climate Applications and Services Programme (WCASP)
- (c) The World Climate Impact Assessment and Response Strategies Programme (WCIRP)
- (d) The World Climate Research Programme (WCRP)

The programme should therefore include the scientific and technical aspects of socio-economic and environmental issues related to the development of response (mitigation and/or adaptation) strategies. The Programme should also support the work of the WMO/UNEP Intergovernmental Panel on Climate Change, in the formulation and implementation of the proposed Framework Convention on Climate Change, and relevant activities that relate to the United Nation's 1992 Conference on Environment and Development.

Second World Climate Conference

The World Climate Programme was reviewed, among others, during the Second World Climate Conference (SWCC) which was held at the International Conference Centre in Geneva, Switzerland, from 29 October to 7 November 1990. It was co-sponsored by the World Meteorological Organization, the United Nations Environment Programme (UNEP), the United Nations Educational, Scientific and Cultural Organization (UNESCO) and its Intergovernmental Oceanographic Commission (IOC), the Food and Agriculture Organization (FAO) and the International Council of Scientific Unions (ICSU). Canada, France, Germany, Italy, Japan, the Netherlands, Norway, Switzerland, the United Kingdom, the United States of America, together with the European Economic Community, the Stockholm Environment Institute and the Environmental Defense Fund (USA), also provided substantial financial support. Mr Zou Jingmeng, President of WMO, chaired the Conference.

Both the Conference Statement and the Ministerial Declaration endorse the work of the World Climate Programme and related global programmes as well as of the Intergovernmental Panel on Climate Change. The Statement and Declaration call for the urgent negotiation of a framework convention on climate change, with a view to signing such an agreement in time for the UN Conference on Environment and Development, which is to take place in Brazil in 1992. Both documents advocate measures leading to the stabilization of atmospheric concentrations of greenhouse gases and note specifically that scientific uncertainties, though significant, should not be used as an excuse for delaying action to minimize adverse impacts of climate warming.

The special requirements of developing countries are clearly recognized, and various recommendations made, emphasizing the need for technical and financial support to encourage sustainable economic development while bearing in mind the need to preserve the environment. The two documents strongly urge increased support for research and enhanced global monitoring of climate. In particular, the Ministerial Declaration recognized the importance of supporting the needs of the World Climate Programme, including contributions to the WMO Special Fund for Climate and Atmospheric Environmental Studies. It also stated that there is a need to meet the requirements of developing countries, that adequate and additional financial resources be mobilized and the best available environmentally-sound technologies be transferred expeditiously on a fair and most favourable basis.

The scientific participation of developing countries and therefore development of their intellectual resources is, as was noted by Eleventh Congress, essential to the understanding of the state of the atmosphere and climate change for the world as a whole. Congress also noted that meeting this objective would require more than just studies and that many activities including monitoring, research and training would be required. Therefore, it agreed to continue arrangements for the WMO Special Trust Fund for Climate and Atmospheric Environment Activities, for at least the eleventh financial period.

Global Climate Observing System (GCOS)

The Eleventh World Meteorological Congress which was held in May 1991 did consider the future of WCP. It took a number of relevant decisions. For instance, one of the significant decisions of this Congress was the approval of the concept of the Global Climate Observing System (GCOS) recommended by the Second World Climate Conference. The Global Climate Observing System is intended to meet the needs for

- Climate system monitoring, climate change detection and monitoring of the response to climate change, especially in terrestrial ecosystems and mean sea-level;
- Data for application to national economic development;
- Research towards improved understanding, modelling and prediction of the climate system.

GCOS will also be based upon

- Improved World Weather Watch systems;
- The establishment of a global ocean observing system for physical, chemical and ecological measurements;
- The maintenance and enhancement of programmes monitoring other key components of the climate system, such as the distribution of important atmospheric constituents (including the Global Atmosphere Watch), changes in terrestrial ecosystems, clouds and the hydrological cycle, the earth's radiation budget, ice sheets, and precipitation over the oceans.

Global Atmosphere Watch (GAW)

Activities of the Global Atmosphere Watch (GAW) have progressed favourably. This major new initiative will ultimately bring atmospheric composition measurements on par with classical meteorological observations and will also act as an 'umbrella' system for existing atmospheric composition and physical characteristic monitoring networks such as the Global Ozone Observing System (GO₃OS) and the Background Air-Pollution Monitoring Network (BAPMoN).

