

Antalya
19–24 February
2010

Commission for Climatology

Fifteenth session



**World
Meteorological
Organization**

WMO-No. 1054

Weather • Climate • Water

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Abridged final report with resolutions and recommendations

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This report contains the text as adopted by Plenary and has been issued without formal editing.

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GENERAL SUMMARY OF THE WORK OF THE SESSION

1. OPENING OF THE SESSION (*agenda item 1*)

1.1 The fifteenth session of the Commission for Climatology (CCI) was held at the Susesi Hotel in Antalya, Turkey, from 19 to 24 February 2010. The session was opened at 09:30 a.m. on 19 February by the president of the Commission, Dr Pierre Bessemoulin (France). He welcomed the participants, especially those who were attending the CCI session for the first time and expressed his appreciation to the government of Turkey for hosting this session and the Technical Conference preceding it. He noted that climate and climate related issues have been at the forefront of national and international debates, whether within the United Nations system, or in the medias and among citizens, especially once the IPCC AR4 was published, and during the preparation of COP 15.

1.2 Dr Bessemoulin highlighted a number of developments including the implementation activities for the UNFCCC Nairobi Work Programme on Impacts, Vulnerability and Adaptation to Climate Change, and the input into the Global Framework for Climate Services (GFCS) which was the major outcome of the World Climate Conference-3 held in 2009. All documents related to adaptation and risk management have in common the expression of the need for climate products and services better tailored to users needs, and more suited to sector decision-making, which is an especially important aspect in climate risk management.

1.3 Dr Bessemoulin recalled that historically, CCI has been working extensively on the themes which constitute the backbone of the GFCS, e.g. management of climate data, reference methods in climatology, climate monitoring, operational implementation of climate research findings - especially those related to seasonal to interannual climate prediction, and sector applications and service delivery to the end-users, particularly within the Climate Information and Prediction Services (CLIPS) project.

1.4 The president noted that the CCI has already anticipated its contribution to post-WCC-3 follow up issues, in several documents, especially in the WMO Position Paper on GFCS, ahead of the high level Task Force. He added that it is on the basis of such documents that the proposed new structure and action plan of the CCI have been established by the Management Group. New constraints resulting e.g. from the Result Based Management (RBM) and the Result Based Budget (RBB) have been considered. The GFCS will definitely frame CCI activities in the upcoming intersession. The new structure relying on Open Panels of CCI Experts (OPACEs) should prioritize very well focused actions, with clear deliverables and deadlines.

1.5 Dr Bessemoulin expressed his satisfaction with the achievements of the Technical Conference held prior to the CCI session which included a special joint session with the Joint Scientific Committee (JSC) of the World Climate Research Programme (WCRP). He believed that the joint statement adopted by both CCI and WCRP would offer new perspectives for a better transfer of knowledge between research and operation, and better consideration of operation needs and constraints by research.

1.6 Dr Bessemoulin thanked all those who were involved in the success of the Commission during the past four years: the Management Group (MG) and the Implementation and Coordination Team (ICT) members, heads of regional working groups on climate-related matters, OPAG chairs, heads of Expert Teams, (ETs), Experts, rapporteurs, and the WMO Secretariat staff.

1.7 In his opening statement, Mr Michel Jarraud, Secretary-General of WMO, welcomed all delegates and representatives of partner organizations within the United Nations. He also expressed his appreciation to the government of Turkey and Mr Mehmet Çağlar, Permanent Representative of Turkey with WMO and Director of the Turkish State Meteorological Services (TSMS). The Secretary-General also thanked the outgoing president of the Commission, Dr Pierre Bessemoulin, for his able leadership in moving forward with the agenda of the

Commission during the previous four years and for his outstanding contribution and dedication to the Commission. Many scientists within the CCI have demonstrated that the climate change challenge is indeed real and that every social, economic and environmental sector is critically susceptible to climate variability and change. They equally share the merit for IPCC Peace Noble Prize, by facilitating their time and efforts to contribute to the authoritative assessments which resulted in the last IPCC report.

1.8 Mr Jarraud added that similarly, over the last CCI intersessional period, WMO has contributed to the implementation of the UNFCCC Nairobi Work Programme on Impacts, Vulnerability and Adaptation to Climate Change, thereby supporting the UNFCCC process through the provision of scientific advice and the achievements of the WMO co-sponsored Global Climate Observing System (GCOS).

1.9 The Secretary-General noted that, in response to the mandate of the fifteenth World Meteorological Congress (Geneva, May 2007), WMO convened with partners the World Climate Conference-3 (WCC-3), which reached unprecedented success in terms of high-level participation. Through the Conference Declaration, the Heads of State of Governments, Ministers and Heads of Delegations present at WCC-3 unanimously agreed to establish a Global Framework for Climate Services (GFCS) to meet the needs of all sectors by strengthening the production, availability, delivery and application of science-based climate predictions and services.

1.10 Mr Jarraud acknowledged the role played by the president of CCI and other leading experts who actively participated in the organizational and technical components of the WCC-3 and contributed to the development of the GFCS concept on behalf of the Commission. He expressed his confidence that the GFCS would offer very positive feedback for CCI, in particular by promoting synergies within the wider climate community, and that the new concept will therefore play a key role in the deliberations of CCI over the next few days, especially as the Commission considers its future workplans and strategies for the next intersessional period.

1.11 Dr Veysal Eroglu, Minister for Environment and Forestry of Turkey, in his opening speech noted that in the context of climate as a natural resource, observation, climate watch and high quality climate services are essential elements for development. Dr Eroglu, also noted that his ministry, has taken every measure to increase efficiency in the waste material management and encourage innovative environmental friendly technologies. He continued that climatological assessments and services provided by Turkish State Meteorological Service (TSMS), serve well the government plans for decision-making processes at national level.

1.12 Mr Mehmet Çağlar, Director General of TSMS and the Permanent Representative of Turkey with WMO, welcomed the participants to the session and noted that challenges posed by climate change are a serious threat to sustainable development and countries are forced to take new measures due to increase of these challenges over time. He underlined that 90 per cent of disasters which occurred between 1980 and 2007 are natural disasters and 70 per cent of human and 75 per cent of economic losses are caused by meteorological, hydrological and climatological events such as storms, floods, drought, and extreme temperatures. He added that TSMS operates 450 stations of surface and upper air observations across the country, conducts satellite observation every 15 minutes with the international cooperation, and operates weather RADAR network as well as "Regional Climate Models" to ensure that TSMS is fulfilling its national commitments to safeguard the community against natural weather and climate disaster and provides early warning.

1.13 The CCI-2010 Awards for Excellence were presented to Mr Yadowsun Boodhoo, Director, Mauritius Meteorological Services and to Dr Francis Zwiers, Director, Climate Research Division, Environment Canada.

1.14 The session of the Commission was attended by 150 participants, including representatives of 84 Member countries of WMO and four international organizations. The list of participants is given in the [appendix to the present report](#).

2. ORGANIZATION OF THE SESSION (*agenda item 2*)

2.1 CONSIDERATION OF THE REPORT ON CREDENTIALS (*agenda item 2.1*)

The representative of the Secretary-General presented the report on credentials. In accordance with General Regulation 22, a list of the individuals present and the capacities in which they are attending the session has been prepared on the basis of examination of credentials. The session unanimously accepted the report and adopted it as the first report on credentials. The session agreed that a Credentials Committee need not be established.

2.2 ADOPTION OF THE AGENDA (*agenda item 2.2*)

The agenda, as contained in CCI-XV/Doc. 2.2(2) REV. 1, was adopted by the session.

2.3 ESTABLISHMENT OF COMMITTEES (*agenda item 2.3*)

2.3.1 A Nomination Committee was established, consisting of:

- Monica Marino (Ms) (Argentina)
- Bruce Angle (Canada)
- Philippe Dandin (France)
- A.L. Koppa (India)
- Tan Huvi Vein (Malaysia)
- Suresh Boodhoo (Mauritius)

Mr Bruce Angle (Canada) was elected chair of the Nomination Committee.

2.3.2 A Selection Committee (SC) was established by the session of the Commission to propose to the Commission the composition of the CCI Management Group, as defined in item 13 to the present report. The SC was composed by six members, one from each WMO Region. With the support of the Secretariat, at the beginning of the session (first morning) regional groups met to select their representative to the SC. The following members were included as members of the SC:

- Mike Coughlan (Australia)
- Louis Molion (Brazil)
- Paul Whitfield (Canada)
- Paul Becker (Germany)
- Mok Hing-yim (Hong Kong, China)
- Emmanuel Mpetta (United Republic of Tanzania)

Mr Mike Coughlan (Australia) was elected the chair of the SC.

2.3.3 In accordance with General Regulation 28, a Coordination Committee was established, consisting of the president of the Commission, the chairs of Plenaries A and B established for the duration of the session and the representative of the Secretary-General.

2.3.4 Further to General Plenary, two other working plenaries were established to examine in detail various agenda items:

- (a) General Plenary to examine agenda items 1, 2, 3, 4, 12, 13, 14, 15, 16, and 17. The president Dr Pierre Bessemoulin (France) chaired the General Plenary;
- (b) Plenary A to examine agenda items 8, 9 and 10. Mr Thomas Peterson (United States of America) was elected chair of Plenary A;
- (c) Plenary B to examine agenda items 5, 6, 7 and 11. Mr Wang Shourong (China) was elected chair of Plenary B.

2.4 OTHER ORGANIZATIONAL MATTERS (*agenda item 2.4*)

2.4.1 It was agreed that the working hours of the session would be 9.30 a.m. to 12.30 p.m. and 14.30 p.m. to 17.30 p.m.

2.4.2 The Commission felt that, in accordance with General Regulation 111 and in view of the technical nature of its discussions, it was not necessary to prepare minutes of its plenary meetings. The Commission therefore decided that such minutes would not be prepared for the fifteenth session and therefore did not establish a Drafting Committee.

3. REPORT OF THE SECRETARY-GENERAL ON THE WORLD CLIMATE PROGRAMME (*agenda item 3*)

3.0.1 The World Climate Programme (WCP), since its inception in 1979, has always remained WMO's authoritative programme whose goals are to improve understanding of the climate system and to apply that understanding for the benefit of societies coping with climate variability and change. During the fourteenth intersessional period of the Commission for Climatology, in response to the unprecedented global attention to climate issues, WMO accorded greater importance to climate and climate-related activities, and strived to bring synergies in its activities in the context of climate change adaptation, food security, sanitation and poverty alleviation, as well as other rising challenges that are becoming ever more urgent in the context of climate change.

3.0.2 The Commission noted that the international community, particularly after the release of IPCC Fourth Assessment Report, rendered higher recognition that every social, economic and environmental sector was sensitive to climate variability and change. To support policy formulation and decision-making in climate change issues and to develop decision-supportive tools and capacity-building in climate-related risk management, the Commission requested the Secretary-General to continue to build on the legacy of the World Climate Conference-3 (WCC-3) to enhance the role of NMHSs to make best use of the available climate information for adaptation planning, climate risk management and public policy advice.

3.0.3 The Commission noted that, during the fourteenth intersessional period, WMO continued active support to the work of EC Working Group on Climate and Related Weather, Water and Environmental Matters (EC-WG-CWE) and retained close interaction with CCI through the president of the Commission who was an ex-officio member of the Group. As regards to the WCP, the session further took note that the EC-WG-CWE had particularly focused on 'Review of WCP and Climate Agenda' and 'Global Framework for Climate Services (GFCS)' to align better WMO's climate activities with the latest international developments. As a result, the ECWG-CWE had considered possible re-orientation of the WCP, and emphasized that it should primarily aim at establishing national climate services (in many cases as part of NMHSs) with adequate focus on user interaction.

3.0.4 With regard to the future reorientation of WCP, the sixty-first session of the Executive Council agreed that while GFCS would involve most of the components of the WCP (i.e. WCDMP, WCASP and WCRP), the way forward would be open for UNEP in reinvigorating the WCIRP. The Commission noted that WMO will associate itself with the UN 'Delivering as One' initiative to coordinate climate issues at the UN level and eventually phase out the Climate Agenda.

3.0.5 The Commission noted that the United Nations system coordination on climate in the intersessional period was inclusive and coherent, amplifying the strengths of the partners, and resulted in a decentralized, specialized, relatively efficient, flexible and responsive arrangement, making full use of specialized agencies' expertise and respective comparative advantage in that area. Such an approach would be appropriate for coordination in other environmental areas.

3.0.6 The Commission noted that the new UN 'Delivering as One' initiative had improved coordination among UN agencies, and WCC-3 provided a unique forum for the UN System to

focus on the application of the climate knowledge to support adaptation to climate variability and change. It welcomed the leading role of WMO and UNESCO in the United Nations system coordination in the area of “science, assessment, monitoring and early warning (climate knowledge base)” as a key cross-cutting area within the United Nations system and requested the Secretary-General to continue consultations with UNESCO.

3.0.7 The session noted that WMO continued to contribute fully in line with the United Nations climate strategy elements, support the UNFCCC negotiation process within an agreed framework, and contribute to the implementation on the Nairobi Work Programme on Impacts, Vulnerability and Adaptation to Climate Change and other activities mandated by Congress. In response to the UNFCCC Nairobi Work Programme, WMO submitted a “Concept paper: on the role of WMO and National Meteorological and Hydrometeorological Services (NMHSs) in the Implementation of the Nairobi Work Programme”, in November 2006. CCI-XV noted that WMO achieved a leading role in the following areas of activities within the Nairobi Work Programme: Methods and tools, Data and observations, Climate modelling, scenarios and downscaling, Climate related risks and extreme events, and Research. It requested the Secretary-General to continue to contribute in the implementation of the Nairobi Work Programme through existing potentials in the Commission for Climatology and the WCP.

3.0.8 The session welcomed the launch of an on-line survey in 2008 for the assessment of the current and potential future role of NMHSs in adaptation to climate variability and change. It requested the Secretary-General to disseminate the analysis and findings of the survey to better identify the key gaps and recognize a baseline for the extent to which WMO Members could be engaged in sector-specific activities relevant to Adaptation to Climate Variability and Change.

3.0.9 The Commission noted that the IPCC had already started the preparation of the Fifth Assessment cycle (AR5), and in particular the identification of benchmark scenarios (or representative concentration pathways) and a Special Report on managing risks of extreme events to advance climate change adaptation. The AR5 cycle is to be finalized in 2014, with a target date of early 2013 for the release of the first Working Group report. The session welcomed the overlap of this cycle with the CCI-XV intersessional period and further encouraged close interaction of the CCI experts in this process.

3.0.10 The Commission noted that a review of the World Climate Research Programme (WCRP) was coordinated by ICSU in 2008 which emphasized the societal needs of climate research underpinning mitigation strategies and climate adaptation. The Commission noted that WCRP would further seamless prediction research on seasonal/interannual to decadal timescales, with an emphasis on supporting the transition from basic research to the applications domain. The Commission welcomed a one-day joint meeting between the CCI experts and the Joint Scientific Committee (JSC) for the World Climate Research Programme (WCRP), which was held before CCI-XV and requested the Secretary-General to follow up on emerging actions identified in the meeting and foster the transition of results from climate research to the operational practices of NMHSs. On this basis the Commission invited the WCRP JSC to work with CCI in developing a mechanism to identify the requirements of Members for, and to facilitate development and operational implementation by Members of, appropriate climate prediction techniques, and to provide technical guidance to NMHSs in contributing to solutions to problems associated with climate variability and climate change, and with climate-related hazards.

3.0.11 The Commission noted with pleasure that the CCI Expert Team (ET) on the *Guide to Climatological Practices* (WMO-No. 100) had finalized the internal and external review processes and prepared the third edition of this mandatory publication. The session approved the text of the third edition of the Guide and placed on record its gratitude to all contributors and reviewers and proposed that a group of selected experts within the Commission continue monitoring the content of the publication for regular updates in the fifteenth intersessional period.

3.0.12 The Commission noted with appreciation the progress made in various aspects of the WCDMP and the increased engagement of Members in modernizing climate database management systems, rescuing millions of invaluable old climate records, contributing to the WMO

climate system monitoring and the start of the process in implementing climate watch systems at national level. It further noted with satisfaction the initiation of cross-border collaboration amongst Members at subregional level in dealing with climate issues, including increased collaboration on climate data aspects, organization of scientific seminars on data homogenization and Metadata establishing subregional climate Data Rescue (DARE) initiatives and developing climate indices, through the provision of peer reviewed publications and guidelines.

3.0.13 The Commission was pleased to note that several Members are providing support for developing and least developed countries to implement the various component of WCDMP at national levels. This was the case of Members funding DARE projects through the Voluntary Cooperation Programme (VCP) or bilateral projects in Africa, Pacific Island countries, the Caribbean and South America. In some cases the assistance also extends to covering modernization of climate data archiving and related database systems, organizing training seminars at subregional levels on climate change detection and indices, etc.

3.0.14 The Commission noted the critical role of academia in the scientific and technical aspects of climate data and monitoring. The Commission was pleased to note the increasing role of universities in developing and maintaining websites for CCI and providing research papers dealing, inter-alia, with climate datasets, climate monitoring and DARE aspects. It urged Members and the Secretariat to further promote this collaboration for the benefit of improving science and contributing to bridging the gap between climate science and its applications.

3.0.15 The Commission appreciated the continuous efforts by Members and the Secretariat to develop NMHSs capacity in developing and least developed countries through the provision of several guidelines on best practices in climate networks, climate data management, DARE, homogenization, and aspects of climate statistics and climate indices. It further noted with satisfaction that more than 100 countries benefited from training on new WMO Climate Data Management Systems (CDMSs) in various WMO Regions.

3.0.16 The Commission appreciated the close interactions with other relevant WMO Programmes, in particular WCRP/CLIVAR and JCOMM through the CCI Open Programme Area Group on Monitoring and Analysis of Climate Variability and Change. It recognized that the collaboration led to excellent and sustained work on climate change indices with direct benefits to the Members' efforts in assessing and monitoring climate extremes, regionally and locally, as well as to the IPCC work. As a result it proposed that the CCI/CLIVAR/JCOMM Joint Expert Team workplan for the current CCI intersessional period would continue to assist NMHSs in developing and least developed countries in using the knowledge developed through that workplan.

3.0.17 The Commission appreciated the contributions of the World Climate Applications and Services Programme in promoting operational climate prediction mechanisms from global through regional and national scales (e.g., Global Producing Centres for Long-range Forecasts (GPCs), Regional Climate Centres (RCCs) and Regional Climate Outlook Forums (RCOFs)). The Commission recognized that these efforts would closely align with the Climate Services Information System (CSIS) of the GFCS and agreed that further efforts would be required to strengthen this approach and also sustain the necessary collaborations with other relevant WMO Programmes and technical commissions.

3.0.18 The Commission recognized the impetus provided by the Climate Information and Prediction Services (CLIPS) project in the development of the concept of climate services around the world, particularly in capacity-building and development of operational mechanisms. Considering that the outcomes of WCC-3 provide a way forward to the logical evolution of the CLIPS concept, the Commission agreed that CLIPS should gradually conclude as a project. The Commission further agreed to work towards consolidating the achievements of the CLIPS project and determining its legacy in the context of the development of GFCS.

3.0.19 The Commission expressed satisfaction with the sustained efforts to issue consensus-based WMO El Niño and La Niña Updates. The Commission urged Members and other relevant

bodies and institutions to consider expanding this process by including the development of reliable updates on other global-scale climatic aspects that have potential impacts on regional climates.

3.0.20 In terms of promoting climate applications, the Commission appreciated the partnerships pursued by WMO with the various UN agencies representing climate-sensitive sectors, such as the United Nations Environment Programme (UNEP), the World Health Organization (WHO), the World Tourism Organization (UNWTO), etc., professional bodies such as the International Society for Biometeorology (ISB), International Association for Urban Climate (IAUC), etc. The Commission urged the Secretary-General and Members to further promote and sustain these partnerships, particularly at the regional and national levels.

3.0.21 The Commission recognized that CLIPS training sessions and RCOFs have significantly contributed to the capacity-building of NMHSs, particularly those in the developing countries, enabling them to undertake climate predictions and assessments. Considering the continued need for sustained training activities, and keeping in view the resource constraints in organizing regional CLIPS training workshops, the Commission urged WMO Regional Training Centres (RTCs) to include CLIPS curriculum as part of their regular training programmes, and to pay special attention to “training of trainers” with the collaboration of RTCs, in climate activities.

3.1 WORLD CLIMATE CONFERENCE-3 (agenda item 3.1)

The Commission was informed of the key outcomes of the World Climate Conference-3 (WCC-3), which took place from 29 August to 4 September 2009. The Commission discussed the outcomes of WCC-3 under agenda item 10.

3.2 REGIONAL ACTIVITIES RELATED TO THE WORLD CLIMATE PROGRAMME (agenda item 3.2)

The Commission was informed of the way in which the regional associations have organized themselves with respect to the activities of the World Climate Programme, and of the interactions between the activities of the Commission and the Regions.

3.3 TECHNICAL CONFERENCE ON CHANGING CLIMATE AND DEMANDS FOR CLIMATE SERVICES FOR SUSTAINABLE DEVELOPMENT (agenda item 3.3)

3.3.1 The Commission was informed of the outcomes of the Technical Conference on - Changing Climate and Demands for Climate Services for Sustainable Development- which took place from 16 to 18 February 2010, immediately preceding CCI-XV, including the outcomes of the joint session of the CCI and the Joint Scientific Committee (JSC) of the World Climate Research Programme (WCRP) on 18 February 2010.

3.3.2 WMO, in collaboration with the Turkish State Meteorological Service and the World Climate Research Programme, organized the Technical Conference on Changing Climate and Demands for Climate Services for Sustainable Development from 16–18 February 2010 in conjunction with the fifteenth session of the Commission for Climatology (CCI), in Antalya, Turkey. A special joint session with the Joint Scientific Committee (JSC) for the World Climate Research Programme (WCRP) was held on 18 February as an integral part of the Technical Conference. Active participation of more than 170 experts, including the members of the JSC for the WCRP, from 73 countries from all WMO Regions and 32 high-level lectures and 18 posters, made this Conference very successful. The following paragraphs give a brief list of ‘fact findings’ and recommendations from the Conference for consideration by the Commission. Whilst the full report of the Conference will be provided in the final proceedings to be published in 2011, the entire set of recommendations will be made available in due time to the CCI Management Group and the JSC for the WCRP for further consideration.

3.3.3 In terms of ‘fact findings’, the Conference:

- (a) Discussed extensively the demands for climate services for sustainable development under a changing climate regime;

- (b) Recognized the need for an integrated climate-society system including an early and sustained understanding, collaboration and partnership amongst all partners concerned;
- (c) Recognized the growing demand for decadal climate information;
- (d) Highlighted the importance and societal benefits of operational climate system monitoring, climate predictions and projections and underlined the critical issue of climate data as the ultimate baseline for related activities and services;
- (e) Acknowledged important issues of common interest to the WCRP and CCI in order to address comprehensively the rapidly emerging societal needs for climate information and services for adaptation and risk management;
- (f) Acknowledged the high level of satisfaction of the participants to have received, at the beginning of the Conference, a high-value abstract document. The Turkish State Meteorological Service also compiled all presentations in a much appreciated CD-ROM which was distributed at the end of the Conference.

3.3.4 The experts provided a set of specific recommendations to the Fifteenth Session of CCI. In particular, the Conference recommended that CCI consider:

- (a) Ways of engagement with partners including trusted information brokers to integrate climate information, services and knowledge successfully into end-user decision systems;
- (b) Making efforts to assist users in understanding probabilistic products and information including uncertainties;
- (c) Assisting in strengthening the whole process of climate data from observations to its exchange;
- (d) Strengthening the development and use of climate-related WMO infrastructure and mechanisms including Global Producing Centres, Global Seasonal Climate Updates, Regional Climate Outlook Forums and Regional Climate Centres and encouraging the implementation of complementary National Climate Outlook Forums;
- (e) Action to start the coordination and exchange of decadal predictions;
- (f) Seeking extended collaboration with producers and holders of 'climate impact data' to facilitate the development and exchange of applicable datasets for services in support to risk management and adaptation;
- (g) Exploring ways to further improve cross-sectoral coordination for awareness raising and effective services;
- (h) Focusing capacity-building on measures to enable developing countries to efficiently uptake and use regional and global climate products;
- (i) Continuation of the successful work of the Joint CCI/CLIVAR/JCOMM Expert Team on Climate Change Detection and Indices as well as the development of sector-focused indices for applications.

3.3.5 The Conference adopted a joint WCRP-CCI Statement on Working Together towards Strengthened Research and Operations Linkages for Enhancing the Use of Climate Information. Recognizing the decision of the World Climate Conference-3 to establish a Global Framework for Climate Services (GFCS) and the respective potential roles for the WCRP and the CCI, the

participating experts agreed to closely collaborate, through appropriate mechanisms, to address the following topical issues of direct relevance to climate adaptation, mitigation and risk management in general and the GFCS in particular:

- (a) Strengthen research observations to serve as prototypes for future climate observing systems, in cooperation with existing observing systems (e.g., Global Climate Observing System and WMO Integrated Global Observing System);
- (b) Establish predictability and develop climate prediction systems with lead times from seasons to centuries;
- (c) Develop reliable high-resolution products needed for climate adaptation, mitigation and risk management at local to global levels;
- (d) Promote interdisciplinary research to develop sector applications, tools and tailored information;
- (e) Facilitate flow of user requirements to the research community and climate services providers through user feedback;
- (f) Support the operational mechanisms of Global Producing Centres for Long-range Forecasts, Regional Climate Centres, National Climate Services and Climate Outlook Forums and their linkages as well as the associated consensus assessments;
- (g) Foster links between WMO Regional Associations, National Meteorological and Hydrological Services, CCI and WCRP, in support of regional and national activities;
- (h) Help improve the availability of high-skilled talent, particularly in the developing countries, to undertake research, operational climate services and communication with users.

