Beijing
3–10 November
2005

Abriged final report with resolutions and recommendations

Commission for Climatology

Fourteenth session

World Meteorological Organization

Weather • Climate • Water

WMO-No. 996

Weather • Climate • Water

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951 — **Commission for Agricultural Meteorology**, thirteenth session, Ljubljana, 10–18 October 2002
953 — **Commission for Aeronautical Meteorology**, twelfth session, Montreal, 16–20 September 2002
955 — **Commission for Basic Systems**, extraordinary session, Cairns, 4–12 December 2002
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985 — **Commission for Basic Systems**, thirteenth session, St Petersburg, 23 February–3 March 2005
995 — **Joint WMO/IOC Technical Commission for Oceanography and Marine Meteorology**, second session, Halifax, 19–27 September 2005

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Technical commissions	— Arabic, Chinese, English, French, Russian, Spanish

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NOTE

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GENERAL SUMMARY OF THE WORK OF THE SESSION

1. OPENING OF THE SESSION
(agenda item 1)

1.1 The fourteenth session of the Commission for Climatology (CCl) was held at the Xiyuan Hotel in Beijing from 3 to 10 November 2005. It was opened at 10 a.m. on 3 November by the president of the Commission, Mr Y. Boodhoo (Mauritius). Having expressed the pleasure of the participants at meeting in Beijing, especially those who were attending a session of the Commission for the first time, Mr Boodhoo remembered and thanked those former members who had left the Commission during the past intersessional period. He noted that the climatology community was indebted to them for their contributions and dedication, among them the former vice-president of the Commission, Mr Volker Vent-Schmidt (Germany), who had retired and the former OPAG 1 chairperson, Mr Richard Masika (Kenya), who had passed away. In particular, he mentioned that the work of presiding over the Commission was becoming more challenging because climate and climate change issues were becoming increasingly important. He highlighted that the Commission might need to follow its activities closely with emerging issues such as the United Nations Millennium Development Goals, new mandates on mitigating the impacts of natural disasters and the Global Earth Observation System of Systems (GEOSS). He also noted that within the World Meteorological Organization (WMO), the Natural Disaster Prevention and Mitigation (DPM) Programme and the WMO Space Programme were other sets of activities that had given rise to particular challenges and tasks placed before the Commission, and had brought particular attention to the climate issue.

1.2 The president continued by stressing that, further to items as spelled out in the agenda, the Commission had to elaborate on the following important issues:

(*a*) The fast and often unpredictable changing global framework for climatological services;
(*b*) The emergence of new stakeholders of climate services and of their needs;
(*c*) The potential for contribution of climate services to the different economic sectors.

1.3 He referred to the outcome of the Technical Conference on Climate as a Resource, held in Beijing, on 1 and 2 November 2005, which had preceded the Commission session, and stressed the necessity to consider the real needs of the various users of climate services as far as socio-economic aspects of climate variability, use of renewable energies, water, agriculture and health were concerned.

1.4 The president noted that CCl was one of the eight WMO technical commissions and built on the concept of cooperation among WMO Members, and there were several issues bearing cross-commission interest that needed to be considered. He further encouraged the delegates to participate fully in the debates as representatives of their respective Governments and believed that each of them might bring a new and important perspective to the issues at hand. The president expressed his thanks to the Secretary-General, the WMO Secretariat and the China Meteorological Administration (CMA) and to its Head, Mr Qin Dahe, who had made wonderful arrangements to facilitate the deliberations and the stay in Beijing.

1.5 In his opening statement, Mr Michel Jarraud, Secretary-General of WMO, welcomed all delegates and representatives of partner organizations within the United Nations system and those of other international organizations. He also expressed his appreciation to the Government of China and Mr Qin Dahe, Permanent Representative of China with WMO and Director of the China Meteorological Administration. The Secretary-General also thanked the outgoing president of the Commission, Mr Y. Boodhoo, for his able leadership in guiding the Commission during the previous four years and for the outstanding work that had been accomplished during the intersessional period.

1.6 Mr Jarraud noted that in the four years since the last session of the Commission, the importance of climate issues to safety and sustainable development had become even more prominent throughout the world. Since that thirteen session held in 2001, some climate system developments, such as one of the strongest heatwaves in central Europe and prolonged drought in western Europe as well as in Africa, had brought the climate and climate change issue to the forefront of the world scene and made it especially challenging. He added that the global mean surface temperature in 2004 placed it as the fourth warmest year in the temperature record since 1861 just behind 2003 (+0.49°C). The Secretary-General added that as those events progressed, WMO strengthened its international partnerships in monitoring its course with major climate prediction centres, regional economic commissions, the donor community and organizations representing user sectors such as public health and food security.

1.7 The Secretary-General further stated that on behalf of the agencies supporting the Climate Agenda, WMO was spearheading the preparation of annual Statements on the Status of the Global Climate to provide credible scientific information on climate and its variability and complement the periodic assessments of the WMO/United Nations Environment Programme (UNEP) sponsored Intergovernmental Panel on Climate Change (IPCC), which was currently in the process of finalizing its Fourth Assessment Report (AR4).

1.8 The Secretary-General recalled that a critical thrust of the contribution of WMO to the United Nations Framework Convention on Climate Change (UNFCCC) related to the importance of strengthening systematic observations of the Earth's climate system, which would require improvements to ground-based monitoring stations, increased use of satellites, and appropriate integration of those observations to produce high-quality data. He stated that such improvements were central to enhancing the effectiveness of WMO Programmes across the interests of several technical commissions and programmes that were implemented in collaboration with other agencies of the United Nations system, and notably the Global Climate Observing System (GCOS).

1.9 Mr Jarraud made an extensive overview of the performance of the work of the Commission in the thirteenth intersessional period, and noted that progress in the priority areas had been achieved through the establishment of task-focused teams of experts to deal with specific issues or projects, timely initiatives such as the Climate Outlook Forums which had become an integral component of the infrastructure for providing climate service in many areas of the world and with committed and active Secretariat support. He added that the Executive Council sessions and Fourteenth Congress had been pleased to see the potential for the Commission to contribute substantially to the four key areas that the Council had decided should receive greater emphasis:

(*a*) Protection of life and property, especially disaster prevention and mitigation;
(*b*) Climate change and its impacts;
(*c*) Provision of services for the socio-economic benefit of people;
(*d*) Hydrology and water resources.

1.10 The Secretary-General was pleased to note that the Technical Conference on Climate as a Resource had successfully provided a forum for exploring the options for future, user-oriented benefits deriving from climate services and placing them on the solid foundation of practices for sustainable development and a cleaner world.

1.11 The session of the Commission as attended by 122 participants, including representatives of 65 Member countries of WMO and four international organizations. The list of participants is given in Appendix A to the present report.

1.12 Mr Qin Dahe, Permanent Representative of China with WMO and Director of the China Meteorological Administration, welcomed the participants to Beijing and wished them a pleasant stay and successful session. He briefed the session on the climate activities of CMA mainly conducted by the National Climate Centre and the Beijing Climate Center. He also briefed the meeting on arrangements made by the local secretariat. In his remarks, Mr Qin Dahe assured WMO and the participants of his cooperation toward the success of the session.

2. ORGANIZATION OF THE SESSION (agenda item 2)

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

In accordance with General Regulation 22, a Credentials Committee was established to check the list of the persons present and the capacities in which they were attending the session on the basis of the examination of credentials. The Credentials Committee reported three times to the session.

2.2 ADOPTION OF THE AGENDA (agenda item 2.2)

The agenda was adopted by the session.

2.3 ESTABLISHMENT OF COMMITTEES (agenda item 2.3)

2.3.1 A Nomination Committee was established, consisting of Mr Raino Heino (Finland) and Mr David Wratt (New Zealand). Mr Heino was elected chairperson of the Nomination Committee. According to General Regulation 31, the session decided to extend the terms of reference of the Nomination Committee to conduct the selection of Expert Team members and Rapporteurs. In addition to the chairperson and member from New Zealand, the following members were included in the membership of the Nomination Committee from other regional associations (RAs): Wing-Mo Leung (Hong Kong, China), Abdalah Mokssit (Morocco), Victor Trenin (Russian Federation) and Diana Perfect (USA).

2.3.2 A Credentials Committee was established, consisting of Mr Masato Sugi (Japan) and Ms Juliana Ukeje (Nigeria) as members. Mr Sugi was elected chairperson of the Credentials Committee.

2.3.3 In accordance with General Regulation 28, a Coordination Committee was established, consisting of the president of the Commission, the chairpersons 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, 10, 12, 13, 14, 15, 16 and 17. The president Mr Yadowsun Boodhoo (Mauritius) chaired the General Plenary;
(*b*) Plenary A to examine agenda items 4, 5 and 9. Mr Roger Street (Canada) was elected chairperson and Mr Wang Shourong (China) was elected co-chairperson of Plenary A;

(*c*) Plenary B to examine agenda items 6, 7, 8 and 11. Mr Pierre Ondongo (Congo) was elected chairperson and Ms Tanja Cegnar (Slovenia) was elected co-chairperson 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 to 12.30 and 14.30 to 17.30.

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 fourteenth session and therefore did not establish a Drafting Committee.

3. Report of the president of the Commission (agenda item 3)

3.1 The Commission took note of the report of the president, which provided an overview of the progress of the Commission since its thirteenth session, covering the work of the Management Group, Open Programme Area Groups (OPAGs) and Expert Teams (ETs). The Commission noted the personal contribution of the president in the issues that the CCl 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) in all Regions, and tighter 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. 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.

3.2 The president of the Commission reported that there were 140 members of the Commission in November 2005, compared with 138 in 2001. Most of the members had corresponded with the president at least once during the intersessional period.

3.3 The president of the Commission made several suggestions in his report and reviewed extensively the activities of the three OPAGs and their Expert Teams and Rapporteurs since the thirteenth session of the Commission. After analysing some of the shortcomings whereby actions could have been more expeditive, he enumerated a number of issues which the next team would have to deal with as a matter of first priority.

3.4 The Commission noted that the work during the thirteenth intersessional period had brought greater importance to climate activities in the forefront of the world scene, and it decided to amend the vision of the Commission as follows: "The vision of the CCl is to stimulate, understand, lead and coordinate international technical activity to obtain and apply climate information and knowledge in support of sustainable socio-economic development and environmental protection".

3.5 Furthermore, the Commission was informed that its interaction had increased with stakeholders such as Global Producers of Seasonal to Interannual Predictions and relevant United Nations specialized agencies, such as the World Health Organization (WHO), the United Nations World Tourism Organization (UNWTO), UNEP and the Food and Agriculture Organization of the United Nations (FAO). It also took note that further to the finalization of a set of Guides on the World Climate Data and Monitoring Programme (WCDMP) and World Climate Applications and CLIPS (WCAC), the Commission had successfully increased its publications during the intersessional period, among them *Climate into the 21st Century*, *We Care for our Climate* (WMO-No. 975), the seventh edition of the *Global Climate System Review* (WMO-No. 950) and *State of the Climate in 2003*.

3.6 The other issues raised in the report requiring actions and decisions are dealt with under the relevant agenda items.

4. Climate data and data management (OPAG 1) (agenda item 4)

4.1 Report of the chairperson of OPAG 1 (agenda item 4.1)

4.1.1 The Commission was pleased to note that the report of the chairperson of OPAG 1, Mr Neil Plummer (Australia), provided an overview of progress made on the work of the Expert Teams and Rapporteurs according to their terms of reference.

At the simplest level, OPAG 1 (Climate Data and Data Management) had responsibilities for providing guidance and support on:

(*a*) Implementation of Climate Database Management Systems (CDMSs);
(*b*) Data rescue activities;
(*c*) Metadata for climate applications;
(*d*) Best practice operation of climate observing networks;
(*e*) Determining and specifying requirements for observations for climate applications.

The report outlined both the successes and "misses" of OPAG 1 with regard to its responsibilities for providing guidance and support to National Meteorological and Hydrological Services (NMHSs) to better manage and deliver climate observations for present and future generations.

Some of the important challenges for Climate and Data Management for the following intersessional period were:

(*a*) Better facilitating the mobilization of resources, the implementation and supporting infrastructures of data collection and exchange, climate databases and data rescue;
(*b*) Transforming guidelines into knowledge, which underpinned the use of the Quality Management Framework;
(*c*) Strengthening of links with groups that had complementary goals, for example the

Commission for Basic Systems (CBS), Commission for Instruments and Methods of Observation (CIMO), Joint WMO/IOC Technical Commission for Oceanography and Marine Meteorology (JCOMM), GCOS and GEOSS;

(*d*) Assisting NMHSs to manage remotely sensed data and other "emerging" data that tended to be managed outside of conventional climate databases;

(*e*) More innovative education and training, such as online courses;

(*f*) Further assisting developing countries in meeting the challenges of automation of observations;

(*g*) Implementing better quality management.

Fundamentally, OPAG 1 activities aimed to improve the foundations on which climate analysis, monitoring, applications development and a range of services were provided, including seasonal to interannual predictions, climatologies of extremes and climate change detection. The Commission also stressed that OPAG 1 activities were directly related to Quality Management Systems and therefore largely determined the related strategy for CCl activities.

