

Expected Result 7

ENHANCED CAPABILITIES OF MEMBERS TO PROVIDE AND USE WEATHER AND CLIMATE, WATER AND ENVIRONMENTAL APPLICATIONS AND SERVICES

Strategic Thrust: Service Delivery

SUMMARY

ISSUES TO BE DISCUSSED:

1. EC Working Group on DRR and Service Delivery
2. User focus
3. Improved products and services
4. Service delivery
5. WMO Quality Management Framework
6. Socio-economic issues related to weather, climate and environmental applications
7. Human resource capacity building in service delivery

ADDITIONAL FINANCIAL IMPLICATION:

See agenda item 7.2(5), with respect to ER 7 and ER 9

DECISIONS/ACTIONS REQUIRED:

- (a) Adoption of the draft text for inclusion in the general summary of EC-LX given in Appendix A;
- (b) Adoption of draft Resolution 4.2/1 (EC-LX) – Executive Council Working Group on Disaster Risk Reduction and Service Delivery, given in Appendix B;
- (c) Adoption of draft Resolution 4.2/2 (EC-LX) – Establishment of National Agrometeorological Station Network (NASNET), given in Appendix C.

REFERENCES:

1. Abridged Final Report with Resolutions of Cg-XV, WMO-No.1026
2. Abridged Final Report with Resolutions of EC-LIX, WMO-No. 1027

CONTENT OF DOCUMENT:

Appendices for inclusion in the final report:

- A. Draft text for inclusion in the general summary of EC-LX
- B. Draft Resolution 4.2/1 (EC-LX) – Executive Council Working Group on Disaster Risk Reduction and Service Delivery
- C. Draft Resolution 4.2/2 (EC-LX) – Establishment of National Agrometeorological Station Network (NASNET)

Appendix for information:

EC-LX/Rep. 4.2: Progress Activity Report

DRAFT TEXT FOR INCLUSION IN THE GENERAL SUMMARY OF EC-LX

4.2 ENHANCED CAPABILITIES OF MEMBERS TO PROVIDE AND USE WEATHER AND CLIMATE, WATER AND ENVIRONMENTAL APPLICATIONS AND SERVICES (*agenda item 4.2*)

EC Working Group on DRR and Service Delivery

4.2.1 The Council recalled that at its fifty-ninth session (May 2007), it had established a working group to address issues specifically related to disaster risk reduction and service delivery. However, the Council had not reached final agreement on the final terms of reference of the working group or its title and had requested the chairperson of the working group, in consultation with members of the group, the presidents of the technical commissions, and the Secretary-General, to refine the terms of reference of the group, and to take the revised terms of reference into account when confirming the title of the working group. The Council considered and approved the revised terms of reference that resulted from the consultation process.

4.2.2 The Council adopted Resolution 4.2/1 (EC-LX) - Executive Council Working Group on Disaster Risk Reduction and Service Delivery.

User focus

4.2.3 With respect to the provision and delivery of meteorological and related services by NMHSs to the public, the Council agreed to enhance the user focus in the public education and awareness building initiatives to be taken by NMHSs and WMO. These initiatives should include enhanced user interactions for user requirement assessments and creation of feedback mechanisms to gauge user satisfaction. This should enable NMHSs to better focus on end user needs.

4.2.4 The Council endorsed the new WWRP initiative concerning the coordination and assessment of functions and capabilities of meteorological forecast systems applied by NMHSs for the provision of products and services to end users. It requested the involvement of other relevant WMO Programmes in that activity and the distribution to Members.

4.2.5 With respect to the provision of user-focused marine meteorological and oceanographic services as documented in the SOLAS Convention, the Council requested to enhance collaboration with international organizations and other entities representing users' interests, such as the International Maritime Organization (IMO), International Hydrographic Organization (IHO), International Association of Oil and Gas Producers (OGP), International Chamber of Shipping (ICS), etc. These efforts should improve the collection and assessment of requirements for products and services identified by marine users and improve service delivery to meet those requirements including the development of guidelines for promulgation of maritime safety information.

Improved products and services

4.2.6 Nowcasting was seen as an essential tool in the generation of warnings of severe weather phenomena. The Council requested to advance the development of nowcasting capabilities and their implementation in NMHSs through initiatives of the PWS/WWRP Joint Nowcasting Applications & Services (JONAS) Steering Committee, the Shanghai Integrated Multi-hazard Early Warning System (MHEWS) Demonstration Project and the meteorological services developed for the 2008 Olympics, Beijing.

4.2.7 Probabilistic forecasts are being utilized by only a few NMHSs, and their communication to and application by users are complex undertakings. The Council urged Members to make maximum use of the recently published *WMO Guidelines on Communicating Forecast Uncertainty* (WMO/TD-No. 1422) and requested that capacity building activities aimed at promoting and facilitating the use of probabilistic forecasts be continued in order to improve NMHSs service products.

4.2.8 The Council recognized the potential service improvement aspects of the Shanghai MHEWS Demonstration Project (Ref. Doc. 4.1) and the Severe Weather Forecast Demonstration Project (SWFDP) (Ref. Doc. 3.1). The Council requested that experiences and lessons learned be extracted and documented, with a view to assist other Member countries in developing EWS solutions for mega-city risk management, related emergency warning and response systems and for improving the service delivery functions of NMHSs. The Council emphasized the need to give full attention to the end user focus in these projects by strengthening the delivery components, including the dissemination and understanding by the public and specialized user sectors of the products generated. The Council agreed to address the budgetary support requirements for these activities in the provisions available from the budget surplus 2008-2009 under agenda item 7.2 (see Doc. 7.2 (5)).

4.2.9 The Commission for Agricultural Meteorology had stressed the importance of increasing the density of agrometeorological station networks to improve the spatial resolution and quality of agrometeorological products. The Council supported the recommendation from the meeting of the Implementation Coordination Team (ICT) on Agrometeorological Services (Hanoi, S.R. Viet Nam, December 2007) that the NMHSs should assist, support, and collaborate with other national, regional and international institutions that establish and maintain agrometeorological stations. The Council adopted Resolution 4.2/2 (EC-LX) - Establishment of National Agrometeorological Station Network (NASNET).

4.2.10 The Council endorsed the initiative of WWRP and GDPFS to assist Members to gain better access to services related to sand and dust storms prediction and warnings through capacity building and improved operational arrangements. The Council welcomed the establishment of the two SDS-WAS regional centres and encouraged Members to access the Websites <http://salam.upc.es/wmo/> and <http://www.sds.cma.gov.cn/> established by these centres, and to periodically verify the accuracy of information on the services they provide.

4.2.11 The Council invited Members to advance the development of regional downscaling techniques and regional climate modelling and requested that outcomes of Regional Climate Modelling workshops be distributed to Members.

4.2.12 The Council endorsed the recommendation of the IPY Intercommission Task Group that the CLIPS concept be extended to polar regions, with the aim to improve NMHS products and services for people living and working at high latitudes, as a WMO contribution to the IPY legacy. It urged Members with polar interests to contribute to scoping the feasibility of establishment of a polar climate outlook forum (PCOF).

4.2.13 The Council recommended that Members develop air quality forecasting (AQF) and dissemination skills as part of expanding and improving their service products. It encouraged to continue the GAW Urban Research Meteorology and Environment (GURME) project and to assist Members in developing capability in air quality forecasting and delivering related services to users including public information activities.