The full development of GAW has started. Desirable locations for background observatory-type GAW stations of global importance have been identified. Several existing GO₃OS and BAPMoN stations have been, or are in the process of being, upgraded to the level of global stations. The infrastructure required to maintain a network of global stations has been determined and a realistic strategy established to proceed with implementation. The focus of this activity is the realization of an early warning system for rapid detection of changes in the atmospheric concentration of chemical components, including ozone and greenhouse gases, and the establishment of reliable long-term datasets to answer questions on major issues related to global change.

In February 1990, scientists from countries signatory to the 1985 Vienna Convention for the Protection of the Ozone Layer responsible for research programmes concerning atmospheric ozone and studies related to the effects of ozone changes on human health and the environment met at the WMO Headquarters. The objective of the meeting — namely to co-ordinate and enhance research and monitoring activities (for which WMO is responsible) in support of the Vienna Convention — was achieved.

Further emphasis was given to the ozone issue in June 1990 at the Second Meeting of the Parties to the Montreal Protocol on Substances that Deplete the Ozone Layer. (The Montreal Protocol entered into force in early 1989.) WMO played a prominent role at the London meeting because its GAW-GO₃OS provides the world with the only existing dataset available for determining ozone trends and on account of its extensive involvement in the preparation of a voluminous work entitled 'Scientific assessment of stratospheric ozone: 1989', published as WMO Global Ozone Research and Monitoring Project Report No. 20.

Used as the basis for scientific discussion, this report, confirm the spectacular ozone losses over Antarctica during the austral spring, and indicates unequivocally that there has been a measurable decline in total column ozone over the northern and southern hemisphere mid-latitudes during the last two decades. The meeting passed a watershed in the protection of the ozone layer, introducing stricter targets that could considerably advance the established reduction and phase-out dates of those harmful substances that deplete the ozone layer.

The WMO World Data Centre for Greenhouse Gases (WDCGG) was inaugurated on 1 October 1990. The WDCGG, located at the Headquarters of the Japan Meteorological Agency, Tokyo, now provides the facility to archive global data, past and present, concerning greenhouse gases, particularly carbon dioxide, methane, chlorofluorocarbons, nitrous oxide and other trace gases that are essential for research and policy development in climate-change matters.

Requests by Members and by the WMO Commission for Atmospheric Sciences have motivated the introduction during the Antarctic spring (the months of August–November) of near-real-time monitoring of the drastic decline of ozone in that area on an experimental basis. Data provided from stations operated by Argentina/Finland, Japan, New Zealand and the USA have been distributed at approximately two-week intervals via the WMO Global Telecommunication System in carefully worded bulletins expressed as relative rather than absolute values. It would appear the ozone depletion during the austral spring over Antarctica in 1990 is very close to the dramatic decline recorded in 1987, when some of the lowest values ever were reported.

Intergovernmental Panel on Climate Change (IPCC)

The WMO/UNEP IPCC held its third plenary session from 5 to 7 February 1990 in Washington, DC, at the invitation of the Government of the United States of America. President George Bush addressed the session at its opening. The fourth plenary session of the IPCC was held from 27 to 31 August 1990 in Sundsvall, Sweden, at the invitation of the Government of Sweden. The opening ceremony was addressed by Prime Minister Ingvar Carlsson.

The IPCC First Assessment Report

At Sundsvall, the IPCC successfully completed its First Assessment Report (FAR) in accordance with the respective decisions of the governing bodies of WMO and UNEP and as embodied in UN General Assembly Resolution 44/207. The report is the first intergovernmental assessment of the climate-change issue. Some 1000 scientists and experts from over 70 countries contributed and the report has undergone extensive peer and expert reviews.

The FAR (about 1 200 pages) consists of:

- The IPCC overview;
- The policy-makers' summaries by the three working groups;
- The policy-makers' summary by the Special Committee on the Participation of Developing Countries;
- The reports of the three working groups.

The First Assessment Report was transmitted by the Executive Heads of WMO and UNEP to the 45th (1990) session of the UN General Assembly and was discussed at the Second World Climate Conference.