3.3.6 The Commission appreciated the successful organization of the Technical Conference and noted that the outcomes and recommendations have direct relevance to the future work of the Commission. The Commission endorsed the joint CCI-WCRP statement, and requested the Management Group to actively pursue the recommendations in the Commission's workplan.

3.4 OVERALL COORDINATION OF CLIMATE ISSUES AND INTER-AGENCY COLLABORATION (agenda item 3.4)

The Commission was informed of WMO's climate coordination activities and interactions currently underway with other UN agencies, including the UN 'Delivering as one' initiative; the role of WMO and UNESCO in the knowledge base for climate and water; the UNFCCC and its Nairobi Work Programme; UNEP's activities and progress to develop a Global Climate Change Adaptation Network; the status of implementation of the United Nations Conventions on Climate Change, Desertification and Biodiversity; the activities and recommendations of the EC Working Group on Climate and Related Weather, Water and Environmental Matters (ECWG-CWE); and the activities pertinent to CCI of WMO's co-sponsored programmes, WCRP, IPCC and GCOS.

3.5 WMO STRATEGIC PLANNING AND RESULTS-BASED MANAGEMENT (agenda item 3.5)

The Commission was informed of the WMO Strategic Plan and the WMO Results-based Management (RBM) approach to its work, which was taken into account by the Commission in developing its workplan.

3.6 WMO QUALITY MANAGEMENT FRAMEWORK (*agenda item 3.6*)

The session was informed on WMO's Quality Management Framework (QMF) and of the arrangements made by WMO and the International Standards Organization (ISO) on recognition of each other's standards, which was taken into account in developing the CCI Quality Management Framework as discussed under agenda item 8.

4. REPORT OF THE PRESIDENT OF THE COMMISSION (*agenda item 4*)

Activities of the president and the CCI Management Group

4.1 The Commission took note of the report of the president, which provided an overview of the progress of the Commission since its fourteenth session, covering the work of the Management Group and its two meetings in 2006 and 2009, the meeting of CCI Implementation/Coordination team in 2007, extensive review of the work of four Open Programme Area Groups (OPAGs), Expert Teams (ETs) and rapporteurs. The session noted that during the fourteenth period since 2005, interaction of the Commission with other WMO's climate-related sponsored disciplines was enhanced, particularly through participation of the president in the WCRP's Joint Scientific Committee and GCOS Steering Committee. The Commission recommended that this practice should be continued in the fifteenth intersessional period to maximize provision of services tailored to global challenges in the area of climate variability and change. The meeting noted that the president had represented the Commission in various regional and international conferences and gained higher recognition for the Commission and its mandate.

4.2 The session noted that the president had issued four circular letters in English and French during the intersessional period, by which he had kept CCI members from NMHSs and other bodies, regularly informed on latest developments in climate-related activities, including function of the Commission and a list of released publications.

4.3 The session noted the personal contribution and dedication of the president in the issues that CCI had addressed, such as training and capacity-building, flexibility of the Commission's structure to respond to emerging necessities and stakeholders requirements, implementation of Regional Climate Centres (RCCs), finalization of the third edition of the *Guide to Climatological Practices* (WMO-No. 100) and closer links with international climate research organizations as well as with other United Nations agencies. The Commission placed on record its appreciation for his efforts during his tenure of office.

Activities of the OPAGs

4.4 The Commission was informed of the activities of the OPAGs, briefly described in the following sections. A list of documents brought out by various Expert Teams under the four OPAGs is provided in the [annex to the present report](#).

OPAG 1 – Climate Data and Data Management

4.5 The ET 1.1 of OPAG 1 on Climate Data Management and Metadata (ET-CDMM) finalized and published a guidelines document on climate data management (WMO/TD-No. 1376/WCDMP-No. 60) and developed a survey for monitoring the status of implementation of Climate Data Management Systems and an outline of a technical document describing new specifications for CDMSs.

4.6 The ET 1.2 of OPAG 1 on Observing Requirements and Standards for Climate (ET-ORSC) initiated the development of two guidelines documents; one addressing the use of Automatic Weather Stations (AWSs) in Climatology and the other addressing capacity-building status and requirements on climate observations for developing countries. ET 1.3 on Data Rescue and Digitization of Climate Records (ET-DRDCR) reviewed the existing DARE projects worldwide and proposed new priorities for the coming intersession period, with a particular recommendation

on setting up a Global Data Rescue Portal which would build on the ongoing MEDARE initiative in the Greater Mediterranean Region. A coordinated work by the OPAG 2 Rapporteur on world records of weather and climate extremes led to the review and update of a number of climate related world records through ad-hoc evaluation committees. The Rapporteur developed a well designed WMO affiliated web based database with GIS composed maps informing on these Records.

OPAG 2 – Monitoring and analysis of climate variability and change

4.7 OPAG 2 and the ETCCDI (ET 2.1) organized two regional workshops on climate data management including two back to back seminars on climate data homogenization and climate indices. A guidelines document (WMO/TD-No. 1500/WCDMP-No. 72), *Analysis of extremes in a changing climate in support of informed decisions for adaptation*, has been finalized, published and distributed to the Members. The OPAG 2 ET 2.2 on Climate Monitoring including the use of Satellite and Marine Data and Products (ET-CMSMDP) developed a comprehensive workplan and published *Guidelines on Plant Phenological Observations* (WMO/TD-No. 1484/WCDMP-No. 70). It set up a website informing on the monitoring activities and related documentations and web resources and published an article on Monitoring the Earth's climate in the twenty-first century published in the *WMO Bulletin*. Two regional workshops on climate monitoring including the implementation of Climate Watch systems were organized in two regions i.e., RA III (December 2008) and RA II (November 2009). Both Workshops led to development of an implementation plan involving NMHSs in these two regions and the existing climate related institutions and RCCs (BCC, TCC in RA II).

4.8 An explanatory brochure on the organization and implementation of Climate Watch Systems at national level based on climate products provided by GPCs and RCCs was developed. http://www.wmo.int/pages/publications/showcase/index_en.html.

OPAG 3 – Climate Information and Prediction Services (CLIPS)

4.9 A number of successful initiatives were undertaken within OPAG 3, including the holding of one-day open seminars preceding ET meetings; the review of 10 years of RCOF operations, development of important publications, and the continued evolution of consensus-based El Niño and La Niña updates. ET 3.1 worked on the development of a guidance document on best practices in downscaling, Multi-model ensembles and consensus methods for seasonal forecasts, the preliminary drafts of which are available. The ET actively contributed to capacity-building in CLIPS training activities, and promoted the use of the IRI CPT for tailoring of seasonal forecasts. ET 3.2 developed a draft update of Technical Note 145, with a revised title of "Socio-economic Benefits of Climate Services", and draft guidance on best practices for verification of seasonal forecasts. The ET has made substantial contributions to the holding of the WMO Conference on Living with Climate Variability and Change: Understanding the Uncertainties and Managing the Risks and the RCOF review. In collaboration with WCRP and IPY, the ET played a key role in extending the CLIPS concept to Polar Regions, which resulted in the proposal for a PCOF, recognized as a WMO contribution to the IPY Legacy. ET 3.3 actively participated in the development of the WMO El Niño/La Niña Updates. With the support of NOAA, ET 3.3 led the organization of a CLIPS Workshop on "Communicating about El Niño-Southern Oscillation (ENSO): Towards Developing a Common Understanding" and made a number of recommendations to promote a common understanding of the phenomenon to develop guidance on best practices. The ET 3.3 developed an outline for a web-based Atlas on impacts of El Niño/La Niña. The two rapporteurs, ET 3.4 on climate and agriculture and ET 3.5 on climate and water, provided very useful perspectives of climate applications in the two key sectors.

4.10 Considering that WCC-3 outcomes (GFCS) have further emphasized, inter alia, the pertinence of CLIPS to operational climate services, OPAG 3 has recommended that, for the remainder of the CLIPS project, the focal point network should be re-established and reinforced. The cooperation with WCRP in CLIPS activities has improved significantly through the participation of their experts in OPAG 3, but it needs a formal process to facilitate sustained and effective

collaboration. OPAG 3 prepared the concept of a CLIPS Toolbox to facilitate sustained capacity-building for national CLIPS activities.

OPAG 4 – Climate Applications and Services

4.11 Successful initiatives within OPAG 4 included development, in partnership with relevant sectoral agencies, of substantial publications and case studies that add value to the interdisciplinary knowledge base on climate applications on health, energy, tourism and urban and building climatology. ET 4.1 developed a draft joint WMO-WHO publication, 'Heatwaves and Health: Guidance on Development of Warning Systems'. The team is also guiding the operational aspects and intercomparison of these systems as part of the Shanghai Multi-Hazard Early Warning System during Expo 2010. The Expert Team has also been promoting climate-health partnerships in contributing to the efforts of WMO in liaising with WHO, the International Society for Biometeorology, EU-COST Action 730, etc. ET 4.2 on Climate and Energy developed a number of case studies on climate and hydropower, solar energy and on climate risk assessment for nuclear and thermal power industry, requirements of oil and gas complex for climate data, information, products and services in the high latitudes, etc. However, keeping in view the establishment of GFCS, the team feels that it may be useful to refocus the direction of this work towards meeting the requirements of energy user communities for practical information, products and services for Climate Risk Management and adaptation to climate change.

4.12 ET 4.3 contributed substantially to publication of a new report entitled 'Climate Change and Tourism: Responding to the Global Challenges' (UNWTO, UNEP and WMO, 2008). The team also led the development of a Tourism Sector White Paper, covering needs and opportunities, for WCC-3. The team actively contributed to the UNEP/Oxford University/UNWTO/WMO International Seminar on "Climate Change Adaptation and Mitigation in the Tourism Sector: Frameworks, Tools and Practices", focusing on developing countries and small island developing States. In association with this seminar, a joint publication has been brought out as part of UNEP Manuals on Sustainable Tourism. In association with the International Association for Urban Climate (IAUC) and with sponsorship of WMO, ET 4.4 on Urban and Building Climatology developed an on-line bibliography on IAUC website. A complete draft of a new Technical Note (TN) on 'Building Climatology' was prepared under the guidance of the ET. The ET has led the technical organization of a training workshop as part of CLIPS training series, with a focus on urban climatology, which is rescheduled to be held in September 2010.

4.13 The OPAG 4 believes the work done in the current intersessional period and the lessons learned from this and the earlier intersessional periods, would be useful to build new perspectives on the use of climate information in sectoral applications, including for agriculture/food security and water resources sectors. OPAG 4 highlighted the strong role played by the academic community and partnering agencies in its successes, and urged that NMHSs take on a stronger involvement in future applications activities through the work of the Commission.

5. DECISIONS OF CONGRESS AND THE EXECUTIVE COUNCIL OF RELEVANCE TO THE WORLD CLIMATE PROGRAMME (agenda item 5)

Climate coordination

5.1 The Commission took note that the fifteenth session of the World Meteorological Congress (Cg-XV, May 2007, Geneva, Switzerland) had emphasized the important role and substance of the World Climate Programme (WCP) and related CCI activities and emphasized that they should be duly reflected in the WMO Strategic Plan. Cg-XV recognized the vast potential of climate applications to key socio-economic sectors, including water, agriculture, health, renewable energy, tourism and urban matters, and supported the need to develop partnerships at all levels for effective delivery of end-to-end climate products and services.

5.2 The Commission noted that, in view of the importance of ensuring the WMO technical leadership and effective role in partnership to climate-related activities, the EC-LIX re-established

the EC Working Group on Climate and related Weather, Water and Environment Matters (ECWG-CWE) with revised terms of reference and composition. The president of CCI is an ex-officio member of the Group.

5.3 The Commission took note that EC-LX had emphasized the legacy of the first and second World Climate Conferences, such as the World Climate Programme, the Global Climate Observing System (GCOS) and the Intergovernmental Panel on Climate Change (IPCC), which were still valid. Considering the development of a new United Nations-wide coordination system, as UN Delivering as One, EC-LX had called upon the ECWG-CWE to revisit the Climate Agenda and its original coordination mechanism. As a result, EC-LXI, in 2009 agreed with the recommendation of the ECWG-CWE not to attempt the revitalization of IACCA, and to use the UN 'Delivering as One' initiative to coordinate climate issues at the UN level. The EC-LXI further recommended that the Climate Agenda should eventually be formally phased out and replaced by the Global Framework for Climate Services (GFCS), but agreed to defer its final recommendation on the future of the WCP and the Climate Agenda until EC-LXII.

5.4 The Commission noted that the new UN 'Delivering as One' initiative, a system-wide coherent approach to climate change activities had improved coordination among UN agencies, and appreciated that WCC-3 would provide a unique forum for the UN System to focus on the application of the climate knowledge to support adaptation to climate variability and change. To that end, the Commission emphasized that WMO should move forward on the 'knowledge-base' theme within the UN initiative, and make use of the opportunity given to WMO and UNESCO.

5.5 The Commission further took note that Cg-XV had agreed that National Meteorological and Hydrological Services could consider strengthening their focus on weather-climate linkage to end-users and adaptation to climate variability and change for the benefit of sustainable development and emerging societal needs. Cg-XV had also stressed that Members should classify their climate activities and deliverables that were relevant to the United Nations Framework Convention on Climate Change (UNFCCC) and to develop programmes as well as services that strengthened new multidisciplinary partnerships. The Commission noted that Cg-XV had stressed that effective national and regional climate services would enhance the capacity of NMHSs to contribute to the Subsidiary Body for Scientific and Technological Advice of UNFCCC and its Nairobi Work Programme on Impacts, Vulnerability and Adaptation to Climate Change (NWP).

5.6 Cg-XV, considering the cooperation between the secretariats of the IPCC, GCOS and World Climate Research Programme (WCRP), recognized that there was a strong need for closer coordination and links between IPCC, GCOS and WCRP, and other relevant programmes of the sponsors including operational agencies, climate applications communities and the media. Congress welcomed the new level of interaction between those programmes and encouraged further building of stronger synergy.

5.7 Cg-XV had urged the Secretary-General to support the establishment of a Capacity-building Programme for NMHSs to produce and interpret future climate scenarios, at the regional and national scales, in order to better support communities, national decision makers and coordination with relevant agencies.

World Climate Data and Monitoring Programme

5.8 The session welcomed the support of Cg-XV for the World Climate Data and Monitoring Programme. It further took note that monitoring, assessing and predicting the climate system at various space- and time-scales was becoming one of the highest priorities of Members at different levels of decision-making.

5.9 The Commission noted that Cg-XV had urged all Members, especially donor countries individually and through appropriate multinational arrangements, to cooperate actively and enthusiastically in the implementation and operation of the World Climate Data and Monitoring Programme.

The Mediterranean Data Rescue Initiative

5.10 The session noted the endorsement by EC-LX of the MEDiterranean climate DATA REScue (MEDARE) initiative, which was set-up under the auspices of WMO in collaboration with CCI, NMHSs, universities and research centres to develop a high quality instrumental climate dataset for the Greater Mediterranean Region (GMR).

Climate Data Management and WIS

5.11 The session noted with satisfaction the EC-LX decision on emphasizing the importance of the metadata in WIS to the climate-related programmes, as underlined by CCI-XIV. It commended the efforts undertaken by the UK Met Office in collaboration with CCI, WCDMP, CBS and the WIS Project to develop data and metadata interfaces for Climate Data Management Systems (e.g. CLIMSOFT as a demonstration) to the emerging standards for data interoperability, including the WMO Core Profile of the ISO Metadata standard.

Climate System Monitoring

5.12 The session welcomed the emphasis made by EC-LXI on the various aspects of Climate system monitoring including the continuous and timely provision of the WMO annual Statement on the Status of the Global Climate (WSSGC) in all WMO official languages.

5.13 The session noted the EC-LXI decision urging Members to promote the use of ETCCDI software on climate indices such as “RClimDex” in their institutions including NMHSs, universities and research centres and its request to CCI and the Secretariat to further promote this tool.

5.14 The session welcomed the EC-LXI decision urging Members to establish a mechanism within NMHSs to implement Climate Watch Systems based on the WMO recommended guidelines (WCDMP-No. 58, WMO/TD-No. 1269) to support improved climate services for decision-making and users. It further requested that such a mechanism should become an essential part of the WCDMP support and NMHSs contribution to the implementation of the GFCS.

World Climate Applications and Services Programme

5.15 The Commission noted that Cg-XV had recognized the vital role of climate information and predictions in socio-economic decision-making and sustainable development processes. It also noted that effective climate services must address the needs and requirements of relevant decision sectors, developed within real-world decision contexts.

5.16 The Commission welcomed the emphasis of Cg-XV that in all WCASP/CLIPS efforts, special priority would be given to: (a) the needs of least developed countries; (b) the needs of all Members with respect to climate aspects of natural disaster prevention and mitigation; and (c) promotion of the role of climate services of NMHSs in supporting NWP of UNFCCC.

5.17 The Commission recalled the decisions relevant to WCASP, made by Members at the 58th through 61st sessions of Executive Council (2006–2009) and Cg-XV (2007). Priority issues for WCAS from these decisions are noted in the following paragraphs.

Climate Information and Prediction Services (CLIPS)

5.18 Cg-XV adopted Resolution 13 (Cg-XV) – World Climate Applications and Services Programme, including the CLIPS project, which consolidated CLIPS and applications and services within WCASP, and decided that implementation, operation and maintenance of WCASP/CLIPS initiatives are essential to meeting the objectives of the WMO Strategic Plan and strengthening climate services within the NMHSs, and that the implementation of WCASP/CLIPS should therefore continue. Cg-XV gave priority to supporting the work of CCI OPAGs on CLIPS and on Applications and Services; promotion of RCOFs, CLIPS Focal Points; partnerships; continuation of El Niño and La Niña updates, and capacity-building through training. Cg-XV requested the

Secretary-General to present a draft Implementation Plan to CCI-XV for its review and appropriate recommendations to the Sixteenth session of Congress in 2011. Subsequently, EC-LXI agreed with the recommendations of the CCI-XIV Management Group that, as a project, CLIPS should have an appropriate sunset date and that its accomplishments be consolidated should the GFCS assume the CLIPS legacy. In this regard, EC-LXI requested CCI to define the role the Commission would play in GFCS implementation and its future programme of work, which would be integrated into the Secretary-General's comprehensive proposal to be submitted to EC-LXII.

CLIPS training and capacity-building:

5.19 At Cg-XV as well as the different Executive Council sessions during the current intersessional period, Members strongly supported CLIPS training activities, and urged the development of a permanent training curriculum for climate specialists, and at EC-LXI, they further proposed working with ETR and Regional Training Centres (RTCs) in developing 'training the trainers' initiatives for climate.

Regional Climate Centres (RCCs)

5.20 Following the request of Members at Cg-XV, a minimum set of mandatory functions were defined jointly by WCAS and DPFS, CCI, CBS and regional representatives, for the designation of WMO RCCs, and Guidelines on RCC establishment and implementation were developed. At EC-LXI, Members adopted the RCC-relevant amendments to the Manual on the GDPFS, thereby establishing the technical regulations on RCC designation, and also commenced the process by designating WMO RCCs at Beijing (China) and Tokyo (Japan). EC-LXI urged promotion of rapid expansion of the WMO-designated RCC network around the world, with high priority on developing countries, and adopted Resolution 4 (EC-LXI) on Establishment of Regional Climate Centres.

Regional Climate Outlook Forums (RCOFs)

5.21 EC-LX, on the occasion of the completion of 10 years of the RCOF process, supported WMO coordination of a global review of the RCOF process, which was carried out through an expert review meeting in Arusha, United Republic of Tanzania, in November 2008. The Executive Council, as well as Congress, also noted the resource requirements for sustainable operation of RCOFs. EC-LXI appreciated WMO's efforts to introduce/revive RCOF processes in other regions where needed (e.g., SEECOF, PRESAC). EC-LXI also supported working towards the establishment of a Polar COF (PCOF) to serve the needs of polar regions, as an IPY legacy initiative.

El Niño and La Niña Updates

5.22 At Cg-XV, Members appreciated the consensus-driven El Niño and La Niña Updates and urged that those be continued. EC-LX suggested development of a common public relations approach to El Niño and La Niña. Cg-XV and EC-LXI recommended that other large-scale indices (planetary-scale oscillations) having potential impacts on regional climates, such as the Indian Ocean Dipole, be considered for future Updates.

Collaboration with WCRP

5.23 Cg-XV, as well as the Executive Council, have urged CCI to pursue closer collaboration with WCRP to provide services adequately addressing global, regional and national challenges in the area of climate variability and change, particularly through improvement and development of prediction methods, modelling techniques including ensembles, verification methods and downscaling. EC-LX urged the Secretary-General, CCI and the WCRP Joint Scientific Committee to establish a mechanism to identify the requirements of Members for, and to facilitate development and operational implementation by Members of, appropriate climate prediction techniques, and to provide technical guidance to NMHSs.

Support for Adaptation to Climate Variability and Change

5.24 At EC-LVIII, Members proposed development of techniques for evaluation and assessment of the socio-economic value of all weather, water and climate products and services, including appropriate decision support tools for use by different sectors. EC-LX emphasized the inclusion of the concept of adaptation in the WMO Strategic Plan and urged CCI and relevant WMO Programmes to identify current activities relevant to adaptation, gaps to be addressed and take steps to incorporate those in future priority setting and planning. EC-LX had also urged establishment of a mechanism to help them find solutions to problems associated with climate variability and climate change, and with climate related hazards; and to help NMHSs in developing reliable climate change scenarios and for assessing their inherent uncertainty. At EC-LXI Members urged development of the GFCS, building on the strengths of the WCASP for especially the Climate Services Information System and the User Interface Programme.

5.25 The Commission took note of the various decisions of the WMO Congress and Executive Council relevant to WCP in its work during the fourteenth intersessional period, and while preparing the workplan for the fifteenth intersessional period.

5.26 The session emphasized the need to review the process of reporting on the work of the Commission for the intersession period under report. It stressed the need for clearly listing the tasks that were decided to be undertaken and to report on what was accomplished, what was not, including those that were not envisioned by the Session but accomplished for good reasons. This report card will improve performance measures.

6. REVIEW OF ONGOING ACTIVITIES (*agenda item 6*)

6.1 The Commission noted the progress achieved during the fourteenth intersessional period, under the four Open Programme Area Groups and also on the other overarching items of priority to the work of the Commission (see agenda items 3 and 4). It noted that the various activities complemented well with the programme of work and the stated priorities of the Commission. The Commission expressed its satisfaction with the overall progress made given the limited resources available, human as well as financial. The Commission appreciated the contributions of all the OPAG expert members, leads and coordinators in addressing the Commission's tasks and deliverables.

6.2 The Commission noted that some activities are still in progress and recognized the need to revisit their priority and decide on the activities that would be required to be continued. In doing so, the Commission agreed that the activities to be continued, particularly those that would need substantial additional work, should be in line with the priorities for the future work of the Commission, particularly in the context of the implementation of the Global Framework for Climate Services (GFCS). The Commission noted that implementation of Regional Climate Centres (RCCs) including their mandatory and highly recommended functions had been guided by all four OPAGs. The Commission further noted that RCC implementation had only recently been initiated and that considerable work was still to be done to ensure worldwide coverage of RCCs with standardized operations as described in the WMO Technical Regulations. The Commission urged all those concerned to expedite the deliverables that were already nearly completed.

Climate Data Management and Metadata

6.3 The Commission noted that the following activities related to climate data management and metadata, which were initiated in the previous intersessional period, needed to be further pursued:

- (a) Updating the list of standards for Automatic Weather Stations (AWS) for climate purposes;

- (b) Guidelines on “climate observational standards in Member countries” and on “Quality Assurance/Quality Control of surface meteorological data”;
- (c) Development of and guidance in climate data management systems (CDMSs) for NMHSs and monitoring their implementation and status of operational migration from CLICOM;
- (d) Guidance on climate data exchange and the use of WIS and ISO standards for Climate Metadata improvement and exchange;
- (e) Catalogue for climate data based on the former INFOCLIMAT as well as the currently available WMO and other approaches.

Climate Data Rescue

6.4 The Commission recognized the importance of data rescue (DARE) and its evolving needs and emphasized the need for CCI to continue with the following activities:

- (a) Technical advice for the development of a global DARE portal which should emphasize the need for climate data rescue and digitization, the apparent lack of some digitized data in the international databases, the techniques and procedures for recovery, digitizing, composing, formatting, archiving, disseminating climate data and metadata;
- (b) Guidance for the implementation of the Mediterranean Data Rescue initiative and the development of similar regional and subregional projects to further strengthen Members collaboration on DARE;
- (c) Facilitating DARE in developing and Least Developed Countries and the associated resource mobilization.