4.2.14 The Council endorsed the establishment of a trust fund to support the quadrennial WMO Scientific Conference on Weather Modification and the Expert Team on Weather Modification and requested Members, especially those engaged in operational weather

modification activities, to contribute to the fund. It also requested that reports on the contributions and the supported activities be made available to EC-XLI.

Service delivery

4.2.15 The Council endorsed the recommendations of the “International Symposium on Public Weather Services: A Key to Service Delivery” (Geneva, 3-5 December 2007) as guidance for the future evolution of the public weather services and the corresponding WMO Programmes. The Council reiterated that the public weather services should work towards increasing the availability, dependability, usability and credibility of weather, climate and water information and contribute to food security, water availability and public health.

4.2.16 The Council acknowledged that much had been done through training and guidance materials to assist Members with their endeavours to improve their delivery of services. However, some Members in developing and least developed countries still need much more and intensified assistance in dealing with challenges in public service delivery in order to keep pace with and contribute to the national sustainable development. The Council endorsed the new approach to building capacity of NMHSs using the ‘Learning Through Doing’ concept, developed by CBS, in selected target sectors such as health, agriculture, energy and transport. It requested promoting the implementation of projects based on this concept and agreed to address the budgetary support for this project in the provisions available from the budget surplus 2008-2009 under agenda item 7.2 (see Doc. 7.2(5)).

4.2.17 As regards the very effective and highly frequented WMO Web sites for the ‘Severe Weather Information Centre (SWIC)’ (<http://severe.worldweather.wmo.int/>) and the ‘World Weather Information Service (WWIS)’ (<http://worldweather.wmo.int/>), the Council urged Members to increase their contribution of information to the Web site and requested the Secretary-General to continue operation of these Web sites.

4.2.18 As regards the project on the provision site-specific forecasts in the medium-range, developed in RA II by Hong Kong-China, Japan, and the Republic of Korea, the Council agreed to explore repeating that project also in other WMO Regions to strengthen the capabilities of NMHSs of developing countries in that specific forecasting service.

4.2.19 Recognizing the increased use in the Arctic region by the marine community (including commercial, military and scientific), and noting the coordinated initiative by WMO, IMO and IHO to expand the Global Maritime Distress and Safety System (GMDSS) and the World-Wide Navigational Warning Service (WWNWS) into the Arctic waters, the Council approved the establishment of five new METAREAs for the Arctic region with the same boundary limits as the corresponding NAVAREAs, recently approved at the 83rd session of the IMO Maritime Safety Committee (Copenhagen, Denmark, October 2007). The Council welcomed and endorsed the commitments by the following NMHSs to serve as METAREA Issuing Service as follows:

- Environment Canada for METAREA XVII and XVIII;
- Norwegian Meteorological Institute for METAREA XIX;
- Roshydromet for METAREA XX and XXI.

4.2.20 In the context of maritime safety services, the Council emphasized the continuing importance to mariners of receiving graphical products via radio transmissions. It therefore requested JCOMM to continue researching methods for transmitting graphical products to marine users, and requested the Secretary-General to promote resource mobilization to further develop these activities and partnerships through national and international support.

Development of the WMO Quality Management Framework

4.2.21 The Council appreciated that the acceptance process of a formal agreement between ISO and WMO with the aim to grant WMO the status of a Standardizing Organization in the field of meteorology and related activities would be concluded soon. Such a status will enable Members to use the WMO technical publications as reference documents in their quest for ISO 9000 certification, which would greatly facilitate and simplify this process for them and reduce cost. In this connection, the Council emphasized again the requirements for developing suitable technical publications to provide the necessary advice to technical commissions in reviewing the existing documents and adjusting them to Quality Management System (QMS) requirements and preparing and publishing the necessary updates. It therefore agreed to address the budgetary support for these activities in the provisions available from the budget surplus 2008-2009 under agenda item 7.2 (see Doc. 7.2(5)).

Quality management system for aviation weather forecasting

4.2.22 The Council recognized that, in particular developing countries will be facing a very serious situation because of the planned elevation by ICAO of the implementation of an ISO recognized Quality Management System to a standard in the ICAO Annex 3 by 2010. Although the cost for implementation of such systems could likely be recovered from aviation, the tight deadline and the necessary up-front investments for documentation and adaptation of operational processes would pose a significant challenge to many Members. Noting the request by Cg-XV to implement a QMS Pilot Project in at least one developing country, the Council endorsed the plan to implement such a pilot project in the Tanzania Meteorological Agency (TMA) and requested that the documentation developed during this process be shared with other developing countries with a view to facilitating and expediting QMS implementations.

Socio-economic issues related to weather, climate and environmental applications

4.2.23 The Council recognized the value of the mechanism set up by the Secretary-General in the form of the "WMO Forum: Social and Economic Applications and Benefits of Weather, Climate, and Water Services" to address socio-economic-related issues. It requested that optimum use be made of this mechanism when addressing the follow-up actions arising from the WMO International Conference on Secure and Sustainable Living (Madrid, Spain, 2007) in the framework of the Madrid Action Plan (MAP).

4.2.24 The Council endorsed the recommendations arising from the first meeting of its Working Group on Strategic and Operating Planning, (Geneva, 27-29 February 2008), on how to advance delivery of the MAP. These included the need to:

- Undertake work on the estimation of socio-economic benefits – for example, a need for improved methodologies and economic models that are transferable among countries. Such models should deal with various sectors, address the needs of users, and allow for regional analyses in the estimation of socio-economic benefits;
- Involve regional associations in the advancement of the process, especially with a view to obtaining a better understanding of the situations across regions, and if possible at country level;
- Integrate relevant MAP activities and projects into the Secretariat Operating Plan in order to feature the MAP in the overall planning of WMO;
- Incorporate relevant Madrid Conference issues into the Third World Climate Conference (WWC-3) to be held in 2009;

- Partner with other organizations, which have existing activities in socio-economic analysis and benefit estimation, in developing WMO's capabilities. One aim is to develop training materials, courses, and fellowships related to socioeconomic studies and cost benefit analysis to advance the delivery of Madrid Action Plan;
- Develop methods for measuring progress in implementation of the Madrid Action Plan. This should be done by monitoring the progress made in delivery of relevant activities.

4.2.25 The Council recognized that with respect to assessing, quantifying and demonstrating benefits of weather, climate and water services to user sectors such as health, energy, tourism, transport and urban environment, many NMHSs would require assistance and guidance. It urged Members to make optimum use of the decision-support tools provided on the Web site: <http://www.wmo.int/pages/prog/amp/pwsp/socioeconomictools.htm> and requested the Secretary-General to give priority to the following supporting activities:

- (a) Pilot projects to assist NMHSs with techniques to enhance services to users;
- (b) Development and publication of methodologies for the evaluation and demonstration of the socio-economic benefits; and
- (c) Production of guidance materials on user-provider dialogue.

Human resource capacity building in service delivery

4.2.26 The Council recognized that in addition to building technical capabilities, NMHSs are required to strengthen their abilities in communicating information and knowledge to their user communities including government officials and decision-makers. It further recognized the need for the meteorological community to take advantage of the application of social sciences to address weather and climate-related social problems and requested the Secretary-General to give priority to assisting Members to:

- (a) Educate NMHS managers in effective communication with government officials, politicians and decision-makers in different user communities;
- (b) Educate NMHS staff on better communication skills with end users;
- (c) Educate users on understanding products, services and information provided by NMHSs and their application to decision-making; and
- (d) Bring the importance of the role of social sciences in applications of meteorology and related disciplines to the attention of Members in various WMO forums.