4.1.2 The Commission noted the contribution of experts from NMHSs and related organizations to training workshops and seminars, as well as the work of the Expert Teams under the terms of reference of OPAG 1 (implementation of Climate Database Management Systems, data rescue activities, metadata for climate applications, and best practice operation of climate observing networks and systems). Significant outputs from OPAG 1 were the publications of Guidelines spanning those areas. The Commission welcomed the proposal that WMO would seek extrabudgetary resources and other contributions including those from Members to translate CCl Guidelines into WMO official languages.

4.2 OBSERVING REQUIREMENTS AND STANDARDS FOR CLIMATE (agenda item 4.2)

4.2.1 The Commission recalled that Fourteenth Congress had endorsed its efforts to promote increased cooperation with GCOS. Noting the GCOS responsibility for global climate observation and the focus of the Commission on regional and national networks, it noted with satisfaction the participation of the CCl Expert Team on National Networks and Observations in Support of Climate Activities on the GCOS Atmospheric Observation Panel for Climate (AOPC).

4.2.2 However, the Commission noted the need for accelerating the implementation process of the GCOS requirements when designing national climate stations. The GCOS Climate Monitoring Principles had to be adhered to when planning, developing and operating all observing systems relevant to climate change, including both in situ and satellite-based systems.

4.2.3 Members recommended inventory of long time series of proxy data of weather and climate parameters that could be used in climate studies. That inventory would be useful in directing users to data centres managing such data.

4.2.4 The Commission noted the efforts made by WCDMP to develop Guidelines on Climate Observation Networks and Systems. The Guidelines series provided information on how to organize and implement climate services, and in particular presented solutions that addressed the situation and needs of smaller NMHSs with limited resources. Other guidelines developed included documents on: phenological observations; managing changes in observation programmes; and assessing the costs/benefits of automatic weather stations (AWSs). Several contributions to the *Guide to Climatological Practices* (WMO-No. 100) were also provided. However, the Commission identified a need for clearer guidelines on the requirements, for example variables and their resolution according to climate consideration, for national networks.

4.2.5 The Commission noted the risks associated with the introduction of AWSs. In particular, AWSs often monitored only a limited range of parameters, such as temperature and pressure, and omitted other important observations. Also, NMHSs required guidelines on the use of AWSs designed to replace human visual observation of meteorological parameters such as cloud cover. However, the Commission acknowledged the many benefits of AWSs in climate, not least of which their higher temporal resolution.

4.2.6 The Commission noted with interest and appreciation the work being undertaken by JCOMM under the VOSClim Project to provide high-quality ship-based marine meteorological data and associated metadata, to serve as a reference data set to support global climate studies. All data and metadata were available through the project website at: http://www.ncdc.noaa.gov/VOSClim.html. It urged JCOMM to continue and fully implement that project, and to keep CCl/OPAG 1 informed of progress.

4.2.7 The Commission noted the collaboration between the World Climate Programme (WCP) and GCOS to produce the CLIREP software to encode and decode CLIMAT and CLIMAT TEMP messages. The Commission welcomed the WWW (World Weather Watch)/WCP/GCOS joint organization of seminars on CLIMAT and CLIMAT TEMP reporting, including the training on the CLIREP software. Members of the Commission were also active in contributing to other GCOS activities, such as contributing to and reviewing the GCOS second adequacy report and the implementation plan. The Expert Team on National Networks and Observations in Support of Climate Activities was also active, with others in OPAG 1, in the development of Statements of Guidance on observation requirements and in the guidance on data access and designing national networks. The Commission was informed on the possibility of using Reference Climatological Stations (RCSs) as reserve stations in the context of the GCOS Surface Network (GSN) and it was suggested that the existing

RCS catalogue should be checked and updated. The Commission noted the need to continue the ongoing WWW/WCP/GCOS joint training activities and requested that OPAG 1 explore ways to extend those activities to other climate reports.

4.3 CLIMATE DATA MANAGEMENT, MONITORING AND PROCESSING, INCLUDING CLIMATE COMPUTING (CLICOM) AND NEW CLIMATE DATABASE MANAGEMENT SYSTEMS (CDMSs) (agenda item 4.3)

4.3.1 The Commission welcomed the accelerated transition from CLICOM to the new Climate Database Management Systems. It noted that over 30 CDMSs were installed, 20 more were planned, and 30 more requests or expressions of interest had been received through the Voluntary Cooperation Programme (VCP). It further noted with appreciation the extrabudgetary contributions through the small island developing States in the Caribbean (SIDS-Caribbean) project and the Regional Training Centre for Agrometeorology and Operational Hydrology and their Applications (AGRHYMET) programme that enabled the implementation of several CDMSs in RAs I and IV, as well as support by the Czech Republic, France, the UK, the Russian Federation and Zimbabwe for systems in RAs I, II and VI. The Commission was particularly pleased to note the contribution of the UK to the implementation of the Climsoft software in RA I and in the small island developing States in the Pacific. It was recommended, however, that the work needed to be accelerated further, especially in RA I. Considering that such robust systems were compliant with very detailed specifications set up by WMO, the consensus encouraged consideration of their use in Regional Climate Centres.

4.3.2 The Commission noted the concern expressed by Members on conditions imposed by the terms in the collaboration between recipients and providers of such CDMSs either in bilateral or regional forms of such collaboration.

4.3.3 The Commission was pleased to note that following the request of Fourteenth Congress for CDMS training materials and manuals, the Guidelines on both metadata and homogeneity and Climate Database Management had been completed. The Commission welcomed the decision to establish an Expert Team on Climate Data Management including Metadata and to develop activities for the implementation of the new CDMSs. Guidelines on the Extensible Markup Language (XML) were another useful addition, and guidelines on Quality Control/Quality Assurance, as well as an update publication on calculating climate normals, were near completion.

4.4 DATA RESCUE (DARE) ACTIVITIES (agenda item 4.4)

4.4.1 The Commission noted the efforts made to accelerate the data rescue activities in all WMO Regions through coordinated installations, workshops and training. It expressed its gratitude to the Government of Finland for supporting the data rescue projects in the SIDS-Caribbean project and to the Government of Belgium for providing data rescue equipment and training in 20 countries in West and Central Africa. The Commission also noted the initiation of national DARE projects that had resulted from the workshops that WMO had conducted in all Regions in 2003 and 2004. The Commission was pleased to note that the Bureau of Meteorology of Australia had initiated a data rescue project for Pacific island countries.

4.4.2 The Commission was also informed by Members on other data rescue projects being implemented through regional and/or bilateral collaboration, such as in the Commonwealth of Independent States.

4.4.3 The Commission was pleased to note that Members in several Regions were currently imaging their climatological records using digital cameras. However, Members expressed the need to continue in DARE capacity-building, including data rescue from microfilms, and welcomed the proposed decision to explore new projects for rescuing data from obsolete tape media such as seven- and nine-track tapes.

4.4.4 Given the decreasing costs and the increased level of accessibility of records associated with that activity, the Commission urged other Members to consider pursuing that avenue and would be supportive of VCP bids for that purpose.

4.4.5 The Commission recognized the importance of inventories and data rescue of historical climatological time series which represented value for the climate community. The inventories could be constructed and put within a specialized portal that linked users toward NMHSs' dedicated websites hosting data rescue activities. That would greatly facilitate the use of the rescued data in all regions.

4.4.6 The Commission noted the work done by the Expert Team on the Rescue, Preservation and Digitization of Climate Records to produce the *Guidelines on Climate Data Rescue, Preservation and Digitization* (WCDMP-55, WMO/TD-No. 1210). The website for resource reference was on Data Rescue: http://www.wmo.int/web/wcp/wcdmp/html/wcdmpreplist.html and on the OPAG 1 website at http://www.bom.gov.au/wmo/climate/ccl/opag1.shtml.

4.4.7 Data rescue activities could usefully be extended to marine climatological data. For example, the USA, supported by the UK, had a major climate data modernization project which included digitization of historical ships' logbook data back to 1850. That was very valuable for climate research.

4.4.8 The Commission noted with interest and appreciation the work that had been undertaken by JCOMM, through the Expert Team on Marine Climatology, to develop and implement a standardized format for the exchange of historical ship data digitized from national logbooks. Those type of data, to be included in global archives such as the International Comprehensive Ocean-Atmosphere

Data Set (ICOADS), were of particular value in the study of climate variability and climate change, and the Commission requested the president to follow the progress JCOMM made in that work.

4.5 Regional aspects of data and metadata management, including recommended new initiatives (agenda item 4.5)

4.5.1 Considering the efforts and resources engaged in the DARE project, together with the potential risks of database loss, the Commission encouraged both existing and future Regional Climate Centres to provide, where acceptable to members, an alternative secure database system for duplication of members' data. Also, RCCs should have a broader role in supporting the data management operations of NMHSs.

4.5.2 The Commission emphasized the need for a greater degree of cohesion between it and the regional Working Groups on Climate Matters and various other relevant Expert Teams and Implementation/ Coordination Teams in order to maximize the effectiveness of the efforts being undertaken. It was noted that the regional associations could benefit from a higher degree of guidance and information flow, whilst the Commission could benefit through additional on-the-ground information as well as detailed review comments on the content and practicality of implementing proposed new guidelines and frameworks.

4.6 Interactions with other WMO technical commissions and Programmes (agenda item 4.6)

4.6.1 The Commission was also informed that an Intercommission Coordination Group on the WMO Information System (ICG-WIS) had been established to look into metadata aspects that were crucial for the development of WIS. The Commission recommended that a member of the CCl Expert Team on Climate Data Management including Metadata be a member of the ICG-WIS. The Commission stressed the need to organize data homogenization workshops in the Regions in collaboration with CBS.

4.6.2 The Commission emphasized the need for a stronger involvement in the development of WIS and its interactions with CBS and others on the project and was pleased to learn that both Mr A. Besprozvannyh (Russian Federation) and Mr J.D. Shortridge (Australia) had been active contributors to the WIS initiative. As a component of WIS, the WMO Climate Information System should not only facilitate liaison between Members but also serve as a point of entry for all those interested in climate affairs. In that respect, the Commission recognized the need to reference the sites (portals) developed and implemented under the its aegis on the sites (portals) of institutions concerned with those questions, particularly those playing a major role at the global or regional level, such as the European Commission in relation to RA VI.

4.6.3 The issue of metadata in WIS, through the WMO Core Profile, was particularly important to the Commission and would require its close engagement. A final version 1.0 of the WMO Core Profile should be submitted to the next session of CBS in November 2006. The issue was important to the monitoring, analysis and applications areas of the Commission for Climatology.

4.6.4 The Commission agreed on the importance of strengthening interactions with other WMO technical commissions and Programmes. A specific example recommended was the participation of the Commission, along with Climate Variability and Predictability (CLIVAR), in the JCOMM Expert Team on Marine Climatology.

4.6.5 The Commission recalled that JCOMM had a long-standing responsibility for the collection, quality control, archival, processing and applications of marine climatological data, derived primarily from ship meteorological reports and managed under the Marine Climatological Summaries Scheme (MCSS). It noted with appreciation that the Scheme, under regulatory and guidance documentation maintained by JCOMM, was becoming increasingly automated, with a range of freeware being made available by several Members. The Commission further noted that JCOMM was currently moving to better coordinate MCSS with its wider ocean data management system, so as to ultimately deliver an integrated stream of marine meteorological and oceanographic data to users. It agreed that the work of JCOMM in that regard should also be better coordinated with its own climate data management system, within the overall umbrella of WIS. The Commission therefore requested OPAG 1 to enhance its collaboration with the Data Management Programme Area of JCOMM, including in particular its Expert Team on Marine Climatology, through the Inter-Programme Task Team on WMO Information System (WIS) and elsewhere, as appropriate.

5. Climate system monitoring and analyses of climate variability and change (OPAG 2) (agenda item 5)

5.1 Report of the chairperson of OPAG 2 (agenda item 5.1)

The Commission was pleased to note that the report of the chairperson of OPAG 2, Mr Thomas C. Peterson (USA), provided an overview of progress made on the work of the Expert Teams according to their terms of reference. The report outlined the numerous workshops, Expert Team meetings and published guidelines. The flexibility of the OPAG structure enabled OPAG 2 to achieve those significant accomplishments. The Commission stressed the importance of the more active involvement of expert climatologists, from such countries as the Russian Federation, for the preparation of the survey papers.

5.2 CLIMATE CHANGE DETECTION, INCLUDING REGIONAL ASPECTS OF ANALYSIS OF CLIMATE VARIABILITY, CHANGE AND CLIMATE SYSTEM MONITORING (agenda item 5.2)

5.2.1 The Commission noted that the press releases on the annual WMO Statements on the Status of the Global Climate were timely and provided a summary of the significant events of the previous year, and it also welcomed the wide media publicity achieved. Members requested that they be informed a few days before the issue of a press release and be advised on the date of the release. The Commission noted with satisfaction that as of 2003, the Statements were issued not only in English, but also in all other WMO official languages. The Commission also stressed the necessity of better cooperation between NMHSs and the WMO Secretariat concerning the use of the estimation techniques dealing with extreme manifestations of the characteristics of the climate system.