Climate Monitoring and Assessment

6.5 The Commission reiterated the continuous need for WMO coordination of the Climate System Monitoring and its strengthening and improvement. It emphasized the need for CCI to continue its leadership in providing scientific coordination and technical guidance on climate indices, WMO climate system monitoring and the implementation of climate watch systems including:

- (a) Sustaining the leading role of the Joint CCI/CLIVAR/JCOMM Expert Team on Climate Change Detection and Indices (ETCCDI) and developing new climate indices and guidance;
- (b) Development of a web portal to improve information exchange for the coordination of WMO statements on the status of the global climate;
- (c) Monitoring global climate extremes and maintaining the WMO Website on world records of weather and climate extremes;
- (d) Integration of satellite products in climate monitoring and enhancing linkages between CCI and the WMO Space Programme and its initiative on Coordinated Processing of Environmental Satellite Data for Climate Monitoring (SCOPE-CM) to bring substantial benefits to WMO global and regional climate monitoring activities;
- (e) Guidance on the implementation of climate watch systems in all WMO Regions as an alert mechanism against climate anomalies and extremes, based on NMHS, RCC as well as GPC facilities.

Climate Information and Prediction Services

6.6 The Commission noted that a number of activities were initiated in the previous intersessional period to support Climate Information and Prediction Services (CLIPS) related

operational practices, particularly with regard to Regional Climate Centres (RCCs) and Regional Climate Outlook Forums (RCOFs), and the associated national mechanisms. The Commission emphasized that several of these activities needed to be continued, including:

- (a) Guidance on best practices in downscaling, including training aspects related to the relevant tools such as Climate Predictability Tool (CPT);
- (b) Guidance on best operational practices in seasonal prediction and consensus development approaches, particularly in RCCs, RCOFs and national services;
- (c) Standardized approaches to RCOF operations and expansion of the RCOF concept to new regions (e.g., Polar Climate Outlook Forum), consolidating the outcomes of the RCOF Review held in 2008;
- (d) Development of a web-based El Niño/La Niña Impacts Atlas, based on the initial structure outlined during the previous intersessional period, taking on board specific information and findings from countries, in terms of national scale impacts;
- (e) Joint activities with the World Climate Research Programme (WCRP) to enhance research inputs into CLIPS operations;
- (f) Development of the next steps for the evolution of CLIPS project, and review and consolidation of its past achievements transitioning into GFCS.

Climate Applications and Services

6.7 The Commission noted that the work on climate applications and services was carried out with a specific focus on four sectors of socio-economic importance, viz., health, energy, tourism and urban and building climatology. While the future work of the Commission in terms of climate applications would be oriented towards the overarching aspects of climate adaptation and climate risk management (see agenda item 9.4) with a new focus on developing sector-specific climate information products and services, the Commission agreed that additional work would be required to complete some important activities taken up by the sector-specific expert teams in the previous intersessional period. These were:

- (a) Joint WMO/WHO Guidance on Heat-Health Warning Systems (HHWS) and the associated inter-comparison projects;
- (b) Refocusing the work on the update of previous technical notes proposed for the previous intersessional period towards documenting the climate information requirements of the energy sector for climate risk management, while making use of the valuable case studies that were developed by the OPAG 4 Expert Team on Climate and Energy;
- (c) Joint WMO/UNWTO report on climate information needs and opportunities for the tourism sector;
- (d) Completing the updated technical note on Building Climatology;
- (e) Completing the updated technical note on Urban Climatology.

Guide to Climatological Practices

6.8 The Commission noted that the third edition of the *Guide to Climatological Practices* (WMO-No. 100) was in its final form for publication, after completing the peer review process. The Commission recognized that further work would be required during the forthcoming intersessional period to complete the formal approval and publication processes and also to develop an oversight mechanism for its regular updates. The Commission recognized the importance to Members of the

Guide, and urged the Secretary-General to ensure its publication as quickly as possible in all official languages. The Commission urged its Members to support the translation of the Guide into additional languages.

6.9 The Commission urged the new CCI Management Group to prioritize those ongoing activities at its first session following the current Commission session.

7. COMMISSION FOR CLIMATOLOGY STRATEGIC PLANNING (*agenda item 7*)

7.1 The Commission noted that WMO had adopted the results-based management (RBM) approach and that Strategic Planning, the WMO Operating Plan as well as Monitoring and Evaluation were an integral part thereof. The RBM approach included the implementation from 2008 of the Strategic Plan that defined three Top Level Objectives, five Strategic Thrusts and eleven Organization-wide Expected Results. The Commission noted that, within the 2008–2011 Strategic Plan, WMO climate activities were covered with respect to Expected Results 2 (Enhanced capabilities of Members to provide better climate predictions and assessments), 5 (Development and implementation of the new WMO Information System), 6 (Enhanced capabilities of Members in multi-hazard early warning and disaster prevention and preparedness), 7 (Enhanced capabilities of Members to provide and use weather, climate, water and environmental applications and services), 8 (Broader use of weather-, climate- and water-related outputs for decision-making and implementation by Members and partner organizations) and 9 (Enhanced capabilities of National Meteorological and Hydrological Services in developing countries, particularly least developed countries, to fulfil their mandates). The Commission recalled that Cg-XV, through Resolution 27 (Cg-XV) on the WMO Strategic Plan, requested the technical commissions to adhere to the direction and priorities set forth in the Strategic Plan and to organize their programme structures and activities so as to pursue the top-level objectives and to achieve the expected results.

7.2 The Commission further noted that the Executive Council, at its sixty-first session (EC-LXI), had endorsed the use of a “results chain”, i.e., Strategic Thrusts (ST) → Expected Results (ER) → Key Outcomes (KO) → Deliverables → Activities, as the structure for the strategic planning process. EC-LXI endorsed the framework for the next SP for the period 2012–2015 consisting of five STs and eight ERs, and called for the development of Key Performance Indicators which should remain stable and be measurable over the longer term enabling the monitoring and performance evaluation process. The Commission noted that the WMO draft Strategic Plan (2012–2015) had recognized the high value of climate information in sectors that significantly benefit from weather, climate, and hydrological information and services such as agriculture, energy, transport, environment, human settlements, and water resources. It noted that within the new Strategic Plan, most of Expected Results were in line with the objectives of the Commission and drew upon availability of climate information. To that end, it proposed that the Commission align its future workplan to WMO’s overall strategy to complement climate-related components of the Strategic Plan.

7.3 The Commission noted the request of EC-LXI to involve regional associations and technical commissions in the development of Expected Results and Key Performance Indicators, Key Outcomes and a manageable number of related performance measurement parameters and to ensure that those are based on Members’ needs and adequately reflect the programme areas of the Organization. Keeping in view the fact that both the present and the future WMO Strategic Plans cover the forthcoming intersessional period in two equal halves, the Commission recognized the need to appropriately align its activities to meet the corresponding monitoring and evaluation requirements.

7.4 The Commission noted that its activities over the entire intersessional period will be further guided by the outcomes of the World Climate Conference-3 (WCC-3) and the relevant elements of the Global Framework for Climate Services (GFCS). In particular, the activities will make a major contribution to the development of the Climate Services Information System, with the key outcome being improved operational systems of Members to develop better climate

information and prediction products and enhanced capacity at the national level to produce and disseminate such products targeted to user needs in support of climate adaptation and risk management. The activities place a special emphasis on regional and national mechanisms required to provide climate information for climate adaptation and risk management in key socio-economic sectors, and development of user-targeted climate products.

7.5 The Commission agreed that its vision and terms of reference should adequately reflect the emerging global societal needs for climate information in line with the broad strategic direction of WMO. The Commission therefore adopted [Resolution 1 \(CCI-XV\) – Vision and mission of the Commission for Climatology](#) and [Recommendation 1 \(CCI-XV\) – Terms of reference of the Commission for Climatology](#).

7.6 The Commission noted that the forthcoming intersessional period will be marked by the sunset phase of the CLIPS project and its transition into the relevant components of GFCS, involving a strategic shift from CLIPS project implementation to a consolidation of the project achievements and pass on the CLIPS legacy to GFCS. Another refocused strategic direction would be in terms of special attention to user-targeted products for climate adaptation and risk management in water and agriculture sectors in collaboration with the concerned WMO Programmes. Other sectors will be considered in collaboration with external partners.

7.7 The Commission expressed satisfaction that its new structure, with four thematic areas being addressed by its OPACEs, is more in line with the concerned elements of GFCS, but agreed that the related activities need to be further refined to be in line with the action plan expected to be developed by the High-Level Task Force on GFCS. National Climate Centres, National Climate Outlook Forums, Sectoral Outlook Forums, etc., are some of the new and potentially more effective ways of addressing the key deliverables. Inter-commission activities, particularly with CBS, will need to be strengthened to provide formal mechanisms for operational aspects of climate services within the GDPFS.

7.8 The Commission recognized the continued need for global and regional initiatives with respect to climate data including modern and inter-operable climate data management systems (CDMSs), Data Rescue (DARE) data digitization and data exchange. Fostering climate system monitoring applications and related product generation at global, regional and national levels; improved coordination mechanisms in data exchange and provision of guidelines to Members will be key activities to be carried out for improved climate system monitoring. Furthermore, fostering the development of global and regional initiatives for climate data rescue and development of high quality datasets and the use of WIS and related WMO and international standards for climate data and products discovery and exchange will need to be undertaken. The Session agreed that practical case studies should be provided of successful implementation of global and regional initiatives in this area. In this respect, it is noted that the UK Met Office/Australia/Chile/United States and GCOS supported “Atmospheric Circulation Reconstructions for the Earth” (ACRE) project, involving extensive global data reconstruction and reanalysis, provides a very useful example of global collaboration in this area.

7.9 The Commission noted the ongoing efforts in the development and implementation of the WMO Integrated Global Observing System (WIGOS) that will improve the surface and space-based observations through further integration and standardization, to meet the increased needs of Members to provide weather, climate (including GFCS), hydrological and related environmental services to their users. The Commission further noted that WMO Information System (WIS) will provide, in an affordable and effective way, the interoperability and information exchange components and management of all WMO activities. In particular WIS will support the collection and sharing of observations and products within WIGOS, disaster risk reduction and for the evolving requirements and needs of GFCS. The Commission therefore recognized the need to work closely with WIGOS and WIS, as well as the co-sponsored programmes such as GCOS, to address the key outcomes related to climate observations.

7.10 The Commission noted the need to pursue enhanced collaboration between CCI and WCRP to work towards constant improvement of climate products and services, especially in the

area of climate prediction on intraseasonal through decadal scales, and also on climate change projections and downscaling. Efforts should be made to highlight important research needs, and also to assist Members in operationalization of research advances in climate prediction. In particular, efforts should be made to enhance WCRP linkages with the operational community at the regional and national levels.

7.11 The Commission stressed that capacity-building activities including expert services, installation and training will need to be pursued with the aim of enhanced Members engagement, collaboration and assistance amongst Members in developing and implementing modern, robust and sustainable systems for climate data management, data rescue, climate monitoring and watches, operational climate prediction, user-targeted climate products, etc. In this regard, the Commission agreed that it needs to build a strategy for capacity-building for climate services, to directly address GFCS requirements (see CCI-XV agenda item 11). The Commission noted the need to provide more sustainable training mechanisms such as the development of permanent climate curriculum modules for use in Regional Training Centres (RTCs) and national training programmes. Keeping in view the requirement of raising the user awareness and facilitating a better understanding of climate products and services by the user sectors, activities will need to be taken up promote the application of climate information such as seasonal outlooks for adaptation to climate change and variability. Explicit attention will need to be paid towards the needs of developing and least developed countries in all the capacity-building activities.

7.12 The Commission noted that WMO would increase coordination among various agencies of the UN system, particularly under the UN Delivering as One which had brought a new impetus to the coordination of climate-related activities among the UN organizations and its Specialized Agencies. The session further took note that WMO's contribution to the work of climate-related activities within the UN System could mainly build on the technical capacity and inputs from the Commission, as appropriate. The Commission noted that WMO would continue to fulfil commitments under multilateral climate and environmental agreements such as the UNFCCC, the UNCCD and the CBD through provision of scientific and technical advice. To that end, it attached great importance to the role of the Commission in development of technical guidelines and materials which could deepen and improve the understanding on the role of climate knowledge in science-based decision-making processes.

7.13 The Commission welcomed the WMO and UNESCO's, leading role under the 'Climate Knowledge base' crosscutting area, within the UN Delivering as One, and suggested that the Commission play an active role in provision and authentication of scientific material for a joint WMO-UNESCO Web Portal in support of climate change adaptation in various sectors.

7.14 The Commission emphasized the need to guide directors of NMHSs on promoting the importance of climate information as an input to public policy, and on their role in highlighting, where appropriate, to governments the benefits derived from climate science for improved decision-making, risk management and adaptation to climate variability and change.

7.15 The Commission recognized the need to make concerted efforts to clearly define the various elements within the results chain of WMO Strategic Plan relevant to the Commission's priorities. The Commission therefore agreed that the CCI Management Group would work with the Secretariat to contribute to all aspects of the RBM process as an explicit component of its terms of reference.

7.16 The Commission acknowledged the ongoing discussions regarding the future structure of technical commissions within WMO. The Commission emphasized that all technical commissions play a crucial role within WMO and that they leverage large amounts of expertise and labour for very little cost. The Commission thanked the outgoing president and vice-president for their contributions to these discussions and urged the incoming president and vice-president to continue the active involvement.

8. COMMISSION FOR CLIMATOLOGY QUALITY MANAGEMENT FRAMEWORK (agenda item 8)

Quality Management (QM) foundations for CCI

8.1 The Commission recalled that climatology is based on collecting, quality controlling and archiving climate data. The information ultimately provided by climatologists depends on the quality, in terms of accuracy, consistency, timeliness and robustness of these data, and on using methods and tools based on best practices in statistical analysis. Climate data management, climate modelling and predictions constitute domains where a Quality Management System approach relies on existing foundations and concepts established through technical documents, guides, manuals, technical regulations and standards. Furthermore, the Commission noted that a Quality Management System should be designed to ensure that the high quality, robust data, information and products are developed in a customer-oriented approach.

8.2 The Commission took note of the decisions taken at Cg-XV and EC-LX and the adoption of the ISO/WMO working arrangements in accordance with Resolution 31 (Cg-XV) as an obligation to strive towards the implementation of QM throughout the Organization including technical commissions and NMHSs. It reaffirmed its full adherence to the WMO Quality Management Framework and agreed to further work with Members on promoting QM in climatology.

8.3 The Commission commended the active role of its president during the current intersessional period in the WMO Inter-Commission Task Team on QMF (ICTT-QMF), which ensured that CCI activities in the field of QMF, its views and proposals are well reflected in the work of the ICTT.

CCI Advisory Role on QMF/QMS for Climatology

8.4 The Commission concluded that the emerging user needs for high quality climate products and services in a competitive environment, and the evolving requirements of the GFCS require CCI to play a leading role in assisting NMHSs and Regional Climate Centres (RCCs) to implement a Quality Management System (QMS) in the production and management processes of their climate related entities, leading to improved products and services.

8.5 The Commission further emphasized that the following critical domains of climatology should be considered as main areas which would benefit from a successful implementation of QM to the entire chain of processes employed in climate-related data, products and services:

- (a) Climate observations including, in-situ and remote sensing measurements;
- (b) Climate data exchange, including time-critical and non real-time exchange through WIS;
- (c) Climate database development and maintenance, including global, regional and national databases and homogenized datasets;
- (d) Climate product generation and development, including climate analysis, predictions, climate watch advisories;
- (e) Climate service delivery, user interactions and promotional activities;
- (f) Publications including Guidelines and the *Guide to Climatological Practices*;
- (g) Capacity-building including educational and training material, curricula as well as e-learning;
- (h) Climate and applied climate research.

8.6 The Commission decided that CCI subsidiary bodies, including CCI MG, ICT, OPACEs, expert teams, working groups and rapporteurs, shall incorporate Terms of Reference on promoting QM and advising Members on the use of QM in their respective domain of expertise. The Commission requested the president of CCI to also promote QM in the CCI work itself. In this regard, the Commission adopted [Resolution 2 \(CCI-XV\) – Quality management implementation strategy for climatology](#).

CCI Reference Documents as Reference Standards for Members

8.7 The Commission concurred with the ICTT recommendation on the procedure to be adhered to before submitting ISO/WMO common Standards for approval by ISO with respect to selection and prioritization of the regulatory documents of technical commissions.

8.8 The Commission further agreed that some CCI publications such as guidelines and the *Guide to Climatological Practices*, at least partially, should be considered as candidate subjects for developing new common ISO/WMO technical standards. Such standards would encompass, for example, definitions (e.g. Essential Climate Variables (ECVs)), algorithms, (e.g. how to compute climate normals, daily mean temperature), and procedures (e.g. QA/QC, homogenization of climatological time series). Recognizing the high level of stringency of such ISO/WMO standards, information on best practices, recommendations and guidelines would remain as separate WMO publications.

8.9 The Commission, taking into account the role that the *Guide to Climatological Practices* plays as a de facto technical standard at the national level in many countries, agreed that a process be established for publishing interim updates of individual sections of the Guide, as and when required, between full-scale updates of the Guide.

9. PRIORITIES FOR THE FUTURE WORK OF THE COMMISSION (*agenda item 9*)

9.0.1 The Commission considered the work of the Commission since its fourteenth session, including the work of the ICT, the four Open Programme Area Groups (OPAGs), Expert Teams (ETs) and the Rapporteurs. It considered the activities of the World Climate Programme, the outcome of the WCC-3, the WMO strategic planning and related Results-based Management (RBM) and the WMO Quality Management Framework (QMF). It noted the recommendations of the Technical Conference on "changing climate and demands for sustainable development". The Commission stressed that the work of CCI in the next intersessional period should build on the successes and strengths of the previous intersessional period; at the same time CCI should address new challenges and opportunities to meet the evolving requirements and needs of the newly established Global Framework for Climate Services (GFCS). Therefore the Commission decided to address the main thematic areas (a) through (d) in addition to the supporting domains of quality management and capacity-building:

- (a) Climate Data Management;
- (b) Climate Monitoring and Assessment;
- (c) Climate Products and Services and their Delivery Mechanisms;
- (d) Climate Information for Adaptation and Risk Management;

with the description of the related priority activities as agreed under agenda items 9.1, 9.2, 9.3 and 9.4 respectively.

9.1 CLIMATE DATA MANAGEMENT (*agenda item 9.1*)

Main achievements in Climate Data Management

9.1.1 The Commission considered the progress made in various aspects of Climate Data Management and was pleased to note that the CCI OPAG on Climate Data Management

(CCI/OPAG 1), in collaboration with the Secretariat, worked effectively towards the achievement of most of the assigned objectives in the intersessional period. It noted with satisfaction that all the three OPAG 1 Expert Teams: on Climate Data Management including Metadata (ET-CDMM), on Observing Requirements and Standards for Climate (ET-ORSC) and on Data Rescue and Digitization of Climate Records (ET-DRDCR) met early in the intersessional period and performed several tasks of their workplans, including publications of guidelines on climate data management and the development of several recommendations for the future priorities in climate data.

Observing requirements and standards for climate

9.1.2 The Commission noted with appreciation the establishment of a close linkage with the Global Climate Observing System (GCOS) at various levels including the participation at the AOPC and GCOS steering committee sessions on a regular basis. This has led to an increased collaboration in various aspects of climate observation and to achieving a common understanding of its requirements and priorities. This was the case in the development of the WMO MEDARE Data Rescue initiative in the Greater Mediterranean Region (GMR) based upon a GCOS recommendation and the coordination between the CCI Management Group and the GCOS-AOPC on the collection and dissemination of CLIMAT and CLIMAT TEMP reports. The Commission urged the Secretariat to continue facilitating this collaboration.

9.1.3 The Commission noted the significant progress towards guidelines documents on the use of AWS for climate purposes, and capacity-building in climate observations in developing countries, and the recommendations contained in the draft documents produced. It recommended the completion of these as peer-reviewed Guidelines documents. The Commission further noted the publication in early 2008 of an article by the Team Leader of the Expert Team on Observing Requirements and Standards for Climate of an article on the suitability of AWS for climate purposes in the WMO *Bulletin*. The Commission noted also that significant progress had been made towards completion of a revised guidelines document on the quality control of surface climate data, and expressed its wish that this task be completed early in the next Intersessional period.

9.1.4 The Commission urged CCI experts to complete the peer-reviewed Guidelines documents identified in paragraph 9.1.3, specifically those on the use of AWS in climate observations, and capacity-building in climate observations for developing countries.

9.1.5 Members expressed their concern on the decreasing number of observation stations for climate, particularly in the least developed countries. The Commission stressed the need to provide further assistance to these countries in maintaining their observation networks in order to sustain adequate observations with the required quantity and quality for climate.

Climate Data Management and Data Rescue

9.1.6 The Commission noted with satisfaction the increased engagement of Members in implementing various aspects of climate data management and the increased assistance provided through WMO-VCP or bilateral collaboration to developing and least developed countries in acquiring and operating modern Climate Data Management Systems. It urged Members and the Secretariat to continue their support to this activity.

9.1.7 The Commission concurred with the conclusions of the Expert Team on Climate Data Management including Metadata on the future work on Climate Data Management Systems (CDMS) including the following main components:

- Provide guidance on Model of Description for CDMSs describing the main functions of the CDMSs based on existing database management standards and protocols to help the providers of these systems to adequately describe them to potential users to make an informed choice of the CDMSs;

- Produce a minimum set of functions that CDMSs should offer based on a new evaluation of the existing and future CDMSs;
- To conduct a comprehensive survey on the degree of operational use of the already installed CDMSs in the developing and Least Developed Countries (LDCs) which benefited from the various capacity-building mechanisms e.g. training workshops, bilateral collaboration and the WMO Voluntary Cooperation Programme (VCP). The result of the survey should lead to revisit the ongoing capacity-building strategy to ensure that the CDMS implementation should have a positive impact on producing CLIMAT reports and their exchange in addition to the improved historical data digitization in the countries.

9.1.8 The Commission considered that data rescue and digitization of old climate records is still a challenging topic for many NMHSs in developing and least developed countries and needs further attention by the Members. It requested Members to increase their support to safeguard the old climate records and make them available for research and applications in the digitized electronic format. It urged Members and the Secretariat to continue the support given to the developing and least developed countries to implement DARE.

9.1.9 The Commission noted with appreciation that the RA VI-RCC Pilot Network Node on Climate Data Management has proved to be an effective mechanism in data gathering, processing and quality control. This mechanism stimulated an increased commitment in data sharing by explicitly labelling RCC functionalities to all participating Members as WMO activities. It further noted with satisfaction the migration of the EUMETNET-ECSN Dataset Initiative (E-OBS) from a project status to a sustainable operational node evolving to a WIS-DCPC.

Priority for future CCI work in Climate Data

9.1.10 Considering the above achievements, and the conclusions and recommendations of the CCI Management Group, the WCC-3 outcomes, the establishment of the Global Framework for Climate Services (GFCS), and the need for climate data to support a wide range of activities in climate monitoring, service provision and workplan, the priority work for the Commission in climate data should be as follows:

- (a) To facilitate an analysis of how the various observation-system types and technologies, including conventional observations, automated observations, and remotely sensed data, can most effectively and synergistically be deployed to support various types of climate activities, including climate monitoring, service provision and workplan, in ways that are appropriate to the level of precision required and cost-effective and to communicate this information to relevant Technical Commissions, space agencies and GOS planners;
- (b) To place an increased emphasis on the quality of in-situ, remote sensing and model data as an integral part of Climate Data Management. In this regard, climate metadata should be given high attention as it is an essential part of data quality management process which requires an end-to-end quality assurance approach in all steps including collection, archiving, dissemination, discovery and exchange; and provide advice to Members, in collaboration with other technical commissions and programmes, on minimum requirements and standards for climate observations;
- (c) To contribute to the activities of the Inter-Programme Expert Team on Metadata and Data Interoperability (IPET-MDI), and improve interoperability and effectiveness of climate data exchange, by prospecting an optimal WMO Core Profile for climate metadata and databased on the ISO 191xx series of standards to refine the WMO stations catalogue to create a more in-depth description of climate databased on the former INFOCLIMA;

- (d) To consider other types of data in climatology including space-based data, radar data and data from other remote sensing platforms, and how these can most effectively be integrated with data from conventional observing systems. The Commission should work closely with CBS, CIMO and GCOS on developing a minimum set of requirements for NMHSs to benefit from these data and be able to properly and practically use them for climate studies and for the development of improved climate services. The Sustained coordinated Processing of Environmental Satellite Data for Climate Monitoring (SCOPE-CM) led by the WMO Space Programme and Eumetsat's SAF-CM were highlighted as offering significant opportunity for advancement;
- (e) To consolidate the ongoing work in Climate Data Management Systems by ensuring improved interoperability through the WIS using the WMO Metadata Core Profile and ISO standards, in addition to incorporating new features, functionalities and interfaces with other databases, such as hydrological, agriculture, health, environmental and socio-economic databases. This effort should include establishing and maintaining a register of existing and any future CDMS and their respective functionalities, and implementing best practices in training and implementation. The use of GIS should be promoted to best use of these new features in the aim of developing modern and useful data services;
- (f) To continue providing the international coordination and monitoring of Data Rescue and Digitization of Climate Records and promoting the development of regional DARE initiatives similar to the one being implemented in the greater Mediterranean region (MEDARE) and the use of web portals to inform on and monitor DARE activities and projects and related data inventories;
- (g) To place an increased emphasis on polar observations and observations of the cryosphere in general and to assist in the development of standards for solid precipitation, and for standards for observations in mountainous terrain;

9.1.11 In view of the above the Commission decided to establish an Open Panel of CCI Experts on Climate Data Management (OPACE 1) focusing on priority areas as described in 9.1.10 (a) to (g), including a Task Team to develop criteria for the WMO Climate Database Management Systems taking into account the WMO Information System (WIS) as well as the needs of the countries and document the existing CDMSs.