4.2.27 The Council further considered it necessary to give more room to subjects related to public service delivery in the training programmes conducted at WMO Regional Training Centres (RTCs) and to include such topics in the WMO training curricula

4.2.28 The Council acknowledged the benefits to the general public in rural communities of Radio Internet (RANET) communication initiative and agreed to continue supporting the initiative.

4.2.29 The Council endorsed the recommendation of the First JCOMM Scientific and Technical Symposium on Storm Surges (Seoul, Republic of Korea, October 2007) that WMO should assist Members to enhance public awareness of the risks of coastal inundation and its associated hazards by using materials available from UNESCO/IOC and by developing outreach materials and training activities (Ref. Doc. 4.1).

4.2.30 Due to the demands on NMHSs to improve the air quality-related services to decision makers and the general public, it would be important to accelerate the provision of the human resource development activities organized within GURME. The Council agreed that training workshops should be organized in the WMO Regions or sub-regions to make possible the expansion of air quality forecasting to countries that require this service but that lack expertise.

4.2.31 The Council supported the continuing activities aimed at improving the knowledge, skills and experience of WMO-RTC and NMHS trainers in the area of education and training as well as the application of distance learning methods with a view to improving service provision and delivery by Members.

4.2.32 The Council noted that the twenty-third session of the EC Panel of Experts on Education and Training had commenced planning for the XIth WMO Education and Training Symposium to be held in the first quarter of 2010 tentatively in RA II. The suggested theme for the Symposium is "New Approaches to the Education and Training for Meteorological and Hydrological Forecasters". The Council requested the Secretary-General to include the output of the EC Panel on the ETRP Key Performance Targets and activities into the WMO Operating Plan.

4.2.33 The Council noted and endorsed the actions taken by the EC Panel of Experts on Education and Training to assist Members demonstrate that their personnel supplying meteorological services to air navigation meet the requirements of Supplement 1 to WMO Publication No. 258. The time lines noted by the EC Panel are challenging and will require concentrated effort by the Members and Secretariat if they are to be met. The Council requested the EC Panel to keep them informed of progress with the revision of Supplement 1 to WMO-No. 258 and in identifying suitable accredited online undergraduate courses available to all Members.

DRAFT RESOLUTION

Res. 4.2/1 (EC-LX) – EXECUTIVE COUNCIL WORKING GROUP ON DISASTER RISK REDUCTION AND SERVICE DELIVERY

THE EXECUTIVE COUNCIL,

Noting:

- (1) The WMO Strategic Plan – WMO-No. 1028,
- (2) Resolution 5 (EC-LIX) – EC Working Group on Disaster Risk Reduction and Service Delivery,
- (3) Resolution 25 (Cg-XV) – Natural Disaster Prevention and Mitigation Programme,
- (4) Resolution 16 (Cg-XV) – Public Weather Services Programme,
- (5) Resolution 6 (Cg-XV) – Tropical Cyclone Programme,
- (6) Resolution 18 (Cg-XV) – Aeronautical Meteorology Programme,
- (7) Resolution 19 (Cg-XV) – Marine Meteorology and Oceanography Programme,
- (8) Resolution 29 (Cg-XV) – Evolution of National Meteorological and Hydrological Services and WMO,

Noting further that weather, climate and water information and risk assessment are important factors in decision-making in many socio-economic sectors,

Recognizing that disaster risk reduction and service delivery are cross-cutting issues requiring the expertise of weather, climate and water professionals and also the expertise of social and economic specialists and sector-based experts,

Decides to establish an Executive Council Working Group on Disaster Risk Reduction and Service Delivery with the following terms of reference:

- (1) To provide guidance on strengthening cooperation among the technical commissions and the regional associations in the delivery of weather-, climate- and water-related services to users, and to ensure effective coordination with relevant Executive Council subsidiary bodies;
- (2) To develop an effective WMO Policy Framework for Service Delivery;
- (3) To ensure that WMO addresses societal issues as expressed in the UN Millennium Development Goals, especially including sustainable development and poverty alleviation in its service delivery;
- (4) To provide guidance on strengthening partnerships at national to international levels between providers of weather-, climate- and water-related products and services and users (customers) in the public and private sectors; the media; academia; social and economic sciences; international and intergovernmental agencies; NGO's etc.;

- (5) To advise on the need for capacity building for information and outreach relevant to improving service delivery;
- (6) To recommend strategies and priorities for research and development as well as infrastructure (operational capability and reliable dissemination channels) relevant to and enabling effective service delivery;
- (7) To assess the effectiveness of programmes in improving services down to the end-user level, and advise on corrective steps where necessary;
- (8) To provide guidance on development and implementation of the Disaster Risk Reduction Programme, in particular with respect to:
 - (a) A coordination framework for the WMO Disaster Risk Reduction Programme involving technical commissions and regional associations, Members and external partners, such as United Nations bodies, other international organizations and donor institutions, particularly related to the role and responsibilities of National Meteorological and Hydrological Services in:
 - (i) Coordination mechanisms for disaster risk reduction;
 - (ii) Hazard analysis and risk assessment on all time scales;
 - (iii) Multi-hazard early warning systems;
 - (iv) Cooperating with financial risk transfer markets related to natural disaster risk (catastrophe insurance);
 - (v) Cooperation with civil protection agencies, disaster risk management authorities, and other stakeholders involved in disaster risk reduction;
 - (vi) Service delivery to disaster risk reduction communities under a multi-hazard framework;
 - (vii) Capacity-building and public education;
 - (b) Aligning the WMO Disaster Risk Reduction Programme with the Hyogo Framework for Action 2005–2015: Building the Resilience of Nations and Communities to Disasters, the strengthened International Strategy for Disaster Reduction (ISDR) System;
- (9) To invite, as appropriate, relevant ISDR-system agencies, and partners in service delivery, to participate in the work of this EC working group;
- (10) To address other matters relating to disaster risk reduction and service delivery as requested by the Executive Council;

Authorizes the working group to establish sub-groups and task teams as and when required;

Requests the Secretary-General to support the work of the working group.

Note: This resolution replaces Res. 5 (EC-LIX), which is no longer in force.

DRAFT RESOLUTION

Res. 4.2/2 (EC-LX) – ESTABLISHMENT OF NATIONAL AGROMETEOROLOGICAL STATION NETWORK (NASNET)

THE EXECUTIVE COUNCIL,

Noting:

- (1) That the Commission for Agricultural Meteorology (CAgM) at its fourteenth session held in New Delhi, India in October 2006 stressed the importance of increasing the density of agrometeorological station networks to improve the spatial resolution and quality of agrometeorological products,
- (2) That the Implementation Coordination Team on Agrometeorological Services (ICT) of CAgM met in Hanoi, S.R. Viet Nam, from 12 to 14 December 2007,
- (3) That the ICT discussed the issue of density of agrometeorological station networks at the national level,
- (4) That the network of agrometeorological stations around the world, especially in the developing countries, is currently on the decline and given the pressing need for improved agrometeorological services and applications, it is crucial that this issue be addressed with some degree of urgency,
- (5) That weather and climate risks to agriculture are growing rapidly, especially in the regions where rainfed agriculture is the norm and that climate change, especially in the arid and semi-arid regions in the tropics, is adding an additional dimension of increasing frequency of extreme events such as droughts and floods,
- (6) That water scarcity and increasing demands of water for agriculture are placing a premium on improved water management for agriculture and enhancing field water use efficiency,
- (7) That improved monitoring is crucial to finding effective solutions to these problems and a well established network of agrometeorological stations is central to the process of improved monitoring and assessment,

