

interoperability. The Council requested the CBS/OPAG on ISS to assist the EC Panel to facilitate acquisition, exchange, and archiving of observational data from Polar Regions in compliance with WIS requirements related to data exchange. Regarding the long-term preservation of data ICSU was beginning to address this issue through the creation of the World Data System.

4. SERVICE DELIVERY (*agenda item 4*)

4.1 ENHANCED CAPABILITIES OF MEMBERS IN MULTI-HAZARD EARLY WARNING SYSTEM AND DISASTER PREVENTION AND PREPAREDNESS (*agenda item 4.1*)

Disaster Risk Reduction Programme Strategy and Implementation Framework

4.1.1 In reference to the decision of the Fifteenth Congress of WMO (Cg-XV), the Council was advised that the Disaster Risk Reduction (DRR) Programme has been working successfully with all relevant technical programmes, the Development and Regional Activities (DRA) Department, the Resource Mobilization Office within the Secretariat, and a small but strategic group of external partners to facilitate a coordinated approach for the implementation of a number of pilot and demonstration DRR projects at national and regional levels. In this regard, the Council noted the need for a strategic and systematic approach engaging WMO Programmes, constituent bodies, Members and external partners to scale up these efforts to benefit other Members.

4.1.2 The Council recalled the outcomes of the country-level fact-finding DRR survey conducted in 2006, which provided a benchmark on Members' National Meteorological and Hydrological Services (NMHSs) capacities, requirements and priorities to support disaster risk management. In this regard, it recalled that the needs and requirements of the NMHSs were assessed along five primary areas. Based on the results of the survey, countries can be divided into four categories with respect to their capabilities, gaps and needs for support from WMO. The Council requested that the results of the survey should be one of the main drivers for the development of the WMO national and regional DRR-related projects undertaken by WMO Programmes, constituent bodies and with external partners.

Provision of hazard information and analysis for risk assessment and planning

4.1.3 In reference to the outcomes of the Country-level DRR survey, related to the top ten hazards of concern to all Members, and expressed need by 90% of NMHSs for guidance on standard methodologies for monitoring, archiving, and analysing hazards, the Council noted the activities of the Commission of Hydrology (CHy), the Commission for Agricultural Meteorology (CAgM), and the Joint WMO/IOC Technical Commission for Oceanography and Marine Meteorology (JCOMM) in developing such guidelines for floods, droughts and storm surges, respectively. It also noted that the Commission for Basic Systems (CBS) has established a task team, under its Public Weather Service (PWS) Open Programme Area Group (OPAG), in consultation with the Commission for Climatology (CCI) and Commission for Atmospheric Sciences (CAS), to address other meteorological hazards. The Council noted the role of the Commission for Instruments and Methods of Observation in developing instrumentation that could withstand the impacts of extreme events ensuring continued monitoring of the meteorological, hydrological and other environmental conditions. The Council also suggested that "best possible practice" approaches should be followed in the work of the technical commissions and their subsidiary bodies, in the development of standard methodologies on hazard and risk assessment. The Council agreed with the decision of the 2009 Meeting of the Presidents of Technical Commissions that air pollution needs to be also added to the list of priority hazards being addressed. The Council:

- (a) Requested that the guidelines developed by the commissions first be tested and operationalized through national risk assessment and DRR pilot and demonstration projects as appropriate;

- (b) Encouraged Members to ensure that their NMHSs establish mechanisms and methodologies for the provision of meteorological, hydrological, climate hazard data and metadata, analyses, value-added information and technical expertise;
- (c) Requested the Secretary-General to facilitate initiation of, or participation in risk assessment pilot projects underway such as the World Bank's Central America Probabilistic Risk Assessment Project (CAPRA) and the UNDP's Global Risk Identification Programme (GRIP)], in which the contribution of NMHSs for the provision of hazard data, analysis and mapping could be demonstrated;
- (d) Requested presidents of technical commissions to develop a joint framework for coordinated collection of statistical hazard information from NMHSs for use in international statistical reporting.

Multi-Hazard Early Warning Systems (EWS) and Emergency Response Operations

4.1.4 Following the expressed needs by nearly 80% of the Members for technical capacity development in support of early warning systems, that 90% of disasters caused by natural hazards are linked to meteorological-, hydrological-, and extreme climate-related events, and with reference to its pertinent decisions linked to Expected Results 1, 2, 3, and 7 under agenda items 3.1, 3.2, 3.3 and 4.2, the Council:

- (a) Re-emphasized the continuing need to improve NMHSs technical capacities and methodologies for the generation of warnings particularly stressing related technical developments related to severe weather, riverine and flash floods, heat-health, sand and dust storm, marine meteorological and environmental hazards, and droughts. In this regard, it requested the Secretary-General: (i) to report to its next session the results achieved through these technical capacity development projects; and (ii) that these technical capacities must be linked at national level to operational disaster risk management and emergency preparedness processes, through well-defined projects, based on user requirements and participation;
- (b) Noted the progress made towards the development of a Sand and Dust Storm Warning Advisory and Assessment System (SDS-WAS), welcomed the initiatives in this area, called for CAS and CBS collaboration to establish SDS-WAS Centres with the appropriate operational and research capabilities, and to clarify the future of the SDS-WAS Centres in the context of the GDPFS and RSMC structures. The Council recommended that the framework being developed for the SDS-WAS and Emergency Response Activities (ERA) be considered as a nucleus for the development of future WMO research, prediction and assessment systems related to forest and bush fires, and air quality services of WMO Members;
- (c) Recognized the potential benefits of collaboration between DRR and activities taking place under CAS, for more rapid transfer of the tools currently under development by the research community for improved disaster risk management and preparedness. The Council stressed that operationalization of these capacities could provide unique, new and effective solutions, particularly for the developing nations. The Council highlighted the WWRP-THORPEX TIGGE project, which would provide critical information for risk quantification and urged the involvement of TIGGE in DDR demonstration projects;
- (d) Emphasized the growing application by NMHSs of probabilistic forecasts to assist forecasters to improve, in particular, the warnings of severe weather. It urged the preparation of guidelines on communicating probabilistic forecasts to users to expand customers' opportunities through appropriate use of this information.

4.1.5 In reference to its request to the Secretary-General to facilitate in consultation with UNESCO-IOC the development of storm surge watch schemes, the Council was pleased to note that through collaborative efforts of JCOMM and TCP, immediate actions were taken by the five

TCP regional bodies to assist their Members by establishing regionally coordinated frameworks for enhancing their capabilities to access and understand existing wave and storm surge products worldwide, and to make use of them for operational forecast and warning services. The Council requested the Secretary-General: (i) to keep Members informed of the developments and to continue; (ii) to give high priority to these activities, including facilitating and supporting the regional associations concerned in the development of storm surge watch schemes; and (iii) to continue capacity-building activities related to use of SSWS guidance information. The Council urged Members concerned to take appropriate actions to improve storm surge and wave forecast and warning services within their areas of responsibility. The Council was pleased to note the strengthened collaboration between WMO and UNESCO/IOC in the coordination of observing, monitoring, modelling, forecasting and warning systems of ocean-related hazards for improved coastal risk management. It acknowledged the UNESCO/IOC initiative in the development of technical and management solutions to address the risks of coastal hazards, including the guidelines on Hazard Awareness and Mitigation in Integrated Coastal Area Management (ICAM), on which WMO was a major contributor.

4.1.6 In recognition of the impacts of the TCP/JCOMM training workshop series on storm surge and wave forecasting, the Council requested the Secretary-General to continue to support such training workshops in the future.

4.1.7 The Council re-affirmed that sea level observations are critical for enhancing storm surge forecasting and thus contribute to the storm surge watch schemes and tsunami prediction. The Council therefore requested that efforts be made, by all concerned, to ensure that *in situ* and remote sensed sea level observations are routinely collected and disseminated via the GTS. It requested JCOMM/Global Sea-Level Observing System to continue supporting activities for extending the network of sea level measuring gauges, as well as increasing the number of those reporting in real-time, and other sea level observing techniques. The Council noted that GLOSS is facilitating real-time exchange of sea level data from its Core Network stations. It requested the Secretary-General to promote resource mobilization to further develop these activities and partnerships through national and international support. The Council urged Members already undertaking sea level observation programmes to make their sea level data freely available in real-time, in support of coastal marine hazard warning services, including in particular for storm surges and tsunamis. The Council also requested the Secretary-General to promote the participation of space agencies in the SSWS, and encourage Members to make maximum use of the scheme applications, including guidance products for marine forecasting purposes.

4.1.8 The Council recognized that severe coastal inundation events from extreme sea state conditions occurred in many parts of the world, including in the Gulf of Guinea, where coastal and ocean surface meteorological observations were still limited or absent, and requested JCOMM and other relevant technical commissions to consider implementing a Coastal Inundation Forecasting Demonstration Project for the West Africa region as a matter of priority. The Council also noted the effective support currently provided by the NMHSs in disseminating early warning and watch messages and related data through the GTS, in support of tsunami and other ocean-related warning systems. The Council recalled its consultation with UNESCO and its IOC in May 2006, related to the Comprehensive Nuclear Test-Ban Treaty Organization's (CTBTO) operation of an advanced global seismological observation network, which had the potential to contribute significantly to the detection of a tsunami threat. The Council recalled that it had agreed with UNESCO-IOC that coordination with the CTBTO should be continued with a view to promoting the development of the CTBTO seismic observation system into a public service-oriented system that would contribute data freely and timely in support of disaster prevention and mitigation (EC-LVIII, paragraph 3.9.18).