5.2.2 The Commission noted that some weather events with significant socio-economic impacts had not been included in the annual Statements on the Status of the Global Climate. The Commission therefore urged Members to report such events regularly and promptly in order to ensure their inclusion in the annual statements. It noted also the need to ensure worldwide distribution so that all Members would receive it.

5.2.3 The Commission was informed of the organization of several joint CCl/CLIVAR Climate Change Workshops (South Africa, Brazil, Turkey, Guatemala and India) funded by the US Department of State through the GCOS System for Analysis, Research and Training (START), the World Climate Research Programme (WCRP) and the Inter-American Institute for Global Change Research (IAI). It noted with satisfaction the great interest in those workshops, especially in developing countries, and their major contribution to the IPCC Fourth Assessment Report through a consolidated peer reviewed publication. The Commission extended its gratitude to the US Department of State and other funding agencies and encouraged them to continue their support for the organization of such workshops. The Commission noted also with interest that seminars, workshops and summer schools on similar subjects were held elsewhere through regional initiatives. On that aspect, it welcomed the China Meteorological Administration initiative to hold the international Summer school on Climate System and Change in 2004 and 2005 with a plan to hold such training courses every year thereafter.

5.2.4 The Commission noted the expressed need to have the software on climate change indices translated into other languages, and welcomed the help offered by the Netherlands to develop new software suitable for regional climate change analysis workshops as a complement to the existing software.

5.2.5 The Commission noted that the long-term consistent reanalysed data provided a sophisticated basis for identifying and monitoring climate variability and change. The Commission was pleased to be informed that a new global reanalysis project conducted by the Japan Meteorological Agency and the Central Research Institute of Electric Power Industry in Japan was in its final stage, and the reanalysed data were going to be served to Members and research communities for climate studies.

5.3 INTERACTIONS WITH OTHER WMO TECHNICAL COMMISSIONS AND PROGRAMMES (agenda item 5.3)

The Commission stressed again the need to develop close interactions with WCRP, other technical commissions (CBS, Commission for Hydrology (CHy), JCOMM) and other WMO Programmes. The work of the Commission within IPCC, GCOS and WCRP CLIVAR was particularly important in showing the important role of CCl in climate research. In that context, it was essential that the Commission be adequately acknowledged in the IPCC Assessment Reports and other activities that had high visibility.

5.4 CLIMATE WATCH/ALERT SYSTEM (agenda item 5.4)

5.4.1 The Commission noted that the Expert Team to Develop Guidance on Climate Watches had been able to accomplish, in a short period of time, the development of the Guidelines on Climate Watches. The guidelines provided information and assistance on how to organize and implement climate watches, and presented processes and technological solutions that attempted to address the special situations and needs of smaller NMHSs with limited resources. It supported the conclusion of the OPAG 2 chairperson that the Expert Team had completed its excellent work, so it endorsed his recommendation to disband the team; however, it requested the CCl Management Group to keep that issue under review so that the Expert Team could be re-established if necessary and appropriate during the intersessional period.

5.4.2 During the session, the Commission established an ad hoc working group to summarize the guidelines developed by OPAG 2 (WCDMP-58, WMO/TD-No. 1269) on the issue of Climate Watch definition. The Group included delegates representing each of the six WMO official languages, from Canada (English), Senegal (French), Spain (Spanish), the Russian Federation (Russian), Egypt (Arabic) and China (Chinese). The working group emphasized that:

(*a*) Climate Watch was a system, i.e. a set of functions and responsibilities, providing information on the status of climate, and foremost on its possible negative impacts;

(*b*) The Climate Watch system did not imply or require creation of new entities to run climate watch activities;

(*c*) Climate watch advisories were to be issued by NMHSs to their users;

(*d*) Regional climate entities would assist NMHSs by providing regional climate products to NMHSs.

5.5 Future strategy for publication of Global Climate System Reviews (agenda item 5.5)

5.5.1 The Commission noted with appreciation the publication in 2003 of the seventh edition of the *Global Climate System Review* (WMO-No. 950) covering the period June 1996–December 2001. The Commission expressed its appreciation to the national climate centres and individual scientists who had contributed to its publication, with special thanks to Mr A. Klein Tank (Netherlands) for the excellent job he had done as coordinator of the publication.

5.5.2 The Commission noted with appreciation that several international, regional and national institutions, such as the US National Oceanic and Atmospheric Administration (NOAA), Beijing Climate Centre, UK Met Office Hadley Centre, Tokyo Climate Centre, Japan Meteorological Agency, Intergovernmental Authority on Development (IGAD) Climate Prediction and Applications Centre (ICPAC, Nairobi) and Drought Monitoring Centre (Harare), had timely and promptly provided climate system monitoring and analysis products through websites, reports and/or bulletins. The Commission strongly encouraged such activity and recognized it as very important and a valuable complement to the publications for monitoring the global climate system.

5.5.3 The Commission recognized the importance of the Reviews as they contributed to drawing attention to the major climate processes affecting communities and the relevant scientific issues that were currently being addressed. The Commission noted that the publication of the "State of the Climate in 2003" in the *Bulletin of the American Meteorological Society* (BAMS) through a NOAA/WMO collaboration, was a cost-effective means to provide future WMO Global Climate System Reviews. Noting the delay in the publication of the Reviews on an annual basis, the Commission suggested that timely action be taken for such publications in following years. To assist the process, the Commission suggested that contributors could send their material on a monthly or periodic basis. The Commission also proposed that regional arrangements be established to facilitate the collection of information for the Secretariat to ensure a more timely release of the annual climate statements. In that context, the following aspects were discussed:

(*a*) Whether to continue with a WMO version of the long annual "State of the Climate" article, currently prepared in association with the American Meteorological Society;
(*b*) The setting of tight but realistic deadlines;
(*c*) The appropriate mix of volunteer and contracted contributions;
(*d*) The involvement of regional entities such as Regional Specialized Meteorological Centres and future RCCs.

5.5.4 The Commission supported the suggestion of the OPAG 2 chairperson that the Global Climate System Review should be replaced by the annual "State of the Climate" article published in BAMS as there was no need for duplication of the same content. However, the Commission recommended:

(*a*) WMO to take part in the process of choosing authors for the BAMS article to ensure a regionally balanced list of authors, and to explore mechanisms with BAMS to make copies of the *Bulletin* available free of charge to all NMHSs, especially those in developing countries;
(*b*) WMO to translate the article into other languages in a progressive manner in order to avoid delay in its issuance and diffusion;
(*c*) WMO to explore the possibility of having the publication posted on a website for more visibility;
(*d*) More geographical coverage in the article, and welcomed the offer from the Russian Federation to take part in that action and to help in its translation into Russian;
(*e*) WMO to explore the possibility of issuing every five years a summary of the state of the global climate system based on the annual BAMS article to replace the previous five-year Global Climate System Review. The first such summary would cover the period January 2002–December 2006.

5.6 Recommended new initiatives for climate system monitoring and analysis of climate variability and change (agenda item 5.6)

5.6.1 The Commission was pleased to note that the Regional Workshops on Monitoring and Analysis of Climate Variability and Change enabled participants from many countries across a Region to meet internationally recognized climate change experts. The workshop programmes combined seminars with hands-on analyses of climate data brought to the event by the participants themselves. The Commission appreciated the contribution to those workshops of Xeubin Zhang (Canada) who had developed the workshops software and José Luis Santos (Ecuador) who had translated the documentation into Spanish. The Commission also supported the proposal to hold further regional climate change workshops with an increased emphasis on capacity-building and focusing on regions that were partially or not yet covered. Some of the new workshops could be assigned follow-up objectives in order to evaluate and consolidate previous workshops. The Commission noted with satisfaction the statement of the Russian Federation concerning its readiness to conduct in 2006–2007 a workshop on estimation of climate change for experts from the Commonwealth of Independent States and Eastern European countries.

5.6.2 The Commission proposed the creation of a list of national focal points who would be responsible for updating the climate change indices at national and regional levels.

5.6.3 Following the recommendations of the Executive Council at its fifty-fourth session, the Commission supported the organization of workshops and seminars on Climate Early Warning Systems including training workshops. The Commission, however, maintained the priority of the existing OPAG 2 activities and suggested that, in order to meet fully those recommendations, the new activities should be shared among all OPAGs in harmony with their respective terms of reference

6. CLIMATE APPLICATIONS, INFORMATION AND PREDICTION SERVICES (OPAG 3)

(agenda item 6)

6.1 REPORT OF THE CHAIRPERSON OF OPAG 3

(agenda item 6.1)

6.1.1 The Commission noted with pleasure the report of the chairperson of OPAG 3, Mr Pierre Bessemoulin (France), which provided an overview of progress made on the work of the Expert Teams and Rapporteurs since the thirteenth session of the Commission, held in Geneva in November 2001. The report outlined aspects of the structure and work that had transpired efficiently and those that had not. It recommended a number of changes that could further enhance and improve the work of OPAG 3 in the fourteenth intersessional period. In particular, the chairperson recommended the continuation, with minimal amendments to the terms of reference, of many of the Expert Teams and Rapporteurs; timely availability of published workplans with deliverables and deadlines; addition of several new themes, including enhanced focus on three WMO cross-cutting initiatives (for Disaster Prevention and Mitigation, Space/GEO, and Least Developed Countries (also small island developing States); WCRP Coordinated Observation and Prediction of the Earth System (COPES); and merging of the two teams that focused on climate and health. The chairperson strongly recommended splitting OPAG 3 into two new OPAGs, to focus separately on CLIPS and on Climate Applications and Services. The chairperson further recommended using a variety of approaches, including meetings and small pilot projects, to strengthen the effectiveness of the work of the new OPAGs and to motivate the new teams as soon as possible after the fourteenth session of the Commission.

6.1.2 Considering the privileged role of the Commission as a major actor in the design, implementation and evaluation of the cross-cutting climate programme of WMO and, following one of the recommendations of the chairperson of OPAG 3, the Commission maintained the principle that the terms of reference of all the OPAGs and all the Expert Teams should explicitly mention their tangible inputs to the other cross-cutting programmes as well as to the field of training and capacity-building. Members recognized the need to understand the costs/investments required in terms of human and financial resources associated with delivery of the proposed workplans, relative to the capacity of the Commission. In addition, the Commission urged publication and dissemination, in print and via the Internet, of the reports, Guidelines and brochures produced by CCl-XIII OPAG 3.

6.1.3 The Commission noted that the issues raised in the chairperson's report that required action and decisions were dealt with under the relevant agenda items. Members expressed appreciation to the leaders and members of OPAG 3 for their support and contributions since the thirteenth session of the Commission.

6.2 CLIMATE AND HUMAN HEALTH, INCLUDING HEAT-HEALTH WARNING SYSTEMS

(agenda item 6.2)

6.2.1 The Commission noted the ongoing, effective partnership between WMO and its collaborating partners on climate and health matters. A number of workshops and training sessions had been held through that collaboration and two books had been published. The Commission also noted the value of CLIPS initiatives in developing sophisticated and reliable climate predictions and products to assist the health sector in mitigating the adverse impacts of climate variability on human health and on health services. Members further recognized the growing need for attention on health needs for urban areas and mega-cities, rural areas, for areas at high latitudes (in support of the WMO/International Council for Science (ICSU) International Polar Year 2007–2008), and in particular for developing and least developed countries. Members urged WMO to:

(*a*) Continue its collaboration with relevant partners working on climate and health matters, particularly WHO and relevant European Union (EU) projects, for example EUROHEAT and ENSEMBLES;

(*b*) Develop, with relevant partners, for example WHO and WMO Public Weather Services (PWS), a training programme on biometeorology to support climate-health applications;

(*c*) Investigate the use of short-range and seasonal to interannual climate predictions to identify areas that faced increased risk of infectious diseases, for example malaria, highland malaria, dengue fever, encephalitis, meningitis, severe acute respiratory syndrome (SARS) and influenza, and animal diseases such as avian influenza that might infect humans and to warn of climate hazards, such as floods, droughts, parallel air quality stresses and windstorms, that had implications for health;

(*d*) Prepare recommendations on the assessment of the health impacts of climate hazards;

(*e*) Evaluate the role of climate in movements of the migratory birds known to be involved in the spread of avian influenza;

(*f*) Work with the CLIPS national focal points and relevant regional institutions, for example the African Centre of Meteorological Applications for

Development (ACMAD) and eventual RCCs, to enhance existing and establish new partnerships between climate scientists and health services at the national level for effective communication of information and warnings, to promote relevant training and capacity-building efforts; and to develop and publish information relevant to their countries or subregions on climate-related health benefits and risks.