Recognizing:

- (1) That multinational private insurance agencies as well as International Financial Agencies such as the World Bank are showing increasing interest in offering insurance instruments based on weather indices for the benefit of small farmers around the world and that reliable and accurate near-real time weather data on a good spatial scale is essential for the computation of weather indices for insurance,
- (2) That NMHSs can indeed enhance the networks of agrometeorological stations by cooperating actively with universities as well as national, regional and international institutes engaged in agricultural research since all of them establish and maintain agrometeorological stations and that on the other hand, universities as well as national, regional and international institutes engaged in agricultural research can indeed benefit from their collaboration with NMHSs since routine calibration and quality control of data can be assured by NMHSs,

- (3) That some weather data from these numerous agrometeorological station networks can also be used for NWP and weather models and that with dwindling resources for standard weather stations, countries should strive to pool resources when necessary,
- (4) That the number of agrometeorological stations operated by universities as well as national, regional and international institutes engaged in agricultural research is large, often running into hundreds of stations, especially in large developing countries,

Decides to approve the recommendations of the ICT as follows:

Recommendation 1: Agrometeorological stations, whether maintained by the NMHSs or universities or national, regional and international institutes engaged in agricultural research, should be considered as a valuable national resource and hence collaboration between all these entities should be considered a priority to ensure efficient and effective use of the national resource for public good, in this case for the benefit of the poor farmers with limited means;

Recommendation 2: Collaboration of all these entities in public sector with the private insurance agencies should be promoted to enhance public-private partnership to address the national priority of assisting poor farmers and improve their livelihoods;

Recommendation 3: The Directors of NMHSs should engage in a dialogue with the Vice Chancellors of Universities and with Directors of national, regional and international institutes engaged in agricultural research as to how a National Agrometeorological Station Network (NASNET) could be established by bringing all the stations being operated by the different entities under one common umbrella. Agrometeorology in the Service of Agriculture should be the ultimate goal and should be actively promoted by all concerned;

Requests the Secretary-General to bring the recommendation to the attention of Directors of NMHSs to engage in a dialogue with the relevant national entities to establish the NASNET as a priority.

World Meteorological Organization

EXECUTIVE COUNCIL

SIXTIETH SESSION

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**ENHANCED CAPABILITIES OF MEMBERS TO PROVIDE AND USE
WEATHER AND CLIMATE, WATER AND ENVIRONMENTAL
APPLICATIONS AND SERVICES**

Strategic Thrust: Service Delivery

PROGRESS/ACTIVITY REPORT

SUMMARY

Reference: EC-LX/Doc. 4.2

CONTENT OF DOCUMENT:

This document contains progress reports on issues concerning:

1. User focus
2. Improved products and services
3. Service delivery
4. WMO Quality Management Framework
5. Socio-economic issues related to weather, climate and environmental applications
6. Human resource capacity building in service delivery

Appendix:

- Progress/Activity Report

PROGRESS/ACTIVITY REPORT

ENHANCED CAPABILITIES OF MEMBERS TO PROVIDE AND USE WEATHER AND CLIMATE, WATER AND ENVIRONMENTAL APPLICATIONS AND SERVICES

User focus

1. Informative materials on the user focus concept, targeting NMHSs and informing them of: the importance of user focus; how to assess user requirements; how to raise NMHSs commitment to serve users; how to establish liaison with end-users and how to assess user satisfaction and perception are available on the Public Weather Services (PWS) Web site (www.wmo.int/pws). The PWS Programme has also produced, distributed and made available various guidelines on this subject on the same Web site.
2. Recently the nature of operational forecasting has been changing in many NMHSs as the continuing and rapid development of numerical techniques and systems have been readily implemented in operational environments. The output of NWP systems is increasingly being fed directly into forecast systems often in gridded numerical form. In this environment, forecasters utilize forecast systems, which run on computer workstations, to generate (often semi-automatically) a range of products for various users which form the core of service provision by NMHSs. Just as NWP has provided the means for NMHSs to make steady improvements in operational forecast accuracy over recent decades, advanced forecast systems will provide the means for NMHSs to build on these advances and deliver the wide range of high-quality (timely, sophisticated and accurate) products expected by their clients. These activities are of increasing importance under the resource constraints of many NMHSs. A technical workshop is needed to consider a number of key issues including: the scope of forecasting system functionality and end user requirements; requirements for the associated forecast process including decision support systems, post processing of NWP and guidance generation, visualization and verification; optimizing the role of the human in forecast process and the potential of automation; assessment of the advantages of the various approaches to forecast system development; sub system requirements, graphical and text product generation; dissemination and communication within the forecast system; and WMO's Role in Forecast System Activities. Involvement of researchers and operational forecasters in the workshop is considered essential.
3. Guidelines for promulgation of maritime safety information to mariners at sea are under preparation. These materials will assist Members in their training activities on marine meteorological services. The Guidelines will be submitted to IMO for wide dissemination among its Members.
4. Following the request by Congress (Cg-XV, May 2007) to enhance the engagement by JCOMM with the user community and the private sector, relating to the development of ocean services and products in line with user requirements, the joint International Association of Oil and Gas Producers (OGP)/JCOMM/WCRP Workshop on Climate Change and the Offshore Industry was convened in May 2008 (Geneva) to: (i) review the evolving industry requirements for met-ocean services in a changing climate; and (ii) identify and prioritize key areas for future research and development towards the adaptation of the offshore industry and its met-ocean services to the climate change, including increased safety and efficiency of offshore operations (Ref. Doc. 9.3).
5. The Commission for Climatology Open Programme Area Group on Climate Applications and Services (CCI OPAG 4) has Expert Teams (ETs) focused on key socio-economic sectors. Each ET works closely with key organizations and entities representing the sectors involved (e.g. the World Health Organization; the United Nations Environment Programme; the UN World Tourism Organization; the International Association of Urban Climate; and the International Society for Biometeorology, etc.). Key priorities in each area are to identify the climate-related

requirements of users, at various levels (international, regional, national and local), and to jointly develop information and other products relevant to both NMHSs and users, to assist in decision-making and in development of effective strategies for adaptation to climate variability and change.

6. Following the meeting of authors on the guidance document on Heat-Health Warning Systems (HHWS) (March 2007), a comprehensive draft was provided to Members at the Fifteenth World Meteorological Congress for comment. Subsequently, editors are revising the document for peer review by WMO and WHO. This guidance, proposed to be jointly published by WMO and WHO, will serve the NMHSs (climate service providers) and the health and emergency services sectors (users) in understanding the health risks of heat waves, and in establishment of the two-way communications mechanisms needed for effective warnings and response actions.

7. WMO has continued to support WHO initiatives on regional aspects of the impacts of climate change on health. WMO supported the participation of NMHSs in WHO Regional Workshops on Climate Change and Health, in Asia (Malaysia, July 2007) and Central America (Costa Rica, September 2007), to provide an opportunity for the NMHSs to build partnerships with the health sector on this important issue. WMO and WHO have also worked together to update the summary document on "Climate Change and Human Health" (originally published in 2003), taking into account the findings of the recent IPCC Fourth Assessment Report.