4.1.9 The Council recalled the Shanghai multi-hazard early warning system project, which provides a coordinated framework for technical capacity development in nowcasting and forecasting of various hazards, including very strong convection, by the NMHSs, involving all relevant WMO technical programmes. The Council stressed the importance of these demonstration projects with the goal to scale up to other countries in need of technical capacity development requiring a multi-hazard approach and requested the Secretary-General to document

lessons learned from these technical capacity development projects and use this model to ensure that Members are assisted more efficiently.

4.1.10 Following the request from its sixtieth session, the Council was informed of the status and results, with respect to the establishment of demonstration projects with a multi-hazard approach and documented good practices in France, China (Shanghai), Cuba and Bangladesh. It appreciated Members' efforts for the documentation of these four cases and contributions of France for hosting the Second Experts' Symposium on Multi-Hazard EWS (MHEWS-II), in Toulouse, France, 5–7 May 2009. The Symposium finalized the first guidelines on "Capacity Development in Multi-Hazard EWS, with Focus on Institutional Coordination, Collaboration and NMHS," based on lessons learnt from demonstration projects and documented good practices and other examples of end-to-end early warning systems. The Council further noted important outcomes of MHEWS-II with regards to identification of other examples of good practices in multi-hazard EWS and recommendations linked to transboundary issues and urged the Members concerned to document their experiences for sharing with other Members. It requested,

- (a) The Secretary-General to ensure that the guidelines are utilized in training workshops for technical development projects to establish demand for NMHSs information within the national emergency planning, preparedness and response of the country and develop operational collaboration between the NMHSs and disaster management agencies;
- (b) The Secretary-General to facilitate documentation of other good practices in multi-hazard EWS identified through MHEWS-II;
- (c) The Secretary-General to take necessary actions to ensure that issues pertaining to transboundary operational cooperation and exchange of forecasts, warnings and other information could be addressed in relevant transboundary Multi-Hazard Early Warning demonstration projects, building on experiences gained in some WMO Regions, such as RA VI, from the projects on cross-border exchange of warnings and information implemented under PWS activities, and that lessons learned be documented to support future projects. The potential of the SWFDP in RA I, Southern Africa, to demonstrate and test protocols across boundaries was also noted, including the need for the development of a web-based software to display severe weather warnings of countries was also found to be ideal for effective cooperation and exchange of information over boundaries. Furthermore, the Council noted that since 2009, in RA III, a new Virtual Centre for Severe Weather involving Brazil, Argentina, Paraguay and Uruguay has been established and can be expanded to other countries through demonstration projects;
- (d) Its EC Working Group on DRR and Service Delivery to assess the emerging results and conclusions and to make recommendations to the Council as regards to possible impacts on the strategic role of WMO Programmes and constituent bodies in this area.

4.1.11 The Council stressed the importance of operational cooperation of NMHSs with disaster risk management agencies for development of end-to-end EWS capacities, including task of the radioactive and pollutants' transport, and particularly noted the need for development of concept of operations among these agencies. The Council further stressed the importance of reliance of emergency preparedness and response operations on the authoritative information provided by the NMHSs. The Council endorsed pilot projects in Central America and Southern Africa that were intended to optimize the utilization of existing tools, methodologies, and information of the NMHSs based on the understanding of user needs. The Council requested:

- (a) The Secretary-General to report on progress with these projects in the next session of the EC;

- (b) Its EC WG DRR and SD to review lessons learned from these projects and provide recommendations and a road map on how these projects can be scaled up to benefit other WMO Members.

4.1.12 The Council noted that international humanitarian agencies' involved in emergency contingency planning could improve their relief and response operations through analyses, forecasts, warnings and other information available from Regional Specialized Meteorological Centres (RSMCs) and NMHSs. In this regard, the Council strongly endorsed CBS' efforts to establish a task team under its PWS OPAG involving experts from the Global Data Processing and Forecasting System (GDPFS) and WMO Information System (WIS) OPAGs together with operational humanitarian agencies to develop a work plan and propose a pilot project to operationally link GDPFS and NMHSs to humanitarian agencies.

Catastrophe insurance and weather risk management within financial risk transfer markets

4.1.13 In reference to the request at its sixtieth session, the Council endorsed the Secretary-General's efforts to:

- (a) Prepare a document on experiences of several NMHSs, currently serving these markets, and lessons learnt from these experiences to be published in 2010;
- (b) Prepare with the World Food Programme (WFP), the International Fund for Agricultural Development (IFAD), the World Bank and NMHSs, a proposal for piloting the development of these markets in Africa, where funding would be available for strengthening of observing networks, data rescue and management systems of the NMHSs for provision of data products for the catastrophe insurance and weather risk management markets.

