

WORLD METEOROLOGICAL ORGANIZATION

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CBS MANAGEMENT GROUP

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ENGLISH

CBS Input to the Sixth WMO Long-term Plan

(Submitted by the Secretariat)

Summary and purpose of document

This document includes the latest draft of the narrative for the World Weather Watch section of the Sixth WMO Long-term Plan along with the associated objectives and Key Performance Indicators.

ACTION PROPOSED

The Management Group is invited to carefully review the proposed text for the 6LTP in this document and provide comments and suggestions for consideration of Executive Council.

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- Annexes
- 1: Narrative for the WWW section of the 6th WMO LTP
 2. Objectives and Key Performance Indicators for the 6th WMO LTP

DRAFT SIXTH WMO LONG-TERM PLAN

WWW Programme

6.1 The World Weather Watch (WWW) Programme

Purpose and scope

6.1.1 The World Weather Watch (WWW) Programme facilitates the development, operation and enhancement of world-wide systems for observing and exchanging meteorological and related observations, and for the generation and dissemination of analyses and forecast products, as well as severe weather advisories and warnings, and related operational information. The activities carried out under this programme collectively ensure that the NMHS of each Member has access to the information it needs to contribute effective services towards improving protection of life and property, increasing safety on land, at sea and in the air, enhancing quality of life, sustaining economic growth and protecting the environment. The WWW is organized as an international cooperative programme, under which the infrastructure, systems and facilities needed for the provision of these services are owned, implemented and operated by the Member countries. This is based on the fundamental understanding that the weather patterns do not recognise national boundaries and are always interactive, and that international cooperation is paramount, as no one country can be fully self-sufficient in the provision of all of its meteorological and related services.

6.1.2 The Programme's main functions are planning, organisation and coordination of the facilities, procedures and arrangements at the global and regional levels, related to the design of observing and communications networks, the standardization of observing and measuring techniques, the use of data management principles, and the presentation of the information in a form and format that is understood by all, regardless of language. In exercising all these functions, the WWW Programme relies upon and makes use of relevant scientific and technological advances.

6.1.3 The WWW basic infrastructure comprises thousands of observing stations on land, at sea, in the air, and several environmental geostationary and orbiting satellites; telecommunication networks and facilities for the rapid collection and exchange of observational data and forecast products; and meteorological centres for the generation of forecasts, advisories and warnings. Each Member country undertakes, according to its means, to meet certain responsibilities in the agreed globally cooperative scheme. The WWW is the key Programme of WMO to provide basic data, forecast products and services for other Programmes of WMO. It directly supports international programmes, such as GCOS, GOOS, IGOS, IGOS and GAW.

6.1.4 One of the main goals will be the restructuring of the Global Observing System (GOS) into a composite system, particularly for upper-air observing based that will increase the use of ground-based remote sensing, AMDAR, satellites and Global Position System-Meteorology (GPS-MET). Meeting the requirements of monitoring the climate and the environment, in collaboration with partner organisations, will also be a GOS priority. Areas of emphasis in the implementation of GOS may differ in the individual countries, but cost-effectiveness, long-term sustainability and new collaborative arrangements among Members will be key elements in the future design and operation of the observing networks. This goal has its major impact on the implementation of Strategy 6 concerning observations of weather, water resources, climate and the related natural environment. It also makes substantial contribution to the Strategy 1 through providing the observational basis for production and delivery of increasingly accurate and reliable warnings of severe events. Enhanced observational capabilities of NMHSs will constitute the major prerequisite towards the implementation of Strategy 7. Finally, the restructured GOS will serve as an essential component for improving the effectiveness, efficiency and flexibility of structure and operations of WMO (Strategy 9).

6.1.5 Another main goal will be the further development of structure and operational principles

of the GTS and its further evolution into the Future WMO Information System (FWIS). The GTS will respond to growing data communication needs of all WMO Programmes and exploit new technical and economic opportunities. Initially, the priority activity will be focused on achieving cost-effectiveness, enhanced data transmission capacity and a greater variety and flexibility of services. In a later phase, the upgraded GTS will evolve into the FWIS jointly supported by the GTS and WWWDM programme, and including input from other relevant programmes, such as AMP, AREP, GCOS, HWR and WCP. Similar to the first goal, this goal has its main impact on Strategy 6 in that part of this Strategy, which concerns maintenance and enhancement of systems for exchange data, products and information, and contributes to the implementation of Strategies 1 and 9. Improved communications will also make critically important contribution towards enabling the provision of increasingly beneficial services to public, governments and other customers as implied by Strategy 2.