International Conference on Climate Data

9.1.12 The Commission stressed the importance of climate data in climate monitoring, research and applications, climate change and adaptation as well as in supporting the operation of the newly established Global Framework for Climate Services (GFCS). It further noted that the rapidly evolving technology provides real opportunities for the improvement of climate data management in its various aspects including archiving, quality control, discovery and timely exchange amongst Members as well as with the end-users.

9.1.13 The Commission recommended to consider climate data issue within the "UN Delivering as One" and bring it to the attention of the UN General Assembly. It further suggested to consider the efforts undertaken by GEO on data policies in furthering data issue.

9.1.14 The Commission emphasized the critical and necessary collaboration of all Members to ensure high quality, timely and accessible climate data from all possible sources encompassing land and marine data and including in-situ, space based and proxy data. To this effect the Commission recommended the organization, under the auspices of WMO, during the fifteenth CCI intersessional period of an international conference addressing the various aspects of climate data and involving a wide participation of technical commissions, programmes and co-sponsored programmes as well as partners. The conference should lead afterwards to the development of a High Quality Global Climate Data Management System (HQ-GCDMS) which will benefit from the progress made in implementing modern Climate Data Management Systems (CDMSs) and

Climate Data Rescue (DARE); the set up of WIS architecture and the utilization of international standards for data representation, exchange and database models.

9.1.15 The Commission strengthened the need for a beneficial collaboration between the NMHSs on one side and the research community, universities and public and private sectors on the other side. It urged both sides to develop strong partnership in conducting studies, research and developing projects for mutual benefits including easier and improved data and knowledge exchange and sharing.

Discontinuation of CLIMAT TEMP reports

9.1.16 The Commission noted the conclusion of the GCOS-AOPC and the CCI-MG to discontinue the CLIMAT TEMP reports and the request by EC-LX addressed to CCI to assess the impacts of a possible discontinuation of CLIMAT TEMP on other domains, such as applied climatology, research, aviation, etc.

9.1.17 The Commission assessed the results of the survey conducted by the WCDMP Secretariat which was sent to all Members as follows:

Total number of respondents:	42
Total number of agreement on discontinuation:	38
Total number of disagreement on discontinuation:	04

9.1.18 The Commission further noted that it was indicated in the survey that a lack of feedback from a Member would imply that the Member does not object in discontinuing the elaboration and the dissemination of CLIMAT TEMP reports. Members therefore agreed with the conclusion of the GCOS-AOPC and the CCI Management Group to discontinue the provision and dissemination of CLIMAT TEMP reports. The Commission adopted [Resolution 3 \(CCI-XV\) – Discontinuation of the monthly upper-air CLIMAT TEMP reports](#).

9.2 CLIMATE ANALYSIS, MONITORING AND ASSESSMENT (agenda item 9.2)

9.2.1 The Commission recalled that monitoring and assessing the climate system at various space-time scales is becoming one of the Members' highest priorities at different levels of decision-making. It noted furthermore that climate system monitoring at global, regional and national levels has benefited greatly from the development of improved Information Technology which allowed the set up of informative climate monitoring websites and portals by a significant number of WMO Members; and for that there is increased potential for further improvement towards providing new types of products and services. It urged Members to increase their efforts in developing continuous climate monitoring systems involving frequent updates on climate trends, variations and related weather and climate extremes which have significant societal impacts.

9.2.2 The Commission noted with appreciation the efforts made by Members in developing long term homogeneous climate datasets required for scientifically sound and authoritative global climate assessment with an improved characterisation of uncertainty . It urged Members to continue supporting this activity and called on all NMHSs to increase their efforts in the provision of the needed all climate data including the base data that underpins value added data and the dissemination of CLIMAT reports in a timely manner as required by WMO Regulations.

9.2.3 The Commission recognized that observed surface air temperature datasets with global coverage are of critical importance for detecting, monitoring and communicating climate change as well as characterizing climate variability. The Commission further recognized the increasing policy relevance of these datasets and the widely expressed need to ensure the highest standards of quality, robustness and traceability of these datasets. The Commission appreciated the sustained efforts of several centres in developing and maintaining these datasets, but noted that it is important to coordinate these efforts through an international analysis under the aegis of WMO ensuring completeness of audit trail and transparency, thus promoting wider ownership and acceptance. The Commission endorsed the proposal made by the United Kingdom of Great Britain

and Northern Ireland and agreed to join the international collaborative efforts to analyse land surface air temperature data in a comprehensive manner. The Commission therefore requested the Management Group to take up this activity as a priority in collaboration with GCOS and WCRP. The Commission also urged that similar efforts be undertaken with other climate variables (based on the experience gained in this effort).

9.2.4 The Commission reiterated the important role of the Joint CCI/CLIVAR /JCOMM Expert Team on Climate Change Detection and Indices (ETCCDI) for monitoring climate change and extremes through developing climate change indices and conducting related regional workshops and seminars. It thanked Dr Albert M.G. Klein Tank from the Royal Netherlands Meteorological Institute; and Francis W. Zwiers and Xuebin Zhang, from Environment Canada for completing and publishing the "Guidelines on Analysis of extremes in a changing climate in support of informed decisions for adaptation" (WMO/TD-No. 1500). The Commission decided to re-establish the ETCCDI with Terms of Reference (ToR) as described in Annex 2 to Resolution 8 (CCI-XV).

9.2.5 The Commission noted with appreciation that the ETCCDI had two meetings in the intersession period, one organized by the Environment Canada and sponsored by WMO in 2006; the meeting led to a comprehensive workplan including substantial capacity-building component. Another meeting was held at KNMI, the Netherlands, in association with a two-day workshop on "Extremes in Changing Climate". A total of six workshops on climate indices were organized by the ETCCDI during this intersession period in various regions. Details on these workshops have been posted on the ETCCDI website.

9.2.6 The Commission was pleased to note that Members are increasingly supporting workshops on climate indices that are organized and conducted by the ETCCDI. This was the case of France which sponsored in 2009 a Seminar on Climate Data Homogenization and Climate Indices in Mauritius for the South Indian Ocean countries; and the joint collaboration of Indonesia and the Netherlands to carry out a multiyear project, that includes data rescue workshops combined with seminars on climate indices with the participation of countries in the Indonesian Archipelago including Indonesia, Malaysia, Thailand and the Philippines.

9.2.7 The Commission further noted with appreciation the increased collaboration with the universities in implementing CCI OPAG 2 workplan. In this regards it thanked Dr Manola Brunet, the OPAG 2 co-chair and the University of Rovira i Virgili in Spain to which she is affiliated for hosting, maintaining and updating the ET website; as well as Professor Randall Cervený, the CCI Rapporteur on World Records of Weather and Climate Extremes and his University (Arizona State University (ASU), United States) for setting up a website on global weather and climate extremes which informs on world records of weather and climate extremes after being verified and certified by a Record Committee Assessment. The Commission decided to continue the activity of the Rapporteur on World Records of Weather and Climate Extremes in the next intersessional period with terms of reference as described in Annex 2 to Resolution 8 (CCI-XV).

9.2.8 The Commission concurred with the recommendation of CCI OPAG 2/ET 2.2 to develop guidance on return period estimates in a changing climate and the physical processes underlying attribution of extreme events such as drought, heatwaves, floods producing regional precipitations anomalies, etc. that cause major societal impacts. It noted the need for increased efforts to develop standard definitions of these extremes.

9.2.9 The Commission noted with appreciation the steps taken by the WMO Space Programme in developing the Sustained Coordinated Processing of Environmental Satellite Data for Climate Monitoring (SCOPE-CM) which will establish a network of facilities ensuring continuous and sustained provision of high quality satellite products related to the Essential Climate Variables (ECV), on a global scale, responding to the requirements of the Global Climate Observing System (GCOS). It noted with satisfaction the ongoing efforts by the satellite community to derive climate data records for Essential Climate Variables (ECVs) and urged the satellite community to continue supporting this activity for the benefit of improved climate monitoring applications. It welcomed the establishment of an increased linkage between the CCI experts and the WMO Space Programme to develop collaboration on climate monitoring applications.

9.2.10 The Commission recalled that the implementation of climate watch systems at national levels should be accelerated in view of delivering a new generation of climate monitoring products and services as was decided by Fifteenth Congress. It urged Members to implement climate watches based on the existing NMHSs and RCCs capabilities which provide useful climate monitoring products to the NMHSs, e.g. those provided by Tokyo Climate Centre and Beijing Climate Centre in RA II. The implementation of climate watch systems is guided by the CCI *Guidelines on Climate Watches* (WCDMP-No. 58) to deliver such products.

9.2.11 The Commission urged Members to benefit from the progress made in global and regional climate monitoring, long-range forecasting and climate prediction capabilities, infrastructures and mechanisms including RCOFs, to achieve a sound and quick implementation of climate watch systems. It further stressed that the proposed Global Framework for Climate Services (GFCS) constitutes an excellent platform for utilizing seamlessly global, regional and national capabilities for supporting climate watch activities.

9.2.12 The Commission emphasized the capacity-building aspects of climate watch activities with regards to supporting NMHSs, in particular in developing and least developed countries, to implement climate watch systems. It urged the Members and the Secretary-General to continue their support to the organization of regional workshops, training and the provision of guidance material and brochures. The Commission further decided that progress in implementing climate watch systems in various regions shall be reported by the Secretariat regularly to the CCI Management Group while the CCI OPACE 2 and OPACE 3 should serve in a joint manner as the appropriate mechanism to guide on climate watch planning and implementation in close coordination with regional associations and their relevant subsidiary bodies and working groups.

9.2.13 The Commission was pleased to note that the WMO annual statements on the status of the global climate has been regularly published in all WMO official languages and noted the importance of coordination with Members for the press release of the statement as was requested by CCI-XIV. It commended the highly valuable input provided on a regular basis by the international climate institutions and centres that carry out regional and/or global functions in climate monitoring. It urged all Members to continue their support to the WMO statements through the provision of regular monthly, seasonal and annual summaries on extreme weather and climate events. It further decided that CCI should continue to provide technical guidance to the WCDMP for improving WMO climate system monitoring and related methodologies and datasets.

9.2.14 The Commission noted with satisfaction the publication of the BAMS article "State of the Climate" coordinated by NCDC/NOAA on a regular basis and welcomed the steps taken by the Secretariat for its re-print and distribution to the Members. It further encouraged Members to translate the article in their official languages to serve a wider use of the publication. It expressed its thanks to the American Meteorological Society for ensuring the continued availability of the article on the Internet.

9.2.15 In view of above and in order to consolidate the current achievements and further develop climate monitoring activities of the Members and the WMO global climate system monitoring, the Commission decided to establish an Open Panel of CCI Experts on climate monitoring and assessment (OPACE 2) with ToRs, activities and expected outcomes as described Annex 3 to Resolution 8 (CCI-XV) and the following priority work areas:

- (a) WMO Climate System Monitoring including methodologies and datasets based on various sources of data in situ, space and model reanalysis data for assessing climate trends and variations; and monitoring reports and dissemination mechanism for timely information on extreme weather and climate events;
- (b) Review the ETCCDI climate indices and develop new ones; and provide the required expertise for organizing regional seminars on climate extremes and indices;
- (c) Methodologies for defining and analysing extreme weather and climate events that cause major societal impacts and assessing their attribution and return periods for

droughts, heatwaves, extreme precipitations anomalies and wind storms, etc. and standards for databases on extreme weather and climate events;

- (d) Updating the WMO website on the world records on weather and climate extremes;
- (e) The use of satellite products for climate monitoring and climate change detection and value assessment of the most current level of suitability of these products to CSM;
- (f) Climate watch systems including development of standards for the content, dissemination and alerting protocols with consideration of existing infrastructure at NMHSs for the provision of climate watch advisories at national level; as well as at RCCs for the provision of information and guidance on regional anomalies and outlooks.

9.3 CLIMATE PRODUCTS AND SERVICES AND THEIR DELIVERY MECHANISMS (*agenda item 9.3*)

9.3.1 The Commission noted with satisfaction the growing recognition by Members of the importance of climate information and products in supporting climate adaptation and risk management, and the rapid developments in the establishment and implementation of a Global Framework for Climate Services (GFCS) which is expected to bridge the gap between climate service providers and users in the many climate-sensitive socio-economic sectors. The Commission recognized its key role in underpinning WMO's contributions to the GFCS, essentially fostering the authenticity, reliability and consistency of climate information, products and services particularly at regional and national scales and enhancement of climate knowledge of users in terms of readiness to use climate information constructively in their applications.

9.3.2 The Commission noted that, at national levels, there exists considerable diversity in the way climate services are developed and provided, and may involve mechanisms in addition to NMHSs. However, there are certain critical roles and responsibilities of NMHSs that are common to all national efforts in providing climate services, such as the basic climate data, diagnostics, climate system monitoring and, in many cases, long-range forecasts (LRF). In all these areas, the Commission expressed the belief that the NMHSs would be the most likely source of authentic information, products and services.

9.3.3 The Commission acknowledged the significant contributions of the Climate Information and Prediction Services (CLIPS) project in promoting climate services, particularly at the regional and national levels and in highlighting the need for a user-targeted approach. The Commission recalled the request of the Fifteenth World Meteorological Congress (Cg-XV, May 2007) to determine the next steps for CLIPS, and agreed with the recommendation of the CCI Implementation Coordination Team (ICT) to work towards the conclusion of CLIPS as a project and determine a CLIPS legacy to guide the future evolution of CLIPS concepts. The Commission recommended that the implementation plan for future evolution of CLIPS should be focused on assimilating its activities into the emerging GFCS, and urged Members to continue to build and sustain CLIPS activities in close liaison with climate-sensitive user sector agencies. The Commission agreed to develop guidance on standard approaches, tools, methods, consistency, common look-and-feel designs for products, etc., in order to enhance the successful transition of CLIPS into the relevant components of the GFCS. In particular, the Commission noted the need to identify core products of climate services at the national level in alignment with the core GPC and RCC products, as a way to identify the first priority deliverables/outcomes.

9.3.4 Taking these factors into account, the Commission recommended the development and implementation, globally, of National Climate Services (NCSs), as an effective mechanism to undertake and/or coordinate CLIPS-related functions at the national level. The Commission urged Members to promote active participation of NMHSs in the development of NCSs and to forge partnerships with other stakeholders (including provider, user and intermediary agencies) at the national level, as part of an overall national climate service approach. In addition, the Commission encouraged NMHSs to consider mechanisms to coordinate their technical activities for basic climate data, diagnostics, climate system monitoring and in many cases long-range forecasts

(LRF) to help alignment with the core products and services of GPCs and RCCs/RCC Networks. In some instances, that might result in the development of a National Climate Centre (NCC). The Commission agreed that there would need to be some flexibility around the proposed roles and responsibilities of NCSs and NCCs according to national capabilities and priorities. The Commission adopted [Resolution 4 \(CCI-XV\) – Further evolution of the Climate Information and Prediction Services project](#).

9.3.5 The Commission recognized that coordination and communications on climate activities would be greatly facilitated through a functioning network of the working groups or other bodies of regional associations dealing climate related matters and national CLIPS Focal Points. The Commission therefore agreed that the CLIPS Focal Point network should be re-invigorated and renewed, and that appropriate Terms of Reference be developed, as a deliverable of OPACE 3, to specify the requirements and responsibilities of the Focal Points. The Commission urged Members to facilitate effective contributions of the Focal Points to further evolution of CLIPS and to its eventual amalgamation into GFCS.

9.3.6 The Commission noted that, in order to plan the human and financial resources required to set up and operationally provide climate information, products and services, and to ensure their quality, Members will require guidance on the requirements and best practices for establishing climate service programmes. The Commission also emphasized the need to identify the education and skills required of climate specialists, and to facilitate the required training including well-balanced climate knowledge of users (see also agenda item 11). The roles and responsibilities of all partnering agencies at the national level (NMHSs, other government agencies, academia, etc.) also need to be clearly identified and fostered.

9.3.7 The Commission expressed its satisfaction with the establishment of the designation process for RCCs/RCC Networks through the joint efforts of CCI and CBS. The Commission recognized the need to establish standardized processes for development of RCC products including LRF, their presentation/style (appearance, formats, etc.), as well as delivery (including through web pages) to NMHSs and NCCs in the region and their verification/assessment. In consideration of the functions and responsibilities of RCCs/RCC Networks, the Commission encouraged OPACE 3 to explore, in consultation with CBS, their potential role as Data Collection or Production Centres (DCPCs) of the WMO Information System (WIS). Further, the Commission noted that there were large areas cutting across the domains of regional associations with common climate information needs (for example, polar regions, the Mediterranean Region, South-East Asia). The Commission therefore encouraged initiatives to develop such cross-regional RCCs, and appreciated the expressed interest of Members in working towards RCCs for the polar regions. The Commission noted the need for continued collaboration with CBS on the establishment, implementation, designation and operations of RCCs/RCC Networks. The Commission adopted [Resolution 5 \(CCI-XV\) – Establishment and operation of Regional Climate Centres worldwide](#).

9.3.8 The Commission recalled that Cg-XV, while appreciating the WMO publication of global consensus-driven El Niño and La Niña Updates, recommended that other large-scale indices suitable for regional impacts assessment could be explored by OPACE 3 for future Updates. CCI and CBS are actively cooperating in the development and communication of climate monitoring and prediction products including climate watch advisories. The Commission appreciated the recent initiatives for the development of Global Seasonal Climate Updates, providing regular global consensus statements on the seasonal climate, through expert assessments of global climate monitoring and outlook products. The Commission agreed that the focus of such Updates would be to assist the NMHSs in the interpretation, tailoring and assessments of the reliability of seasonal predictions. The Commission urged all GPCs, RCCs/RCC Networks, RCOFs, NMHSs and other relevant institutions to provide the required inputs and actively support the development of this important product.

9.3.9 The Commission appreciated the outcomes of the CCI-WCRP joint session during the Technical Conference, and highlighted the need to sustain these linkages on a continuing basis to expedite the implementation of research advances in operational climate services and to ensure ongoing improvement to the GFCS operational practices and outcomes. In particular, the

Commission recommended the development of a joint CCI-JSC/WCRP/CAS mechanism for operationalizing research advances in seasonal prediction (such as an intersect between OPACE 3 and the WCRP Working Group on Seasonal to Interannual Prediction). The Commission also urged enhanced interaction between the CLIVAR regional panels and the RCCs/RCC Networks and RCOFs, particularly in pursuing the research components of RCCs/RCC Networks listed as highly recommended functions, as well as introducing new methods and techniques in RCOF operations and new parameters to be predicted (e.g., products for hydrological applications).

9.4 CLIMATE INFORMATION FOR ADAPTATION AND RISK MANAGEMENT (*agenda item 9.4*)

9.4.1 The Commission recalled that, at the World Climate Conference-3 (WCC-3, Geneva, 31 August–4 September 2009) participants representing a wide range of socio-economic communities acknowledged that their activities were sensitive to climate, and that their decisions for planning, operations, risk management and for adaptation to both climate change and variability (covering time scales from seasonal to centennial) would be improved by a higher level of climate knowledge, and by access to and use of actionable information and products, tailored to meet their needs. Health, sustainable energy, water, tourism, transportation, biodiversity, natural resources management, sustainable cities, land management, agriculture, food security, oceans and coastal community representatives supported the establishment and implementation of a Global Framework for Climate Services (GFCS). In the conference statement, participants called for climate user interface mechanisms focused on building linkages and integrating information, at all levels, between providers and users of climate information.

9.4.2 The Commission was informed that the EUMETNET Assembly (RA VI) approved a programme, run by the European Climate Support Network (ECSN), that explores the role of the NMHSs in establishing a mechanism to implement climate services in line with WCC-3 outcomes. The outcomes will be reported at the 9th European Conference on Applied Climatology (ECAC) that will take place in Zurich, Switzerland during 13–17 September 2010. The session programme is organized in alignment with the major components of GFCS.

9.4.3 The Commission agreed that it should continue to support applications of climate for societal benefit, and noted that its work will benefit greatly from the enhanced partnerships with agencies representing key socio-economic sectors, and with relevant boundary organizations, developed through the Climate User Interface Programme (CUIP) component of the GFCS. The Commission noted that development of CUIP could benefit from guidance based on existing national adaptation programmes.

9.4.4 The Commission acknowledged that the effective assessment and management of climate risk requires an understanding of the complex interplay between the climate factors and the vulnerability of the affected sector. The Commission urged the OPACE on Climate Information for Adaptation and Risk Management to consider, as available, vulnerability information, both physical and socio-economic, as a critical factor in their discussions. The Commission further recognised that effective communication of this advice is dependent on an understanding of the user needs and experiences and encouraged the OPACE to work effectively with the users to develop the appropriate advice.

9.4.5 In this regard, the Commission agreed on a number of long-term priorities required to underpin development of tailored climate information, products and services for user application for climate risk management and adaptation, and to facilitate effective use of this information:

- (a) Interdisciplinary knowledge, which requires applied climate research for a range of socio-economic applications;
- (b) Understanding of the user requirements for climate and applied climate information;

- (c) Demonstrations of the benefits of the use of climate information in decision-making including disaster risk reduction;
- (d) Sharing of best practices in applying climate information and products to decision-making in various socio-economic sectors;
- (e) Education, training and awareness-raising for both providers and users of climate information, including aspects of communication particularly with the policymakers and the media;
- (f) Useable regional and national scale information and products based on sound climate science and on scale-relevant climate prediction and projection products;
- (g) Authoritative advice to users on effectively using climate variability and change information in decisions related to climate risk management and adaptation.

9.4.6 Members noted that, in the agriculture and water sectors, WMO through its Technical Commissions on Hydrology and Agricultural Meteorology (CHy and CAgM, respectively) has developed certain programmes that share information, knowledge and best practices in these fields. Further, WMO has long-standing and effective relationships with the Food and Agriculture Organization (FAO), the World Food Programme (WFP) and with the United Nations Educational, Scientific and Cultural Organization (UNESCO). To take advantage of the unique position of WMO in these sectors, and recognizing the high priority global needs for food and water security, the Commission agreed that a special emphasis should be placed on development of more guidance materials on best practices in the use of climate information for climate adaptation and risk management in water resources and agriculture, through the development of user-targeted products. The Commission agreed that efforts should be made to enhance capacity at the national level to produce and disseminate products targeted to user needs in support of climate adaptation and risk management, to enable a better understanding of the impacts of climate variability and change on agriculture and water resources within the countries.

9.4.7 The Commission noted that with respect to applications of climate in other sectors (e.g. health, sustainable energy, tourism, transportation, biodiversity, natural resources management, sustainable cities, land management, oceans and coastal community, etc.) WMO largely interacts with sectoral users through joint activities with various UN Agencies and other Inter-governmental organizations and non-governmental organizations at the global level. In terms of addressing the relevant priorities of these sectors in a more comprehensive manner than has been achieved in the past, the Commission recognized that the CUIP of the GFCS would substantially address the development of the functional partnerships needed between climate scientists; sector-specific and multi-disciplinary scientists; academia; sector-focused agencies including WHO, UNEP, UNWTO, etc.; the IPCC; co-sponsored Programmes (WCRP and GCOS); WMO's Public Weather Services Programme and Non-Governmental Organizations (e.g., IFRC); as well as for the interdisciplinary data, information and knowledge needed for development of user-targeted products.

9.4.8 The Commission noted that for the next intersessional period, in addition to enhancements to the systems for development and delivery of information, products and services (see agenda item 9.3), it would focus particularly on several key areas of work (listed below), and would closely follow developments in implementation of the GFCS to identify additional priorities for consideration, as requirements are identified. For the upcoming intersessional period, the Commission agreed to work with appropriate partners to undertake the following, as a contribution to the GFCS activities related to interface with user sectors:

- (a) Extension of the systematic, well-organized and highly respected approach of the Joint CCI/JCOMM/WCRP Expert Team on Climate Change Detection and Indices (ETCCDI) and building on their current set of climate indices through collection and/or development of new climate-relevant indices of particular relevance to sectoral applications at national and regional scales, for which it will be possible to establish time series including historical data, in order to bring out the variability and trends, noting the need of decision-makers to access and apply socio-economic information for climate risk management and adaptation;

- (b) Promotion and enhancement of user participation in Regional Climate Outlook Forums (RCOFs) and in post-COF Internet-based open Forums; and facilitation of development of user-specific outlook forms led by user agencies (e.g. Malaria Outlook Forums (MALOFs) and Hydrological Outlook Forums (HYDROFs)) to provide sectoral outlooks that take climate outlooks into account;
- (c) Development of joint (e.g., inter-agency, inter-commission (e.g. CCI-CBS)) information documents on the sensitivity of various sectors to climate variability and change and the use of climate information for risk management and adaptation in sectoral activities, for awareness raising and development of the knowledge base;
- (d) Development of case studies that demonstrate the benefits of the use of climate information and knowledge in sectoral decision-making;
- (e) Development of processes and information that objectively determine best practices for the provision of climate risk forecasts, decision-support systems and climate information in decision-making;
- (f) Development of case studies that demonstrate the value of integrated climate information for supply-chain management needs.

9.4.9 The Commission therefore adopted [Resolution 6 \(CCI-XV\) – Climate information for adaptation and climate risk management](#).

10. FOLLOW-UP TO THE WORLD CLIMATE CONFERENCE-3 (*agenda item 10*)

10.1 The WCC-3 Conference Declaration, adopted by the high-level segment, decided to establish the GFCS to strengthen the production, availability, delivery and application of science-based climate prediction and services. The WCC-3 Declaration further decided that a taskforce, consisting of high-level independent advisors (expected to be set up through an intergovernmental process), would recommend the proposed elements of the Framework. The taskforce is also asked to propose next steps for developing and implementing the Framework.