8. The CCI ET on Climate and Energy met in Geneva, Switzerland (19-21 November 2007). Participants agreed to develop a new Technical Note on Meteorological Aspects of Renewable Energy Sources (solar and wind) and prepared an outline. UNEP and the World Climate Impacts and Responses Programme managed by UNEP will collaborate in this work. Case studies will be developed that demonstrate the benefits to users in the energy sector, energy users and governments of using climate variability and change information in operational and future planning decisions.

9. The CCI ET on Climate and Tourism participated in development of a new UNWTO/UNEP/WMO report on Climate Change and Tourism. This report was presented at the Second International Conference on Climate Change and Tourism (1-3 October 2007, Davos, Switzerland). The Commission for Climatology Expert Team on Climate and Tourism plans to launch a joint WMO-UNWTO survey to assess user needs in the tourism sector, and to identify existing applications and services for tourism provided by NMHSs. WMO and UNWTO are scoping development of a joint survey to assess needs within the tourism sector for climate information and services, and to identify activities, best practices and products developed by NMHSs for the sector.

10. The CCI ET on Urban and Building Climatology are completing a bibliography and are engaged in writing two new Technical Notes on 'Building Climatology in a changing world' and 'Urban climatology and its relevance to urban design'. A full draft of the former was delivered to WMO in December 2007 and is under review. The Expert Team is engaged in an inter-comparison of urban energy balance models and has begun to issue newsletters on progress.

11. The CCI ET on CLIPS Operations, Verification and User Liaison has embarked on the preparation of a WMO Guide to Best Practices for User Liaison in Climate Services, and prepared an outline. An important objective of the guide is to assist NMHSs in perceiving the role of climate as one part of the total system to be considered by decision-makers and the associated interactive processes.

Improved products and services

12. The following activities have been implemented as part of WMO efforts in assisting NMHSs in improving weather services to the public:

- A training course for the Balkans and East European NMHSs on nowcasting techniques (Bucharest, Romania, November 2007), designed to build the capability in developing countries in the region through “open laboratory” concept by providing knowledge on the underlying technique of nowcasting and its application to severe weather warning systems, as well as promoting the use of advanced technologies in nowcasting and provision of warning services. The need for nowcasting services had clearly been identified in the 2006 PWS Survey on Severe Weather Warning Services and its utility established by the various research and forecast demonstration projects of the nowcasting Working Group of WWRP;
- Publication of the ‘Guidelines on Communicating Forecast Uncertainty’ (WMO/TD-No. 1422) as decided at the meeting of the PWS Expert Team on Application of Probabilistic Forecasts (Shanghai, China 24-28 September 2007), to help NMHSs address the challenges associated with the communication of forecast uncertainty information.

13. At its meeting in Geneva, in December 2007, the ICT of the CBS OPAG on PWS discussed with the director of the Shanghai Meteorological Bureau various components of the Integrated MHEWS being developed for Shanghai, to be operational in time for World Expo 2010. Those components that contribute to service improvement and delivery were highlighted. An advisory expert group comprising the members of the PWS ICT was formed at the meeting to advise on the process of integrating PWS input in the project. The meeting agreed that nowcasting, multi-agency response, forecast dissemination and public outreach formed the major components of the PWS contribution to the project. In addition, the MHEWS will include a HHWS which will be based on the system that has been operational in Shanghai since the HHWS demonstration project launched it in 2000. The MHEWS also includes efforts to enhance the capabilities to forecast tropical cyclones through EWS and early warnings for other high impact weather through the development and application of Mesoscale Ensemble Systems (Ref. Doc. 4.1).

14. The Severe Weather Forecasting Demonstration Project (SWFDP) aims at enhancing the application of NWP products for the improvement of severe weather forecasting services. It was implemented in Southern Africa with the participation of Botswana, Madagascar, Mozambique, Tanzania and Zimbabwe. The role of PWS in the project includes ensuring effective dissemination and proper communication of warnings and forecasts to the public and other users; coordination with the media; building and improving capability in NMHSs participating in the SWFDP to communicate with stakeholders at all levels and to lead the efforts of the participating NMHS in public education and outreach. The meeting of the DPFS Steering Group of the SWFDP with Development of Disaster Risk Reduction Strategy for SWFDP (Geneva, 17-20 March 2008), expressed the strong need for the continued role of PWS in the SWFDP and specifically stressed on the need to strengthen the nowcasting element in the project.

15. In March 2008, the 3rd Edition of the Guide to Agricultural Meteorological Practices was prepared for publication. The Secretariat represented and promoted WMO at the following fourteen meetings: Coordination and Kick-off Meeting of CIIFEN project entitled “Climate Information Applied to Agricultural Risk Management in the Andean Countries (Ecuador, June 2007); Meeting of GEOSS Operational Agricultural Monitoring System (Rome, July 2007); Mediterranean Training Programme for the Harmonization of Early Warning Systems and Operational Instruments for Monitoring Climate Change and Desertification (Florence, September 2007); Meeting of the Intersectorial Association about Cereal and Other Arable Lands (Bologna, September 2007); American Society of Agronomy Meetings (New Orleans, November 2007); First Venezuelan Congress and Fifth Latin-American Meeting in Agrometeorology (Venezuela, November 2007); Meeting of the Agriculture Service on Agriculture and Climate Change (Parma, Italy, January 2007); UNECE 3rd Regional Implementation Meeting on Sustainable Development (Geneva, January 2008); Workshop on Climate and Crop Disease

Management (Bangladesh, February 2008); International Symposium on Agrometeorology and Food Security (India, February 2008); 31st Session of the Governing Council of IFAD (Rome, February 2008); Climate Change and Biodiversity in the Americas (Panama, February 2008); and Sharing Knowledge Foundation Meeting (Greece, April 2008).

16. The WMO Sand and Dust Storm Warning and Assessment System (SDS-WAS) is being implemented through collaborative regional efforts organized through Regional Centres in four WMO Regions. They are dedicated to the establishment of strong partnerships between the scientific community, NMHSs and health agencies to facilitate collaborations in the delivery of dust products and related services to the user community. One important community includes health researchers working in RA I, since it is thought that large dust plumes from the southern Sahara and the Bodele depression might be linked to meningitis outbreaks in the Sahel region (the "Meningitis Belt"). WWRP will host two technical workshops to strengthen new partnerships between users and providers consistent with the Madrid Action Plan (MAP). One workshop will be held in RA I with support from partners of the Regional Centre for Sand and Dust Storm Warning and Assessment System (SDS-WAS) North Africa, Middle East and Europe in Spain and the second in RA II (Mongolia), with the support of partners of the SDS-WAS Regional Centre for Asia/Central Pacific Centre in Beijing.

17. The following events were organized to improve the capabilities of NMHSs in enhanced service provision:

- The Tenth International Workshop on Wave Hindcasting and Forecasting and Coastal Hazard Symposium (North Shore, Hawaii, November 2007). Up to 150 participants (some 120 non-local) attended the Workshop. All relevant information regarding the Workshop is available on the following Website: <http://www.wmo.int/pages/prog/amp/mmop/news.html>. (Ref. Doc. 3.1);
- The First JCOMM Scientific and Technical Symposium on Storm Surges (Seoul, Republic of Korea, October 2007). Up to 120 participants (some 70 non-local) attended the Symposium. All relevant information regarding the Symposium is available on the Symposium Website: <http://www.jcomm2007sss.org/> (Ref. Doc. 4.1).