6.1.6 The third main goal is the provision to all NMHSs of more specialized and increasingly reliable NWP products spanning forecast ranges from instantaneous to long-term and from local to global scale, improved early warning services for the mitigation of meteorological disasters and effective advice for emergency response to environmental catastrophes. This goal will make the main contributions to Strategy 6 in connection with the use of observational data for the preparation of operational forecast and warning services and related information. The main contributions will be made to the enhancement of the NMHSs capabilities (Strategy 7) and the improvement of the working mechanisms and practices of WMO (Strategy 9). Attaining this goal will support the delivery of warnings and the provision of services (Strategies 1 and 2). Provision of the information on the socio-economic benefits of understanding the weather, water, climate and related environment (Strategy 4) and the improvement of modelling of environmental processes (Strategy 5) will also be supported.

6.1.7 Members will enhance efforts to make operational systems and practices more cost-effective. This will be achieved through establishing and sustaining new flexible, composite, Earth- and space-based observing systems and adaptable networks for observing the conditions of the atmosphere/ocean system on a global scale. New strategies will be required to facilitate data availability and access so that the observing systems and programmes can be useful to operational meteorology and the research community for addressing the global environmental problems.

6.1.8 The WWW Programme will continue to put priority on capacity-building activities to avail of technological advances to enhance the WWW components, especially in developing countries, and on cost-effective, systematic monitoring and improvements to the operations of the WWW that can be derived thereof. It will thus endeavour after assisting NMHSs to fully participate in and obtain maximum benefits from the WWW system.

Overall objectives

6.1.9 The overall objectives of the World Weather Watch Programme are:

- (a) To maintain and strengthen an efficient and economic world-wide integrated system for the generation, collection, processing and exchange of meteorological and related environmental observations, analyses, forecasts, advisories and warnings and other specialized products to meet the needs of all Members, WMO Programmes and relevant programmes of other international organisations;
- (b) To promote and support, through capacity building, measures the introduction of standards, procedures and technology, which enable Members to contribute to, and benefit from, the WWW system and ensure the high level of quality, reliability and compatibility of observations and forecasts needed for the delivery of services required in Member countries;
- (c) To provide the basic infrastructure for obtaining observational data and related services needed by relevant international programmes addressing global environmental issues.

Programme structure

6.1.10 The WWW comprises the design, implementation, operation and further development of the following three interconnected, and increasingly integrated, core components:

- Global Observing System (GOS), consisting of facilities and arrangements for making observations at stations on land and at sea, and from aircraft, meteorological satellites and other platforms;
- Global Telecommunication System (GTS), consisting of integrated networks of telecommunications facilities and services for the rapid, reliable collection and distribution of observational data and processed information;
- Global Data-processing System (GDPS), consisting of World, Regional/Specialized and National Meteorological Centres to provide processed data, analyses, and forecast products.

6.1.11 Coordination, integration and efficient operation of three core components are achieved through support programmes as follows:

- The WWW Data Management (WWWDM) programme monitors and manages the information flow within the WWW system to assure quality and timely availability of data and products and the use of standard representation formats, to meet the requirements of Members and other WMO programmes;
- The WWW System Support Activity (WWWSSA) programme provides specific technical guidance, training and implementation support, the WWW Operational Information Services, and supports cooperative initiatives.

6.1.12 In addition, the WWW Programme incorporates five programmes, which, while complementing and enhancing the core components of the WWW, provide significant input and support to other WMO Programmes:

- The Instruments and Methods of Observation Programme (IMOP) improves the accuracy and standardisation of instruments and observation/measurement techniques and promotes implementation new instrument technology;
- The WMO Satellite Activities (WMOSAT) programme coordinates the WMO requirements for environmental satellite data and products, facilitates cooperation between WMO and the satellite operators, and strengthens Members' capabilities to receive and effectively use satellite data;
- The Tropical Cyclone Programme (TCP) assists Members in their efforts to mitigate tropical cyclone disasters and helps them to obtain the humanitarian, social and economic benefits of effective mitigation and to achieve sustainable development.
- The Emergency Response Activities (ERA) programme assists NMHSs to respond effectively to large-scale atmospheric pollution emergencies in close collaboration with other relevant international organisations;
- The WMO Antarctic Activities coordinate the WWW basic systems implementation and operation in Antarctica to meet the requirements for meteorological services as well as for environmental monitoring and climate research.

6.1.13 The WWW will be managed under the technical responsibility of the CBS, which covers the WWW component programmes GOS, GTS, and GDPS, the support programmes WWWDM and WWWSSA, as well as the technical elements of the space-based component of the GOS under the WMOSAT programme. The IMOP will be managed under the technical responsibility of CIMO. The TCP will be managed through regional associations and other regional bodies concerned.