10.2 Subsequent to these decisions, WMO has taken steps to organize an Intergovernmental Meeting of Member States (hereafter the IGM-GFCS). The IGM-GFCS reviewed the draft terms of reference of the High-level Task Force on the Global Framework for Climate Services (HLT-GFCS), and its composition, as proposed by the Secretary-General. The Commission noted the establishment of the HLT-GFCS and its terms of reference by the IGM-GFCS, and requested the CCI Management Group (CCI-XV) to take into account the recommendations of the HLT-GFCS in the conduct of its work, as and when they were made.

10.3 The Commission was informed that in June 2009, acting upon the request made by EC-LXI, the Secretary-General initiated steps within the Secretariat to prepare a draft Position Paper articulating how WMO Programmes should become core elements of the GFCS, especially through the unique capabilities and capacities of the NMHSs, and to actively promote these contributions as elements of the proposed GFCS. The first draft of this Position Paper was reviewed at an extraordinary session of the Executive Council Working Group on Climate and Related Weather, Water and Environmental Matters (ECWG-CWE) (21–23 October 2009, Geneva).

10.4 The Commission noted that the ECWG-CWE recommendations on the Position Paper included considering climate monitoring as an integral element of the CSIS (instead of considering it in conjunction with observations), and ensuring that all operational prediction activities would be described under the CSIS. The new proposed components of the GFCS, being proposed in the revised Position Paper, are: (i) Observations; (ii) Climate Research, Modelling and Prediction; (iii) the CSIS; (iv) the Climate User Interface Programme (CUIP); and (v) Capacity-building. The Commission noted with satisfaction that the relevant programmes and activities of the WCP have

been adequately reflected in the Position Paper, ensuring a strong role for CCI in supporting the various components of GFCS as follows:

- (a) To guide the Members' activities in climate observations in collaboration with CBS, CIMO, WWW, WMO Space Programme and the GCOS-SC, with particular emphasis on the quality and standards aspects of all type of observations, including in-situ, remote sensing and space based observations needed in climate monitoring, applications and services;
- (b) To guide Members in establishing high quality climate data management systems with improved capabilities in climate data archiving, management and exchange, to meet the quality, timeliness and completeness as needed by the various functions of the GFCS;
- (c) To support the development, operations and coordination of CSIS activities of the Members for the provision of actionable climate information, predictions and products, in collaboration with CBS, relevant WMO Programmes (WWW, DRR, etc.) as well as with partners at global and regional levels;
- (d) To promote improved modelling and prediction, particularly on regional and national scales, in assessing model uncertainty and predictive skill and to facilitate transfer of research achievements into operational practice, in collaboration with WCRP and other relevant programmes, CAS and other technical commissions as well as with partner organizations and international and regional research projects and initiatives;
- (e) To help design and develop climate information products needed by governments and society for decision support related to climate risk management and adaptation to climate change, jointly with CAgM, CHy, UN agencies and other sectoral partners through the CUIP;
- (f) To develop and implement a strategy on capacity-building for climate services in collaboration with ETRP, and advise on the associated requirements and needs in developing countries, particularly at the regional and national levels.

10.5 The Commission agreed that the priorities for its future activities and work programme described in CCI-XV agenda items 6–11 and 13 were supportive of implementation and effective operation of the GFCS. It recognized, however, that focused funding for some activities would be required for the Commission to meet the key objectives in the timeliest fashion.

10.6 The Commission recognized that, once established, the GFCS high-level task force is likely to require expert technical inputs. It urged that the CCI Management Group should extend its full support to meet these needs and should fully utilize the skills and knowledge of the Members of all four OPACEs. The Commission also recognized that subsequent to the report of the high-level task force the Commission may have to focus urgent attention on certain technical matters. It therefore authorized the president, through its Management Group, to make suitable changes in the workplan as required. Therefore, the Commission agreed that the Terms of Reference of the CCI Management Group shall include appropriate support to meet the requirements of the GFCS high-level task force and undertake new activities and update or revise the priorities of the activities in its workplan. In this regard, the Commission urged Members to support the Commission in efficiently contributing to the work of the GFCS high-level task force, and requested the Secretary-General to facilitate greater involvement of the Commission in such work, to the extent possible.

11. CAPACITY-BUILDING (*agenda item 11*)

11.1 The Commission noted with satisfaction the various achievements during the previous intersessional period towards enhancing the capacity of NMHSs in various aspects of climate activities. It welcomed the WCC-3 emphasis on efficient and enduring capacity-building through education, training and strengthened outreach and communication in climate services. The expert segment of WCC-3 had clearly noted the need for capacity-building in every possible sense – on climate variability and change and natural hazards; on climate knowledge; on resilience and

adaptation; for climate professionals, young scientists, students at all levels; for user communities in climate-sensitive sectors; for infrastructure, tools and manpower, etc. The Commission considered the important progress made in developing Regional Climate Centres (RCCs) in which training in the use of RCC products and effective climate services on regional levels is an important part of their mandatory functions.

11.2 Considering that capacity-building is an overarching requirement among all the areas of work of the Commission, Members agreed that the Commission should have a comprehensive strategy clearly defining all the key elements and articulating the aspects to be covered, including climate data management, interpretation of seasonal forecast, generation of climate information and products and service provision.

11.3 Noting that the strategy in capacity-building should have a well-defined implementation plan with adequate and complementary representation of its activities in close liaison with other relevant programmes, bodies and activities, the Commission agreed that an action plan for the Capacity-building for Climate Services should be developed and urged the CCI Management Group to oversee its implementation in working towards enhanced capacities of NMHSs to efficiently produce and deliver climate products and services in close collaboration with other technical commissions and the Executive Council Working Group on Capacity-building. The Commission, through [Resolution 7 \(CCI-XV\) – Capacity-building for climate services](#), endorsed this approach.

12. ELECTION OF OFFICERS (*agenda item 12*)

12.1 The Commission established a Nomination Committee chaired by Mr Bruce Angle (Canada) and composed of Mr Suresh Boodhoo (Mauritius), Mr A. L. Koppar (India), Ms Monica Marino (Argentina), Mr Tan Huvi Vein (Malaysia) and Mr Philippe Dandin (France) under agenda item 2.

12.2 Mr Thomas Peterson (United States) was unanimously elected president of the Commission.

12.3 Mr Serhat Sensoy (Turkey) was unanimously elected vice-president of the Commission.

13. COMMISSION FOR CLIMATOLOGY WORKPLAN AND FUTURE STRUCTURE (2010–2014) (*agenda item 13*)

Factors influencing the work and priorities of the Commission

13.1 The Commission recognized that it had special responsibilities to advise and guide WMO's activities within the World Climate Programme, particularly the World Climate Applications and Services Programme and the World Climate Data and Monitoring Programme, in collaboration with other WMO Technical Commissions as needed. With respect to coordination and management of cross-cutting initiatives, CCI noted the participation of the president of CCI in the WMO Meetings of Presidents of Technical Commissions, in the World Climate Research Programme (WCRP) Joint Scientific Committee, and the Global Climate Observing System (GCOS) Steering Committee. The updated vision and mission statements for the Commission were adopted in Resolution 1 (CCI-XV), and the Commission recommended changes to its Terms of Reference for consideration and approval by EC-LXII (2010) and Congress XVI (2011) in Recommendation 1 (CCI-XV).

13.2 The Commission recognized that its work programme for the upcoming intersessional period would be expected to be aligned to support implementation of the Global Framework for Climate Services (GFCS), the outcome of the World Climate Conference-3, particularly with respect to its work that deals with the applications of climate services to various socio-economic sectors.

13.3 The Commission agreed to examine the updated GCOS Implementation Plan 2010 in support of UNFCCC and consider support, as appropriate, to actions relevant to the work of the Commission.

13.4 The Commission agreed on the importance of following Quality Management principles, rooting its efforts in a 'results based management (RBM) approach', and of taking the WMO Strategic Plan into consideration in its work programme.

13.5 The Commission noted the importance of factoring in regional needs and considerations on the development of the draft CCI work programme 2010–2014, and appreciated that the CCI Management Group, during its last session, had invited the chairs of the Working Groups on Climate-related Matters and other representatives of the regional associations to assist in planning for the CCI fifteenth intersessional period. The Commission expressed the need to draw upon the activities of the regional working groups while designing and implementing the Commission's programme of activities. The Commission further noted that the workplan 2010–2014 would factor in any ongoing activities from the fourteenth intersessional period that needed to be completed, the recommendations of the MG, and recommendations made during the Technical Conference on Changing Climate and Demands for Sustainable Development held just before CCI-XV.

13.6 The Commission particularly noted the importance of the authenticity, integrity and reliability of the outcomes of its work, and strongly agreed that its management and technical bodies be constituted so as to ensure that the highest possible level of expertise is available to carry out the CCI work programme. With technical expertise, experience and leadership as the key factors in the selection of candidates for these roles, the Commission further agreed that gender, regional balance and discipline should be taken into account wherever possible.

13.7 The Commission agreed that it was important to disseminate the outputs from the work of the Commission (reports, proceedings, recommendations, decisions, guidance documents, software, etc.) freely and in a timely manner. The Commission urged the Secretary-General and Members to support translation of important documents into as many of the working languages of the Organization as possible.

CCI volunteers

13.8 The Commission recognised the role of volunteers in the work of the Commission. To facilitate the participation of a greater number of experts in CCI work, the Commission developed a strategy of Open Panels of CCI Experts (OPACEs), whereby a large pool of volunteers could be developed based on interest and experience. This more flexible approach would address limitations observed in the past with a fixed structure of OPAGS and the embedded Expert Teams and Rapporteurs. The Commission noted that nomination of experts to join the OPACEs could be made at any time during the intersessional period, as per the established WMO procedures.

13.9 The Commission noted that leadership positions within the proposed new CCI structure would require considerable time on the part of the nominated experts. CCI urged its members to not only nominate experts with appropriate backgrounds and expertise from NMHSs and elsewhere as required, but to also (at least for NMHS-based experts) support their work for the Commission as part of their mandates within their normal duties. The Commission appealed to Members to facilitate the participation of experts in the activities of CCI and expressed that participation by a greater number of volunteers (e.g. through the OPACEs) was necessary in the future to enhance the accomplishment of CCI results. It is strongly recommended that a current *curriculum vitae* for each nominee is provided to the Commission for decision purposes.

13.10 With respect to performance measurement of the Commission, the Commission agreed to recognize experts making outstanding contributions to the work of the Commission and to inform the Permanent Representatives of their countries.

CCI structure and programme of work for the fifteenth intersessional period

13.11 The Commission, considering the recommendations of the MG made at its 2009 session and the emerging priorities including through the expected implementation of the GFCS, agreed to establish a new and more flexible structure consisting of following four Thematic Areas of work:

1. Climate data management;
2. Climate monitoring and assessment;
3. Climate products and services;
4. Climate information for adaptation and risk management.

The scope of activities and the long-term priorities for these Thematic Areas are discussed under agenda items 9.1 through 9.4.

13.12 The Commission, having duly considered the performance of its past structures, decided to minimize the number of Expert Teams, and to continue the use of task teams of experts to manage particular tasks and establish Open Panel of CCI Experts (OPACE) for each of the Thematic Areas lead by two co-chairs who would share the responsibility of implementing the work of their Thematic Areas with the support of the experts from the respective OPACE. The membership of the OPACE will be open for the entire intersessional period.

13.13 The Commission decided to establish the CCI MG with a strengthened role by incorporating the highly valued coordination with regional associations on climate activities formerly assigned to an Implementation/Coordination Team (ICT), and to undertake the required guidance and decision-making in matters related to implementation of RCCs, the GFCS, the CCI capacity-building strategy, etc. The membership of the MG will include, in addition to the president and the vice-president, all co-chairs of the OPACEs (i.e. 8 OPACE experts. The Commission took steps to ensure that the CCI MG Membership has representation from all the six WMO Regions.

13.14 Interaction between the CCI MG members will be enhanced, including through increased use of electronic communications. The enhanced interaction is intended to ensure the efficacy of the CCI guiding process, and promote sustained engagement of the Management Group throughout the fifteenth intersessional period. The Commission also emphasized the flexibility needed for the CCI MG to deal with rapidly emerging climate issues and the recommendations of the GFCS task force.

13.15 Accordingly, the Commission adopted [Resolution 8 \(CCI-XV\) – Working structure of the Commission for Climatology](#). This resolution contains three annexes, as follows:

Annex 1:

- Terms of Reference, composition and modes of operation for the Management Group (MG);
- Terms of Reference for the president and vice-president;

Annex 2:

- Terms of reference of the OPACE co-chairs;
- Terms of Reference of the Expert Teams and Rapporteurs under the four OPACEs;

Annex 3:

- Components of the CCI work programme for the fifteenth intersessional period, namely the proposed deliverables for each of the elements of the Commission structure.

13.16 The Commission noted that the deliverables identified in Annex 3 to Resolution 8 (CCI-XV) reflected the priorities identified under agenda items 5 through 11, and in Resolutions 2 (CCI-XV), 3 (CCI-XV), 4 (CCI-XV), 5 (CCI-XV), 6 (CCI-XV) and 7 (CCI-XV). Most of the work will be undertaken on a voluntary basis by the expert(s) involved, but some tasks may be facilitated (e.g. through meetings, etc.) by the Secretariat, or supported through extrabudgetary funding. The Commission urged the co-chairs responsible for a particular Thematic Area to make special efforts to carry out their activities with the active support from the members of the relevant OPACEs, at

the same time keeping in mind the cross-cutting nature of their activities and the need to involve experts from outside their OPACEs as required. The Commission agreed that in the conduct of its activities, it would set specific, measurable, achievable, realistic and time-bound goals. In making those commitments, the Commission recognized that the work of the OPACEs was performed by volunteers, and that it therefore might not be able to complete all of the deliverables identified in Annex 3 to Resolution 8 (CCI-XV). The CCI Management Group, which includes the OPACE co-chairs, would ensure that effort and deliverables were appropriately prioritized so that the attention was first focused on the deliverables with the highest priorities, and those that could be most practically and expeditiously completed, always bearing in mind the limitations in the capacity of the volunteers to undertake work and the need to ensure that they undertook work that was also consistent with the objectives of their home organizations.

13.17 Keeping in view the available resources, the Commission recognized the need to set priorities in its work. The Commission proposed that the deliverables, in principle, be categorized as: (a) 'mission critical', which should be accomplished within the intersessional period and funded mainly from the core budget; (b) 'strategically important', which would be very useful but less critical to achieve during the intersessional period and for which resources could be available from the core budget or might have to be arranged from extrabudgetary resources; and (c) 'discretionary', which would be beneficial but not a high priority for completion during the intersessional period and that, if undertaken, should be funded essentially through extrabudgetary resources.

13.18 The Commission recommended that at the first meeting of the CCI MG following CCI-XV, the MG work with the Secretariat to identify deliverables as mission critical, strategically important or discretionary, with all due consideration for the human and financial resource implications of these decisions. The agreed set of deliverables would then constitute the fundamental component of the CCI workplan for the fifteenth intersessional period. With the prioritized set of deliverables, the co-chairs would establish OPACE workplans in their respective thematic areas; issue calls for contributions using the database of OPACE nominees, as required; would align timing with the upcoming budget and strategic planning decisions of WMO and would align tasks with appropriate volunteers.

13.19 The CCI MG would establish additional teams, groups or rapporteurs (as required) to undertake the tasks identified in Annex 3 to Resolution 8 (CCI-XV), for example for data rescue (DARE), with deadlines that respect the availability of the volunteers, as well as WMO Strategic Plans. Decisions and final workplans will be provided to the CCI MG as quickly as possible by correspondence, after which the MG will take steps to ensure that all critical activities will be completed within the upcoming fifteenth intersessional period and that as many as possible of the other activities for which the human and financial resources can be identified can also be completed.

13.20 With respect to nominated members of the OPACEs, co-chairs, teams, groups and rapporteurs, the Commission agreed to authorize the president, under the advisement of the MG, to propose substitutes should any of those members be unable to serve their full term or unable to devote the required time during the intersessional period. The Commission agreed that the MG would define the procedures for making such substitutions, which should be compatible with established WMO procedures, and share them with the members of the Commission.

13.21 The Management Group, in its work, will develop opportunities for co-sponsorship and cost sharing of events with partners and sponsors, and will conduct as much of the work as possible through electronic means of communication, thus minimizing the costs and environmental impacts of travel, to the extent possible. The Commission urged the Secretary-General to work towards ensuring adequate future support for the World Climate Programme for the timely and efficient administration of Commission activities. The Commission urged that special efforts be made to explore extra-budgetary resources to support its work programme.

13.22 The Commission noted that expertise in both climate science and sectoral knowledge was often available in universities and various boundary organizations, outside of the purview of

the NMHS. Therefore, the Commission agreed to develop and strengthen partnerships with universities and other national institutions through the GFCS Climate User Interface Programme (CUIP). The Commission further noted that its work is expected to fit in with WMO's commitments to the 'UN: Delivering as one' initiative.

13.23 The Commission recognized that it will have to consider its workplan in light of the GFCS and an evolving WMO Strategic and Operating Plan (SOP) 2012–2015 which will be concluded at Congress XVI (2011). Further, there are ongoing discussions on the overall structure of Constituent Bodies that may also affect the future governance of the Commission, e.g. joint meetings of technical commissions, greater integration of systems and networks under WIGOS and greater use of intercommission teams. The Commission requested the MG to keep them apprised of developments in these areas and their potential impact on the CCI workplan and structure.

14. REVIEW OF PREVIOUS RESOLUTIONS AND RECOMMENDATIONS OF THE COMMISSION AND OF RELEVANT EXECUTIVE COUNCIL RESOLUTIONS (*agenda item 14*)

The Commission examined the resolutions and recommendations adopted at its previous sessions that were still in force at the time of the fifteenth session. It also examined those Executive Council resolutions based on previous recommendations of the Commission that were still in force. The decisions of the session were incorporated in [Resolution 9 \(CCI-XV\) – Review of previous resolutions and recommendations of the Commission for Climatology](#) and [Recommendation 2 \(CCI-XV\) – Review of resolutions of the Executive Council based on previous recommendations of the Commission for Climatology](#).

15. ANY OTHER MATTERS (*agenda item 15*)

Other items of concern to the fifteenth session of the Commission had been discussed under the respective agenda items.

16. DATE AND PLACE OF THE SIXTEENTH SESSION (*agenda item 16*)

The Commission noted that the date and place of the sixteenth session would be determined in accordance with Regulation 186 of the General Regulations of WMO.

17. CLOSURE OF THE SESSION (*agenda item 17*)

17.1 In his closing address, the president of the Commission thanked all those who had contributed to the successful completion of the work of the session, in particular the delegates, and the Government of Turkey and the Turkish State Meteorological Service and its Head, Mr Mehmet Caglar, for the excellent arrangements and facilities made available to the Session, as well as the staff of both the WMO and the local Secretariats, including the interpreters, translators and those producing the documents behind the scenes. He congratulated Mr Thomas Peterson and Mr Serhat Şensoy on their election as president and vice-president, respectively, of the Commission for the next intersessional period. He also congratulated the new Chairs of OPAGs and experts and wished them the very best.

17.2 The fifteenth session of the Commission for Climatology closed at 12.03 p.m. on 24 February 2010.

RESOLUTIONS ADOPTED BY THE SESSION

Resolution 1 (CCI-XV)

VISION AND MISSION OF THE COMMISSION FOR CLIMATOLOGY

THE COMMISSION FOR CLIMATOLOGY,

Noting:

- (1) The *Abridged Final Report with Resolutions and Recommendations of the Fourteenth Session of the Commission for Climatology* (WMO-No. 996),
- (2) The *Abridged Final Report with Resolutions of the Fifteenth World Meteorological Congress* (WMO-No. 1026), Resolution 13 (Cg-XV) – World Climate Applications and Services Programme, including the CLIPS project,
- (3) The *Abridged Final Report with Resolutions of the Sixty-first Session of the Executive Council* (WMO-No. 1042),
- (4) The final report of the 2009 Meeting of Presidents of Technical Commissions (Geneva, February 2009),
- (5) The *WMO Strategic Plan* (WMO-No. 1028),
- (6) The outcomes of the World Climate Conference-3 including its declaration on the establishment of a Global Framework for Climate Services (Geneva, 31 August–4 September 2009),
- (7) The report of the CCI Management Group (March 2009),

Recognizing:

- (1) The rapidly increasing demand for effective climate services and the need for the Commission to position itself to take a lead role in the relevant activities,
- (2) The growing needs for improved climate assessment and prediction for risk management, adaptation to climate change and applications in socio-economic growth and sustainable development,
- (3) The long-standing recognition of WMO as the United Nations system's authoritative voice on weather, climate and water,

Considering:

- (1) That the Commission brings together the normative, standard setting and knowledge sharing capacities of a network of climate scientists and other specialists and climate service providers at the global level,
- (2) That the leadership role of WMO and the United Nations Educational, Scientific and Cultural Organization on climate knowledge base under the United Nations "Delivering as One" requires additional input from the Commission within the United Nations system,

Decides:

- (1) To adopt the following as the vision of the Commission:
"To provide world leadership in expertise and international cooperation in climatology";

- (2) To adopt the following as the mission statement of the Commission:

"To stimulate, lead, implement, assess and coordinate international technical activities within WMO under the World Climate Programme and the Global Framework for Climate Services to obtain and apply climate information and knowledge in support of sustainable socio-economic development and environmental protection."

Resolution 2 (CCI-XV)

QUALITY MANAGEMENT IMPLEMENTATION STRATEGY FOR CLIMATOLOGY

THE COMMISSION FOR CLIMATOLOGY,

Noting:

- (1) The decisions taken by the Fifteenth World Meteorological Congress and the Executive Council at its sixtieth session and the adoption of the working arrangements between the International Organization for Standardization (ISO) and WMO in accordance with Resolution 31 (Cg-XV) – Implementation of Quality Management Systems by National Meteorological and Hydrological Services, as an obligation to strive towards the implementation of quality management throughout the Organization, including technical commissions and National Meteorological and Hydrological Services,
- (2) The final report of the third session of the Inter-Commission Task Team on Quality Management Framework, 2008,
- (3) The report of the CCI Management Group (March 2009), emphasizing a Quality Management Framework,
- (4) The outcomes of the World Climate Conference-3 including its declaration on the establishment of a Global Framework for Climate Services (Geneva, 31 August–4 September 2009),

Recognizing:

- (1) That climate observations, climate data management, climate modelling and predictions constitute a domain where a quality management system approach relies on existing foundations through technical documents, guides, manuals, technical regulations and standards,
- (2) The growing needs for improved climate products and services including climate monitoring, climate assessment and prediction for risk management, adaptation to climate change and applications in socio-economic growth and sustainable development,
- (3) The progress made in capacity-building through the Climate Information and Prediction Services (CLIPS) training, Regional Climate Outlook Forums training, climate data management training, regional workshops on climate change indices and regional workshops on climate monitoring including the implementation of climate watch systems,
- (4) The improvement in organizational mechanisms and networking with the establishment of the Global Framework for Climate Services,

- (5) The publication of a series of guidelines and brochures covering a wide range of knowledge, including the World Climate Data and Monitoring Programme guidelines on climate observations, climate data management, data rescue, climate watch systems and climate change indices, the CLIPS curriculum and a number of other related educational material in climate-related fields,
- (6) That the emerging user needs for high-quality climate products and services in a competitive environment, and the evolving requirements of the Global Framework for Climate Services, require National Meteorological and Hydrological Services, Regional Climate Centres and Global Producing Centres including global climate data archiving and monitoring centres to implement a quality management system in the production and management processes of their climate-related activities and processes,
- (7) The need for addressing increased demand by the users for documenting the processes involving the development and generation of climate data, products and services. Applying quality management in climatology would help to establish the required trust and transparency between the providers and users of climate information and services,
- (8) The importance of paying specific attention to promote data exchange globally and regionally to make best use of the available national, regional and global climate databases,

Decides:

- (1) To develop a strategy for implementing quality management in climatology including in the main areas as follows:
 - (a) Climate observations, including in situ and remote-sensing measurements;
 - (b) Climate data exchange, including time-critical and non-real-time exchange through the WMO Information System;
 - (c) Climate database development and maintenance, including global, regional and national databases and homogenized datasets;
 - (d) Climate product generation and development, including climate analysis, climate predictions and climate watch advisories;
 - (e) Climate service delivery, user interaction and promotional activities;
 - (f) Publications including Guidelines and the *Guide to Climatological Practices* (WMO-No. 100);
 - (g) Capacity-building, including educational and training material, curricula and e-learning;
 - (h) Climate and applied climate research;
- (2) To request the CCI Management Group to consider the decisions which will be taken by the WMO Executive Council at its sixty-second session related to Quality Management Framework and the Inter-Commission Task Team on Quality Management Framework recommendations. The following activities should frame the CCI implementation strategy in quality management:
 - (a) Organize a technological watch on quality management developments and report on best practices in quality management in other disciplines and foster their adaptation to National Meteorological and Hydrological Services and Regional Climate Centres, considering the wide spectrum of their level of competency and sophistication in climate activities;
 - (b) Develop an integrated concept for implementation of quality management in the areas of climatology as defined in (1);

- (c) Propose CCI reference documents and practices as candidate subjects for developing new common ISO/WMO technical standards;
 - (d) Report regularly to the president of the Commission and the CCI Management Group;
- (3) To request the CCI Management Group to set up, at an appropriate time during the intersessional period and taking into consideration the decisions of the Executive Council taken at its sixty-second session, an Expert Group on Quality Management for Climatology comprised of co-chairs of Open Panels of CCI Experts and other experts whom the Management Group considers appropriate to call upon for their expertise in quality management. The terms of reference for this Group should be drawn up from quality management activities proposed in (2) (a) to (d). The Management Group should ensure a close interaction with other technical commissions and programmes and Executive Council subsidiary bodies on quality management framework;

Requests the president of the Commission:

- (1) To interact with the presidents of the other WMO technical commissions to integrate their perspectives of QM needs of the various components of climatology to support enhanced climate services, including adequate user interface aspects;
- (2) To ensure that CCI and related activities benefit from other WMO programme experience in the accreditation and certification of services through the ISO/WMO working arrangements;
- (3) To guide quality management in climatology through the CCI Management Group and any other group of the Commission as appropriate;

Requests the Secretary-General to facilitate appropriate inter-programme coordination within, and support by, the Secretariat to ensure an efficient performance of the expert group;

Urges all Members, regional associations and relevant technical commissions, through appropriate arrangements or agreements, to:

- (1) Mobilize national and regional support for the implementation of quality management in climatology;
- (2) Mobilize additional resources required at the regional and national levels for this purpose;
- (3) Facilitate technology transfer to developing countries in implementing quality management in the production and management processes of climate data, products and services.