18. The Guide to Storm Surge Forecasting is under preparation. This publication will assist Members in developing an operational storm surge forecasting system (Ref. Doc. 4.1).

19. Regional Climate Models (RCMs) are important tools being used for a wide variety of applications, from climate change projections to (more recently) seasonal to interdecadal prediction, particularly in developing countries. The field of regional climate modelling has expanded tremendously in the last decade and WCRP co-sponsors workshops on the theory and uses of regional climate models. A training workshop was held in March 2008 at the Abdus Salam International Centre for Theoretical Physics to assist developing countries in applying RCMs in support of climate change assessment and extended-range prediction. The workshop reviewed the status of regional modelling and downscaling, identified outstanding issues and investigated possibilities of new applications in regional climate modeling.

20. Through the Commission for Climatology Expert Teams, work has been undertaken on a number of new Technical Notes and guidance documents, which will provide the technical information required for Members to undertake new and improved services to various key-socio-economic sectors.

21. WMO has continued to support the consensus-based and user-targeted approach to provide climate services. WMO has provided support to RCOFs in a number of sub-regions, to a limited extent subject to the availability of resources, which helped in the regional networking of

climate service providers and also in user liaison. RCOFs are now increasingly being recognized to be effective mechanisms in providing climate information (Ref. Doc. 3.2 and Doc. 6.1).

22. WMO Members are broadening their traditional roles so as to respond to air quality and related weather-sensitive public health threats. In order to help enhance the capabilities of NMHSs to handle meteorological and related aspects of urban pollution and to provide an international platform for cross-cutting urban air pollution activities, WMO established the GAW Urban Research Meteorology and Environment (GURME) project. GURME addresses the end-to-end aspects of air quality that link observational issues, data assimilation techniques, numerical models, dissemination methods, and capacity building required especially for developing countries to provide and use air quality services. GURME and PWS plan to collaborate to enhance the capabilities of NMHSs to develop their air quality services.

23. In September 2007 at its annual meeting in Oslo, CAS Management Group (CAS-MG) approved revised versions of the “WMO Statement on Weather Modification (including an Executive Summary)” and the “WMO Guidelines for the Planning of Weather Modification Activities”. The Management Group requested that approval of these revisions is reported to EC-LX. The CAS Management Group also approved the terms of reference of the WMO Weather Modification Research Trust Fund. The Secretariat established the Trust Fund in February 2008 and distributed a letter in April 2008, requesting contributions by Members.

Service delivery

24. The “International Symposium on Public Weather Services: A Key to Service Delivery” (Geneva, December 2007), was attended by some 120 participants and speakers. The Symposium reviewed achievements of the PWS Programme and provided a forum for debating at length the driving forces that will shape the evolution of service delivery for the next decade and beyond, various aspects of improving those services, as well as the use by society of weather-, climate- and water-related information. The Symposium which had been organized at the request of Congress (Cg-XV, May 2007), formulated a number of recommendations focusing the attention of NMHSs and other partners particularly on strengthening user focus, effective communication, responding to climate change issues, partnership building, capability building, engagement of social sciences in order to respond to societal needs, as well as maximizing the results of advances in science and technology, all of which would aid the enhancement of the range, quality and relevance of public weather services. The recommendations also called on NMHS and other entities engaged in weather, climate and water issues to explore ways of strengthening existing, and establishing new, partnerships between users and providers of services and information.

25. As part of its efforts to build the capability of NMHSs in service delivery, WMO has started implementing projects modelled on the ‘Learning Through Doing’ concept, which focuses on participative learning involving NMHSs, equipping them with skills to develop and transform their service delivery, particularly with regard to their interaction with users. One such project is being implemented in Latin America while similar projects are being planned for other WMO Regions.

26. The Severe Weather Information Centre (SWIC) Web site (<http://severe.worldweather.wmo.int/>) continued to disseminate official warnings on tropical cyclones for all the tropical cyclones basins, supplied by 20 participating Members. It also disseminated information on heavy rain, snow and thunderstorms. It recorded over 13 million visitors in 2007.

27. The World Weather Information Service (WWIS) site (<http://worldweather.wmo.int/>) experienced continued growth with 118 Members supplying official weather forecasts for 1263 cities and 160 Members providing climatological information for 1256 cities worldwide. The Web site operates in Arabic, Chinese, English, French, Spanish, and Portuguese. It is hosted

respectively by the Sultanate of Oman, China, Hong Kong-China, France, Spain and Portugal, with the overall coordination provided by Hong Kong-China.

28. Establishment of a Pilot Project on the Provision of City-Specific NWP Products via the Internet was endorsed by the thirteenth session of RA II in December 2004. The project aimed at enhancing the capacity of NMHSs of developing countries in Region II, with the supply of city-specific NWP products by advanced meteorological centres in Hong Kong-China; Japan and Republic of Korea. Under the pilot project, forecasts for a total of 160 cities are being provided to 13 participating Members.

29. The World Agrometeorological Information Service website (www.wamis.org) continued to assist Members in disseminating their products. Products from 40 countries or institutions are now available on WAMIS and there were over 100,000 visits to the website in 2007 with a monthly average of 8000 visits.

30. The WMO marine broadcast system under GMDSS Web site (<http://weather.gmdss.org>) continued to disseminate official maritime safety information and warnings supplied by 17 participating Members for all existing METAREAs (high seas). The inclusion of maritime safety information prepared for NAVTEX dissemination (coastal waters) is under preparation. IHO expressed its interest to collaborate with WMO and JCOMM to include navigational warnings in this Web site.

31. The sea ice services, a single Web site (<http://ipy-ice-portal.com/>) for the global sea ice operational information, supported financially by the GMES with its content under purview of the JCOMM, has been in operation since May 2007. Recognizing its importance, the JCOMM Management Committee decided at its sixth session (Paris, France, December 2007) to approach a national agency involved in operational sea ice services for continuing financial support after the current funding runs out in June 2008.

32. WMO participated in several IMO and IHO meetings to coordinate the expansion of the Global Maritime Distress and Safety System (GMDSS) into the Arctic waters, including the World-Wide Navigational Warning Service (WWNWS).

33. Climate adaptation and the associated risk management are areas of crucial importance to Members and the delivery of reliable and more detailed regional climate information, including current and future assessments of climate variability and change, is essential in the design of effective strategies for adaptation to climate change. To assist the developing and least developed countries of Eastern Africa to undertake and appropriately use climate projections in adaptation planning, three linked workshops to demonstrate the key elements of an effective climate risk management strategy for the region are being organized. GCOS, WCRP, the Climate Prediction and Adaptation (CLPA) programme of WMO and the IGAD Climate Prediction and Applications Centre (ICPAC) are collaborating, with the support of the World Bank, to implement the workshops. The overall objectives of the workshop programme are to demonstrate the use and value of observational records from the region and of regional model outputs, to build appreciation for model limitations, and to improve regional capabilities for using data records and model projections for adaptation planning.

34. In coordination with the CCI Expert Team on El Niño and La Niña and in collaboration with NOAA, WMO organized a CLIPS Workshop on Communicating ENSO in April 2008 (Honolulu, Hawaii, USA) to develop a common understanding of the terminology for communicating ENSO information.

Quality management system for aviation weather forecasting

35. The Working Arrangements between WMO and ICAO stipulate that ICAO has the prerogative to define the requirements for the provision of meteorological services to aviation. These requirements are laid down in the Annex 3 to the ICAO Convention, which is updated on a regular basis to reflect the evolving needs of aviation.