Programme 1.1 - Global Observing System

Purpose and scope

6.1.14 The Global Observing System (GOS) provides from the Earth and from outer space observations of the state of the atmosphere and ocean surface for the preparation of weather analyses, forecasts, advisories and warnings, for climate monitoring and environmental activities carried out under programmes of WMO and of other relevant international organisations. It is operated by national Meteorological Services, national or international satellite agencies, and involves several consortia/¹ dealing with specific observing systems or specific geographic regions. The development of GOS represents the major part of pursuing the implementation of WMO Strategy 6, as regards weather, climate, water and other related observations..

Main long-term objectives

6.1.15 The main long-term objectives of the Global Observing System are:

- (a) To improve and optimize global systems for observing the state of the atmosphere and the ocean surface to meet the requirements, in the most effective and efficient manner, for the preparation of increasingly accurate weather analyses, forecasts and warnings, and for climate and environmental monitoring activities carried out under programmes of WMO and other relevant international organizations;
- (b) To provide for the necessary standardization of observing techniques and practices, including the planning of networks on a regional basis to meet the requirements of the users with respect to quality, spatial and temporal resolution and long-term stability.

Implementation activities 2004 - 2007

6.1.16 Implementation components of the programme are aimed at achieving the following end results:

- a) Standardization and improvement of observing techniques and practices, including the redesign, optimum planning and the implementation of redesigned observational networks on the regional basis;
- b) Improved performance of the global network to meet in the most efficient manner the stated requirements in terms of accuracy, timeliness and coverage of meteorological observations.
- c) Assessment of cost-effectiveness, long-term sustainability and innovative collaboration arrangements between NMHSs related to operations of the upgraded GOS;
- d) Analysis of evolving observational data requirements from various application programmes and development of guidance for the further development of the GOS.

Members should carry out planning and implementation, within the surface-based sub-system of GOS, of new techniques and systems such as wind profilers, Doppler and HF radars. Aircraft automated observing and reporting systems (AMDAR), automated upper-air sounding facilities on ships (ASAP) and advanced automatic weather stations (AWS) should be increasingly used. Members also should introduce into the operational space-based sub-system a new generation of polar orbiting and geostationary satellites with improved instruments and services and with wider use of R&D satellites.

Further, Members will take the major role in the planning and implementation of the advanced composite surface and space-based systems. On a regional basis, observing networks that are adaptable to changing requirements should be developed. Studies and observing system experiments on the redesign of the GOS also should be carried out.

¹ Examples are AMDAR, ASAP, COSNA, EUMETNET, DBCP

A number of constituent and other bodies will participate in the planning and future implementation of the GOS. Among these bodies the leading role will belong to CBS. It is planned that participating bodies will undertake:

- (a) Development of guidelines and new strategies to facilitate closer cooperation between NMHSs for the implementation and effective use of new and advanced observing technologies;
- (b) Development of guidelines to enable WMO programmes, relevant programmes of other international organizations to more fully benefit from the GOS operations;
- (c) Stimulation and support NMHSs efforts to contribute more efficiently to the GOS, including joint funding and other innovative arrangements.

Under the guidance of the EC, CBS and other constituent bodies, the Secretariat will ensure the management of WWW/GOS programme. The related tasks will include:

- Evaluation of the GOS performance based on WWW monitoring results;
- Coordination of the work of CBS/OPAG Integrated Observing System expert teams and rapporteurs;
- Coordination of studies and activities on the redesign of the GOS as an advanced, cost-effective and operationally reliable composite observing system;
- Assistance and support to developing countries in rehabilitation, upgrading and redesign of their observational networks.

Programme 1.2 - Global Telecommunication System (GTS)

Purpose and scope

6.1.17 The Global Telecommunication System (GTS) is an integrated system of managed data communication networks, point-to-point circuits and satellite-based data collection and broadcast systems, which interconnect meteorological centres through agreed procedures and services. It provides the telecommunication services for the collection, and exchange of observational data (particularly GOS data) and the distribution of processed information from GDPS and other related centres. Maintenance and enhancement of systems to exchange data, products and information in the framework of Strategy 6 thus facilitate access to information needed for the preparation of analyses, forecasts and warnings, research activities and other environment-related applications. The GTS is operated by national Meteorological Services, national or international satellite agencies or contracted commercial telecommunication service providers. The Internet complements the GTS where technical or economic conditions limit the scope of the GTS.