Resolution 3 (CCI-XV)

DISCONTINUATION OF THE MONTHLY UPPER-AIR CLIMAT TEMP REPORTS

THE COMMISSION FOR CLIMATOLOGY,

Noting:

- (1) The *Abridged Final Report with Resolutions of the Sixtieth Session of the Executive Council* (WMO-No. 1032), general summary, paragraphs 3.5.2.6 and 3.5.2.7 addressing climate-related data exchange/CLIMAT TEMP,

- (2) That the Executive Council at its sixtieth session had requested the Commission to assess the impacts of a possible discontinuation of CLIMAT TEMP on domains such as applied climatology, research and aviation,

Considering:

- (1) The result of the CCI/Secretariat questionnaire sent to all Members to assess the impacts of a possible discontinuation of CLIMAT TEMP on other domains, as requested by the Executive Council at its sixtieth session, and given the overwhelming majority of responses agreeing on the discontinuation of the provision, dissemination and international exchange of CLIMAT TEMP reports,
- (2) The importance of sustaining the provision, timely dissemination, international exchange and monitoring of monthly surface CLIMAT reports for climate monitoring, research and applications,

Decides:

- (1) That the provision, dissemination, monitoring and international exchange of the monthly upper-air CLIMAT TEMP reports shall be discontinued with immediate effect after the final report of the fifteenth session has been issued;
- (2) That the discontinuation of CLIMAT TEMP should not affect in any way the provision, dissemination, monitoring and exchange of the daily upper-air TEMP reports nor the monthly surface CLIMAT reports, which remain critical and essential for the World Weather Watch, the Global Climate Observing System and the World Climate Programme;

Requests the Secretary-General to bring this resolution, through a formal information letter, to the attention of WMO Members, the Commission for Basic Systems, the Global Climate Observing System and the manufacturing industry.

Resolution 4 (CCI-XV)

**FURTHER EVOLUTION OF THE CLIMATE INFORMATION AND
PREDICTION SERVICES PROJECT**

THE COMMISSION FOR CLIMATOLOGY,

Noting:

- (1) The *Abridged Final Report with Resolutions of the Fifteenth World Meteorological Congress* (WMO-No. 1026), Resolution 13 (Cg-XV) – World Climate Applications and Services Programme, including the CLIPS project,
- (2) The *Abridged Final Report with Resolutions of the Sixty-first Session of the Executive Council* (WMO-No. 1042),
- (3) The outcomes of the WMO Conference on Living with Climate Variability and Change: Understanding the Uncertainties and Managing the Risks (Espoo, Finland, 17–21 July 2006),

- (4) The findings of the WMO Conference on Secure and Sustainable Living: Social and Economic Benefits of Weather, Climate and Water Services (Madrid, Spain, 19–22 March 2007) (WMO-No. 1034),
- (5) The outcomes of the World Climate Conference-3 including its declaration on the establishment of a Global Framework for Climate Services (Geneva, 31 August–4 September 2009),
- (6) The report of the Second Regional Climate Outlook Forum Review meeting (Arusha, United Republic of Tanzania, 3–7 November 2008),

Recognizing:

- (1) The progress made in the Climate Information and Prediction Services (CLIPS) project through the development of improved forecasting products and methodologies; the inception of the Global Framework for Climate Services, a global/regional/national cooperative framework for climate product generation; establishment of Regional Climate Centres (RCCs)/RCC Networks; the worldwide expansion of Regional Climate Outlook Forums; user engagement and the provision of technical assistance through training and capacity-building,
- (2) That support to adaptation and climate risk management, essentially through the implementation of the Global Framework for Climate Services, is a key priority for the Commission during its fifteenth intersessional period,
- (3) That national-level activities need to be further strengthened in order to deliver state-of-the-art climate information and prediction products to users, and to enable mainstreaming of this information and knowledge into users' decision systems,
- (4) The global importance of food and water security, the climate sensitivity of both, and the opportunity provided through WMO extensive resources and experience in the Commission for Agricultural Meteorology (CAgM) and the Commission for Hydrology (CHy) to underpin rapid progress in identification of climate services for the agriculture/food security and water resources sectors,

Decides:

- (1) To make proposals in defining the functions of National Climate Centres (for example, to develop and coordinate their technical activities for basic climate data, diagnostics, climate system monitoring, and in many cases long-range forecasts), in close consultation with the Commission for Basic Systems, for their integration into the Global Data-processing and Forecasting System, specifically taking into account existing and emerging Global Producing Centre and RCC products, national needs with various social and cultural backgrounds as well as the further evolution of Regional Climate Outlook Forums;
- (2) To develop the concept of National Climate Services as a potentially efficient mechanism to undertake/coordinate CLIPS activities at the national level and contribute to the Global Framework for Climate Services;
- (3) To prepare and implement an action plan to facilitate the transition of CLIPS into the Global Framework for Climate Services, and to conclude CLIPS as a project by 2015 at the latest;
- (4) To develop and implement a toolbox for generating climate information and prediction products;

Requests the president of the Commission:

- (1) To set up a task team to develop and provide to the CCI Management Group for further action, within the frame of nine months:
 - (a) A set of overall functions of National Climate Centres as part of the Global Data-processing and Forecasting System;
 - (b) An outline for a climate information and prediction services toolbox;
 - (c) A draft action plan for the transition of CLIPS into the upcoming Global Framework for Climate Services;
 - (d) A concept note on National Climate Services, to include proposals for a range of possible structures and coordination mechanisms and clear definitions of climate services, from the perspectives of national programmes, and a range of services to users;
- (2) To specify and refine requirements for, and to demonstrate on the provision of, sector-specific climate services as part of the functions of National Climate Services, through a joint CCI-CAGM-CHy mechanism, in consideration of eventual services for the agriculture/food security and water resources sectors as a first priority;

Requests the Secretary-General to strengthen Secretariat support to the Commission and facilitate appropriate inter-programme coordination within the Secretariat to ensure an efficient performance of the task team;

Urges all Members, regional associations and relevant technical commissions and coordinating bodies of Programmes, through appropriate arrangements or agreements:

- (1) To contribute to the needed activities to allow for an efficient transition of CLIPS into the Global Framework for Climate Services;
- (2) To mobilize additional resources required at the regional and national levels for this purpose.

Resolution 5 (CCI-XV)

ESTABLISHMENT AND OPERATION OF REGIONAL CLIMATE CENTRES WORLDWIDE

THE COMMISSION FOR CLIMATOLOGY,

Noting:

- (1) The *Abridged Final Report with Resolutions of the Fifteenth World Meteorological Congress* (WMO-No. 1026), general summary, sections 3.1 and 3.2,
- (2) The *Abridged Final Report with Resolutions of the Sixty-first Session of the Executive Council* (WMO-No. 1042),

- (3) The outcomes of the World Climate Conference-3 including its declaration on the establishment of a Global Framework for Climate Services (Geneva, 31 August–4 September 2009),
- (4) The *Manual on the Global Data-processing and Forecasting System* (WMO-No. 485), 2009 revised version,

Recognizing:

- (1) The inclusion of a formal mechanism for designation of Regional Climate Centres (RCCs)/RCC Networks into the WMO Technical Regulations, jointly developed by the WMO Commission for Climatology, Commission for Basic Systems and regional associations,
- (2) The designation of Regional Climate Centres in Regional Association II (Asia) and establishment of a pilot RCC Network in Regional Association VI (Europe), and the existing capabilities in the other regional associations to deliver RCC-related services and products, that help to strengthen National Meteorological and Hydrological Services in meeting national (and regional) climate information needs,
- (3) The need to standardize RCC products and services to ensure their consistency and quality, and to establish an oversight mechanism for efficient RCC/RCC Network implementation, designation and operation, in order to ensure a systems approach providing the best possible linkage and most efficient use of global, regional and national climate products and services for the benefit of the end-users,

Decides:

- (1) To develop technical guidance to standardize the mandatory RCC products and services in terms of, for example, methods, format, content, quality, dissemination and regular assessments, fully recognizing the importance of meeting specific needs of respective regions as a priority issue;
- (2) To develop an oversight mechanism, jointly with the Commission for Basic Systems and regional associations, to steer the implementation, designation and effective operation of RCCs/RCC Networks including identification of region-specific technical and procedural issues to be taken into account;

Requests the president of the Commission to set up, as a matter of priority, an expert team to develop, and provide to the CCI Management Group for further consideration, the above-mentioned technical guidance as well as the oversight mechanism, and to closely liaise with the experts of the Commission for Basic Systems, regional associations and RCCs/RCC Networks concerned on this matter;

Requests the Secretary-General:

- (1) To promote a global coverage of RCCs/RCC Networks, particularly keeping in view the needs of developing and least developed countries, through resource mobilization efforts with Members that have the capacity, relevant partnering agencies in the United Nations system and development agencies;
- (2) To facilitate appropriate inter-programme coordination within, and general support by, the Secretariat to ensure an efficient performance of the expert team;

Urges:

- (1) The regional associations, in which implementation of RCCs/RCC Networks has not yet been initiated, to make all possible efforts to accelerate their establishment;

- (2) All Members to support RCC activities, and to use their products and to provide feedback to RCCs/RCC Networks and Global Producing Centres on effectiveness, improvement and tailoring, including the necessary data;
 - (3) The Joint Scientific Committee of the World Climate Research Programme to facilitate closer involvement of the research community in enhancing the RCC product portfolio, particularly with regard to the highly recommended RCC functions, and to increase interaction with RCCs/RCC Networks through relevant regional expert panels.
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Resolution 6 (CCI-XV)

CLIMATE INFORMATION FOR ADAPTATION AND CLIMATE RISK MANAGEMENT

THE COMMISSION FOR CLIMATOLOGY,

Noting:

- (1) *The Abridged Final Report with Resolutions of the Fifteenth World Meteorological Congress* (WMO-No. 1026), general summary, sections 3.1 and 3.2,
- (2) *The Abridged Final Report with Resolutions of the Sixty-first Session of the Executive Council* (WMO-No. 1042),
- (3) The outcomes of the WMO Conference on Living with Climate Variability and Change: Understanding the Uncertainties and Managing the Risks (Espoo, Finland, 17–21 July 2006),
- (4) The findings of the WMO Conference on Secure and Sustainable Living: Social and Economic Benefits of Weather, Climate and Water Services (Madrid, Spain, 19–22 March 2007) (WMO-No. 1034),
- (5) The outcomes of the World Climate Conference-3 including its declaration on the establishment of a Global Framework for Climate Services (Geneva, 31 August–4 September 2009),

Recognizing:

- (1) The establishment of a Global Framework for Climate Services by the World Climate Conference-3 to strengthen the production, availability, delivery and application of science-based climate prediction and services,
- (2) The existing national and international technical and institutional capability to develop and deliver climate information, products and services that are required by decision-makers in governments, in climate-sensitive sectors and by the public,
- (3) The progress made in building effective inter-agency, inter-commission, interdisciplinary and international partnerships for applications of climate information to societal needs,
- (4) That the needs of the various user communities are diverse, including regional and gender aspects,

- (5) The need of decision-makers to access and apply socio-economic information for climate risk management and adaptation,

Decides:

- (1) To support provision of climate information and products in a manner that facilitates their effective use in the decision support systems, climate risk management and longer-term climate adaptation strategies of key socio-economic sectors;
- (2) To support standardized assessments of the impacts of climate variability and change in, and development of tailored climate information and products for, socio-economic sectors, in close coordination with partner agencies and to work with the Commission for Agricultural Meteorology and the Commission for Hydrology to undertake these tasks for the agriculture and water sectors as a priority;
- (3) To contribute to quantification of the social and economic benefits of climate information and products to various sectors, in collaboration with the concerned sectoral agencies;
- (4) To pursue new opportunities relevant to user engagement through sectoral partners and other technical commissions in close alignment with the implementation of the Global Framework for Climate Services;
- (5) To promote worldwide sharing of best practices in applying climate information and products to decision-making in various socio-economic sectors;

Requests the president of the Commission:

- (1) To develop guidance on and to promote establishment and operation of sector-focused outlook forums led by sectoral agencies in conjunction with Climate Outlook Forums, particularly the water resources management and agriculture/food security sectors, and to invite the participation and support of all relevant agencies, organizations and WMO technical commissions, particularly the Commission for Hydrology and the Commission for Agricultural Meteorology;
- (2) To set up, as a matter of priority, an expert team to develop the methods and tools, standardized software and associated training materials required to produce sector-specific climate indices for systematic assessment of the impact of climate variability and change, and to invite the participation and support of all relevant agencies, organizations and WMO technical commissions;
- (3) To develop, in partnership with relevant socio-economic sectors and United Nations agencies, information notes on the sensitivity of various sectors to climate variability and change and the use of climate information in climate risk management and adaptation by specific sectors;
- (4) To facilitate development of case studies relevant to quantifying the social and economic benefits of using climate information, products and services;

Requests the Secretary-General:

- (1) To facilitate resource mobilization efforts to support collaborative/joint activities leading to more effective user engagement, particularly keeping in view the needs of developing and least developed countries;
- (2) To provide strong support to the Commission in these efforts and to facilitate appropriate inter-programme and inter-commission coordination within, and general support by, the Secretariat;

- (3) To facilitate the required partnerships, particularly within the United Nations system, for sharing of multidisciplinary information required for climate risk management;

Urges the Members:

- (1) To contribute to the development of national multidisciplinary information and indices and exploration of best practices in the application of climate information through inter-agency efforts;
- (2) To develop and foster partnerships and collaborations between National Meteorological and Hydrological Services and national user groups, particularly through regional and national climate outlook forums;
- (3) To facilitate the development of sector-specific outlook forums by providing the required climate inputs and guidance.

Resolution 7 (CCI-XV)

CAPACITY-BUILDING FOR CLIMATE SERVICES

THE COMMISSION FOR CLIMATOLOGY,

Noting:

- (1) *The Abridged Final Report with Resolutions of the Fifteenth World Meteorological Congress (WMO-No. 1026), Resolution 13 (Cg-XV) – World Climate Applications and Services Programme, including the CLIPS project,*
- (2) *The Abridged Final Report with Resolutions of the Sixty-first Session of the Executive Council (WMO-No. 1042),*
- (3) The outcomes of the WMO Conference on Living with Climate Variability and Change: Understanding the Uncertainties and Managing the Risks (Espoo, Finland, 17–21 July 2006),
- (4) The outcomes of the World Climate Conference-3 including its declaration on the establishment of a Global Framework for Climate Services (Geneva, 31 August–4 September 2009),

Recognizing:

- (1) The progress made in capacity-building through the CLIPS training, RCOF training, climate data management training, regional workshops on climate change indices and regional workshops on climate monitoring including the implementation of climate watch systems,
- (2) The improvement in organizational mechanisms and networking with the establishment/designation of Global Producing Centres for Long-range Forecasts and Regional Climate Centres, which offer great potential for knowledge and technology transfer for National Meteorological and Hydrological Services,
- (3) The publications of series of guidelines and brochures covering a wide range of knowledge including the World Climate Data and Monitoring Programme guidelines on climate observations, climate data management, data rescue, climate watch systems and climate

change indices; the CLIPS curriculum and a number of other related educational material in climate-related fields,

- (4) The growing needs for improved climate products and services including climate monitoring, climate assessment and prediction for risk management, adaptation to climate change and applications in socio-economic growth and sustainable development,
- (5) That National Meteorological and Hydrological Services need to be further strengthened with, inter alia, advanced technology and human resources to become well positioned to support adaptation to climate change, climate risk management and socio-economic development,

Decides to develop a strategy for Capacity-building for Climate Services that supports Members in meeting the current and emerging demands for climate information, products and services;

Requests the Management Group of the Commission:

- (1) To consider the guidance in the annex to this resolution and to further develop and refine the various elements of the Capacity-building Strategy for Climate Services;
- (2) To review the existing WMO mechanisms/procedures for capacity-building and propose revisions/guidelines to address the relevant needs of climate services;
- (3) To develop an implementation plan for the Capacity-building Strategy keeping in view the ongoing developments towards the implementation of the Global Framework for Climate Services;
- (4) To coordinate and liaise on these matters with the relevant WMO Programmes and advisory bodies, particularly the Education and Training Programme, the Executive Council Working Group on Capacity-building and the Executive Council Panel of Experts on Education and Training;

Requests the president of the Commission:

- (1) To interact with the presidents of the other WMO technical commissions and identify a mechanism to integrate their perspectives of capacity-building needs to support enhanced climate services including adequate user interface aspects;
- (2) To guide capacity-building in climatology through the CCI Management Group and any other group of the Commission as appropriate;

Requests the Secretary-General to facilitate appropriate inter-programme coordination within, and support by, the Secretariat for the capacity-building activities;

Urges all Members, regional associations and relevant technical commissions, through appropriate arrangements or agreements:

- (1) To mobilize national and regional scientific and technical support for capacity development;
 - (2) To mobilize additional resources required at the regional and national levels for this purpose;
 - (3) To facilitate technology transfer to developing countries in various climatology applications, in particular generation of climate information and products and service provision.
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Annex to Resolution 7 (CCI-XV)

COMMISSION FOR CLIMATOLOGY: TOWARDS A CAPACITY-BUILDING STRATEGY FOR CLIMATE SERVICES

1. Introduction

Climate science is progressing rapidly and is benefiting from the increased knowledge in climate monitoring, assessment, modelling, seasonal to interannual prediction and long-term climate projections as well as from the fast development of computer technology and Internet access worldwide. Over the last two decades there has been an increasing demand to reduce the impact of climate-related hazards and to exploit opportunities afforded by climate as a resource. This requires translating scientific knowledge and technological progress, through climate services, into societal benefit and well-being of ecosystems. The importance of capacity-building has been highlighted in the Conference Statement of the World Climate Conference-3, which recommended capacity-building to be included as a key component of the Global Framework for Climate Services (GFCS).

The Commission for Climatology, over the years, has been engaged in a variety of training activities towards enhancing the capacity of National Meteorological and Hydrological Services (NMHSs) in various aspects of climate activities, including the regional/thematic training workshops under the Climate Information and Prediction Services (CLIPS) project, the training component of Regional Climate Outlook Forums (RCOFs), implementation of Climate Data Management Systems (CDMSs), development of knowledge on climate extremes and indices, homogenization of climate time series, data rescue, regional workshops on climate monitoring and climate watch systems, and user awareness activities. With the new challenge posed by increasing climate variability and climate change and its likely impacts on the safety and well-being of human beings and ecosystems, the time is now ripe to consolidate the gains of these early initiatives, address the gaps and build a WMO-wide comprehensive strategy with the overarching goal of mainstreaming, standardizing and strengthening capacity-building at various levels within the Global Framework for Climate Services. The following sections provide an outline for the CCI Capacity-building Strategy for Climate Services.

2. Basic requirements

The strategy for capacity-building should provide a unifying context for a range of capabilities required for providing comprehensive end-to-end climate services of increased societal relevance focusing on development of regional and global support mechanisms for building the capabilities of NMHSs required to play a core role in the implementation of GFCS. The strategy should facilitate the development and implementation of training programmes and events as well as the establishment and strengthening of climate information infrastructure for climate service providers to:

- Prepare reliable and relevant climate information and assessments;
- Provide predictions at monthly and longer timescales;
- Provide required interpretation for specific socio-economic sectors through a provider–user interface;
- Educate and advise policy- or decision-makers on climate matters;
- Provide interface for the effective transmission of climatic and methodological information with special attention to web technologies.

Framing the strategy for capacity-building in climate services involves consideration of the basic requirements of and best practices for:

- Climate observations, including standards for their collection and exchange;
- Climate data management and quality control;
- Data rescue and digitization;
- Product development including climate diagnostics, analysis and summaries;
- Seasonal, annual and multi-decadal predictions including workplan and downscaling;
- Developing interface with various application sectors.

3. Components of the CCI Capacity-building Strategy for Climate Services

In order to assist NMHSs to meet these basic requirements, the capacity-building strategy should have certain core components addressing the common needs.

3.1 Institutional mandate in climatology

National Meteorological and Hydrological Services and their partners will need to have clear roles and responsibilities within the national context to undertake actions such as climate data management, climate monitoring and assessment, climate prediction and projection, and development of tailored climate products for various sectors in order to provide end-to-end climate services for various sectors of the economy and sections of society. An adequate mandate to take up the appropriate roles is important for an effective implementation of climate services and related activities. In some cases these roles would extend beyond national boundaries and encompass a lead role at the global and/or regional levels, for example, Global Producing Centres for Long-Range Forecasts (GPCs), Regional Climate Centres (RCCs) and Regional Training Centres (RTCs).

Achievement of this mandate could require a range of institutional reforms or reorganizations that facilitate flexibility and networking with user organizations to effectively respond to the wide varieties of required climate services. The strategy will facilitate the approach for developing an institutional mandate of climate services, which would ensure a sustained flow of knowledge and sharing of data, products and services with the required quality and timeliness for the benefit of all Members.

3.2 Establishing and strengthening climate infrastructure

Adequate financial support is needed for maintaining and strengthening the capacity of NMHSs and also for establishing and strengthening national, regional and global climate-related infrastructures to generate and disseminate climate products and services. Members will be required to take up a major share of the challenge of developing these infrastructures and strengthening their own capacity.

To enable global access to national, regional and global climate products and services, NMHSs will require robust and advanced information processing, storage and communication technologies (such as Internet and wireless satellite-based telecommunication), and remote and parallel computing facilities. This infrastructure will be required for Members to reap the full benefit from the wide range of international efforts to operationally produce global, regional and national climate products.

The data and products related to climate services can be exchanged through the WMO Information System that provides international standards needed to interface climate data with non-climate socio-economic data for the multidisciplinary products and climate services designed to benefit society.

Members need to work towards strengthening the capacity of RCCs and NMHSs to develop and deliver the full suite of climate data, products and services including climate predictions and projections at all possible and relevant space-time scales, as well as climate watch advisories and early warnings, targeting the needs of national sectoral agencies. In this regard, it is important to

recognize the special needs for, inter alia, transfer of advanced technology and skills to developing and least developed countries including small island development States, and particularly vulnerable regions such as Africa, as highlighted by the United Nations Framework Convention on Climate Change and its Bali Action Plan.

The strengthening and provision of support to NMHSs, regional and subregional climate centres will improve their services in the production of forecasts for climate extremes and seasonal to interannual outlooks.

3.3 Human resource development

The CCI capacity-building strategy should include a process for identifying new and ongoing requirements for education and training at the national and regional levels. A particular emphasis is to be placed on updating climate curricula at WMO Regional Training Centres to incorporate the new advances in climate sciences, applications and services. Sustained efforts are required to upgrade human skills in, for example, climate data management, climate statistics and diagnostics techniques, climate prediction, climate monitoring and climate watch and early warning systems.

Communication with users through wider access to education and training utilizing appropriate methodologies such as traditional training workshops (for example, CLIPS, CDMS, data rescue, and climate change detection and indices) as well as distance learning through modern communication technologies, manuals, guidance and best-practice documents, technical papers and fellowships is critical to the overall success of the strategy.

Members need to optimally utilize education and training resources within their countries such as universities, research institutes and other academia, as well as accessing WMO RTCs. National Meteorological and Hydrological Services need effective mechanisms to obtain practical techniques to generate climate information and products in alignment with products of GPCs and RCCs as well as expertise in climatology. At the regional and global levels, collaboration on developing e-learning facilities such as the WMO/Met office e-learning system needs to be encouraged and expanded. Further development of CLIPS curriculum and also regular updates of its components are of particular importance in this regard. This will allow a sustained mechanism for advanced training and complement the face-to-face regular training with focus on the specific domain of climatology.

Users also require education and real-time assistance to better understand their own vulnerability to climate, climate services and how to effectively use and derive benefits from these. Therefore, the need for provider-user platforms, particularly at the national level, for example, national forums, is to be adequately addressed. The approach taken by the WMO Space Programme to a similar problem through the development of the WMO Virtual Laboratory for Education and Training in Satellite Meteorology is a useful example to be considered while determining an effective approach to dealing with education and training in climate-related matters.