36. ICAO has notified the WMO Secretariat of its intention to upgrade an existing recommendation for the implementation of an ISO recognized Quality Management System for this service provision to a Standard with a planned entry into force in November of 2010. Fifteenth Congress Resolution 18 requested the Secretary-General to support the implementation of at least one demonstration project for the implementation of an ISO recognized QMS in at least one suitable Member among the Least Developed Countries. The Secretariat undertook to identify a suitable group of Members that could not only benefit from Secretariat support in implementing a QMS, but would also have the demonstrated capacity for a sustainable operation of such a system, well-established links and cooperation agreements with neighbouring Members to ensure that the documentation developed, expertise gained and the role model established could serve as a nucleus for successful application and implementation in these countries.

37. In view of the very short time available before the ICAO deadline in 2010, the existing framework of the East African Community Secretariat for regional cooperation, and the existing Cost Recovery scheme for aviation meteorological services, the WMO Secretariat has obtained the commitment by the Tanzania Meteorological Agency to implement Quality Management with its help, seeking funding from external sources such as the World Bank, and making its experiences and documentation available to other Members in the East African region.

38. As costs for the implementation of a Quality Management System, following its elevation to a Standard, will be fully recoverable, it was considered essential to launch the demonstration project in a Member country that has a working cost recovery scheme in place, so that any loans obtained from the World Bank or other funding agencies could be serviced through recovery of costs from aviation.

39. In view of emerging competition for aviation meteorological service provision by the private sector, it is considered essential that NMHSs are made fully aware of the potential risks to their role in service provision, and the revenue derived from this activity, if they are unable to provide these services to the Standards required by ICAO and the aviation industry.

40. A catalogue on marine meteorological and oceanographic best practices and standards is under preparation by JCOMM in accordance with the recommendations from ICT-QMF and Resolution 32 (Cg-XV, May 2007). This catalogue would assist Members in developing quality management systems for marine meteorological forecasts and services. Members are encouraged to document their marine meteorological forecasts and services in accordance with the quality management principles, as stated in Resolution 32 (Cg-XV), and to investigate feasibility for engaging in the certification process.

Socio-economic issues related to weather, climate and environmental applications

41. During the Second Meeting of the Task Force on Socio-Economic Applications of Meteorological and Hydrological Services (Geneva, 11-13 July 2007) the Task Force agreed to be renamed as the "WMO Forum: Social and Economic Applications and Benefits of Weather, Climate, and Water Services" with modified Terms of Reference to, among other functions, provide WMO with recommendations for assisting NMHSs to more fully assess and enhance the socio-economic benefits of weather, climate and water information through the full range of user communities.

42. Through the work of the Forum, an inventory of Decision Support Tools and Case Studies on Socio-Economic Applications of Meteorological and Hydrological Services has been developed, and made available to NMHSs on the WMO Web site (<http://www.wmo.int/pages/prog/amp/pwsp/socioeconomictools.htm>). This is a dynamic site to which new tools are added continuously.

43. Guidelines on socio-economic-related issues such as improving user-provider dialogue and assessment of benefits of meteorological and hydrological services to the public and user sectors are under preparation. These materials will form the basis of training activities on the above subjects, requested by Members as part of the implementation of the MAP.

44. The new generation of marine meteorological and ocean forecasting products and services (Ref. Doc. 3.1) are essential for many aspects of national socio-economic development, including maritime safety and maritime commerce and industry. Members are urged to give priority to these marine services and make every effort to enhance their status and visibility among marine users. A web-based catalogue on the new generation of marine meteorological and ocean forecasting products and services, including their benefit to marine users, is under preparation. This will be a dynamic site that will be updated continuously, providing the most up-to-date information on these products and services. This catalogue will identify common challenges and opportunities among Members related to the use of the new generation of marine meteorological and ocean forecasting systems.

45. The Expert Team on CLIPS Operations, Verification and User Liaison has developed an updated Technical Note on Socio-economic Benefits of Climate Services. A draft version of the Technical Note has been delivered to WMO, and is under the review process.

Human resource capacity building in service delivery

46. The following human resource development events were organized to improve the capabilities of NMHSs in service provision and delivery:

- Joint DPFS and PWS RA I Workshop (Pretoria, South Africa, October 2007). The PWS component of the Workshop was designed to equip participants with the skills to use public weather services products in support of natural disaster reduction;
- Joint TCP and PWS RA I/RA V SIDS 7th Southern Hemisphere Training Course on Tropical Cyclones and Public Weather Services (Melbourne, Australia, September 2007). The course helped the participants to acquire skills on modern techniques of tropical cyclone forecasting and warning and on how to deliver those products through the national PWS programmes and activities;
- Joint TCP and PWS RA IV Workshop on Hurricane Forecasting and Warning, and Public Weather Services, (Miami, USA, April 2007). The Workshop was designed to help Members improve their tropical cyclone warning systems and related public weather services.

47. The subject of the future of training in PWS, and training of trainers in PWS topics have been discussed on different occasions including the Meeting of the RA VI Sub-committee on PWS (Langen, Germany 29-31 August 2007) as well as in various PWS ICT meetings. Discussions have resulted in the recommendation that PWS training should be formalized in the WMO education and training structure and that trainers should receive training in PWS-related subjects in addition to other applications of meteorology areas. The planned approach will include collaboration between PWS and ETR on the content and style of the proposed competencies and

syllabus for inclusion in WMO Publication No. 258 as well as consideration of Regional Training Centre trainers participating in appropriate PWS training workshops from 2010 onwards.

48. The Radio Internet (RANET) Project combines innovative and affordable technologies with appropriate applications to create communication systems. These communication systems are suitable for enhancing the capability of NMHSs to increase the reach of their products to isolated rural communities who have no means of accessing weather, climate or water services produced by NMHSs. The project is under implementation in about 12 countries of RA I and RA V. The RANET-Africa Leadership Team meeting (Arusha, Tanzania 25-26 January 2008), in which WMO participated, recognized training and sourcing of equipment as areas in which WMO could assist NMHSs to implement the RANET project.

49. As regards the improved agrometeorological services for agricultural production, initiatives have been taken to organize a number of Roving Seminars on Weather, Climate and Farmers in Columbia, Ethiopia and India by bringing together farmers, agricultural extension agencies, and agrometeorologists to raise the awareness of the rural communities regarding weather and climate issues, especially the impact of projected climate change on their crops/cropping systems. These one-day seminars were developed by NMHSs with WMO guidance and focused on basic weather and climate information, applications of weather and climate in agricultural decision-making, and pest and disease control provided by agricultural extension agents.