Main long-term objectives

6.1.18 The main long-term objectives of the Global Telecommunication System are:

- (a) To improve and optimize the GTS and its operational procedures to provide effective and efficient telecommunication services for the collection and communication of observational data, processed information, advisories, warnings, etc., within established time limits;
- (b) To develop and implement the Future WMO Information System (FWIS) that will provide the information systems and services for the exchange of and access to data, which will meet the requirements for such services of all WMO programmes;
- (c) To provide technical advice, training and support to developing NMHSs to improve their telecommunication infrastructure and related operational capabilities so as to facilitate access to data and products needed for operations to mitigate meteorological and other natural disasters.

Implementation activities 2004 - 2007

6.1.19 The implementation of the programme will ensure:

- (a) Enhancement of the structure, organization and operation of WMO data-communication networks to form the backbone of the Future WMO Information Systems at global, regional and national levels and to support an improved exchange and distribution of meteorological data, products and related information;
- (b) Strengthening the GTS where it is weak or deficient, particularly in developing regions and areas with adverse conditions;
- (c) Continued international allocation of sufficient and suitable radio-frequency bands for meteorological and related operations and research.

Activities to be carried by Members will include:

- (a) Implementation and operation of the data-communication facilities, systems and services, including in particular international telecommunication links and hardware/software systems at centres, comprising the respective national, regional and, where appropriate global components of the GTS;
- (b) Enhancement of information and communication systems operated by NMHSs for accommodating national data exchange requirements supporting the provision of national services, particularly weather analyses, forecasts and warnings;
- (c) Continuous monitoring of the performance and reliability of the GTS components they operate;
- (d) Studying and developing meteorological data-communication strategies and design/implementation plans for WMO data-communication network at national, regional and global levels.

Constituent bodies and other bodies involved, particularly CBS, should undertake the following activities:

- a) Review or approve, as appropriate, recommended guidelines, procedures and practices, for the extended use by NMHSs of adequate and cost-effective information and communication technologies enabling efficient international WMO data-communications that accommodate growing real-time data exchange requirements, including the coordinated and secure use of public data-communication resources (e.g. the Internet);
- b) Developing and adopting meteorological data-communication strategies and design/implementation plans for WMO data-communication networks at regional (RAs) and global (CBS, EC) levels;
- c) Managing and co-ordinating an efficient use of radio-frequency bands for meteorological and related environmental applications, and supporting new requirements;

To assist Members and support the activities of international bodies, the Secretariat will.

- a) Organize and facilitate activities and meetings of relevant subgroups established by EC, CBS and RAs;
- b) Provide support to developing countries for the strengthening and sustainability of their GTS functions and systems at regional and national level through expert missions, implementation-coordination meetings, workshops and training events, and technical expertise of cooperation projects;
- c) Monitor the performance of the whole GTS operation;
- d) Support WMO requirements and interests for radio-frequency allocations in ITU (ITU-R and World Radio Communication Conferences).

Programme 1.3 - Global Data-processing System

Purpose and scope

6.1.20 The Global Data-processing System (GDPS) is the network of meteorological centres which generates weather and climate analyses, forecasts, advisories, warnings and specialized forecast products required by NMHSs and other Members' agencies for providing effective services for the protection of life and property, increased safety on land, at sea and in the air, enhanced quality of life, sustainable development and the protection of the environment under the WWW Programme or within the framework of other WMO or international programmes. The development of GDPS is crucial for pursuing Strategy 6 in the area of preparation of operational forecast and warning services, and also for the enhancement of the NMHSs capabilities (Strategy 7) and improvement of the WMO operations (Strategy 9).

Main long-term objectives

6.1.21 The main long-term objectives of the Global Data-processing System are:

- (a) To contribute to an improved understanding of the current and future state of the atmosphere, the weather and related environmental parameters through continuing efforts to improve the quality of numerical models and forecasting techniques;
- (b) To review the operational requirements for, and implement new functions, techniques and improvements to ensure provision of analyses, forecast and warnings of weather in general and high-impact weather phenomena and natural disasters in particular;
- (d) To support capacity building of developing NMHSs through strengthening regional and/or national GDPS components, and providing technical guidance and training.