6.2.2 The Commission recognized the extensive work in progress on thermal extremes, both heatwaves and cold waves, and human health, particularly in the development of Heat-Health Warning Systems (HHWS) and a Universal Thermal Climate Index (UTCI). Members urged WMO to:

(*a*) Work with the appropriate partners, such as WHO, EU, JCOMM, WMO PWS, WMO Atmospheric Research and Environment Programme (AREP), WCRP and CCl-XIV OPAG 2, to complete and distribute the Guidelines on HHWS and to complete development, publication and dissemination of UTCI, including software and source code, as matters of priority, noting that those Guidelines would discuss methods for working with epidemiological and health data, and would provide information on appropriate statistical methods;

(*b*) Conduct a series of regional workshops on HHWS and UTCI, for both climate and health experts, possibly in parallel with OPAG 2 workshops on Climate Early Warning Systems (see 5.6.3);

(*c*) Develop a Cold-Health Warning System (CHWS).

6.2.3 The Commission recognized the impacts of natural hazards on individual and community health and urged WMO, through its cross-cutting initiatives, to support appropriate activities related to health aspects of disaster prevention and mitigation. It also recognized the importance of remote sensing of atmospheric, oceanic and terrestrial phenomena, such as urban heat island, dust storms, soot and ash from fires and eruptions, toxic plumes and standing water, that would provide early warnings and detection of precursors to health problems. The Commission also highlighted the existing possibilities for large-scale modelling to simulate background pollution and its variations. It therefore recommended that the impacts of background pollution and its variations on health form part of the work programme of the new OPAG 4 on Climate Applications and Services in collaboration with relevant partners, for example WMO AREP.

6.3 URBAN CLIMATOLOGY, INCLUDING TRAINING (agenda item 6.3)

6.3.1 The Commission recognized that an increasing number of the world's people currently lived in urban areas. That trend was expected to continue in the immediate future, especially in less industrialized parts of the world. The Commission noted that that would place the health and well-being of an increasing share of the world's population at risk from the effects of urban climate hazards, such as air pollution, flooding and thermal extremes. Given the importance of the urban environment to modern societies, and the need to support development of buildings and communities that could withstand urban climates, Members urged WMO to:

(*a*) Take a leading role in climate-related studies of urban environments;

(*b*) Identify the requirements for urban and building climatology research, prediction and applications, and to support the efforts of Members to monitor urban environments;

(*c*) Update, develop and disseminate Technical Notes on urban and building climatology;

(*d*) Develop curricula and training modules on urban climatology and its applications and work with the Education and Training (ETR) Department of WMO to make those available to all WMO training centres;

(*e*) Assess appropriate weather forecasting, mesoscale, regional and global climate models' capabilities and availability for use in urban studies;

(*f*) Develop partnerships and collaboration with key WMO Programmes, such as the Global Atmosphere Watch (GAW), Space, Public Weather Services, Hydrology, and other relevant institutions in related disciplines, for example the International Association for Urban Climate (IAUC), and to organize joint ventures for publications, workshops, training, etc.

6.3.2 Members recalled that at its twelfth session, held in Geneva in 1997, the Commission had endorsed the Plan of Action for the Tropical Urban Climate Experiment (TRUCE), an international meteorological experimental programme first proposed at the Technical Conference on Urban Climatology and its Applications with Special Regard to Tropical Areas in Mexico in 1984. The Commission requested the Secretary-General to review the current status of TRUCE and to make recommendations on how that initiative could contribute to the work of the Commission on urban matters in the fourteenth intersessional period.

6.3.3 The Commission requested that research and application of building climatology be expanded to include design and construction of large infrastructure projects such as dams, canals, highways and coastal defences.

6.4 CLIMATE AND RENEWABLE ENERGY (agenda item 6.4)

6.4.1 The Commission noted that a major shift towards the use of renewable energy resources, demand side management, energy efficiency and conservation would be vital to international efforts to reduce greenhouse gas emissions and the protection of the climate system, in line with the ultimate objective of the United Nations Framework Convention

on Climate Change/Kyoto Protocol and other related instruments. It further noted that access to energy was a vital component in achieving international development goals adopted under the United Nations Millennium Declaration of 2000. Members recognized the importance of the data collected by NMHSs for ensuring a sustainable, climate-friendly energy industry, for example wind, solar radiation, precipitation, runoff and tides, and the value of weather, climate and hydrological forecasts on all timescales for the management and the enhancement of the competitiveness of renewable energy resources. The Commission noted the request of Fourteenth Congress (Geneva, May 2003) to Members to update their networks for measurement of solar radiation and wind, including the use of satellite remote-sensing data, and recognized that that would support the identification of conditions that would lead to the development of renewable energy resources. Members urged WMO to:

(*a*) Regularly review, update and disseminate Technical Notes related to climate and energy, particularly those pertaining to renewable energy resources;

(*b*) Continue to study the socio-economic costs and benefits associated with applications of climate information on the energy sector, including the development and dissemination to all members of reliable information and products on weather derivatives and on climate as a resource for sustainable energy;

(*c*) Identify or develop training modules on applications of climate information for the energy sector, including use of geographical information systems (GISs), modelling and data interpolation techniques;

(*d*) Work with relevant regional institutions, for example ACMAD and eventual RCCs, to enhance existing and establish new partnerships between climate scientists and renewable energy specialists;

(*e*) Support and encourage the efforts of NMHSs to assess the impacts of climate-related natural hazards on the availability and cost of renewable energy;

(*f*) Focus specific attention on the growing needs of urban areas and mega-cities for renewable energy, and on high-latitude regions in conjunction with the goals of the International Polar Year (2007–2008).

6.4.2 The Commission recognized the importance of partnerships in the development of renewable energy as a sustainable resource, and in particular noted the efforts of UNEP through initiatives such as its Solar and Wind Energy Resource Assessment (SWERA) project. Members urged WMO to:

(*a*) Further enhance collaboration with UNEP and other relevant programmes and organizations working in the field of climate and renewable energy, including WMO CHy on matters related to hydropower;

(*b*) Work with those partners to organize joint workshops and training sessions for the various disciplines involved in sustainable energy development, including representatives from user groups in the energy sector.

6.5 Implementation of the CLIPS project and network of CLIPS Focal Points

(agenda item 6.5)

6.5.1 Members recalled that Fourteenth Congress (Geneva, May 2003) had urged all NMHSs to create and implement plans for the development of Climate Information and Prediction Services (CLIPS), and stressed the importance of CLIPS as a vehicle for underpinning the improvement of climate services in a wide range of sectors. The Commission expressed satisfaction with the progress made in the implementation of the CLIPS project in all Regions, and noted in particular the benefits to the Regions of the CLIPS capacity-building activities implemented during the thirteenth intersessional period. It noted with satisfaction the increasing number of regular Regional Climate Outlook Forums held in various subregions. Those activities built the capacity of both climate specialists and key user sectors for whom specialized products and services were being developed. The Commission recognized that not all Regions had been able to arrange training workshops on CLIPS during the thirteenth intersessional period, and urged that training on seasonal to interannual prediction and its application be organized in particular for Regional Associations I and III, but also for parts of RAs II and V (see also 6.8.4).

6.5.2 Members appreciated the support provided through CLIPS activities, in collaboration with climate experts from NMHSs and other relevant climate institutions and organizations, for the development of climate prediction tools and downscaling techniques that enabled CLIPS focal points and regional climate centres to produce predictions more suitable to national and subregional applications than those available from Global Climate Producing Centres (GPCs). The Commission urged that the CCl Expert Teams, the Secretariat and the regional associations continue to strengthen and enhance the excellent collaboration already established between CLIPS, research programmes and institutions and GPCs including, for example WCRP CLIVAR, the International Research Institute for Climate and Society (IRI) and the European Centre for Medium-range Weather Forecasts (ECMWF).

6.5.3 The Commission commended the progress made in the development of the global network of CLIPS Focal Points, and the initiation of biannual reporting on CLIPS initiatives within Member countries. The importance of sharing experiences and information on national and regional projects and training opportunities through the network and the benefits of the resultant "culture of mutual support" were strongly endorsed. The Commission urged

those members that had not yet appointed CLIPS Focal Points to do so as soon as possible. It urged all members to inform WMO of any changes to their Focal Points or their contact information to enable regular updates to be circulated to Members.

6.5.4 The Commission requested the presidents of regional associations to appoint subregional coordinators to take on the responsibility for CLIPS biannual reporting, in order to increase efficiency in developing and distributing that information. Those coordinators would work with the Secretariat following requests, twice per year, for CLIPS activity reports, review and edit the contributions, identifying issues to be raised with WMO, and post the reports on the CLIPS web page.

6.5.5 Members appreciated the development of and upgrades to the Internet-based CLIPS training curriculum on the CLIPS website, and urged that WMO, CCl Expert Teams, the WMO Education and Training Department and experts from relevant institutions continue to build and keep that important resource up to date. The Commission noted the usefulness of having such information available in as many WMO official languages as possible, and requested that those members with the capacity take steps to translate key components of the curriculum.

6.5.6 Noting the special importance of practical demonstrations of tailored climate information and prediction services to various user groups, the Commission encouraged Members to implement further CLIPS showcase projects and to share the related results and lessons learned amongst Members.

6.5.7 The Commission noted the need for assisting developing countries, particularly in the Sahel, that continued to face difficulties in acquiring funding from their governments to attend training for CLIPS activities, including Climate Seasonal Prediction at regional centres.

6.5.8 The Commission noted that the development of CLIPS programmes and activities would further enhance opportunities for improved understanding and awareness of the benefits of climate services and user requirements for those services. Those in turn would help members increase their use and application of climate services in decision-making, particularly those services needed for national sustainable development and formulation of adaptation and mitigation policies and measures to climate variability and change. The Commission encouraged Members to take the importance of climate prediction and service into their country's strategy and programmes. The Commission therefore urged WMO and Members to ensure adequate human and financial support for the CLIPS project, at the level of both the Secretariat and NMHSs, and thanked those institutions and experts that generously supported the modelling, product development, training and capacity-building facets of CLIPS.

6.5.9 The Commission was pleased to note that the specialists from the All-Russia Research Hydrometeorological Information Institute — World Data Centre (Russian Federation) and the National Climatic Data Center (USA) were developing high temporal resolution temperature and precipitation sets to be made available for the wide research community.

6.6 USER REQUIREMENTS FOR INTEGRATED, TAILORED DATA AND PRODUCTS

(agenda item 6.6)

6.6.1 To provide integrated, tailored data and products for user groups, it was vital that NMHSs had timely access to a broad range of national, regional and global data and data-based products including high-quality, digital data from in situ and space-based observing platforms, and model output on various spatial scales. The thirteenth session of the Commission (Geneva, November 2001) had urged NMHSs to examine their data distribution policies with the objective of eliminating any impediments to the provision and free exchange of climatological data, in line with the terms and conditions of Resolution 40 (Cg-XII) — WMO policy and practice for the exchange of meteorological and related data and products including guidelines on relationships in commercial meteorological activities. The Commission strongly reiterated that request for the fourteenth intersessional period, and urged that all members and Global Producing Centres made available, in a timely and consistent manner, their climate and model data, information and prediction services and products, and facilitated access to that information by NMHSs, in particular those in developing countries, to the extent possible. That information had to be backed up with adequate explanatory and educational material in order to facilitate its appropriate and objective use.

6.6.2 The Commission recognized that provision of pertinent and useful climate information and products for specific user groups required extensive dialogue with those groups to ascertain the climate sensitivity of their activities, timing issues and the key parameters on which past, present and predicted information was required, and on what temporal and spatial scales. The Commission noted several key results from a survey completed by the CCl-XIII Expert Team on End-user Liaison in 2004: some countries with sophisticated climate prediction programmes (national to global scale) and most countries with regular RCOFs tended to have well-developed programmes for two-way interaction with users; many users needed client support for effective incorporation of probabilistic forecasts into their decision-making; clients benefited from products written in clear language and simple formats that demonstrated how to get the best out of the available information and how to deal with inherent uncertainty.

6.6.3 The need for basic but up-to-date climate publications in schools was noted by Members, and the Commission also agreed on the importance of ensuring that NMHSs and training centres, as well,

had up-to-date climate reference material for the benefit of their climatologists.

6.6.4 The Commission recognized that some countries elected to have tailored services developed mainly by the private sector, but noted that in many regions, particularly in developing countries, there was an urgent need for guidelines on how to most effectively support user needs for climate information and prediction services, particularly for stakeholders and decision makers. In consideration of those findings, the Commission urged that the work to develop guidelines on best practices in user liaison be continued and urged WMO, its regional associations and NMHSs to support the inclusion of user groups in RCOF processes.

6.6.5 Although the Commission agreed that the seasonal forecast was one of the most important products for users, it recognized that there was often a lack of common understanding of the skill of seasonal forecasts among WMO Members and users. In order to facilitate the most effective use of seasonal forecast products by the wide range of users in many application fields, a comprehensive assessment of the current and potential skill of seasonal forecasts should be a very high priority.