Future activities

The Executive Council of WMO (forty-second session, Geneva, June 1990) and the Governing Council of UNEP (special session, Nairobi, August 1990) requested their respective Executive Heads to arrange for the continuation of the IPCC as a joint WMO/UNEP body to:

- Undertake scientific and technical work in support of the negotiations of a framework convention on climate change;
- Periodically update the assessments of available scientific information on climate change and the resulting environmental and socio-economic impacts;
- Undertake further environmental and socio-economic analyses of the various policy options posed as response strategies;
- Further pursue studies on the incremental costs to developing countries and small island States of combating climate change, as well as on the sources from which such costs might be met and on mechanisms for the channelling of these resources, and to present these studies for consideration at the negotiating sessions as soon as possible;
- Take all appropriate steps to ensure the effective participation of developing countries and the broad promulgation of its work;
- Report regularly to the WMO Executive Council on the progress of its work, and, through the Secretary-General of WMO and the Executive Director of UNEP, to the UN General Assembly.

The IPCC met in its fifth plenary session from 13 to 15 March 1991 at the *Palais des Nations* in Geneva and discussed *inter alia* its future work plan and its responsibilities to the Intergovernmental Negotiating Committee.

Negotiations on a Framework Convention on Climate Change

Following the adoption in 1989 by the UN General Assembly of its Resolution 44/207 — Protection of Global Climate for Present and Future Generations of Mankind — the WMO Executive Council authorized the Secretary-General to convene, jointly with the Executive Director of the United Nations Environment Programme (UNEP), an open-ended *ad hoc* working group of government representatives to prepare for negotiations on a framework convention on climate change, based essentially on the findings of the IPCC First Assessment Report.

The *ad hoc* working group met in Geneva from 24 to 26 September 1990. Representatives of the governments of 72 countries, including 39 developing countries, made 20 recommendations, relating mainly to the organizational aspects of the negotiating process, for consideration by the General Assembly and the first negotiating session. The governing bodies of WMO and UNEP also requested their Executive Heads to report, jointly, to the 45th session of the General Assembly on the progress in the preparations for negotiations and to convene the first negotiating session no later than February 1991. The session took place in Washington, DC, at the kind invitation of President Bush.

Following reports to it by the two Executive Heads, the General Assembly noted the 20 recommendations of the *ad hoc* working group and decided, by its Resolution 45/212 of 21 December 1990, that the negotiations should proceed under its auspices, with support from WMO and UNEP. It created an Intergovernmental Negotiating Committee (INC) to prepare an effective framework convention on climate change, containing appropriate commitments and any related instruments as might be agreed upon, and decided to establish an *ad hoc* secretariat in Geneva.

It is noteworthy that the work of the IPCC was thoroughly endorsed by the Second World Climate Conference and that the Statement and the Ministerial Declaration of that Conference were reproduced in a document of the 45th United Nations General Assembly, thus helping ensure the best possible foundation for international negotiations on the protection of the climate for present and future generations of mankind.

A clear relationship has been established between the INC and the UN Conference on Environment and Development (UNCED) to ensure that, whilst the negotiations form a single process under the INC, the UNCED remains informed and the two bodies collaborate closely. The objective is to complete the framework convention, as well as any related legal instruments, prior to UNCED in June 1992 and open it for signature during the Conference.

WMO has contributed at all stages of the preparations for negotiations (and, indeed, in the UNCED planning) so as to help bring about the most effective international action to counter the adverse effects of global climate change. It hopes and expects to continue to contribute in this way, especially through the WCP.

OCEANS

Meteorological forecast and warning services for shipping on the high seas and in coastal waters are an essential contribution to the safety of life and property at sea. A revised version of WMO's globally co-ordinated system for the provision of such services was prepared during 1990, to be in conformity with the communications provision of the Global Maritime Distress and Safety System of IMO.

Under the World Climate Research Programme of WCP, the Tropical Ocean/Global Atmosphere (TOGA) programme is one of the most prominent activity. The aim of the TOGA programme is to predict seasonal and annual climate variability linked to dynamic and thermodynamic interactions between the atmosphere and tropical oceans. The mid-point in this ten-year programme was marked by the International TOGA Scientific Conference in Honolulu in July 1990 when some 300 scientists from 27 countries gathered to review the progress made to date. Spectacular advances in the implementation of ocean observing systems were reported, in particular in the use of moored and drifting buoy arrays and in the capabilities of modelling large-scale perturbations in the tropical ocean and overlying atmosphere. The special ocean observing systems established for TOGA have both contributed to and benefited from the existing ocean observing networks of the Global Observing System of the World Weather Watch of WMO (in particular the Voluntary Observing Ships and drifting buoys) and the Integrated Global Ocean Services System (IGOSS) of IOC and WMO.