Leveraging Cooperation and Partnership to Strengthen the Role and Capacities of NMHSs in DRR

4.1.14 The Council stressed the need for enhanced recognition of NMHSs' potential contributions in disaster risk management by their governments that would translate into resources for building and sustaining NMHSs capacities. In this regard, effective utilization of the PWS arm of NMHSs can be one such method that could greatly enhance achievement of success in this effort. The Council noted WMO strategic partnerships with agencies such as the ISDR, UNDP and World Bank that influenced national DRR planning and funding. The Council was informed of the progress with the DRR projects in partnership with these agencies in seven countries in Southeastern Europe (SEE) (launched in 2007) and eight countries in Central Asia and Caucasus (launched in 2009) and that discussions were underway to initiate similar projects in five countries in Southeast Asia and later in the Pacific. The Council stressed that these projects had demonstrated a successful model for cooperation with partners, whereby a small amount of WMO resources had resulted in much higher returns by leveraging partners' resources and expertise and the cooperation had led to recognition of the role of NMHS by their governments. The Council requested the Secretary-General to continue efforts in development of similar partnership projects. Noting that the NMHS involved in these projects need significant technical development and operational partnerships with disaster risk management agencies, the Council urged the WMO technical programmes and constituent bodies to support these projects, as relevant and requested the Secretary-General to ensure a coordinated approach engaging all relevant WMO programmes in these projects.

4.1.15 The Council also recognized the importance of WMO contributions in the ISDR System, particularly in the ISDR Management Oversight Board (ISDR-MOB), ISDR Scientific and Technical Committees, as well as WMO's initiatives in support of the ISDR Global Risk Assessment Report 2009. The Council stressed that the primary issue for these efforts is to raise awareness on the role of NMHSs in DRR that could, in turn, result in investments from their governments for strengthening and sustainability of NMHS capacities. The Council urged the participation of the NMHSs and regional associations in the national and regional DRR platforms, noting ISDR

Secretariat's offer to assist in this regard, as this could lead to securing or increasing the funding for NMHSs through active engagement in the national and regional implementation plans. It also requested the Secretary-General to:

- (a) Continue to participate in and service the international ISDR mechanisms and events;
- (b) Facilitate participation of the NMHS and regional associations in the DRR and ISDR coordination processes at the national and regional levels;
- (c) Further strengthen WMO partnerships with the ISDR partners for the implementation of national and regional DRR projects.

4.1.16 The Council recalled the potential increase in hydrometeorological disasters associated with climate variability and change. The Council stressed the importance of climate information from monthly to decadal time scales for climate adaptation and disaster risk management decision making. In this regard, the Council acknowledged the WMO/World Bank project, funded through GFDRR, to undertake "climate observations and regional modelling in support of climate risk management and sustainable development" in Africa and the need to expand this initiative to other regions. The Council requested the Secretary-General:

- (a) To develop and implement DRR and climate adaptation demonstration projects at national and regional level through coordinated approach, involving the DRR and climate-related programmes, as well as external partners;
- (b) To strengthen cooperation of the DRR Programme with the UNFCCC on the implementation of the relevant topics of the Nairobi Work Plan, and with UNCCD on topics related to combating drought and desertification.

Strategic Issues for the Implementation of the DRR Programme

4.1.17 The Council noted with appreciation the report of the Chairman of the EC WG DRR and SD regarding the outcomes of the first meeting of the working group from 19–21 March 2009. In light of the achievements of the DRR Programme reported to its session, the Council stressed the need for advice from its EC WG on a number of strategic issues that would enable scaling up of the pilots and lessons learnt to larger regions or for implementation on a global scale. In this regard, the Council particularly noted the need for development of a coordinated framework leveraging capacities and expertise of WMO Programmes, constituent bodies, Members and external partners with clarification of roles and responsibilities in the implementation of DRR programme at national and regional levels.

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

User focus

Public Weather Services (PWS)

4.2.1 The Executive Council took into consideration recommendations of the fourteenth session of Regional Association II (RA II, Tashkent, Uzbekistan, 5–11 December 2008) as well as the results of PWS surveys regarding enhancing user focus in National Meteorological and Hydrological Services (NMHSs). It agreed that any development of NMHSs through their public weather services should be undertaken in response to the real and stated needs of the user community, and not as an end in itself.

4.2.2 The Council recognized that understanding user needs was a fundamental requirement for the development of effective services. Furthermore, the Council noted that an important consequence of effective service delivery is the creation of a service user community that becomes an influential group of advocates for the services of the NMHS. This community of advocates is, in