3.4 Qualification and certification of climatologists

Keeping in view the need for the provision of improved climate products and services through the GFCS leading to decision-making and actions on the ground, which induce risks and costs for the users, it is important that such products and services are provided by qualified climatologists or trained climate officers. There should be well-defined minimum qualifications and a certification process in the education and training in various aspects of climatology, climate services and related fields, with reviewing ongoing related education and training at the national level and capabilities of climatologists at NMHSs. To ensure an appropriate certification process it is necessary to adopt a quality management system. In the context of the GFCS and the current attention to climate risk management and adaptation to climate change, there is a need for WMO to work with its partners to better define what qualifications and experience a climatologist, climate services specialist, climate prediction expert, etc., should have, and also work towards a common terminology for designating such personnel within the climate services.

4. Approach towards the implementation of a Capacity-building Strategy

4.1 Resource mobilization

In order for a CCI capacity-building strategy to succeed, Members should give high priority to providing support to the capacity-building needs of NMHSs. Further, concerted efforts should also be made for resource mobilization to seek support from development and cooperation agencies, regional economic groupings, etc., to help raise funding for developing a climate-related infrastructure primarily at the regional level (for example, development of RCCs and RTCs and organization of regular RCOFs) and at the national level within the least developed countries and small developing islands States. Capacity-building activities will also benefit from appropriate alignment with major institutional programmes related to climate change and adaptation, such as ClimDev–Africa led by the African Union and the Economic Commission for Africa. Capacity-building needs should be integrated into climate-related projects with extrabudgetary support, with explicit allocations to training activities.

4.2 Development of an action plan

The elements of the Capacity-building Strategy for Climate Services outlined above need to be further developed and refined, and a comprehensive action plan be developed by the CCI Management Group covering all the key aspects in a complementary manner. The following are some specific items of work that may be considered for inclusion in the action plan:

- (a) Review and adapt climate components of the publication entitled *Guidelines for the Education and Training of Personnel in Meteorology and Operational Hydrology* (WMO-No. 258) to suit the new requirements of GFCS for climate information and services, and climate change adaptation as well as climate risk management;
- (b) Develop a guidelines resource for WMO RTCs in building new climate curricula, including theoretical and practical components, based on the latest edition of the *Guide to Climatological Practices* (WMO-No. 100), for example, on basic climatology, climate statistics (including extreme value analysis), data representation techniques, data management, data rescue, quality assurance/quality control methods, homogeneity techniques, techniques for empirical and dynamical climate prediction and downscaling, climate change assessment methods and consensus development;
- (c) Review the current status of requirements and competencies of a climate specialist's functions and propose an update of these requirements based on the evolving techniques in climate observations and monitoring (land, marine, remote-sensing as well as space-based platforms), climate assessment, workplan, climate predictions and projections;
- (d) Identify optimal mechanisms for certifying competencies and functions of climate specialists of varying types based on existing similar examples in other WMO-related activities;
- (e) Promote "training the trainers" activities to spread the training capability across the Regional Training Centres;
- (f) Provide expert climatologists for short periods to countries willing to set up a National Climate Centre as part of the CCI action plan and capacity-building strategy.

Further, it is important that the action plan be developed in close liaison with the relevant programmes and activities within WMO as well as those with partners, to ensure that the capacity-building strategy contributes effectively to achieve completeness and consistency of climate services in their functioning as well as uptake.

Resolution 8 (CCI-XV)**WORKING STRUCTURE OF THE COMMISSION FOR CLIMATOLOGY**

THE COMMISSION FOR CLIMATOLOGY,

Noting:

- (1) The *Abridged Final Report with Resolutions of the Fifteenth World Meteorological Congress* (WMO-No. 1026),
- (2) The outcomes of the WMO Conference on Living with Climate Variability and Change: Understanding the Uncertainties and Managing the Risks (Espoo, Finland, 17–21 July 2006),
- (3) The findings of the WMO Conference on Secure and Sustainable Living: Social and Economic Benefits of Weather, Climate and Water Services (Madrid, Spain, 19–22 March 2007) (WMO-No. 1034),
- (4) The outcomes of the World Climate Conference-3 including its declaration on the establishment of a Global Framework for Climate Services (Geneva, 31 August–4 September 2009),
- (5) The report of the CCI Management Group (March 2009),

Considering:

- (1) The need to align the activities of the Commission with the WMO Strategic Plan and its results-based management approach,
- (2) The WMO efforts towards meeting the needs of developing countries,
- (3) The need to be flexible and adaptable to new priorities to support the eventual recommendations of the High-level Task Force on the Global Framework for Climate Services (GFCS),
- (4) The need to follow the principles of the WMO Quality Management Framework,
- (5) The strategic directions agreed to by the Commission at its fifteenth session in agenda items 5 to 11 and related resolutions,
- (6) The WMO commitments to the United Nations “Delivering as One” initiative,
- (7) The WMO pledge to the United Nations Framework Convention on Climate Change Nairobi work programme on impacts, vulnerability and adaptation to climate change,

Decides:

- (1) To closely align the Commission work programme and activities for the upcoming intersessional period to support implementation of the five components of the proposed Global Framework for Climate Services and to respond to emerging priorities as and when determined by the High-level Task Force on the Global Framework for Climate Services;
- (2) To adopt the working structure of the Commission, with immediate effect, as follows:

- (a) CCI Management Group;
 - (b) Open Panel of CCI Experts (OPACE 1): Climate Data Management;
 - (c) OPACE 2: Climate Monitoring and Assessment;
 - (d) OPACE 3: Climate Products and Services and their Delivery Mechanisms;
 - (e) OPACE 4: Climate Information for Adaptation and Risk Management;
- (3) To further adopt expert teams, groups and rapporteurs as follows:
- (a) Expert Group on Quality Management for Climatology (members to be selected from within the CCI Management Group and taking into consideration the decision of the Executive Council at its sixty-second session on Quality Management Framework);
 - (b) Expert Team on Climate Database Management Systems (reports to OPACE 1);
 - (c) Joint CCI/CLIVAR/JCOMM Expert Team on Climate Change Detection and Indices (reports to OPACE 2);
 - (d) Rapporteur on World Records of Weather and Climate Extremes (reports to OPACE 2);
 - (e) Expert Team on Regional Climate Centres (reports to OPACE 3);
 - (f) Expert Team on Climate Risk and Sector-specific Climate Indices (reports to OPACE 4);
- (4) To align the work of the Commission to the structure of the Global Framework for Climate Services as follows (noting the interrelationships between all five pillars of the Framework and the subsequent required interrelationships between the CCI OPACEs):
- (a) OPACE 1 will support the GFCS Observations component, and the GFCS Climate Services Information System;
 - (b) OPACE 2 will support the GFCS Climate Services Information System and, to some extent, both the GFCS Climate Research, Modelling and Prediction component and the GFCS Climate User Interface Programme;
 - (c) OPACE 3 will support the GFCS Climate Services Information System and, to some extent, the GFCS Climate Research, Modelling and Prediction component;
 - (d) OPACE 4 will support the GFCS Climate User Interface Programme;
 - (e) OPACEs 1 to 4 and relevant components of the CCI Management Group will support GFCS capacity-building;
- (5) To adopt the terms of reference, composition and mode of operation for the CCI Management Group, and the terms of reference for the president and the vice-president as contained in Annex 1 to this resolution;
- (6) To adopt the terms of references of the co-chairs of OPACEs and of the expert teams and rapporteurs of these bodies as contained in Annex 2 to this resolution;
- (7) To adopt the key components of the workplan for the fifteenth intersessional period, including proposed deliverables for each of the elements of the Commission structure, as contained in Annex 3 to this resolution;

Authorizes the president to activate the work of the OPACEs, expert teams and rapporteurs in accordance with priorities agreed by the Commission and the CCI Management Group, and taking into account the availability of necessary resources;

Authorizes further the president, with the assistance of the CCI Management Group, to establish during the intersessional period expert teams and rapporteurs, additional to those agreed by the Commission during its fifteenth session, if a requirement has been established, especially once recommendations of the High-level Task Force on the Global Framework for Climate Services on proposed elements of the Framework are made available, or to disband those of which the tasks have been completed;

Requests the president of the Commission, with the assistance of the CCI Management Group, to keep the impact and effectiveness of the amended working structure under review and to provide an interim intersessional report to members of the Commission and a final report at its next session;

Requests further the Secretary-General to arrange, within available resources, a level of support for the structure of the Commission that will facilitate the participation of the members of the CCI Management Group, OPACEs and expert teams and of the rapporteurs, and to provide a level of support that will enable completion of effective and useful deliverables as noted in Annex 3 to this resolution.

Annex 1 to Resolution 8 (CCI-XV)

MANAGEMENT GROUP OF THE COMMISSION FOR CLIMATOLOGY

1. Terms of reference of the Management Group of the Commission for Climatology

- (a) Review and decide upon priorities for the tasks to be undertaken by the Open Panels of CCI Experts (OPACEs), and by the expert teams/groups and rapporteurs reporting directly to the CCI Management Group, especially those necessary to fulfil the WMO role in the operational implementation of the Global Framework for Climate Services; endorse workplans, taking into account recommendations of the Commission at its fifteenth session and the resource implications; assess and evaluate the progress achieved and provide continuing guidance on timescales for their work and outputs;
- (b) Keep under review the internal structure and working methods of the Commission and make adjustments to the working structure in the intersessional period including the establishment, activation or disbanding of teams and rapporteurs as necessary; ensure that procedures for these actions are clearly defined; are consistent with established WMO procedures and are shared with the Members; and consider inclusion of experts from all regions, with particular attention to the representation of women and developing and least developed countries including to establish a Gender Focal Point reporting to the CCI Management Group, with terms of reference relevant to the WMO Policy on Gender Mainstreaming;
- (c) Advise the president of the Commission on the designation of Expert Team leaders, and on requirements arising between its sessions;
- (d) Oversee, guide and advise on key implementation matters for Regional Climate Centres, including evaluation of the applications for the designation of such centres and consultation with the Commission for Basic Systems and regional experts as required;

- (e) Steer the work of the CCI Expert Group on Quality Management for Climatology, and promote the use of quality management systems in the work of the Commission;
- (f) Develop and implement a CCI Strategy for Capacity-building, in consultation with the WMO Education and Training Programme, regional associations and other technical commissions, as needed;
- (g) Oversee the update of the *Guide to Climatological Practices* (WMO-No. 100) and other reference CCI publications to ensure that they remain pertinent, up to date and in line with WMO evolving priorities for climate; advise on peer-reviewing, editing and production of publications prepared on behalf of CCI; and advise on development of a virtual document library, where all CCI documents, for example reference CCI publications, meeting reports, guidelines and brochures, could be accessed;
- (h) Work with the WMO Secretariat to contribute to the results-based management process, as required; to meet its commitments to the WMO Strategic Plan; to develop specific tactics towards acquiring extrabudgetary resources that are required to support the work of the Commission; and advise the president on appropriate actions;
- (i) Advise the president of the Commission on matters related to cooperation with other technical commissions and support to other WMO and co-sponsored programmes;
- (j) Assist the Secretariat to develop and maintain close linkages with United Nations and other agencies or associations partnering with WMO on climate-related matters;
- (k) Support development of a new international dataset for land-surface air temperatures in collaboration with, inter alia, the Global Climate Observing System and the World Climate Research Programme.

2. Terms of reference of the president of the Commission for Climatology

- (a) Undertake the duties required of a president of a WMO technical commission in accordance with WMO General Regulation 185;
- (b) Represent the Commission at a range of relevant WMO meetings, workshops and conferences including other technical commissions, the Executive Council and Congress, meetings of Executive Council bodies such as its Working Group on Climate and Related Weather, Water and Environmental Matters and Meetings of Presidents of Technical Commissions and, ex-officio, on the Joint Scientific Committee of the World Climate Research Programme and on the Steering Committee of the Global Climate Observing System;
- (c) Promote the recognition of and increase awareness about the role of WMO in climate, particularly with respect to the role of WMO in the Global Framework for Climate Services;
- (d) Provide input, presentations and reports, as required, to WMO constituent body sessions, particularly the Executive Council and Congress;
- (e) Designate a substitute if any OPACE co-chair is unable to continue in that role, relying on WMO General Regulation 33 for the appropriate guidance;
- (f) Maintain regular communication with the members of the Commission in its activities, for example, through newsletters.

3. Terms of reference of the vice-president of the Commission for Climatology

- (a) Assist the president of the Commission and lead the activities assigned by the president as and when required, represent the Commission on occasions when the president cannot

personally participate, and chair the meetings of the CCI Management Group in the president's absence;

- (b) Ensure effective communications between the CCI Management Group and any regional working groups and rapporteurs on their climate activities and priorities, especially before sessions of WMO constituent bodies addressing climate-related matters, that is, Congress, the Executive Council, regional associations and relevant technical commissions;
- (c) Liaise with the OPACE co-chairs in implementation of their workplans, seek solutions for and advise on overcoming problems in completion of the agreed tasks, in consultation with the Secretariat and the CCI Management Group;
- (d) Submit reports to the CCI Management Group and the Secretariat for meetings, newsletters, constituent body sessions and for the next session of the Commission.

4. Composition of the Management Group of the Commission for Climatology

The CCI Management Group shall include the president, the vice-president and the co-chairs of OPACEs 1 through 4 with the total membership not exceeding 10. The following co-chairs were selected in accordance with WMO General Regulation 32:

OPACE 1: Climate Data Management

Co-chair: Song Lianchun (China)

Co-chair: William Wright (Australia)

OPACE 2: Climate Monitoring and Assessment

Co-chair: Fatima Driouech (Ms) (Morocco)

Co-chair: Manola Brunet (Ms) (Spain)

OPACE 3: Climate Products and Services and their Delivery Mechanisms

Co-chair: Kiyoharu Takano (Japan)

Co-chair: Jean-Pierre Céron (France)

OPACE 4: Climate Information for Adaptation and Risk Management

Co-chair: Rodney Martinez (Ecuador)

Co-chair: Albert Martis (Netherlands Antilles)

5. Mode of operation of the Management Group of the Commission for Climatology

- (a) The CCI Management Group, subject to available resources, should meet annually, or at least three times during the intersessional period, but should carry out most of its work by correspondence or by teleconference whenever possible;
- (b) In order to harmonize regional activities and priorities in climate matters and to ensure consideration of regional interests in the work of the Commission, the regional representatives would be invited to at least one session of the CCI Management Group during the intersessional period, preferably the first meeting at which the priorities of the work programme are established. These regional experts may be from regional working groups or sub-groups on climate-related matters, or may be another climate expert appointed for this purpose by the president of the regional association;
- (c) The president may invite to its sessions individual expert team/group leaders or rapporteurs that report to the CCI Management Group, and/or experts on specific major issues, subject to the agenda and availability of funds;
- (d) Members of the CCI Management Group may be selected to serve as rapporteur for specific, important cross-cutting topics such as on disaster prevention and mitigation, or liaison to research or the Climate User Interface Programme, or as Gender Focal Point.

6. Expert Group on Quality Management for Climatology

The terms of reference will be identified by the CCI Management Group as indicated in Resolution 2 (CCI-XV), under Decides (2).

Annex 2 to Resolution 8 (CCI-XV)

OPEN PANELS OF THE COMMISSION FOR CLIMATOLOGY EXPERTS

1. Terms of reference common to all Open Panels of CCI Experts (OPACE) co-chairs

- (a) Act upon matters referred to the OPACE by the CCI Management Group and maintain an active and responsive overview of all deliverables and associated activities related to the priorities of the OPACE, as indicated in Annex 3 to Resolution 8 (CCI-XV);
- (b) Ensure that the OPACEs including any OPACE teams or rapporteurs are well informed of global and regional activities within their areas of responsibility;
- (c) Monitor the roles, activities and priorities of expert teams and rapporteurs established by the Commission under the responsibility of the OPACE to ensure coordination of work between the teams and advise on changes;
- (d) As members of the CCI Management Group, participate in decisions on the composition of OPACE teams including their leadership;
- (e) Provide advice to team leaders on their workplans and the composition of their teams, including potential interaction with other interested bodies;
- (f) Following a call for contributions, work with the Secretariat and the CCI Management Group to establish or update OPACE workplans;
- (g) Provide feedback to the members of the OPACE including an activity report by the end of calendar years in the intersessional period;
- (h) Promote the use of quality management principles in the work of OPACE, expert teams/groups and their activities including liaison with users, reporting and publication processes; as well as provision of guidance to the Members on using quality management systems in the OPACE domain of interest that would have positive impacts on the activities of Members in climatology;
- (i) Submit reports to the CCI Management Group and the Secretariat for meetings, newsletters, constituent body sessions and the next session of the Commission.

2. Modes of operation common to all Open Panels of CCI Experts

- (a) The co-chairs will undertake the work within their thematic areas with the support of the experts of their respective OPACE. For the purpose they will have to communicate effectively with the experts in their OPACE and among each other on all matters pertaining to the thematic areas of the OPACE, and will share the responsibilities of the conduct of the OPACE;
- (b) The chairs OPACE will work with leaders of relevant teams, groups and rapporteurs to establish workplans in accordance with the priorities set by the CCI Management Group, by assigning tasks, deliverables and deadlines, as agreed in wide consultation throughout the

OPACE; will oversee and promote adherence to the workplan; will maintain a dialogue with those experts that have been assigned tasks; and will communicate on achievements and issues with the Management Group;

- (c) Limited number of task teams may be established by the CCI Management Group under a thematic area during the fifteenth intersessional period to undertake specific tasks.

3. Terms of reference of OPACE expert teams and rapporteurs

3.1 Expert Team on Climate Database Management Systems (OPACE 1)

- (a) Assess the current WMO Climate Database Management Systems (CDMSs) since their first evaluation in 2001 and the development of new systems;
- (b) Work in collaboration with the WMO Information System project office on using interoperable systems to integrate and exchange climate data from National Meteorological and Hydrological Services and data from other sources such as remote-sensing data, Geographical Information Systems, and data from applications sectors;
- (c) Keep technology watch on software and the capability of data transfer through various means including mobile phones; and develop guidance and advice to the Members on the most practical, secure, reliable and affordable technologies in this domain;
- (d) Develop and implement a monitoring mechanism for a continued updating of the CDMSs;
- (e) Liaise with the Commission for Basic Systems, Commission for Hydrology, Joint WMO/IOC Commission for Oceanography and Marine Meteorology, Commission for Agricultural Meteorology and the WMO Space Programme on the any relevant issues related to climate data management and related systems;
- (f) Assess the success of past and current capacity-building activities in implementing new CDMSs operationally in replacement of Climate Computing, and revise them as necessary;
- (g) Submit reports in accordance with timetables established by the OPACE 1 co-chairs.

3.2 Joint CCI/CLIVAR/JCOMM Expert Team on Climate Change Detection and Indices (OPACE 2)

- (a) Provide international coordination and help organize collaboration on climate change detection and indices;
- (b) Further develop and publicize indices and indicators of climate variability and change and related methodologies, from the surface and subsurface ocean to the stratosphere, with international consensus;
- (c) Encourage the comparison of modelled data and observations, perhaps via the development of indices appropriate for both sources of information;
- (d) Coordinate these and other relevant activities the Expert Team chooses to engage in with other appropriate working bodies, including those affiliated under CCI, the World Climate Research Programme and the Joint WMO/IOC Commission for Oceanography and Marine Meteorology as well as others, such as the Global Climate Observing System, Commission for Basic Systems, Commission for Instruments and Methods of Observation, Commission for Agricultural Meteorology, Commission for Hydrology, Intergovernmental Panel on Climate Change and the System for Analysis, Research and Training, and regional associations;

- (e) Explore, document and make recommendations for addressing the needs for capacity-building in each region pertinent to this topic;
- (f) Submit reports in accordance with timetables established by the OPACE 2 co-chairs.

3.3 Expert Team on Regional Climate Centres (OPACE 3)

- (a) Steer the implementation, designation and effective operation of Regional Climate Centres (RCCs), including to keep the Centres up to date on evolving or new research or operational developments; to promote inclusion of highly recommended functions in the RCCs and RCC-Networks; to identify the needs for and promote training in development and delivery of RCC products and services; and to monitor performance of Regional Climate Centres and propose improvements as required;
- (b) Establish global standards for mandatory RCC products and services and their delivery, as well as verification of forecasts and reporting of results;
- (c) Promote the use of forecast products from Global Producing Centres for Long-range Forecasts and RCCs at the regional and national levels and development of consensus-based forecasts, especially through mechanisms such as Regional Climate Outlook Forums;
- (d) Liaise with regional associations, the World Climate Research Programme/Climate Variability and Predictability regional panels, the Commission for Basic Systems/Data-processing and Forecasting System, and the Commission for Atmospheric Sciences and other relevant entities as required;
- (e) Seek sponsors and financial support for RCC implementation in vulnerable regions;
- (f) Submit reports in accordance with timetables established by the OPACE 3 co-chairs.

3.4 Expert Team on Climate Risk and Sector-specific Climate Indices (OPACE 4)

- (a) Develop methods and tools including standardized software for, and to generate, sector-specific climate indices, including their time series based on historical data, and methodologies to define simple and complex climate risks;
- (b) Promote the use of sector-specific climate indices to bring out variability and trends in climate of particular interest to socio-economic sectors, for example, droughts, with global consistency and to help characterize the climate sensitivity of various sectors;
- (c) Develop the training materials needed to raise capacity and promote uniform approaches around the world in applying these techniques;
- (d) Work with sector-based agencies and experts, including those of relevant WMO technical commissions, particularly the Commission for Hydrology and the Commission for Agricultural Meteorology, to facilitate the use of climate information in the decision-support systems of users for climate risk management and adaptation strategies;
- (e) Submit reports in accordance with timetables established by the OPACE 4 co-chairs.

3.5 Rapporteur on World Records of Weather and Climate Extremes (OPACE 2)

- (a) Work with OPACE 2 to create guidelines and appropriate mechanisms (for example, ad hoc Assessment Committee, on verification of national, regional and global extremes;
- (b) Work on the creation, verification and documentation of a database of national, regional and global extremes;

- (c) Take the lead in creating and maintaining a database of extreme records, and in documenting such events, for example, in peer-reviewed scientific papers;
 - (d) Develop guidelines and recommendations for continuing this record of extremes beyond the fifteenth intersessional period;
 - (e) Promote quality management systems in the work of the rapporteur including the provision of guidelines and reports;
 - (f) Submit reports in accordance with timetables established by the OPACE 2 co-chairs.
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Annex 3 to Resolution 8 (CCI-XV)

COMPONENTS OF THE WORK PROGRAMME OF THE COMMISSION FOR CLIMATOLOGY FOR THE FIFTEENTH INTERSESSIONAL PERIOD

Components of the work programme of the Commission for the fifteenth intersessional period, including proposed deliverables, are presented for the CCI Management Group and each of the four Open Panels of CCI Experts (OPACEs).

Proposed deliverables of the CCI Management Group:

- (a) Identification of the priority work for the OPACEs, CCI working groups and rapporteurs (in three classes: mission critical, strategically important and discretionary);
- (b) Advice and strategy to the president;
- (c) Advice on the role of the Commission in the implementation of the Global Framework for Climate Services as input to WMO constituent and other bodies;
- (d) Strategy for implementing quality management principles in climatology and guidance on adaptation of the best practices in the climate work of National Meteorological and Hydrological Services and Regional Climate Centres;
- (e) Documents and practices for development of common International Organization for Standardization/WMO technical standards for development of climate services;
- (f) Finalized CCI Capacity-building Strategy for Climate Services and guidance for improving existing capacity-building practices of WMO to address the requirements for climate services;
- (g) Implementation plan for capacity-building to support implementation of the Global Framework for Climate Services;
- (h) Updated and accessible CCI reference documents;
- (i) Assessment of implementation of CCI deliverables at the regional levels;
- (j) Agreement with the Commission for Basic Systems (CBS) to make the Expert Team on Regional Climate Centres a joint CCI-CBS Expert Team.

OPACE 1: Climate Data Management

OPACE 1 activities should lead to the following deliverables during the intersessional period 2010–2014:

- (a) Finalize the ongoing work on climate observations requirements, including in particular the provision of peer-reviewed guidelines on the use of automatic weather stations in climatology and capacity-building status and requirements on climate observations for developing countries;
- (b) Undertake, in cooperation with the Commission for Instruments and Methods of Observation, the establishment of standards related to the measurement of snowfall, snow depth and solid precipitation and the performance of automatic weather stations and alternate standards for climate observations in mountainous terrain;
- (c) A new Climate Metadata catalogue based on the former World Climate Data Information Referral Service, which should provide a more in-depth description of climate Metadata for improved climate data discovery and exchange through the WMO Information System;
- (d) Assessment report on the progress made in migration from Climate Computing to new Climate Data Management Systems (CDMSs) and improved model description for interoperable climate databases and related management systems including functionalities of Geographical Information Systems and improved data services;
- (e) Monitoring Report on Data Rescue worldwide including support to and progress review of the Atmospheric Circulation Reconstructions over the Earth Project, the Mediterranean Data Rescue Initiative, and similar initiatives in other regions;
- (f) Guidance on minimum set of requirements for National Meteorological and Hydrological Services to benefit from space-based data, radar data and data from other remote sensing platforms for climate studies and applications;
- (g) A project study for the implementation of a High Quality Global Climate Data Management System, including the design of an operational manual on the collection, quality control, dissemination and exchange of climate data;
- (h) Advise on the organization of seminars, conferences and training workshops on climate data including data rescue, CDMSs and climate data exchange;
- (i) Improved collaboration and working arrangements with other WMO programmes and co-sponsored programmes, such as the WMO Space Programme, WMO Integrated Global Observing System, WMO Information System, Global Climate Observing System, Education and Training Programme, International Polar Year and the World Climate Research Programme, which would benefit in developing climate observations and related climate data aspects.