Another programme priority is to foster the development of global climate modelling. A major activity now being organized is the comprehensive assessment of the performance of the atmospheric component of climate models being run for a ten-year period, forced by the observed monthly-averaged distributions of sea-surface temperature and sea ice. The realism with which models are able to represent circulation anomalies, low-frequency variations and inter-annual variability will also be assessed. An evaluation of climate simulations so far obtained using coupled ocean-atmosphere models, examining in particular the representation of the coupling and the treatment of the ocean circulation, is also being undertaken.

Another landmark reached in 1990 was the start of field operations in the World Ocean Circulation Experiment (WOCE), a world-wide oceanographic programme led by the ICSU Scientific Committee on Ocean Sciences and the Unesco Intergovernmental Oceanographic Commission, and organized as a component of the WCRP, to determine oceanic circulation at all depths and on a global scale within the five-year period 1990-1995. All major oceanographic agencies and institutions are joining forces to deploy the fleet of research vessels needed for the WOCE hydrographic programme.

WATER

Since the early 1980s the progress of the Mar del Plata Action Plan (MPAP) has been reported biennially to the UN Economic and Social Council (ECOSOC), through the ACC Intersecretariat Group for Water Resources (ISG-WR), which is currently chaired by WMO. In preparation for the 1991 report to ECOSOC, the ISG-WR launched during 1989 a detailed examination of six broad areas covering the MPAP, leading to its revision and the promotion of a comprehensive strategy for water for the 1990s and beyond. WMO, with UNESCO, had the task of reporting on progress, problems and prospects for water resources assessment (WRA) activities, so during 1990 a major effort was made to determine the current status of the WRA capabilities of Hydrological Services and related agencies in all parts of the world. The findings, which were presented to the Committee on Natural Resources at its 12th session, March 1991, show that since 1977 the level of activity has generally declined, in some countries seriously, in terms of the numbers of instruments collecting data, the storage of data and their applications and also in terms of the numbers of qualified staff involved. The consequences of this decline are extremely serious for these Services, but even more so for the wide range of activities requiring hydrological data, e.g. the design of water supply and sanitation schemes, the planning and management of irrigation systems and the implementation of flood forecasting and warning procedures. It also means that safeguarding the freshwater environment, including the maintenance of water quality, has become that much more difficult, just at a time when these problems have also become much more serious and when sustainable development is being vigorously pursued.

Sustainable development is especially important where water is concerned, for although globally water resources are considerable, they have a finite limit — a limit which has already been reached in a number of areas. As the demand for water is rising rapidly, an increasing proportion of the globe is likely to face serious water problems in the next century, particularly as regards shortages and pollution. For this reason and others, freshwater is one of the principal topics to be addressed by the UN Conference on Environment and Development (UNCED), to be held in Brazil in June 1992. To prepare the freshwater input to UNCED, WMO will convene, on behalf of the UN system,

an International Conference in Dublin in January 1992 on Water and the Environment. There, the strategy for water will be discussed, aiming at the rational development, meaningful management and the protection and husbandry of this most vital resource. WMO has also been active in technology transfer especially through its Hydrological Operational Multipurpose System (HOMS) project.

In addition, one of the highlights of the World Climate Research Programme in 1990 was the progress in the organization of the Global Energy and Water Cycle Experiment (GEWEX), which has the goals of observing, modelling and predicting variations of the global hydrological cycle and its impact on atmospheric and ocean dynamics with implications to climate change. The scientific plan for GEWEX has been completed, fixing priorities and schedules, and extensive discussions have been undertaken with the various agencies engaged in the preparation of the Earth Observing System on the optimization of platform orbits and instrumental payloads to achieve the goals of the experiment.

The first of a number of observational and modelling studies focused on atmospheric and hydrological processes, the GEWEX Continental-scale International Project, has been initiated. Its aim is to reproduce the hydrology of a continent-size river basin using daily precipitation and evaporation estimates.