Implementation activities 2004-2007

6.1.22 Implementation of the programme, with active participation of <Members and under the guidance of EC and CBS, include:

- (a) Continued enhancement of the quality and use of the NWP output from the short-range (including nowcasting) up to multi-season time scale. This will be based on and driven by advances in science and technology, as they become available. The main advances foreseeable over the next 4 to 5 years will likely be in the areas of 4DVar data assimilation schemes (including new types of observational data such as satellite and Earth-based remote sensing data as well as oceanographic and atmospheric chemistry data), ensemble prediction systems, coupled and climate models;
- (b) Development and operational application of PC based post-processing tools for generation of forecast products for improving user-oriented weather and climate services;
- (c) Increased use of workstation and PC versions of limited domain regional/local NWP models and NWP output driven application models in developing countries. They will enhance the generation and availability of environmental quality, hydrological/flood and sea state predictions in these countries. RMTCs should develop materials to train forecasters in the use of these products and tools and workshops and seminars will facilitate knowledge transfer;
- (d) Dissemination of new agreed sets of improved medium- and long-range forecast products and related verification results;
- (e) Continuous review of product requirements in the light of scientific and technological advances, coordination of output programmes of major centres, and development of systematic procedures for dissemination of warnings and predictions of critical high-impact weather and other changes in the environment;

The Secretariat should:

- (a) Assist, and provide support to, developing countries for the further development and sustainability of their GDPS functions, including emerging centres with international responsibility through making available expert services for definition of needs, and implementation of appropriate hardware and software. This will include in particular regional area models for work stations, technical guidance including expert missions in support of the implementation of the GDPS at regional and national level and organization of relevant workshops and training events;
- (b) Support the availability of well-trained forecasters able to evaluate and to enhance automatically produced forecasts successfully in short range forecasting and in case of severe weather; and in the development of efficient interactive tools.

Programme 1.4 - WWW Data Management

Purpose and scope

6.1.23 WWW Data Management (WWWDM) programme develops and coordinates the support functions including data formats and codes, needed for an orderly and efficient overall management of meteorological data and products. It coordinates the monitoring of the operations of the WWW to improve the availability and quality of data and products.

Main long-term objectives

6.1.24 The main long-term objectives of the WWW Data Management are:

- (a) To implement modern standardised data handling and archiving procedures, practices, interfaces and formats required for efficient exchange, archive and retrieval of all information used in the WWW and other related WMO programmes;
- (b) To define and coordinate implementation of the management functions for the FWIS so that it meets the data exchange and access requirements of all WMO Programmes;
- (c) To provide technical advice and training for developing countries related to application of modern data management techniques.

Implementation activities 2004-2007

6.1.25 Implementation activities include:

- (a) Development and introduction of FWIS to ensure more efficient collection and dissemination of meteorological and related data and information. The system should include support for ad hoc requests as well as routine distribution of information and should support automated monitoring functions and quality control procedures with monitoring results available in real-time.
- (b) Expanded use of table-driven codes as the primary formats for the world-wide exchange of meteorological and related observations and NWP products. Enhanced training in the use of table-driven codes will be carried out in 2004-2006. The use of traditional alphanumeric codes will be gradually phased out.

The CBS should develop the overall system design for Basic Systems with contributions from all technical commissions. Implementation of prototype components by Members should begin in 2004 with phased implementation beginning in 2006 and continuing for several years.

The Secretariat should organise and support the necessary meetings of experts, studies, and documentation and assist Members in solving problems related to data management and processing by maintaining and enhancing the on-line CBS Software Registry, which facilitates exchange of computer programmes developed by Members for WWW-related applications. The Secretariat will coordinate and support arrangements for maintaining and making available encoding/decoding software for BUFR, CREX and GRIB edition 2 to all interested users.

Programme 1.5 - WWW System Support Activity, including the Operational Information Service

Purpose and scope

6.1.26 The WWW System Support Activity (SSA) programme provides technical advice and support, especially to developing NMHSs, in order to assist in achieving the most effective and efficient implementation and sustainable operation of the WWW. The programme promotes the development of standard solutions to common operational problems and their implementation through coordinated projects.

6.1.27 The Operational Information Service (OIS) collects from and distributes to WMO Members detailed and up-to-date information, in a timely and efficient manner, on facilities, services and products made available through the operation of the WWW.

Main long-term objectives

6.1.28 The main long-term objectives of the WWW System Support Activity are:

- (a) To assist developing NMHSs in obtaining the necessary self-reliance for providing weather forecasting and warning services in their country and to allow them to fulfil agreed responsibilities within the WWW system and other related WMO or international programmes;
- (b) To promote development and implementation of innovative arrangements for cooperation and funding within the WWW system to strengthen the long-term and cost-effective operation of the basic infrastructure;
- (c) To provide the information services on the operation of the WWW and related systems and improve their utility for the users.