6.6.6 The Commission recognized efforts by NMHSs directed at understanding users' requirements, as well as the related potential benefits that would result from the deliberations at the WMO Conference on Living with Climate Variability and Change: Understanding the uncertainties and managing the risks (LWCVC) in 2006, where the focus would be on decision processes in real-world contexts, on opportunities and challenges in managing climate variability and change, drawing on the experiences of governments, local communities, civil society and private organizations worldwide that had been engaged in creating and using climate information and prediction services to assess and manage climatic risks in pursuit of sustainable development. To further strengthen the above-noted benefits, the Commission urged Members to continue to support those efforts, including through participating in the WMO Conference (see also agenda item 6.11). Members also urged that CCl ETs, for example ET on CLIPS Operations, Verification and Applications Services and ET on Research Needs for Interseasonal, Seasonal and Interannual Prediction, including the Application of those Predictions, develop, based on meeting identified users' requirements, the tools and techniques to deliver high-quality, well-designed climate services and products.

6.7 Infrastructure and developments in operational seasonal to interannual climate prediction, including progress in and sustainability of RCOFs (agenda item 6.7)

6.7.1 The Commission recognized that understanding the climate and predicting its evolution and potential for change represented one of the most difficult challenges for modern science because of the complexity of physical, chemical and biological interactions occurring on the Earth's system, in its atmosphere, oceans and on land, at the widest range of space- and timescales. It further recognized that despite major efforts to advance understanding of the climate and its predictability through monitoring, assessment and research, current climate predictive capability was still relatively modest. Coarse model outputs, limited knowledge of global to regional influences on the initiation, evolution and predictability of the climate system, data assimilation problems and systematic errors embedded in the models, were only a few of the many difficulties currently faced by the climate community in its efforts to improve the accuracy and skills of climate forecasts. In that regard, the Commission urged members to collaborate with relevant programmes and institutions, such as WCRP, GEOSS, JCOMM, WWW, GCOS and GPCs, to strengthen monitoring systems and observational networks, to improve existing and develop new forecasting methods and modelling techniques, to improve tests, calibration and verification methods and downscaling techniques and multi-model ensembles in order to improve the accuracy and skills of seasonal predictions. The Commission noted the importance of working with Members, GPCs and WMO CBS to determine common formats for delivering products, including File Name and File Saving Format.

6.7.2 Most application models were based on seasonal climate prediction or forecast information by GPCs. At the WMO Workshop of GPCs on Long-range Forecasting (LRF) held in Jeju, Republic of Korea, from 10 to 14 October 2005, the Korea Meteorological Administration, in collaboration with the Asia-Pacific Economic Cooperation (APEC) Climate Centre, suggested a need for a "Lead Center for LRF MME". The GPCs had recognized the importance of coordination of activities for LRF Multi-model Ensemble (MME). The Commission noted the suggestion and the importance of such modelling activities to seasonal prediction.

6.7.3 Since 1997/1998, Regional Climate Outlook Forums had developed from experimental exploratory efforts to mature, near-permanent and highly valued regional mechanisms that were a significant component of the infrastructure used to develop and deliver operational seasonal to interannual climate predictions and related products. RCOFs brought numerous benefits of climate services to both NMHSs and user communities: enhancement of capacity, education and skill for the scientists; regional networking and collaboration; awareness raising and education, for the users, of the potential benefits of climate services, with particular emphasis on alleviating poverty and maintaining public safety and welfare; enhanced understanding of the capabilities and uncertainties in the climate products; enhanced visibility of NMHSs

and their climate programmes; and development of stronger linkages to decision makers in government and industry. It was recognized that as accuracy and skill of seasonal forecasting developed and confidence grew within user groups, more effective decisions would be made to improve risk management and provide greater opportunities for sustainable development. While RCOFs had become an integral part of climate programmes and services in some regions, sustainability of funding for their continuation was a major issue for many Members, particularly in developing countries. The Commission recognized the benefits of RCOFs to NMHSs and user sectors, and urged WMO, the regional associations and NMHSs to promote RCOFs; to ensure that political, financial and management support at all levels was secure; to initiate the RCOF process in all Regions and subregions where they would be of benefit; and to work together to identify mechanisms to achieve sustainable funding from development partners, governments and other funding sources, including the private sector (see also agenda item 6.8).

6.7.4 The Commission noted the importance of the technological components of the infrastructure required for further development of the CLIPS project, and urged WMO to collaborate with other United Nations agencies, relevant institutions and programmes and NMHSs to take steps to facilitate the transfer of technology, including modern computing equipment, up-to-date software (including GIS, Climate Prediction Tool (CPT), Rclimdex, Agri-tempo, Climsoft and other packages), and data storage devices. In addition, Members requested that WMO facilitate access to up-to-date literature on all aspects of climate analysis, research and prediction techniques, and facilitate, as far as possible, the establishment of stable communications capacities including Internet access. The Commission urged WMO, the regional associations and relevant regional centres to facilitate and enhance research and training related to the onset of the precipitation component of seasonal prediction, as that information was vital to the agriculture sector and could help prevent crop failure in regions under water stress.

6.7.5 Considerable progress had been made in Regions II, IV, V and VI in designing and implementing Regional Climate Centres (see also agenda item 9.1). The Commission noted that RCCs would, once established, become an important component of the regional infrastructure required for future CLIPS activities and that in some Regions, cooperation and collaboration through RCCs could ensure maximum benefits from limited resources, such as shared equipment, data archiving and training facilities. The Commission commended the success in Africa of the long-standing Drought Monitoring Centres in Harare and Nairobi (the latter currently the IGAD Climate Prediction and Applications Centre, ICPAC) and ACMAD and urged RA I to take the necessary steps to evaluate the establishment of a network of RCCs for Africa, building on those existing and successful initiatives. It further noted the effort that was being made to initiate the process of considering RCCs in RA III, through organizing the meeting of the Working Group on Climate Matters.

6.7.6 The Commission urged the facilitation of issuing seasonal forecasts from some WMO-approved Drought Monitoring Centres for the benefit of Members in activities related to agriculture, water management and energy. Members urged that WMO follow up and evaluate the centres' productivity and provide the essential technical assistance needed to enable such centres to fulfil their mandate.

6.7.7 The Commission noted with appreciation that a great deal of work had been carried out on the preparation of mathematical tools for optimum decision-making for continental shelf oil and gas production using climate products, and requested the Russian Federation to inform the Commission members on the results of the research.

6.7.8 Australia and Canada had undertaken a leadership role in the Lead Centre for Long-range Forecast Verification. The Lead Centre aimed to assist Global Producing Centres to verify their seasonal outlooks by supplying software, verification data and general guidance on how to follow the WMO Standardized Verification System for Long-range Forecasts.

6.8 INTEGRATING CLIPS WITH CLIMATE APPLICATIONS AND SERVICES, INCLUDING CAPACITY-BUILDING (agenda item 6.8)

6.8.1 The Commission recognized the need for improved, reliable climate information, including long-lead climate predictions and the practical application of that information (end-to-end services) for socio-economic benefits. It urged WMO, the regional associations and Members to develop a "tool-kit" (i.e. a collection of methodologies, examples and techniques to assist members in delivering effective "tailored" services for specific sectors, in collecting reliable data on the costs and socio-economic benefits of the services, and to enhance national and regional efforts to raise funds for climate activities) and to organize demonstration and pilot projects with wide sectoral and geographic applicability to showcase those methodologies and their benefits. The Commission noted that key user groups, especially those related to food security, water resource management, agriculture, renewable energy, human health, urban and building climatology and tourism, should be included in developing and implementing the projects, to ensure effective exchange of information on science capacity and user needs. The Commission further urged that the CLIPS Focal Point network, relevant WMO technical commissions, for example CHy and the Commission for Agricultural Meteorology (CAgM), and other partners be actively involved in all stages of such projects, and that existing mechanisms such as Regional Climate Outlook Forums, the World Hydrological Cycle Observing System (WHYCOS),

Climate Prediction for Agriculture (CLIMAG) and START be used wherever possible for momentum and efficiency.

6.8.2 End-to-end services required timely, reliable access to high-quality data and model output. Improved monitoring, from the Earth's surface and from space, of atmospheric and oceanic parameters, particularly those related to the El Niño/Southern Oscillation (ENSO) and rapid advances in computer capacity and in modelling had enabled reliable prediction of seasonal-scale climate parameters, such as temperature and precipitation, particularly in tropical regions. The Commission urged that continued research efforts be undertaken through the WCRP CLIVAR Working Group on Seasonal to Interannual Prediction (WGSIP), through Members with the capacity, and through organizations and institutions such as IRI and ECMWF, to further improve climate monitoring, assessment and prediction for all regions of the world. Members strongly recommended that the results of the monitoring and research, including data and improved techniques and products, be made available, along with the requisite software, training and information packages, to all Members, particularly those in developing and least developed countries, and that workshops and other mechanisms, for example teleconferences, be regularly scheduled in subregions to build and maintain capacity at state-of-the-art levels for all NMHSs. The Commission noted that a key priority for capacity-building was personal development of skill and knowledge amongst climate scientists.

6.8.3 The Commission noted the proposed split in the OPAG on Climate Applications, Information and Prediction Services into two new OPAGs, one on CLIPS and the other on Applications and Services, a proposal that had been made by the CCl Management Group at its second session, held in Geneva in February 2005. In order to maintain the achievements to date in the effective integration of CLIPS and applications activities, the Commission requested that all Expert Teams and Rapporteurs in the new structure collaborate closely and regularly exchange information. Members therefore urged that WMO and the CCl Management Group facilitate web-based information sharing on all OPAG activities and on the membership of each OPAG, including brief biographies covering areas of professional interest, and encourage relevant CCl experts to keep the websites up to date and accessible.

6.8.4 The Commission noted that, since 2001, regional CLIPS Focal Point training workshops had been held for RA I (Eastern and Southern Africa, Nairobi, Kenya, 2002), RA VI (Erfurt, Germany, 2003), RA II (Western part, Doha, Qatar, 2004) and RA III (Lima, Peru, 2005). Recognizing the need for such specialized training, it urged that the workshops be implemented in other areas, as needed. The Commission approved the proposal from the Russian Federation to host a training workshop on CLIPS. Members urged that trained Focal Points use the acquired knowledge to build capacity within their national Services. Further, Members urged that the Focal Points, regional associations, Expert Teams and Rapporteurs take steps to build capacity within the user group community, through the promotion of existing and potential climate services and the development of information kits on a variety of climate topics for various sectors.

6.8.5 The Commission noted that RCOFs were a particularly important vehicle for capacity-building, generating prediction products and exchanging information between users and producers of climate information and products. Those continued to be held in various parts of the globe including eastern, western and southern Africa, Central America, eastern South America and the Pacific. The Commission noted the success of the Island Climate Update bulletin and associated activities led by New Zealand for the Pacific Region, and the development of climate prediction software and capacity-building that had been undertaken by Australia with nine Pacific NMHSs. A key feature of the project was to develop system outputs in collaboration with the NMHSs end-user communities. RCOFs had also expanded in new areas such as Asia with the support of the Beijing Climate Center, and the western coast of South America with the support of the International Research Centre on El Niño (CIIFEN).

6.8.6 The Commission noted the need for capacity-building on communication skills to ensure the better use and understanding of climatological information within the community of decision makers, the general public and other users. That aim could be largely achieved by conveying the information through the media and in direct communication with policymakers. There was a need for guidelines and training workshops on communication skills, tailored specifically to meet the needs of climatologists, especially with respect to the issues of climate variability, change and extremes. The Commission noted that in RA VI, those activities were already foreseen in the GCOS Action Plan for Eastern and Central Europe. The Commission agreed to work in partnership with the CBS/OPAG-PWS, WMO Communications and Public Affairs (CPA) and other relevant partners to develop guidelines and training proposals for effectively communicating meteorological and climatological information to the media and decision makers.

6.9 INTERACTIONS WITH OTHER WMO TECHNICAL COMMISSIONS AND PROGRAMMES (agenda item 6.9)

6.9.1 The Commission noted the cross-cutting nature of CLIPS activities ranging from longer-term predictions to applications and services, and that success in such activities was heavily dependent on the availability of quality-controlled climate data, effective communication of the information and effective operational collaborations with partners and users. Having taken those into consideration, the Commission requested the

Secretary-General to facilitate the flow of information through well-designed and accessible websites, interdepartmental meetings, conferences and workshops, the circulation of reports of the Meetings of Presidents of Technical Commissions, etc. It also urged WCP to make every effort to raise awareness of the activities of WCP and the Commission to all relevant programmes and projects, such as Hydrology and Water Resources (HWR), DPM, WWW including PWS and WIS, ETR, AREP, WCRP, GCOS, IPCC, IPY and THe Observing System Research and Predictability EXperiment (THORPEX).

6.9.2 In particular, the Commission noted the importance of CCl-CBS collaboration to revise the *Manual on the Global Data-processing and Forecasting System* (WMO-No. 485), Volume I (see also agenda item 9.1), the ongoing work with WCRP CLIVAR and THORPEX on improving longer-term prediction capability, the work with CHy on developing better integration of climate and hydrological information for joint applications including hydrological disasters, with WWW and GCOS on ensuring the timely availability of quality-controlled data (with metadata), and with WWW PWS on the development of effective applications for health and the disaster communities. The Commission stressed that every effort should be made to use cross-cutting approaches to planning, and to reduce duplication of work on matters of common interest.