THE INTERNATIONAL DECADE FOR NATURAL DISASTER REDUCTION (IDNDR)

The International Decade for Natural Disaster Reduction was launched by the United Nations on 1 January 1990. This was the first globally concerted effort to reduce the impact of natural hazards in all their forms.

Combating disasters continues to occupy the efforts of many branches of science and engineering, particularly those involved with the extremes of weather and water. About 70 per cent of these hazards fall within the purview of WMO and include, tropical cyclones, floods, storm surges and droughts. Since its inception 40 years ago, the energies of the Organization and the Meteorological and Hydrological Services of its Member countries have been aimed at reducing the impact of weather-related hazards, through frequent and reliable forecasts and warnings. Thus the designation of the 1990s as the IDNDR was an event of considerable importance. A WMO Plan of Action for the IDNDR described below, was endorsed by the Executive Council in June 1990 and adopted by the WMO Congress in May 1991.

The main WMO thrust is:

- Filling the gaps in implementing of the observing networks, telecommunications and data-processing facilities, as defined in the World Weather Watch Plan, required for establishing or upgrading warning systems;
- Promoting, initiating or accelerating action on improved response to warnings to ensure that they are effectively used;
- Risk assessment, particularly as needed for disaster-prevention measures;
- Public information, education and awareness.

In many developing countries the two serious impediments to such improvements at national level in the short term are:

- Lack of knowledge and expertise in the technology concerned;
- Lack of funds to install, operate and maintain systems using existing technology and procedures.

WMO's technical co-operation activities, with emphasis on technology transfer and/or institution building, provision of facilities and human resources development, aims at overcoming these shortcomings.

In 1990 the theme of World Meteorological Day was 'Natural disaster reduction: How Meteorological and Hydrological Services can help' and relevant information in English, French and Spanish was widely distributed for use on the occasion. This included a video on the subject commissioned by WMO as part of its IDNDR activities, and a brochure on WMO's role in the Decade.

It can fairly be stated that a large part of the ongoing activities of WMO concerns aims which are indistinguishable from those of the Decade. Prominent among these activities is the Tropical Cyclone Programme.

Tropical Cyclone Programme (TCP)

During 1990 many tropical cyclones occurred around the globe. A number of reports indicated that, compared with earlier years, activities under the TCP for the improvement and upgrading of tropical cyclone warning systems contributed significantly to the reduction of loss of life and property damage from these cyclones.

In 1990, the first year of the Decade, the major thrusts under the general and regional components of the TCP concerned the promotion of transfer of technology and human resources development and the technical plans of the five tropical cyclone regional bodies. Substantial progress was made in 1990 towards the improvement of tropical cyclone warning systems, especially through the installation or upgrading of observing, telecommunications and data-processing facilities and services.

Steps were taken to establish regional and sub-regional tropical cyclone advisory and warning centres in the south-west Indian Ocean and the South Pacific and in the south-east Indian Ocean. Proposals were made for the designation of the centres in St Denis, Réunion and Nadi-Fiji as RSMCs with activity specialization in tropical cyclones for their respective regions.

Training of personnel, in particular tropical cyclone forecasters, was provided through group training events (including one course and three regional workshops) fellowships, exchange programmes, Technical Cooperation Schemes for Developing Countries (TCDC) and consultancy services with financial support from UNDP regional projects and the WMO Voluntary Co-operation Programme. A new project, TCP Project No. 16 — Guide on Tropical Cyclone Forecasting — has been established to provide guidance and assistance to tropical cyclone forecasters in all tropical cyclone regions.

The first phase of the regional computer network project for the Bay of Bengal and the Arabian Sea has been implemented under the UNDP/WMO regional project and the SHARE (Software Help for Applications, Research and Education) project.

The Typhoon Committee in the Western Pacific region conducted a typhoon operational field experiment (SPECTRUM: Special Experiment Concerning Typhoon Recurvature and Unusual Movement) during August and September, to obtain enhanced meteorological observational data required for studies on the movement of typhoons with a view to improving operational typhoon forecasting. Pre-experiment planning and subsequently an evaluation of the SPECTRUM were carried out by a Steering Group of the Typhoon Committee at meetings in Manila and Tokyo respectively.