Implementation activities 2004-2007

The implementation components coordinated by the Secretariat include:

- (a) Provision of technical advice on development and implementation of strategic plans for strengthening and operating the WWW in selected Regions in collaboration with TCO and ETR Programmes, and Regional Office for Africa;
- (b) Promotion of new concepts for collaboration, burden-sharing, joint-funding for selected WWW basic system components to facilitate long-term sustained operation of the these components taking into account the economic potential of participating Members;
- (c) Provision of technical advice, training and assistance to developing NMHSs in the implementation and use of specific observing, telecommunication or data-processing systems or equipment;
- (d) Provision of the Operational Information Service to accurately update and publish in near real-time WWW operational information using the Internet and on-line data bases for collection, collation and user access; integration of these activities with the WWW monitoring; elimination of the paper phase in these activities with a fully electronic on-line operation by about 2006.

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Programme 1.9 - Emergency Response Activities

Purpose and scope

6.1.xx The Emergency Response Activities (ERA) programme assists NMHSs, other relevant agencies of Member countries and relevant international organisations to respond effectively to environmental emergencies with large-scale transboundary air pollution, caused in particular by major nuclear accidents, volcanic eruptions, chemical accidents, and land fires, through the provision of specialised GDPS products by designated RSMCs, the development and

implementation of procedures for the provision and exchange of specific observational data, and of related training support for users. Activities related to nuclear accidents are based on the International Conventions on Early Notification and on Assistance, to which WMO is party along with other international organisations concerned under the overall coordination of the IAEA. The Programme serves the implementation of Strategy 7 by assistance to the NMHSs to enhance their capabilities and that of Strategy 8 by ensuring more effective work with international partners.

Main long-term objectives

6.1.xx The main long-term objectives of the Emergency Response Activities programme are:

- (a) To develop and improve Members' capabilities to respond effectively to environmental emergencies with large-scale transboundary air pollution, in particular major nuclear incidents;
- (b) To co-ordinate and collaborate within the programme with those of relevant international organisations to ensure optimum programme effectiveness.

Implementation for the period 2004-2007

The implementation components, carried out essentially by Members, include:

- (a) Co-ordination of development and implementation of agreed emergency response arrangements, procedures and standards in case of large-scale atmospheric pollution emergencies; this includes the activities of national centres and relevant RSMCs;
- (b) Capacity building of NMHSs through development of guidance and provision of facilities for accessing information from major centres, post processing of transport model output and generation of user oriented products for local emergency disaster management;

The Secretariat undertakes the coordination function, particularly through:

- (a) Periodic organisation of emergency response exercises in collaboration with Members' agencies and other UN agencies/organisations concerned and based on the Joint Radiation Emergency Management Plan; this will ensure a continued high level of readiness for executing emergency response operations to mitigate the impact of such disasters;
- (b) Organisation of inter-programme meetings to enhance the understanding of meteorological, oceanographic and hydrological conditions and climate patterns that determine the transport and dissipation of toxic material in the atmosphere and water bodies;
- (c) Further development and co-ordination of implementation of collaborative activities with the Comprehensive Nuclear Test Ban Treaty Organisation (CTBTO) with regard to meteorological measurements, the exchange of meteorological observations and transport modelling and related procedures; this will strengthen the GOS and assist the CTBTO in fulfilling its mission based on the WMO/CTBTO Working Arrangements.
- (d) Coordination and/or provision of expert emergency missions and assistance, if requested by Members.

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Programme 4.1 - Public Weather Services Programme (PWSP)

Purpose and scope

The purpose of PWSP follows Strategy 2 and is to assist Members to provide reliable and effective weather and related services in support of safety of life and protection of property, as well as for general welfare and well being of their people, which have enormous potential socio-economic benefits. The programme also aims, following Strategy 7, to strengthen Members' capacities to achieve the objectives of the PWSP by means of effective plans, organizations, infrastructure, trained staff, and a total user-based focus.

Main long-term objectives

The main long-term objectives of the PWSP are:

- (a) To strengthen Members' capabilities to meet the needs of the community through the provision of comprehensive weather and related services with particular emphasis on public safety and welfare;
- (b) To foster a better understanding by the general public of the capabilities of NMHSs and how best to use their services.

Implementation Activities 2004-2007

Implementation components include:

- (a) Enhancement of utilization by Members of tools and techniques to achieve as widespread availability of information as possible

This component of the programme will be implemented in particular through application by Members of technological advances in communication pathways and dissemination systems, such as international satellite TV broadcasts, the Internet, and through significant improvements in graphics display capability. Assistance to Members' efforts will be provided mainly through the PWS expert teams set up by CBS and the Secretariat.

- (b) Provision of assistance to Members in keeping abreast of scientific and technological developments including more sophisticated satellites, Doppler radars and other remote-sensing devices, advanced numerical prediction models, and new data assimilation and analysis schemes.

These activities will be carried out mainly through the Secretariat and the PWS expert teams set up by CBS, bearing in mind the role of Public Weather Services (PWSs) in continuing to ensure the provision of high-quality and tailored services and their effective use by the recipients in the face of political and economical trends of global dimension.