6.9.3 The Commission noted with interest and appreciation the work being undertaken by JCOMM in further developing procedures, methodologies and techniques in the application of marine climatological data. That included the preparation and maintenance of the *Guide to the Applications of Marine Climatology* (WMO-No. 781), as well as the convening of a series of international workshops on Advances in Marine Climatology (CLIMAR), held in Vancouver (1999) and Brussels (2003) and planned tentatively for 2007, and the second International Workshop on Advances in the Use of Historical Marine Climate Data (MARCDAT-II), held in Exeter, UK, in October 2005. The Commission agreed that the work represented an important contribution to the overall development of climate applications and services, and requested that each OPAG develop appropriate contacts with the JCOMM Expert Team on Marine Climatology, with a view to possibly supporting and contributing to future CLIMAR workshops. The Commission further encouraged JCOMM to consider submitting posters to the forthcoming WMO multidisciplinary Conference on Living with Climate Variability and Change: Understanding the uncertainties and managing the risks (LWCVC), as discussed in detail under agenda item 6.11.

6.10 Recommended new initiatives for applications, prediction and services (agenda item 6.10)

6.10.1 The Commission recognized the importance of sustainable funding for climate-related activities. It further noted that the availability of financial resources from traditional funding agencies was becoming increasingly dependent on performance-based systems aimed at monitoring the effectiveness of the predictions and services for the user communities. However, the best methods and techniques for capturing reliable information on the value of climate products and services were not widely known. The Commission requested the Secretary-General to facilitate development of tools and techniques for evaluation and assessment of the socio-economic value of all weather, water and climate products and services (see also 6.8.1), to integrate those activities to minimize duplication wherever possible, and to establish a cross-cutting activity on the topic with input and advice from social scientists and economists, particularly specialists in the economies of developing countries.

6.10.2 Noting the importance of the tourism sector to the global economy, the ongoing inter-agency activity between WMO and UNWTO, and the needs of the sector for reliable information related to climate hazards, climate statistics, data and long-range forecasts, the Commission decided to create a new interdisciplinary Expert Team on Climate and Tourism. The ET should comprise a number of experts with both climate and tourism expertise, and would need to work closely with other relevant WMO Programmes that had tourism projects, particularly DPM and CPA. The Commission urged the Secretary-General to ensure that WMO continue to participate in interdepartmental and inter-agency coordination mechanisms for tourism.

6.10.3 Recognizing the importance of the availability of freshwater to health and to sustainable development, the importance of the climate aspects of hydrology in effective understanding and management of hydrological hazards, and the WMO Sixth Long-term Plan (6LTP) objective for the World Climate Applications and Services Programme (WCASP) to support the organization of a series of roving seminars on flood forecasting and mitigation of the effects of floods, the Commission would take on a stronger role with the WCP-Water programme (see agenda item 9.10), and would nominate a Rapporteur on Climate and Water.

6.10.4 The Commission recognized the value of WMO's efforts to coordinate activities related to Natural Disaster Prevention and Mitigation, space-based observations and Least Developed Countries (also small island developing States) in a cross-cutting manner, and decided to promote that approach in the terms of reference of the Commission and all of its relevant Expert Teams and Rapporteurs (see agenda item 11). Members urged the Secretary-General to support the expanded function in the Commission's activities with appropriate programme resources, and to ensure effective information-sharing between the Secretariat and Members through the Internet, reports and newsletters, and through the regional associations

and technical commissions. The Commission recommended that CLIPS Focal Points work closely with national DPM focal points in coordination of the full suite of products and services related to weather- and climate-related hazards and risk management. The Commission further decided to appoint a Rapporteur on Climate-related Hazards, from within the Management Group. The new Rapporteur would work in close collaboration with relevant WMO Programmes and technical commissions, particularly DPM and CPA, and would focus principally on development of climate hazard databases, outreach projects, guidelines on risk assessment, investigation of the impacts of climate extremes on various sectors and, in collaboration with research groups and other CCl ETs, development of user-friendly and reliable climate products for the user groups in the disaster prevention and mitigation community.

6.10.5 The Commission noted that the United Nations Millennium Declaration adopted by the United Nations General Assembly in 2000, the World Summit on Sustainable Development, held in Johannesburg, South Africa, in August/September 2002 and the 2005 World Summit, held in New York in September, had addressed issues relating to climate, water, food security, hunger and poverty eradication. The Commission further realized that several forums in the intersessional period, such as the World Food Summit: Five Years Later, held in Rome in June 2002, which fed into the previous Summits, had all stressed the need for governments to strengthen efforts towards the attainment of international development goals such as the Millennium Development Goals of which food security and the eradication of hunger and poverty were some of the key targets. To that end the Commission decided to establish a Rapporteur on Climate and Agrometeorology to liaise with CAgM and facilitate the use of climate science and information for agriculture in support of those goals.

6.10.6 The Commission noted progress in the preparation of the IPCC Fourth Assessment Report (AR4) and its expected release in September 2007, and urged the Secretary-General to participate in IPCC outreach activities in order to ensure that national and regional climate services were provided with information, particularly on the key AR4 findings. That would help NMHSs in communicating the IPCC outcomes to relevant groups and the public in their countries. The Commission urged climate specialists of NMHSs to be fully engaged in ongoing climate impact assessments so as to be able to contribute, as needed, to policy decisions.

6.10.7 The CLIPS project was an important component of the World Climate Applications and Services Programme. At its thirteenth session, the Commission had established Expert Teams on CLIPS Operations including Product Generation, on Verification and on End-User Liaison. In order to increase collaboration and to focus activities on the key priorities for CLIPS, the Commission decided to merge those ETs into a new Expert Team on CLIPS Operations, Verification and Application Services.

6.10.8 The Commission recognized that at its thirteenth session it had launched two Expert Teams focused on Climate and Health, on issues related to thermal extremes: 'Operational Heat/Health Warnings' and 'Health-related climate indices and their use in early warning systems'. The Commission decided to merge the two into a new Expert Team on Climate and Health. That ET would complete the outstanding activities related to thermal extremes and launch a new initiative related to the role of climate in the life cycle and spread of infectious disease. It would work closely with relevant ETs including the CCl-XIV OPAG 3 Expert Team on CLIPS Operations, Verification and Application Services and with relevant WMO Programmes and technical commissions, particularly WMO PWS and DPM.

6.11 WMO Conference (2006): Multidisciplinary Conference on Decision-making Processes in Climate Applications (agenda item 6.11)

6.11.1 The Commission recognized that climate variability and climate-related disasters were significant impediments to achieving the national and international development goals such as those established under the 2000 United Nations Millennium Declaration on poverty eradication, protection of human health, provision of adequate food, water, energy and shelter in clean and safe environments for all, and that uncertainty about climate variability and change hindered effective planning for socio-economic development. Members further recognized that effective integration of information on past, present and possible future climates into societal, government, corporate and individual decision-making processes would help in the management of climate-sensitive endeavours and in the reduction of risk. The Commission therefore endorsed the goals of the WMO multidisciplinary conference entitled Living with Climate Variability and Change: Understanding the uncertainties and managing the risks (LWCVC), to be held in Espoo, Finland, from 17 to 21 July 2006), to:

(*a*) Review efforts to date regarding how climate information, encompassing all planning horizons relating to climate variability and change, could be used to manage risk across all critical financial, environmental and social sectors;

(*b*) Identify more effective ways to develop and incorporate risk management strategies and techniques, including early warning systems, within the virtual continuum of climate variability and change;

(*c*) Examine the techniques and challenges associated with blending the required data and information, including climate, for planning, making decisions and managing risks;

(*d*) Determine the requirements for climate data and related information on multiple planning

horizons and spatial scales relevant to functioning societies;

and urged Members to participate in the event. The Commission noted that WMO and its co-sponsors had initiated mobilization of the resources required for the Conference, and urged that all Members support the initiative to the extent possible, particularly to ensure the participation of representatives from various disciplines from developing countries. To that effect, the Commission adopted Resolution 1 (CCl-XIV) requesting support by Members and other relevant parties for the Conference.

6.11.2 The Commission urged the Secretary-General to ensure the participation in the Conference of decision makers from key climate-sensitive sectors and to ensure that the Conference develop a lasting legacy. The Commission highly recommended that the Conference develop a framework through which its recommendations would be carried forward and whereby the results of climate science would continue to be promoted and brought routinely and more effectively into the mainstreams of economic, societal and environmental planning, decision processes and risk management. It was further recommended that the goals and expected outcomes of the Conference be brought to the attention of the provisional organizing committee for the proposed third World Climate Conference to assist in integrating any common follow-on activities.

7. Overall coordination of climate issues and inter-agency collaboration (agenda item 7)

7.1 WMO/CCl coordination role in climate matters, including the EC Advisory Group on Climate and Environment (EC-AGCE) (agenda item 7.1)

7.1.1 The Commission noted that the second meeting of its Core Management Group had been held in Geneva, from 31 January to 2 February 2005, and that it had requested the Secretary-General to arrange for the finalization of the editing process of the *Guide to Climatological Practices* (WMO-No. 100) before the fourteenth session of the Commission and expedite its publication (see also agenda item 9.8). The Commission took note that the Management Group had considered the reports of the president, vice-president and OPAG chairpersons and had advised the Commission to improve its dialogue and cooperation with the regional associations. The Management Group had reviewed and made new proposals to update the terms of reference of the Commission. It had further assessed the implementation of the Commission's objectives, proposed a number of amendments to split OPAG 3 and considered various cross-cutting activities and future priorities in which the Commission would be involved (see agenda item 9).

7.1.2 The Commission noted that the Executive Council Advisory Group on Climate and Environment had held its sixth meeting in Geneva on 31 March and 1 April 2005, in which the president of the Commission had participated. The Advisory Group had to date reviewed the overall coordination mechanism of climate activities within the Secretariat, within the Organization and with other agencies. It requested that the incoming president of the Commission continue the practice of participating in sessions of the EC-AGCE. The Commission further noted that at its sixth session the Advisory Group had considered the report of an ad hoc Exploratory Committee on World Climate Conference 3 (WCC-3). It was informed that, on the recommendation of the fifty-seventh session of the Executive Council, the Secretary-General had established a provisional Organizing Committee to develop a meeting plan for WCC-3 for further review and decision. The president of the Commission was a member of the Committee.

7.2 Cooperation with other United Nations agencies, including an update on UNFCCC activities — GCOS and IPCC (agenda item 7.2)

7.2.1 The Commission noted that WMO had continued to participate in the United Nations Framework Convention on Climate Change (UNFCCC) activities, including the tenth session of the Conference of the Parties (COP 10) in Buenos Aires, Argentina (6–18 December 2004) and the Subsidiary Body for Scientific and Technological Advice/Subsidiary Body for Implementation (SBSTA/SBI) 22, in Bonn, Germany (19–27 May 2005) and that WMO would be participating at the eleventh session (COP 11), to be held in Montreal, Canada, from 28 November to 9 December 2005. Recognizing the emphasis given by the COP 10 and SBSTA 22 sessions to adaptation to both climate variability and change, the side event scheduled for COP 11 on 1 December 2005 entitled "Enhancing Climate Knowledge to Improve Adaptation to Climate Variability and Change", with partners such as IRI, the Regional Committee for Water Resources (CRRH) and ICPAC and the commitment of countries to take measures accordingly, the Commission endorsed several initiatives in those areas, requesting the Secretary-General to:

(*a*) Provide support for the development of capacities both in human resources and infrastructure of NMHSs, especially in developing and least developed countries, to enable them to carry out activities that support adaptation to climate variability and change;

(*b*) Provide support to national and regional efforts, through relevant institutions, that address issues related to adaptation to climate variability and change;

(*c*) Collaborate with other international organizations and United Nations agencies that address adaptation to climate variability and change issues.

7.2.2 The Commission welcomed the progress made in the preparations of the IPCC Fourth Assessment Report (AR4) and the decision taken by

the Panel at its twenty-second session to prepare an AR4 Synthesis Report (SYR), and requested Members to continue their efforts to ensure effective contributions to IPCC assessments and technical papers.

7.2.3 The Commission welcomed the development, under GCOS leadership, of the Implementation Plan for the Global Observing System for Climate in Support of the United Nations Framework Convention on Climate Change. The Plan had been submitted to COP 10 in December 2004 and had been supported by COP through decision 5/CP.10. The Plan called for some 131 actions needed over the next 5 to 10 years to address the critical issues related to global observing systems for climate, namely: improving key satellite and in situ networks for atmospheric, oceanic and terrestrial observations; generating integrated global climate analysis products; enhancing the participation of least developed countries and small island developing States; improving access to high-quality global data for essential climate variables; and strengthening national and international infrastructure. Many of the actions involved the WMO technical commissions explicitly as "agents for implementation" of the actions, including five specific actions requiring the support of CCl (see Annex I to the present report). The Commission supported the Plan as a major step in the full implementation of the global observing system for climate and agreed to participate fully in implementing the relevant actions. It also encouraged Members to support implementation of the Plan on an individual basis.