WMO projects relating to the IDNDR

As a specific contribution towards the IDNDR, WMO has developed plans for three relatively low-cost projects aimed specifically at the goals of the IDNDR. These should have a significant impact at both international and national levels. The three projects are:

Tropical Cyclone Warning System for the South-west Indian Ocean Region

The objective is to upgrade substantially the tropical cyclone warning system in the SW Indian Ocean region through the application of meteorological satellite and microcomputer technology and the transfer of scientific knowledge. This will be accomplished by strengthening the capabilities of the national Meteorological Services to meet their responsibilities for the provision of tropical cyclone warning services in their respective countries.

Comprehensive Risk Assessment

The objective is to promote a comprehensive approach to risk assessment, to enhance the effectiveness of efforts to reduce the loss of life and damage caused by flooding, violent storms and earthquakes. The technology involved will include geographic information systems, remote sensing and seismic hazard studies.

System for Technology Exchange for Natural Disasters (STEND)

STEND will identify and facilitate the transfer of technology for use in reducing the impact of natural disasters. Technology relevant to all the types of natural disaster encompassed within the IDNDR will be included. This technology will comprise instrumentation and other equipment, technical manuals and guidance material, and

These three projects were selected as demonstration projects for the decade by the Scientific and Technical Committee of the IDNDR at its first session, Bonn, March 1991.

OTHER RELEVANT ACTIVITIES

WMO Technical Conference on the Economic and Social Benefits of Meteorological and Hydrological Services

The WMO Technical Conference on the Economic and Social Benefits of Meteorological and Hydrological Services was held in Geneva from 26 to 30 March 1990 in response to the request of Tenth Congress to stimulate and promote studies on the subject.

The conference was attended by 125 participants from 67 countries, including the President of WMO, presidents of WMO regional associations and technical commissions, many directors, managers, and experts from national Meteorological and Hydrological Services. Many planners, economists, social scientists and specialists from universities, other institutes and private consultant firms also attended. Sixty-one papers were presented by speakers from all parts of the world.

In opening the conference, the Secretary-General of WMO, Professor G. O. P. Obasi, referred to similar studies on the subject which had been carried out with WMO participation during the last 30 years and noted that there had always been a clearly recognized connection between these studies and management aspects of national Meteorological and Hydrological Services. As global concern about climate change and environmental pollution led to increasing awareness of the importance of meteorology and hydrology, many of the earlier concepts had to be reconsidered. New scientific results and new technologies offered possibilities for improving services. However, they also entailed increasing costs to provide these services. National Meteorological and Hydrological Services should be able to present a well-founded case to their national authorities regarding their contribution to the national development, in order to convince them of the necessity of giving appropriate support for the continuing growth and development of those Services. This was the reason for the renewed interest in cost/benefit analyses and similar studies, which were the subject of the conference.

The papers and discussions covered four main topics: (a) methodologies for assessing the economic and social benefits of meteorological and hydrological services; (b) user requirements for specific weather and climate services and related economic studies; (c) user requirements for hydrological services and related economic studies; (d) the role and status of national Meteorological and Hydrological Services in economic and social development.

The conference was highly successful in achieving its immediate objectives. Many examples of both concrete and potential benefits of meteorological and hydrological services were presented, based on specific case studies carried out in a number of countries. But success in the broader context would ultimately depend on the follow-up as Dr John Maunder, chairman of the conference emphasized. In this connection he hoped that the recommendations made under the specific topics would provide useful guidelines to the directors and managers of national Meteorological and Hydrological Services.

Technical co-operation

Technical co-operation has been an on-going activity encouraged by WMO. The use of important schemes such as Technical Co-operation among Developing Countries and Transfer of Knowledge through Expatriate Nationals were carried on actively in 1990. The importance of WMO's strategic approach to technical co-operation, aiming at bridging the gap between the Meteorological and Hydrological Services of developed and developing Member countries was stressed both by the Executive Council and the Congress.

The Organization's technical co-operation activities are financed from the United Nations Development Programme (UNDP), the WMO Voluntary Co-operation Programme (VCP), trust funds (TF) and the WMO regular budget (RB). About 130 Member countries received technical assistance to the value of some US \$33 million during the year. The distribution of this assistance was as follows: UNDP 53 per cent, VCP 28 per cent, TF 16 per cent and RB 3 per cent.