- (c) Organizing specialized training seminars and workshops on PWS with a special emphasis on public safety and the importance of effective delivery of services to the public in raising the visibility and enhancing the credibility of NMSs;
- (d) Provision of further assistance to Members on the implementation of various activities concerning their public weather services

Under this implementation component, advice and guidance prepared by the PWS expert teams and the Secretariat concerning the following activities carried out by Members will be provided:

- exchange and coordination of hazardous weather information among neighbouring countries;
- creation of appropriate agreements and procedures for the expeditious coordination and exchange of warning and critical information across national borders
- involving users of NMSs' products and services, including local communities, in developing service provision and delivery concepts and facilitating the developments of methodologies for assessing user requirements and ways and means to meet those requirements;
- developing methodologies for assessing the level of service provided, degree of customer satisfaction, and quality control of defined services;
- formulation of the best practices for the verification of warning and forecast products;
- professional development strategies, including building capacity to cope with the new

trends and changing living environment through developing training programmes for staff of NMSs and identifying training activities that could be modified and shared with other Members;

- introducing effective management structures and techniques to be employed by NMSs in support of PWSs, including those in area of the development and strengthening of service delivery;
 - development of agreements and procedures among Members and the national and international media to give attribution to NMHSs as the sole “official voice” for warnings issued in their areas of responsibility;
 - effective formulation and content of warnings and forecasts, as well as effective and improved dissemination, communication and presentation techniques and methods, including alphanumeric and graphic for use by mass media
 - exchange of information and transfer of ideas and materials for increasing the public’s knowledge of appropriate safety rules;
 - further development of Members’ capacity to educate the public on awareness and preparedness actions related to extreme meteorological and hydrological events, and on the role of the NMSs and their services;
 - further development of training programmes by NMSs for technical users such as emergency managers, the media, and local officials.
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Key Performance Indicators

3.1 WWW PROGRAMME

3.1.1 Global Observing System (GOS)

Expected results

1. Improved composite GOS comprising upgraded and operationally reliable surface-based and space-based sub-systems as a result of experiments on the impact of observing systems on NWP and related applications, adaptable observing programmes, and deployment of modern and cost-effective technology in the observational networks of WMO Members.
2. Improved quality, accuracy and optimized coverage of observational data to meet requirements for weather analysis and forecasts, warnings, for climate monitoring and other environmental activities within WMO programmes at the local, regional and global levels

Key Performance Indicators for the expected results

- (i) Statistics of implementation of RBSN and RBCN obtained from the WWW monitoring results;
- (ii) Degree of meeting stated requirements for coverage, timeliness, reliability and accuracy of observational data;
- (iii) Number of NMHSs which, through WMO through technical guidance and cooperation projects, have been enabled to introduce new observational technologies including satellites stations and adaptable observing programmes.

3.1.2 Global Telecommunication System

Expected results:

1. An enhanced structure and organization of WMO data-communication networks will form the backbone of the Future WMO Information Systems at global, regional and national levels and to support an improved exchange and distribution of meteorological data, products and related information.
2. Extended use by NMHSs of efficient and cost-effective information and communication technologies for accommodating growing real-time data exchange requirements, including a secure use of public data-communication resources (e.g. the Internet).
3. Enhanced the capability of less developed NMHSs to implement and operate cost-effective data-communications systems.
4. Continued international allocation of sufficient and suitable radio-frequency bands for meteorological and related operations and research.

Key Performance Indicators for the expected results

- (i) Level of development and implementation of meteorological strategies and plans for interoperable WMO data-communication networks at regional (by RAs) and

global levels;

- (ii) Statistics on increased volume of data and products exchanged via the WMO global and regional data-communication networks;
- (iv) Number of NMHSs that, through WMO assistance (technical guidance, training, expert services, cooperation projects), will be enabled to improve their data-communication systems operations.
- (v) Degree of satisfaction with the international allocations of radio-frequencies for meteorological applications.

3.1.2 Global Data Processing System (GDPS)

Expected results:

1. Improved global, regional and national centres outputs and provision of high quality analysis, forecasts, warnings and other environmental quality products to users as a result of operational use of advances in atmospheric sciences and enhanced adoption of modern and cost-effective technology.
2. Enhanced capability of the less developed WWW centres for the assimilation and analysis of the voluminous information received from major centres and for generation of local and value added products by provision of technical assistance, guidance and training;
3. Wide availability of PC-based post-processing tools for generation of value added products from NWP output and EPS products for improving severe weather guidance.