7.2.4 The Commission noted that GCOS would soon complete the Regional Workshop Programme that it had organized with the encouragement of COP 5 (1999), aimed at identifying priority capacity-building needs and deficiencies for climate observing networks in the regions. The Commission welcomed the Regional Action Plans that had been developed as a result of the workshops and encouraged Members to support and participate in the implementation of the plans.

7.2.5 The Commission welcomed the ongoing cooperation between GCOS and UNFCCC aimed at solidifying support for the establishment and maintenance of the observing systems needed for climate observations, and encouraged Members to continue to support that effort through participation in national activities relating to UNFCCC.

International Strategy for Disaster Reduction (ISDR)

7.2.6 The Commission noted the importance of active participation by the World Climate Programme in the Inter-Agency Task Force on the International Strategy for Disaster Reduction and its Working Group on Climate Change and Disaster Risk Reduction. The Commission further noted the involvement of WCP in the thematic clusters of the World Conference on Disaster Reduction, held in Kobe, Hyogo, Japan, from 18 to 22 January 2005. It requested the Secretary-General to arrange for continued support and participation of WCP in the implementation and follow-up to the outcome and Framework for Action of the Conference. The Commission recommended that, to ensure more effective disaster preparedness, emphasis should be given to the promotion and application of climate modelling and forecasting, communication tools and early warning systems. The Commission stressed the need for full coordination between the CCl Management Group, OPAG chairpersons and the GCOS Secretariat in matters related to future strategic plans for improving the current Global Observing System.

United Nations Convention to Combat Desertification (UNCCD)

7.2.7 The Commission was informed that the UNCCD Secretariat, in cooperation with WMO, had organized a Technical Workshop on Drought Preparedness in the Balkans, in Poiana Brasov, Romania (25–26 October 2004), and that the workshop had proposed the establishment of a Balkan subregional Drought Management Centre for early warning of drought events, assessment of their severity and mitigation of their damages.

7.2.8 The Commission noted that by a resolution adopted at its fifty-eighth session, the United Nations General Assembly had declared 2006 as the International Year of Deserts and Desertification. In that regard, the Commission suggested that droughts and desertification feature appropriately in the work of relevant Expert Teams.

7.2.9 The Commission noted further that WMO had continued to work closely with UNCCD through participation in its COP sessions, including COP 7 held in Nairobi, Kenya, from 17 to 28 October 2005, where WMO had held a side event on climate and land degradation.

8. Emerging issues for CCl (agenda item 8)

8.1 Mainstreaming seasonal climate prediction and services into user awareness (agenda item 8.1)

8.1.1 Surveys of user requirements for climate information and feedback on user satisfaction with currently available climate prediction products indicated that there was much to be done before the users, including the public, would routinely apply, with confidence, climate predictions and analyses in everyday decision-making. One issue was the difficulties that end users experienced in dealing with probabilistic outputs and uncertainties. Other potential impediments were the limited numbers of parameters predicted, timing issues and level of skill. Seasonal prediction currently focused on seasonal rainfall and temperature, but a given user might require temperatures in terms, for example, of the probability of extremes for their purposes. Users might need to know the seasonal distribution of precipitation and

whether it would be heavy or light at the beginning of the season, in addition to information for the season as a whole.

8.1.2 The Commission recognized the importance of working with users to develop a clear understanding of their needs for data and products, and urged the following actions by climate service specialists of NMHSs to encourage mainstreaming seasonal prediction and products into public awareness:

(*a*) Work closely with user groups, through the trial and error process, in an end-to-end approach to come up with products, client support mechanisms and product delivery tools that would foster acceptance of the products;
(*b*) Demonstrate to users how to interpret probabilistic forecasts in the context of their specific decision path;
(*c*) Provide verification information from the user point of view on past forecasts, having them compared with the average climate experience and other alternatives of seasonal climate prediction;
(*d*) Ensure the reliability and timeliness of the forecasts, and base timeliness on an understanding of the lead-time requirements of the users;
(*e*) Provide information in sector-specific language, so that users could see the information had been tailored to their interests;
(*f*) Encourage and support the trained and experienced users to become "advocates" of the processes and outputs in their sector;
(*g*) Ensure consistency within a region. Subregions needed to work together to minimize "boundary" problems that could arise between forecasts produced by neighbouring countries;
(*h*) Ensure users were aware of confidence levels and uncertainties associated with the predictions;
(*i*) Develop partnerships with the media to ensure effective communication of forecast products.

8.2 Development of climate guidance for adaptation and mitigation (agenda item 8.2)

8.2.1 The Commission noted that climate change scenarios/projections and guidance encompassed a suite of activities which collectively provided the mechanism for transforming research results into information designed to assist potential users. Those outputs were distributed to key decision makers who were involved in adaptation and mitigation practices. To that effect the Commission requested the following actions to be taken in a concerted effort between NMHSs and WMO and through effective engagement of the World Climate Impact Assessment and Response Strategies Programme:

(*a*) Analysis of the anticipated impacts of projected climate variability and changes in the physical environment on natural and human systems;
(*b*) Studies on vulnerability to short-term fluctuations in climate, and the influence of changing socio-economic conditions;
(*c*) Development, evaluation and use of improved assessment techniques and methodologies which provided for the integration of physical climate predictions into existing decision-making and risk management structures;
(*d*) Analyses of how the adoption of climate forecasts would alter management decisions in climate-sensitive sectors, and how those new patterns of adjustment would, in turn, affect other sectors and society as a whole;
(*e*) Gathering information on indigenous and community-based coping strategies that were relevant to adaptation to climate variability and change;
(*f*) Development of methodological recommendations on taking account of climate change impacts.

8.2.2 The decision-making Conference on Living with Climate Variability and Change: Understanding the uncertainties and managing the risks (LWCVC), to be held in Finland in July 2006, would be important in positioning the Commission to respond to the need for information on climate impacts and adaptation.

8.3 International initiatives to explore possible global consensus on definitions of and indices for El Niño and La Niña (agenda item 8.3)

8.3.1 The Commission noted that there was no international agreement in place on what constituted an ENSO event and that currently various services and agencies analysed, interpreted, predicted and disseminated information on ENSO using diverse methods, definitions and interpretations. It further noted that in various parts of the world, the terms El Niño and La Niña had in general become strongly associated with local and regional impacts. Those factors led to some confusion in the public, in particular the media and other non-climate communities, whenever El Niño was discussed at regional and global scales. The Commission also noted that the impacts of ENSO were variable as they depended on the pattern of sea surface temperature anomalies and were not proportional to the strength of ENSO. The Commission noted that the CCl Management Group, at its meeting in Geneva in February 2005, had established an Expert Team within CCl-XIII OPAG 2 to catalogue the various operational definitions and indices for El Niño and La Niña in use by WMO Members and relevant organizations, i.e. with official El Niño monitoring and prediction functions. The catalogue was meant to serve as a reference for stakeholders and should help to clarify some of the ambiguities associated with the various definitions of El Niño and La Niña in use around the world. Members appreciated the efforts of the Expert Team to complete its mandate in time for the fourteenth session of the Commission, and requested that WMO provide the results as soon as possible to all Member countries.

8.3.2 Members recalled that at the fifty-sixth session of the Executive Council (2004) the president of the Commission had proposed the "development of a universally-acceptable definition for an El Niño event". The president also noted the work of the WCRP CLIVAR Working Group on Seasonal to Interannual Prediction (WGSIP) which, in 2004, had also proposed development of an Index that would describe the state of the tropical Pacific, be scientifically robust, and would minimize the scope for public confusion about impacts. The Commission also noted the decision of RA IV at its fourteenth session in April 2005 to adopt the index and definitions developed by NOAA and in operational use in the USA since 2003. That would now be known as the WMO RA IV Consensus Index and Definitions of El Niño and La Niña, with the understanding that the index and definitions could be revised in the future based on further scientific research and findings. Regional Association IV urged its members to define local thresholds for impacts based on the index. In consideration of those factors, the Commission decided to establish a new Expert Team on El Niño and La Niña within the CCl-XIV OPAG 3 on CLIPS. That ET would follow up on the work of the ET established within CCl-XIV OPAG 2 (ENSO) (see 8.3.1) and would develop a strategy and common language for public communiqués, recommend Guidelines for Members and relevant organizations to follow to improve collaboration on information and predictions of El Niño and La Niña, and would collaborate with and complement the work of WCRP CLIVAR WGSIP, the Global Predicting Centres, research institutes including IRI, ECMWF and CIIFEN, and other relevant institutions in their ongoing investigations of the potential for the development of a single approach to the ENSO phenomenon. Members agreed that the proposed Expert Team on El Niño and La Niña in CCl-XIV OPAG 3 (on CLIPS) should focus on impact forecasts and warnings for specific regions rather than on definitions of ENSO indices.

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

9.0 A brainstorming session was held where Members were invited to speak on issues which they felt required greater attention. The Commission was requested to lay more stress on the following:

(*a*) Undertake the assessment of the economic impact of climate services on socio-economic sectors;
(*b*) Reinforce capacity-building in the different fields, including numerical prediction;
(*c*) Give more attention to climate extremes;
(*d*) Claim greater visibility through contributions of Members in IPCC and UNFCCC matters;
(*e*) Interact with the Meteorological Societies of WMO Members, which had interest in climate activities;
(*f*) Assist WMO Members to devise better communication skills to support them when dealing with the media;
(*g*) Pay particular attention to precipitation and monsoon climatology.

Such activities would enhance the visibility of the Commission and further enable members' capabilities to make positive contributions to their national development.

9.1 FOLLOW-UP TO THE ESTABLISHMENT OF REGIONAL CLIMATE CENTRES (RCCs) (agenda item 9.1)

9.1.1 The Commission noted that the Meeting of Experts on Organization and Implementation of Regional Climate Centres (Geneva, November 2003) had established Guidelines for all Regions to use in their consideration of implementation of RCCs, and that since that time considerable progress had been achieved, particularly in Regions II, IV and VI. Under Resolution 9 (XIII-RA II) — Establishment of a Regional Climate Centres Network in RA II, adopted by Regional Association II at its thirteenth session in Hong Kong, China, in December 2004, RA II was proceeding to establish a network of multifunctional RCCs and contributing centres on a pilot basis. RA II had developed Guidelines on the eligibility to become an RA II RCC, and on designation procedures for the establishment of the RCC Network for RA II. At its fourteenth session, held in San José, Costa Rica, in April 2005, RA IV had inaugurated the RA IV Regional Climate Centre Pilot Project, which would serve as the first node in the creation of a '"virtual RCC" and would serve as a model for the Caribbean subregion. At its fourteenth session in Heidelberg, Germany, in September 2005, RA VI had adopted Resolution 9 (XIV-RA VI) — Establishment of a Regional Climate Centres Network in RA VI to initiate a network of multifunctional RCCs and/or specialized centres on a pilot basis. The Commission commended that significant progress and further noted the ongoing efforts in RA V to successfully conduct a virtual RCC network. Members noted that meetings of Working Groups on Climate-related Matters were scheduled for RAs I and III for early December 2005 to discuss various issues including implementation of RCCs, and urged the Secretary-General to encourage those Regions to take effective actions to initiate RCCs. The Commission noted with appreciation that the contributions and continued efforts made by the WMO Secretariat to speed up the organization and implementation of RCCs, in particular to strengthen the collaboration of climate centres within one RA as well as across different RAs, had provided a useful pilot for the establishment of RCCs.

9.1.2 The Commission recalled the possibility for a regional association to choose to establish a Regional Climate Centre under the terms of Volume II of the *Manual on the Global Data-processing and Forecasting System* (WMO-No. 485). However, the Commission recognized that some Regions would want to formally designate RCCs through Volume 1 of the *Manual* and requested that CCl and CBS begin work as soon

as possible to undertake the necessary revisions to the *Manual* to incorporate new text related to the roles and functions of RCCs and climate prediction (see also 6.9.2). Members appreciated the flexibility offered in the Guidelines (see 9.1.1) that allowed each regional association to decide on the RCC structure and functions for its members based on their specific requirements. The Commission encouraged all Regions to actively and positively initiate the designation and organization of their RCCs following the Guidelines on Organization and Implementation of Regional Climate Centres based on their own needs, requirements and current status of climate service and related matters, which might bring useful practical knowledge to facilitate the revision of the *Manual on the Global Data-processing and Forecasting System* related to the roles and functions of RCCs.