OPACE 2: Climate Monitoring and Assessment

OPACE 2 activities should lead to the following deliverables during the intersessional period (2010–2014):

- (a) Review report on the existing indices and provision of peer-reviewed guidelines on new climate indices;
- (b) A new strategy for climate indices workshops of the Joint CCI/CLIVAR/JCOMM Expert Team on Climate Change Detection and Indices considering the requirements of the Global Framework for Climate Services and the contribution to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change;

- (c) Guidelines on methodologies and standards for defining extreme weather and climate events that are of major societal impacts and assessing their attribution and return periods in the framework of a changing climate, such as for drought, heatwaves, extreme precipitation anomalies and wind storms;
- (d) Project proposal for developing standards for creating global, regional and national databases on extreme weather and climate events;
- (e) Updated WMO Website on the world records on weather and climate extremes;
- (f) Guidance/advice on best practices in the use of satellite products for climate monitoring and climate change detection and provide an assessment of the most current level of suitability of these products to climate monitoring applications;
- (g) Recommendations for improving WMO Climate System Monitoring including real-time identification of extreme weather, methodologies and datasets for assessing climate trends and variations; and dissemination mechanism for timely informing on extreme weather and climate events;
- (h) Review report on the implementation of climate watch systems at the regional and national levels, with provision of guidance on the content, dissemination and related alert systems, taking into consideration the recommendations from various regional workshops organized by the World Climate Data and Monitoring Programme on climate monitoring and implementation of climate watch systems;
- (i) Improved collaboration and working arrangements with other WMO Programmes and co-sponsored programmes, such as the WMO Space Programme, WMO Integrated Global Observing System, WMO Information System Disaster Risk Reduction, Atmospheric Research and Environment Programme, Education and Training Programme, Global Climate Observing System, World Climate Research Programme and the International Polar Year, which would benefit in developing climate monitoring knowledge, user requirements and standards.

OPACE 3: Climate Products and Services and their Delivery Mechanisms

OPACE 3 activities should lead to the following deliverables during the intersessional period 2010–2014:

- (a) Definition of the functions of National Climate Centres (this should be done in close consultation with the Commission for Basic Systems, for their integration into the Global Data-processing and Forecasting System, specifically taking into account existing and emerging products from Global Producing Centres for Long-range Forecasts and Regional Climate Centres as well as the further Regional Climate Outlook Forum evolution);
- (b) A concept paper on National Climate Services at the national level and how they would contribute to the Global Framework for Climate Services;
- (c) An action plan to facilitate the transition of the Climate Information and Prediction Services project into the Global Framework for Climate Services, and to conclude the project by 2015 at the latest;
- (d) A toolbox for generating climate information and prediction products, including methods for tailoring and downscaling;
- (e) A conceptual framework to identify methods and communications strategies National Climate Services should use to provide sector-specific climate information, products and services (this should be done through a joint mechanism of the Commissions for

Climatology, Agricultural Meteorology and Hydrology, in consideration of eventual services for the agriculture/food security and water resources sectors as a first priority);

- (f) Technical guidance including reference documents standardizing the mandatory RCC products and services, for example, in terms of methods, format, content, quality, dissemination and regular assessments;
- (g) Training modules for RCC core product development in order to assist potential RCC aspirants in developing countries and to promote a degree of consistency in mandatory RCC products as well as to contribute to sustainable capacity-building;
- (h) Assessments of applications for RCC designation and evaluations of performance with respect to defined criteria;
- (i) Terminology for climate predictions, to clarify uses of terms such as long-range forecasts, seasonal-to-interannual predictions, seasonal forecasts, seasonal predictions and climate outlooks (to be developed in consultation with the Commission for Basic Systems);
- (j) Pilot project(s) to introduce Regional Climate Outlook Forums into new, vulnerable regions, for example, a Polar Climate Outlook Forum, as an International Polar Year legacy project;
- (k) Guide for users to help them access, interpret and understand climate prediction products and associated uncertainties;
- (l) Guidance on development of consensus-based climate outlook products, for example, the El Niño and La Niña Updates and the Global Seasonal Climate Update;
- (m) Guidance on standardized Regional Climate Outlook Forum/National Climate Outlook Forum operations and outputs, keeping in mind regional diversity.

OPACE 4: Climate Information for Adaptation and Risk Management

OPACE 4 activities should lead to the following deliverables during the intersessional period (2010–2014):

- (a) A collection of new and existing climate indices with particular specific sectoral applications at national and regional scales;
- (b) Guidance and promotional materials, for the use of sectoral agencies, on the establishment and operation of sector-focused, sector-driven outlook forums in conjunction with Climate Outlook Forums, particularly the water resources management and agriculture/food security sectors (to be done in collaboration with relevant agencies, organizations and WMO technical commissions, particularly the Commission for Hydrology and the Commission for Agricultural Meteorology);
- (c) Methods and tools, standardized software and associated training materials required to produce sector-specific climate indices for systematic assessment of the impact of climate variability and change and to facilitate climate risk management and adaptation (to be done in collaboration with relevant agencies, organizations and WMO technical commissions);
- (d) Information notes on climate sensitivity and the use of climate information in climate risk management and adaptation by specific sectors;
- (e) A collection of new and existing case studies relevant to quantifying the social and economic benefits of using climate information, products and services;
- (f) Pilot or showcase project(s) to demonstrate benefits to a specific sector of the uptake of climate information into the decision support systems of the sector;

- (g) Updated guidance for National Meteorological and Hydrological Services for improved interaction with users in various sectors for communicating climate services;
 - (h) A mechanism of the Commissions for Climatology and Hydrology to coordinate climate-water interactions, joint activities and projects, as a follow-on to the former World Climate Programme–Water programme.
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Resolution 9 (CCI-XV)

REVIEW OF PREVIOUS RESOLUTIONS AND RECOMMENDATIONS OF THE COMMISSION FOR CLIMATOLOGY

THE COMMISSION FOR CLIMATOLOGY,

Noting the action taken on its previous recommendations,

Considering that all resolutions of CCI-XIV are now obsolete or should be replaced, and Recommendation 1 (CCI-XIV) remains in force,

Decides not to keep in force the resolutions and other recommendations adopted before its fifteenth session.

Note: This resolution replaces Resolution 5 (CCI-XIV), which is no longer in force.

RECOMMENDATIONS ADOPTED BY THE SESSION

Recommendation 1 (CCI-XV)

TERMS OF REFERENCE OF THE COMMISSION FOR CLIMATOLOGY

THE COMMISSION FOR CLIMATOLOGY

Noting:

- (1) *The Abridged Final Report with Resolutions of the Fourteenth Session of the Commission for Climatology* (WMO-No. 996),
- (2) *The Abridged Final Report with Resolutions of the Fifteenth World Meteorological Congress* (WMO-No. 1026), Resolution 13 (Cg-XV) – World Climate Applications and Services Programme, including the CLIPS project,
- (3) *The Abridged Final Report with Resolutions of the Sixty-first Session of the Executive Council* (WMO-No. 1042),
- (4) The final report of the 2009 Meeting of Presidents of Technical Commissions (Geneva, February 2009),
- (5) *The WMO Strategic Plan* (WMO-No. 1028),
- (6) The outcomes of the WMO Conference on Living with Climate Variability and Change: Understanding the Uncertainties and Managing the Risks (Espoo, Finland, 17–21 July 2006),
- (7) The findings of the WMO Conference on Secure and Sustainable Living: Social and Economic Benefits of Weather, Climate and Water Services (Madrid, Spain, 19–22 March 2007) (WMO-No. 1034),
- (8) The outcomes of the World Climate Conference-3 including its declaration on the establishment of a Global Framework for Climate Services (Geneva, 31 August–4 September 2009),

Recognizing:

- (1) The growing needs for improved climate products and services including climate monitoring, climate assessment and prediction for risk management, adaptation to climate change and applications in socio-economic growth and sustainable development,
- (2) The long-standing recognition of WMO as the United Nations system's authoritative voice on weather, climate and water,
- (3) The unique role of the Commission in guiding WMO climate activities, especially the World Climate Programme,
- (4) The rapidly increasing demand for effective climate services and the need for the Commission to position itself to take a lead role in the relevant activities,

Considering:

- (1) That the terms of reference of all technical commissions of WMO should be linked to and in conformity with the WMO results-based management approach and overall Organization objectives and strategic thrusts,
- (2) That the new preamble proposed at the 2010 Meeting of Presidents of Technical Commissions to be incorporated in the WMO General Regulations,

Recommends that the existing terms of reference for CCI should be amended as given in the annex to this recommendation;

Urges its president to work with the Executive Council and Congress to ensure that the CCI terms of reference are appropriately aligned with other technical commission terms of reference and to demonstrate their relevance to the overall WMO strategies through linkage with the approved Strategic Plan;

Authorizes the CCI Management Group to align the workplans of the four Open Panels of CCI Experts with the expected results given within the draft WMO Strategic Plan;

Requests the Secretary-General to bring this recommendation to the attention of the Executive Council at its sixty-second session for its consideration and approval.

Annex to Recommendation 1 (CCI-XV)**TERMS OF REFERENCE OF THE COMMISSION FOR CLIMATOLOGY**

The terms of reference of the Commission for Climatology shall be:

- (a) To advise and guide WMO climate activities relevant to the implementation of the Global Framework for Climate Services;
 - (b) To assist Members in the gathering, management and sharing of climate data;
 - (c) To promote the analysis, monitoring, assessment and reporting of the climate system;
 - (d) To promote the development of climate products and services and, in conjunction with the Commission for Basic Systems, their delivery mechanisms;
 - (e) To promote the development of climate products, services and information to inform adaptation and climate risk management, in collaboration with relevant institutions and demonstrate the social and environmental benefits of such services;
 - (f) To assist Members, especially those from developing and least developed countries, to build their climate-related capacity to meet the needs of their stakeholders;
 - (g) To play an active role in WMO interactions with other United Nations and international agencies on climate-related matters.
-

Recommendation 2 (CCI-XV)**REVIEW OF RESOLUTIONS OF THE EXECUTIVE COUNCIL BASED ON PREVIOUS
RECOMMENDATIONS OF THE COMMISSION FOR CLIMATOLOGY**

THE COMMISSION FOR CLIMATOLOGY,

Noting with satisfaction the action taken on its previous recommendations by the Executive Council,

Recommends:

- (1) That the following Executive Council resolutions be maintained in force:

Resolution 6 (EC-XXXVI)
Resolution 4 (EC-XL)
Resolution 6 (EC-XLI)
Resolution 14 (EC-XLIV)
Resolution 15 (EC-XLIV)
Resolution 7 (EC-XLV)
Resolution 13 (EC-XLV)
Resolution 1 (EC-LVI);

- (2) That the following resolutions be replaced, as indicated:

Resolution 1 (EC-LIV) be replaced by Resolution 1 (EC-LVIII)
Resolution 18 (EC-LV) be replaced by Resolution 22 (EC-LIX)
Resolution 2 (EC-LIV) be replaced by Resolution 4 (EC-LVIII)
Resolution 3 (EC-LII) be replaced by Resolution 3 (EC-LVII).

ANNEX

ANNEX

Annex to [paragraph 4.4](#) of the general summary

DOCUMENTS PUBLISHED OR ISSUED IN DRAFT FORM DURING THE FOURTEENTH INTERSESSIONAL PERIOD

OPAG 1:

- i) *Guidelines on Climate Data Management*, WCDMP-No. 60 / WMO/TD-No. 1376
- ii) *Guidelines for Managing Changes in Climate Observation Programmes*, WCDMP-No. 62 / WMO/TD-No. 1378
- iii) *The Role of Climatological Normals in a Changing Climate*, WCDMP-No. 61 / WMO /TD-No. 1377
- iv) *Climate Observation and Climate Data Management Guidelines*, CD-ROM. Containing six previously published guidelines, WCDMP-No. 68 / WMO/TD-No. 1481
- v) FINAL REPORT: Meeting of the CCI Expert Team on the Rescue, Preservation and Digitization of Climate Records, Bamako, Mali, 13–15 May 2008, WCDMP-No. 69 / WMO/TD-No. 1480
- vi) Medare Initiative, Proceedings of the International Workshop on Rescue and Digitization of Climate Records in the Mediterranean Basin, WCDMP-No. 67 / WMO/TD-No. 1432
- vii) FINAL REPORT: Expert Team on Observing Requirements and Standards for Climate, Geneva, Switzerland, 28–30 March 2007, WCDMP-No. 65 / WMO/TD-No. 1403
- viii) *Observing the climate – challenges for the 21st Century*, WMO *Bulletin*, January 2007
- ix) IN DRAFT: Report of the Expert Meeting on WCP requirements for Metadata, Toulouse, France, 11–13 March 2009
- x) IN DRAFT: Report of the second meeting of the CCI Expert Team on Climate Data Management and Metadata, Casablanca, Morocco, 23 –25 November 2009
- xi) IN DRAFT: Report of Climsoft workshop on training of trainers, Lusaka, Zambia, April 2009

OPAG 2:

- i) *Guidelines on Analysis of Extremes in a Changing Climate in Support of Informed Decisions for Adaptation*, WCDMP-No. 72 /WMO/TD-No. 1500
- ii) Proceedings of the Fifth Seminar for Homogenization and Quality Control in climatological Databases, Budapest, Hungary, 29 May–2June 2006, WCDMP-No. 71 / WMO/TD-No. 1493
- iii) *A Case-Study/Guidance on the development of Long-term Daily Adjusted Temperature Datasets*, WCDMP-No. 66 /WMO/TD-No. 1425
- iv) Monitoring changes in climate extremes: A tale of international collaboration, *Bulletin of the American Meteorological Society*, 89:1266–1271
- v) *Guidelines for Plant Phenological Observations*, WCDMP-No. 70 / WMO/TD-No. 1484
- vi) FINAL REPORT: Joint CCI/Clivar/JCOMM Expert Team on Climate Change Detection and Indices, Niagara-on-the-Lake, Canada, 14–16 November 2006, WCDMP-No. 64 / WMO/TD-No. 1402 / ICPO Publication Series No. 115
- vii) FINAL REPORT: WMO CCI/CLIVAR/JCOMM Expert Team on Climate Change Detection and Indices (ETCCDI) workshop on exploring changes in South East Asia temperature

and precipitation extreme indices, Ha Noi, Viet Nam, 3–7 December 2007. Available on the ETCCDI Website at: http://www.clivar.org/organization/etccdi/docs/ETCCDI_Vietnam_workshop_report_final.pdf

- viii) Exploring changes in Central African temperature and precipitation extreme indices, *Journal of Geophysical Research*, Vol. 114, January 2009
- ix) The adaptation imperative: is climate science ready?, *WMO Bulletin*, Vol.57(2), April 2008
- x) Monitoring the Earth's climate, *WMO Bulletin*, Vol. 57(2), April 2008
- xi) Brochure on *Climate Watch System: Early Warning Against Climate Anomalies and Extremes*, available also on the WMO Website http://www.wmo.int/pages/publications/showcase/documents/CWS_EN_v1.pdf
- xii) Climate Watch Systems, Purpose and Requirements, *Climate Sense* publication for WCC-3, 2009
- xiii) *WMO Statement on the Status of the Global Climate in 2005*, WMO-No. 998
- xiv) *WMO Statement on the Status of the Global Climate in 2006*, WMO-No. 1016
- xv) *WMO Statement on the Status of the Global Climate in 2007*, WMO-No. 1031
- xvi) *WMO Statement on the Status of the Global Climate in 2008*, WMO-No. 1039
- xvii) *WMO Statement on the Status of the Global Climate in 2009*, WMO-No. 1055
- xviii) *State of the Climate in 2005*, WMO-No. 1015, WMO re-edited version of the BAMS article on the state of the climate
- xix) *State of the Climate in 2006*, WMO-No. 1020, WMO re-edited version of the BAMS article on the state of the climate
- xx) *State of the Climate in 2007*, WMO-No. 1036, WMO re-edited version of the BAMS article on the state of the climate

OPAG 3:

- i) FINAL REPORT: WMO Conference on Living with Climate Variability and Change: Understanding the Uncertainties and Managing the Risks (Espoo, Finland, 17–21 July 2006), WMO/TD-No. 1512, WCASP-No. 79
- ii) FINAL REPORT: Expert Meeting on Water Manager Needs for Climate Information in Water Resources Planning (Geneva, Switzerland, 18–20 December 2006). WMO/TD-No. 1401, WCASP-No. 74
- iii) FINAL REPORT: CCI/CBS Intercommission Technical Meeting on Designation of Regional Climate Centres (Geneva, Switzerland, 21–22 January 2008). WMO/TD-No. 1479, WCASP-No. 77
- iv) FINAL REPORT: WMO WCRP IPY Workshop on CLIPS in Polar Regions: Climate Product Generation, User Liaison and Training (St Petersburg, Russian Federation, 8–11 September 2008), WMO/TD-No. 1509, WCASP-No. 78
- v) FINAL REPORT: CLIPS Workshop on Communicating about El Nino-Southern Oscillation (ENSO): Towards developing a Common Understanding (Honolulu, Hawaii, United States, 8–10 April 2008)
- vi) FINAL DRAFT: Guidance on Best Practices for Verification of Seasonal Forecasts, to be published in WCASP series
- vii) IN DRAFT, IN REVIEW: Report of the International Expert Review Meeting on Regional Climate Outlook Forums (Arusha, United Republic of Tanzania, 3–7 November 2008), to be published in WCASP series

- viii) IN DRAFT, IN REVIEW: Technical Document 'Socio-economic benefits of Climate Services', to be published in WCASP series
- ix) IN DRAFT: Terminology on Climate Prediction, to be published in WCASP series

OPAG 4:

- i) FINAL REPORT: Meeting of the Commission for Climatology Expert Team on Climate and Health (London, United Kingdom, 20–22 November 2006), WMO/TD-No. 1413, WCASP-No. 75
- ii) FINAL REPORT: Climate change and tourism: responding to the Global Challenges (UNWTO, UNEP and WMO, 2008)
- iii) FINAL REPORT: *Climate Change Adaptation and Mitigation in the Tourism Sector: Frameworks, Tools and Practices*. Joint Publication of UNEP, University of Oxford, UNWTO and WMO, 2008
- iv) IN DRAFT, IN REVIEW: Heat waves and Health: Guidance on development of Warning Systems, to be jointly published by WMO and WHO
- v) IN DRAFT; IN REVIEW: Building Climatology, to be published in WCASP Series
- vi) WEBSITE: Bibliography on Urban and Building Climatology http://www.urban-climate.org/bibliography_fr.htm (hosted by the International Association for Urban Climate)
- vii) IN DRAFT: Report of the Planning Meeting on Heat-Health Warning Systems (Shanghai, China, 21–24 July 2009)
- viii) IN DRAFT: Case studies on applications of climate information for the energy sector
- ix) IN DRAFT: Weather and Climate Information for Tourism, a WCC-3 White Paper, to be published as part of the WCC-3 Conference Proceedings, and as a joint WMO-UNWTO publication in the WCASP series
- x) IN DRAFT: Climate and Tourism-Recreation Bibliography (2010 Update)
- xi) IN DRAFT: Urban Climatology, to be published in WCASP Series

OTHERS:

- i) IN DRAFT, REVIEW COMPLETED, IN PRESS: *Guide to Climatological Practices* (WMO-No. 100), third edition
 - ii) IN DRAFT: Brochure on the history of CCI
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APPENDIX

LIST OF PARTICIPANTS

1. Officers of the session

President	Pierre Bessemoulin (France)
Vice-President	Wang Shourong (China)

2. Representatives of WMO Members

Angola

Pedro S. Teta	Principal Delegate
Luis Domingos Constantino	Alternate
Antonio Bastos Jose Dias	Delegate

Argentina

Mónica Beatriz Marino (Ms)	Principal Delegate
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Armenia

Levon Vardanyan	Principal Delegate
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Australia

Michael Coughlan	Principal Delegate
David Walland	Delegate
Roger Stone	Delegate

Austria

Ingeborg Auer (Ms)	Principal Delegate
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Bahrain

Yousif Ali Khalaf	Principal Delegate
Abdul-Rahman Mohammed Abdulla	Delegate

Belgium

Marc Vandiepenbeeck	Principal Delegate
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Belize

Ann N. Gordon (Ms)	Delegate
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Brazil

Luiz Carlos Baldicero Molion	Principal Delegate
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Brunei Darussalam

Sidup Sirabaha	Principal Delegate
Hassanul Kamal Haji Adam	Delegate

Bulgaria

Aneliya Dimitrova Gocheva (Ms)	Principal Delegate
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Diane Campbell (Ms)	Principal Delegate
Francis Zwiers	Alternate
Paul Whitfield	Delegate
Bruce Angle	Delegate

China	
Wang Shourong	Principal Delegate
Zhang Zuqiang	Alternate
Zhang Qiang	Delegate
Zhang Peiqun	Delegate
Song Lianchun	Delegate
Croatia	
Zvonimir Katušin	Principal Delegate
Marjana Gajić Čapka (Ms)	Delegate
Cyprus	
Stelios Pashiardis	Principal Delegate
Czech Republic	
Radim Tolasz	Principal Delegate
Denmark	
Claus Kern-Hansen	Principal Delegate
Egypt	
Amal Hanfy A. Gaber (Mrs)	Principal Delegate
Nadia Mohamed Hassan (Mrs)	Alternate
Finland	
Raino Heino	Principal Delegate
Reija Ruuhela (Ms)	Delegate
Jaakko Helminen	Delegate
France	
Philippe Dandin	Principal Delegate
Jean-Pierre Céron	Alternate
Pierre Bessemoulin	Delegate
Ghana	
Zinedeme Minia	Principal Delegate
Germany	
Paul Becker	Principal Delegate
Klaus-Jürgen Schreiber	Delegate
Martin Werscheck	Delegate
Tobia Fuchs	Delegate
Franz Berger	Delegue
Hong Kong, China	
Mok Hing-yim	Principal Delegate
Honduras	
Jose Salgado	Principal Delegate
Hungary	
Zita Bihari Konkolyné (Ms)	Principal Delegate
India	
A.L. Koppar	Principal Delegate
Rama Rao E. Pattabhi	Delegate
Iran (Islamic Republic of)	
Iman Babaeian	Principal Delegate
Mohsen Madadi	Alternate
Ireland	
Liam Keegan	Principal Delegate

Israel Avner Furshpan	Principal Delegate
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Jordan Mohammad M. Semawi	Principal Delegate
Kenya Peter Ambenje	Principal Delegate
Lebanon Riad Assolh Al Khodari	Principal Delegate
Libyan Arab Jamahiriya Khalid I. EIFadli Husien M. Ahmid	Principal Delegate Delegate
Luxembourg Léon Wietor	Principal Delegate
Macao, China Tong Si Man	Principal Delegate
Malaysia Tan Huvi Vein	Principal Delegate
Maldives Aishath Shimana	Principal Delegate
Mauritius Yadowsun Boodhoo	Principal Delegate
Mongolia Erdenebat Eldevochir	Delegate
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New Zealand David Wratt	Principal Delegate
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Norway Eirik Førland	Principal Delegate
Peru Amelia Isabel Díaz Pabló (Mrs)	Principal Delegate

Poland	
Janusz Filipiak	Principal Delegate
Republic of Korea	
Yoon Hong	Principal Delegate
Jun-Seok Chung	Alternate
Sang-Baek Kim	Delegate
Won-Tae Yun	Delegate
Hyun-Soo Lee	Delegate
Republic of Moldova	
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Russian Federation	
Victor Blinov	Principal Delegate
Nina Kobysheva (Ms)	Delegate
Valentina Khan (Ms)	Delegate
Olga Bulygina (Ms)	Delegate
Saudi Arabia	
Sameer Bukhari	Principal Delegate
Hassan Mira	Delegate
Shaher Al-Hazmi	Delegate
Murad A. Hashim	Delegate
Senegal	
Cherif Diop	Principal Delegate
Serbia	
Goran Pejanovic	Delegate
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Pavel Št'astný	Principal Delegate
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Osman Şimşek	Principal Delegate
Abdullah Ceylan	Delegate
Gönül Kiliç (Ms)	Delegate
Mesut Demlrcan	Delegate
Serhat Sensoy	Delegate
Ukraine	
Vyacheslav Lipinskiy	Delegate

United Arab Emirates

Youssef Nasser Al Kalbani Delegate

United Kingdom of Great Britain and Northern Ireland

Chris Gordon Principal Delegate
 Chris Hewitt Alternate
 Simon Gilbert Delegate
 Julia Slingo Delegate

United Republic of Tanzania

Emmanuel Jonathan Mpetia Principal Delegate

United States of America

Thomas C. Peterson Principal Delegate
 William C. Bolhofer Alternate Delegate
 Wassila M. Thiaw Delegate

Uzbekistan

Irina Zaytseva (Mrs) Principal Delegate

Zimbabwe

Tirivanhu Muhwati Principal Delegate

3. Representatives of international organizations**CIIFEN**

Rodney Martinez

EUMETNET

Aryan Van Engelen

Niger Basin Authority (NBA)

Oyewole Ogunmola
 N'touvi Hilaire Doffou

4. Other participants

Djamel Boucherf (Algeria)
 Sahib Khalilov (Azerbaijan)
 Dakpanon Felicien Chede (Benin)
 Karma Dupchu (Bhutan)
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