50. WMO provided scientific and technical expertise in publishing special journal issues and books. Since EC-LIX, two CAgM reports were published in addition to the following publications:

- Special issue by Agricultural and Forest Meteorology journal entitled “Contribution of Agriculture to the State of Climate”;
- Technical Book by Springer entitled “Climate Prediction and Agriculture: Advances and Challenges”;
- Technical Book by Springer entitled “Managing Weather and Climate Risks in Agriculture” based on proceedings from an international workshop held in New Delhi, India;
- Technical Book by Springer entitled “Climate and Land Degradation” based on proceedings from an international workshop held in Arusha, Tanzania;
- Proceedings of the Tenth International Workshop on Wave Hindcasting and Forecasting and Coastal Hazard Symposium;
- Proceedings of the First JCOMM Scientific and Technical Symposium on Storm Surges, a subset of papers presented at the Symposium will form a special edition of the journal *Natural Hazards – Journal of the International Society for the Prevention and Mitigation of Natural Hazards* (Springer);
- Members Training Requirements, Opportunities and Capabilities in Meteorology and Hydrology, WMO Survey 2006, WMO/TD-No. 1380 - ETR-No.19;
- Manual on Policies and Procedures for WMO Fellowships WMO/TD-No. 1356 - ETR-No.18;
- Training Programmes of WMO Regional Training Centres WMO-No. 240 (Part V);

- Guidelines for the Education and Training of Personnel in Meteorology and Operational Hydrology WMO-No. 258 (Russian and Spanish Editions);
- Guidelines for the Education and Training of Personnel in Meteorology and Operational Hydrology - Training and Qualification Requirements for Aeronautical Meteorological Personnel Supplement No. 1 - WMO-No. 258.

51. CLIPS training sessions constitute an important WMO initiative in the development of human resources for climate services. A CLIPS training session was held in RA I with special focus on the Mediterranean region, during October-November 2007. The CLIPS Training Curriculum is also under constant development and the modules are available on CLIPS web pages. RCOF sessions, held in different sub-regions, also have provided opportunities for capacity building of climate experts from developing and least developed countries. WMO has also been working with UNEP, UNWTO, WHO and other organizations to assist in the capacity building of application sectors in efficiently using climate information products. (Ref. Doc. 3.2, paragraph 4.2.1.4 and Doc. 4.2)

52. WMO has worked with staff from WMO Regional Training Centres and trainers from NMHS training institutes to improve the overall education and training capacity of Members through activities such as the Train the Trainer Seminar for 25 national trainers from RA III/IV held in Venezuela in March 2008; external assessments of WMO-RTCs in Costa Rica, Egypt and Barbados scheduled in 2008; promotion and support of distance learning through assistance for seven WMO-RTC and NMHS trainers to attend conferences such as the CALMET conference in Beijing in July 2007, and "Use of new educational technologies in preparation and retraining of the experts of hydrology and meteorology" seminar in St Petersburg, Russian Federation in May 2008.

53. There have been many expressions of interest for enhancing air quality forecasting activities in the different WMO Regions. As a response, the GURME air quality forecasting (AQF) course was developed by the GURME Training Team. The course is designed to provide the background knowledge needed to design, develop, implement and evaluate a basic air quality-forecasting programme. It contains practical advice, introduces the participants to available tools and methods, and provides reference materials for follow-on activities. The topics covered include: meteorological aspects of air pollution; meteorological products and examples; chemical aspects of air pollution; case studies; air quality forecasting tools; developing a forecast programme; and daily forecast operations. Each course will be fitted to the needs of the participants. The first course was delivered in July 2006 in Lima, Peru, for the RA III countries. The material that was delivered in Lima is available on the web. The next course will be held in India in autumn 2008. However, due to limited funding, WMO has not been able to respond to the requests from Members for organizing AQF courses in a comprehensive manner. There is a need to hold these workshops in other Regions, especially in Central Asia and Africa in order to assist NMHSs expand their scope of activities and improve their air quality products.

54. A separate initiative in enhancing the capabilities of Members to improve their air quality modelling activities is the strong collaboration between GURME and COST Actions, specifically with COST Action 728 "Enhancing Meso-Scale Meteorological Modelling Capabilities for Air Pollution and Dispersion Applications" resulting in the preparation of joint publications which have proved very beneficial for this purpose.

55. The twenty-third session of the Executive Council Panel of Experts on Education and Training was held in Costa Rica from 17 to 21 March 2008. The session focused on: reviewing and refining the purpose and objectives of the Education and Training Programme (as expressed in the Secretariat Operating Plan) for inclusion in the WMO Operating Plan and the WMO Strategic Plan; examining the known training needs of WMO Members, particularly those associated with aeronautical meteorology personnel (Ref. Doc. 3.1); the range and scope of the proposed training

activities for 2008-2009 and gaps between the training needs and training activities (Ref. Doc. 6.2(1); and, issues around the processes and procedures for the reconfirmation of WMO Regional Training Centres (Ref. Doc. 6.2(1)). In addition to suggesting new key performance targets for the Education and Training Programme for inclusion in the WMO Operating Plan three new deliverables were also identified. It was further noted that the WMO Strategic Plan does not include a performance indicator for Education and Training under Expected Result 7. The Panel highlighted the importance of including the outcomes of the Eleventh WMO Education and Training Symposium (scheduled for early 2010) within the planning process for the Education and Training Programme for the sixteenth financial period and agreed that the theme for the Symposium should be "New Approaches to the Education and Training of Meteorological and Hydrological Forecasters". Whilst the final location of the Symposium has not been decided, the session noted with thanks the offer by the Republic of Korea to host the symposium. A full discussion of the work of the Panel can be found in the report of the Panel session.

56. At its twenty-third session, the EC Panel of Experts on Education and Training considered processes and time lines to assist Members have their personnel certified to provide meteorological services for air navigation. The Panel noted that it was not practical or desirable to change the underlying thrust of the fourth edition of WMO publication No. 258 and retrospectively remove the requirement that WMO Meteorologists hold an appropriate degree in meteorology or an appropriate science and mathematics degree and have successfully completed a condensed basic instruction package (meteorology) course. With this starting point the Panel noted the following time lines:

- (a) Aviation forecasters trained prior to 1 January 2005 don't need to have a degree to be independent forecasters but they do need to be able to demonstrate that they meet the requirements outlined in Supplement 1 to WMO-No. 258;
- (b) Aviation forecasters trained after 31 December 2004 must have an appropriate degree as well as meet the requirements laid down in Supplement 1 to WMO-No. 258;
- (c) In late 2010, ICAO will mandate that Air Navigation Service Providers (ANSP) must have implemented an ISO approved Quality Management Framework.

57. Given these time lines the Panel recommended the following actions:

- (a) Revision and strengthening of Supplement 1 to WMO-No. 258 into a standalone "Guide" or minimum set of standards that must be met. This would include developing an instruction and assessment "kit", to complement the Guide that could be used by Members;
- (b) Advising ICAO that non-degreed forecasters trained after 31 December 2005 and prior to 1 January 2011 be allowed to continue operating as independent aviation forecasters provided they are pursuing appropriate undergraduate studies that will allow them to graduate with the appropriate qualification prior to 31 December 2014 **and** they can demonstrate that they meet the requirements outlined in Supplement 1 to WMO-No. 258.

58. To assist in the implementation of these two actions, the Panel formed two Expert Teams; the first one to revise and strengthen Supplement 1 to WMO-No. 258 and develop the instruction and assessment "kit". The Convenor for this team is Mr Ian Lisk from the UK Meteorological Office. The second team to be convened by Dr Vilma Castro from the University of Costa Rica is to investigate options for delivery of an accredited online undergraduate degree that could be taken by Members whilst continuing to work as aviation forecasters. The team will initially pilot the project for RA III and RA IV Members and then extend it to other Regions as suitable providers are identified.

59. In addition, the Panel noted the discussions in some Regions for Members to form regionally based Aviation Forecasting Centres to provide meteorological services for air navigation to a range of Members. Noting that in this situation, staff from one Member would be providing services to one or more other Members, consideration of training and fellowship requests to support these initiatives should take into account the potential for these activities to benefit the Members in that Region.