Key Performance Indicators for the expected results

- (i) Degree of meeting stated requirements for the availability of specified NWP products of all time ranges NWP products and Ensemble Prediction System products at NMCs using modern means including Web technology and degree of satisfaction with the quality of the provided NWP products;
- (ii) Number of Members that, through WMO assistance, have acquired the capability to run local NWP models and /or PC-based post-processing tools for generation of value added from NWP output and Ensemble Prediction System products;
- (iii) Level of development support through WMO to facilitate the wide use of PC-based post-processing tools.

3.1.4 WWW Data Management (WWWDM)

Expected results

1. Improved exchange of meteorological and related data and information between Members as a result of enhanced adoption of modern and cost-effective technology through implementation of the FWIS.
2. Expanded use of modern table-driven codes as the primary formats for the world wide exchange of meteorological observations.
3. Wider availability of standard software for meteorological data management applications and post-processing for generating end-user focused products.

Key Performance Indicators for the expected results

- (i) Decree of satisfaction with the timeliness and reliability of delivery of observational data and products to Members' NMCs meet the stated requirements;
- (ii) Number of Members that, through WMO Secretariat coordination, assistance and training, have acquired the capability to use modern table-driven data representation code forms and/or acquired automated access to meteorological products and information;

3.1.5 WWW System Support Activities (WWWSSA)

Expected results:

- 1. Improved and strengthened WWW basic systems infrastructure in developing countries;
- 2. Long-term sustainable operations of selected WWW components and observing systems/networks will be promoted through new concepts of burden-sharing, joint-funding and related cooperative arrangement to ensure.
- 3. Effective and efficient collection and compilation as well as timely provision of accurate information on status and operation of the WWW to all users.

Key Performance Indicators for the expected results:

- (i) Number of countries benefiting from the development of strategic technical plans at regional level and the provision of implementation support through technical expert advise, training and other capacity building activities, following decisions and priorities of the Regional Associations;
- (ii) Level of development and implementation of innovative funding concepts of the operation of components of the WWW infrastructure;
- (iii) Statistics on the use of computer and Web techniques in the collection/collation of WWW operational information and elimination of the paper phase in the documentation and near real-time provision of operational information, reference and ancillary data through the Web.

3.1.9 Emergency Response Activity Programme (ERA)

Expected results:

- 1. Effective response by Members and relevant international organisations to environmental emergencies, in particular nuclear emergencies, volcanic ash plumes, land fire smoke/haze and chemical accidents, through provision and exchange of enhanced observational data and specialized products.
- 2. Enhanced capability of the NMHSs through technical assistance, guidance, training and provision of facilities for accessing information from major centres, post processing and interpretation of specialised products and generation of user-oriented products and services for local emergency disaster management.

Key Performance Indicators for the expected results

- (i) Degree of satisfaction with the generation, upon request, of agreed high-quality ERA specialised products at designated centres and access to these products by NMHSs and relevant international organisations using modern means including

Web technology;

- (ii) Level of availability of PC-based tools for post-processing of specialised products for generation of user-oriented products for local emergency disaster management.
- (i) Number of Members that, through WMO assistance, have acquired the capability to use ERA products received and/or to run local pollution models or PC-based post-processing tools for generation of user-oriented ERA products and services.

4.1 Public Weather Services Programme

Key Performance Indicators for the Public Weather Services Programme for the period (2004-2007) are indicated below assuming that the main purpose of the Programme according to 5LTP, namely "to assist Members to provide reliable and effective weather and related services in support of safety of life and protection of property" and the main long-term objectives will not change drastically for the next financial period.

Expected results:

1. Improved provision of services to the public and other users in support of protection of life and property as part of WMO's overall disaster mitigation and prevention efforts, resulting from better application of guidance material and advice and acquired skills through successful training events;
2. Enhanced access by the public and other users to the regionally and internationally exchanged public weather warning and forecast products through the implementation of pilot projects to make such warnings and forecasts widely available.
3. Improved communication and exchange of information with the user community as part of efforts to meet user requirements and enhance user satisfaction.

KPIs for the expected results:

1. Number of Members that, through the WMO Secretariat assistance, in particular training and guidance materials have capacity for better and more efficient dissemination of public weather warning and forecast products, in particular through mass media channels and the Internet;
2. Number of Members that have agreed to participate in pilot projects on regional basis, involving the use of the Internet for improved access to official warnings and forecasts as part of their collaboration with other NMSs;
3. Increased number of Members establishing or improving relations with the user community, including important partners such as the media and the emergency management authorities, the education authorities, and the general public as a result of better response to the needs of those communities in providing services for the socio-economic benefit of their citizens.