9.2 WMO'S CONTRIBUTION TO CLIMATE AND SUSTAINABLE DEVELOPMENT (agenda item 9.2)

9.2.1 The Commission noted that WMO had participated in the UNFCCC COP 10 in Buenos Aires, Argentina (6–18 December 2004) and SBSTA/SBI 22 in Bonn, Germany (19–27 May 2005) and established a Task Team to follow up active participation in the first meeting of the Parties to the Kyoto Protocol (COP/MOP 1) in conjunction with COP 11, to be held in Montreal, Canada, from 28 November to 9 December 2005. Recognizing the emphasis of both the COP 10 and SBSTA 22 sessions on adaptation to climate change and the commitment of countries to take measures on that, the Commission endorsed initiatives on adaptation to climate variability and emphasized studies on socio-economic scenarios for assessments of climate variability and change impacts, vulnerability and adaptation in the context of sustainable development. The Commission recognized the importance of UNFCCC-COP as a mechanism whereby Members could address deficiencies in consistency of project activities with nationally defined sustainable development goals, objectives and policies. WMO would conduct a side event at COP 11/MOP 1, in Montreal in December 2005, entitled "Enhancing Climate Knowledge to Improve Adaptation to Climate Variability and Change", in association with its partners IRI, the Regional Committee for Water Resources (CRRH) and ICPAC. The Commission strongly recommended that the UNFCCC National Focal Points involve meteorological experts from their respective countries in order to obtain their opinions with a view to attaining the objectives regarding sustainable development policies.

IMPLEMENTATION OF THE MILLENNIUM DEVELOPMENT GOALS

9.2.2 The Commission emphasized that the Millennium Development Goals of the United Nations Millennium Declaration were closely related to the mandate of the Organization and ongoing activities of the Commission. The Commission took note that WMO actively participated in the implementation of the Goals with other United Nations organizations, in particular with Goal 1 — Eradicate extreme poverty and hunger and Goal 7 — Ensure environmental sustainability".

9.2.3 The Commission noted that the 2005 World Summit, held in New York in September, had reviewed the progress and implementation of the Goals. It urged members to participate in and contribute to the implementation of the Millennium Development Goals at national and regional levels and recognized that further discussions could be strengthened on climate as a resource within development and energy strategies.

FOLLOW-UP TO THE INTERNATIONAL MEETING ON THE SMALL ISLAND DEVELOPING STATES

9.2.4 The Commission noted that WMO had been actively involved in the preparatory process and had participated in the International Meeting to Review the Implementation of the Programme of Action for the Sustainable Development of Small Island Developing States, held in Port Louis, Mauritius, from 10 to 14 January 2005.

9.2.5 The Commission noted that the International Meeting had approved the Mauritius Declaration and the Mauritius Strategy for the further Implementation of the Programme of Action for the Sustainable Development of Small Island Developing States. The Mauritius Strategy addressed high-priority issues of concern to small island developing States that relate to climate change and sea level rise, natural and environmental disasters, management of wastes, coastal zone management, etc., some of which were related to the mandate of the Organization.

9.2.6 The Commission was informed that in order to contribute to the implementation of the Mauritius Strategy in areas falling under the responsibility of WMO and NMHSs, an Action Plan was being developed to take into account WMO Programmes and activities, in particular the Programme on Least Developed Countries.

9.3 THE GEOSS CLIMATE SOCIETAL BENEFIT AREA AND ITS RELATIONSHIP TO THE WORLD CLIMATE PROGRAMME AND CCl (agenda item 9.3)

9.3.1 The Commission was informed that at the invitation of the United States of America, 33 nations and the European Commission had joined together at the first Earth Observation Summit (EOS-I) in Washington, DC, on 31 July 2003, to adopt a Declaration that called for action in strengthening global cooperation on Earth observations. The purpose of the Summit was to:

> "Promote the development of a comprehensive, coordinated, and sustained Earth observation system or systems among governments and the international community to understand and address global environmental and economic challenges… [and] begin a process to develop a conceptual framework

and implementation plan for building this comprehensive, coordinated, and sustained Earth observation system or systems."

9.3.2 The Commission took note that the Summit participants had launched an ad hoc Group on Earth Observations (GEO), with the goal of furthering the creation of a comprehensive, coordinated and sustained Earth observing system or systems. In order to promote the development of the currently named Global Earth Observation System of Systems (GEOSS), GEO had decided to develop a document describing the GEOSS framework and an associated 10-Year Implementation Plan.

9.3.3 The conceptual Framework Document for GEOSS had been agreed at ministerial level at the second Earth Observation Summit in Tokyo, Japan, on 25 April 2004. At the third Earth Observation Summit in Brussels, Belgium, on 16 February 2005, ministers from almost 60 countries and the European Commission had established the intergovernmental Group on Earth Observations (GEO) on a long-term basis to take those steps necessary to implement GEOSS, endorsed the GEOSS 10-Year Implementation Plan describing collective targeted actions for establishing GEOSS, and stated their intention to provide the support necessary to execute the plan.

9.3.4 The first meeting of the newly established GEO had taken place in Geneva in May 2005, at which China, the European Commission, South Africa and the United States were selected as GEO co-chairs and an Executive Committee was created to facilitate and implement decisions of the GEO Plenary between meetings. GEO also addressed mechanisms for obtaining scientific and technical advice and for interfacing with the user community, as well as actions needed to support tsunami warning, response and recovery.

9.3.5 The Commission acknowledged the increasing role of satellite observations in climate monitoring and pledged its full support to those vital initiatives. The Commission noted that GEO would meet in December 2005 to agree on a workplan for 2006, based on targeted actions in nine societal benefit areas, including one on climate. The climate sections for the GEOSS Implementation Plan, and associated, more detailed Reference Document, and the draft Work Plan for 2006 had been developed in collaboration with the World Climate Programme, including WCRP and GCOS so that they reflected key elements of the GCOS Implementation Plan.

9.3.6 The Commission encouraged NMHSs to start with active participation in GEOSS at an international level, and to become involved as coordinators or lead participants in developing the GEOSS 10-Year Implementing Plan at the national level.

9.4 The WMO Space Programme meeting the needs of the climate space-based component for CCl (agenda item 9.4)

9.4.1 The Commission was informed that Resolution 5 (Cg-XIV) — WMO Space Programme had established a new major cross-cutting Programme in response to the momentous expansion in the availability of satellite data, products and services and in recognition of the increase in responsibilities for WMO. The Commission realized that Fourteenth Congress had supported the WMO Space Programme Long-term Strategy reviewed at the third session of the Consultative Meetings on High-level Policy on Satellite Matters, and agreed that the WMO Space Programme Long-term Strategy provided an excellent balance to the Sixth Long-term Plan and the programme and budget for 2004–2007.

9.4.2 The Commission was informed that the Executive Council at its fifty-sixth session had agreed with the recommendation of CM-4 towards the development of the space component of an integrated WMO global observing system as described below, and looked forward to CBS development, in consultation with all other relevant WMO and co-sponsored bodies, of the space-based component of the integrated WMO global observing system on the basis of space-based observation components for three earth-system domains, namely the atmosphere, the ocean and the terrestrial.

9.4.3 The Commission noted that the climate cross-cutting requirement was incremental to, and integrating across, the domain-based observing systems, as coordinated through the Steering Committee for the WMO co-sponsored GCOS to meet the needs of:

(*a*) Climate research, articulated through WCRP;
(*b*) Climate policy, articulated through SBSTA and COP based on information provided by IPCC, etc.;
(*c*) Climate monitoring and services, articulated through CCl, CAgM, CHy and JCOMM.

9.4.4 The Commission noted that the Executive Council at its fifty-sixth session had acknowledged the need expressed by space agencies and WMO Members for a single set of climate requirements and agreed that that would be achieved by the Steering Committee of the WMO co-sponsored GCOS through its coordination with relevant climate communities.

9.4.5 The European Space Agency (ESA) thanked the Commission for the kind invitation to attend the session as Observer. ESA informed the Commission that ESA contributed to the space-based component of the WMO GOS, being a member of the Coordination Group for Meteorological Satellites (CGMS). Also, since its creation ESA had attended the WMO High Level Consultative meetings on satellite matters. The Commission took note that, with regard to climate issues, ESA was taking due consideration of the GCOS principles for climate monitoring in relation with satellite data.

9.4.6 The Commission noted that the WMO Space Programme Long-term Strategy and associated Implementation Plan provided for increased utilization of the Virtual Library to the benefit of WMO Members especially for fuller exploitation of research and development data, products and services, as well

as those From new and existing operational meteorological satellite systems. To that end, the Commission decided:

(*a*) To encourage and advise NMHSs, RCCs and Regional Working Groups on Climate-related Matters to assess strengths and weaknesses in the existing satellite data and products aimed to climate monitoring at national and regional scales. The Commission endorsed the GCOS Climate Monitoring Principles including those developed specifically for satellite systems, presented in Annex II to the present report;

(*b*) To establish a feedback mechanism to the satellite data and products producers, on practical needs and improvements in the use of those data and products in climate monitoring and climate change detection;

(*c*) To include training modules on satellite applications within training workshops related to the World Climate Data and Monitoring and World Climate Applications and Services Programmes;

(*d*) To establish an expert team within CCl, to develop and provide guidelines on the implementation, use and evaluation of satellite data and products in climate monitoring and climate change detection (OPAG 2 Expert Team on Climate Monitoring, including the Use of Satellite and Marine Data and Products; see agenda item 11).

9.5 CAPACITY-BUILDING AND TRAINING ACTIVITIES (agenda item 9.5)

9.5.1 The Commission urged that all organizations and institutions with the appropriate level of expertise continue to support the development of the CLIPS curriculum, with a future priority on "end-to-end" modules. Members agreed to offer to host CLIPS training sessions and workshops as often as feasible, and requested the Secretary-General to support those opportunities to the extent possible, especially for developing countries.

9.5.2 The Commission recognized that funding agencies required detailed hard evidence and data on the socio-economic benefits of RCOFs, and seasonal to interannual prediction more generally, to user groups and governments, and also noted that few countries had the tools and mechanisms to produce that information. Members with the capacity for cost-benefit analysis and other relevant tools, and relevant agencies with an understanding of financing for developing countries, were strongly urged to assist developing countries in that regard. The Commission requested the Secretary-General to develop training packages in multiple languages on the costs and socio-economic benefits of climate predictions, products and services and to establish regional training workshops. The Commission also requested the Secretary-General to ensure the transfer of capacities between countries that had mastered the principles of cost-benefit analysis for meteorological services and developing countries.

9.5.3 Members recognized the utility of standardized tools for seasonal to interannual prediction (SIP), such as GIS mapping and analysis, downscaling techniques and satellite applications. The Commission requested the Secretary-General to support an effort to assess and review the existing tools and techniques used in preparing SIPs, and to subsequently develop those high-priority items not currently available, particularly for the benefit of NMHSs in developing countries. The Commission urged the Secretary-General to encourage regional and international efforts to assess and review the existing tools and techniques used in preparing SIPs.

9.5.4 The Commission noted the importance of access to up-to-date technical and policy-related literature, such as WMO reports, Technical Notes, Manuals, IPCC reports, information related to the Conventions, the World Summit on Sustainable Development and the Hyogo Framework. It further noted that in many developing countries, access to that information was constrained by the lack of resources for journals and documents, and by unreliable Internet access. The Commission requested the Secretary-General to facilitate development of cost-effective mechanisms to ensure that the scientists in NMHSs, particularly in developing countries, had access to the information they needed to make effective contributions to climate science and policy frameworks.

9.5.5 The Commission recognized the huge benefits of international collaboration (including through secondments, international exchange opportunities and fellowships) on matters of climate information, monitoring, assessment, prediction and application. The Commission noted that the Conference on Living with Climate Variability and Change: Understanding the uncertainties and managing the risks (LWCVC) (Espoo, Finland, 17–21 July 2006), which would explore better use of climate products in decision-making in all climate-sensitive sectors, would be a major opportunity for producers of climate information and services and users to exchange and share experience. The Commission requested Members to ensure participation by their scientists in, and inform efficiently the national user communities of, that milestone event, and urged the Secretary-General to provide support for the participation of various experts from developing countries.

9.5.6 A number of CCl Expert Teams, for example on Urban and Building Climatology or on Climate and Health, were developing training modules that would build capacity for climate specialists and user groups. Members were urged to support regional workshops in extending the new skills and knowledge, as broadly and quickly as possible once the materials were available. The Commission encouraged all ETs to develop and maintain an updated list of experts available for capacity-building purposes and to provide the CLIPS curriculum with training modules.

9.6 IMPLEMENTATION OF RECOMMENDATIONS FROM THE TECHNICAL CONFERENCE ON CLIMATE AS A RESOURCE (agenda item 9.6)

9.6.1 The Commission received with satisfaction the report of Mr Zhai Panmao, chairperson of the Technical Conference on Climate as a Resource, held in Beijing on 1 and 2 November 2005. The report emphasized a number of major points on the societal benefits of climate for sustainable development.

9.6.2 WMO had organized, in collaboration with the China Meteorological Administration, the two-day international Technical Conference on Climate as a Resource, back to back with the fourteenth session of the Commission. Four topics had been included in the agenda within four sessions, respectively as follows:

Session 1: Climate, sustainable development and economy
Session 2: Climate and water
Session 3: Climate and food production
Session 4: Climate applications and decision-making.

9.6.3 The Commission was pleased to be informed of the high number of participants (122) from 71 countries and that all WMO Regions had been adequately represented. The Commission noted the high level of presented lectures and posters that included contributions from various sectors.

9.6.4 The Commission welcomed the specific recommendations to its fourteenth session and urged the WMO Secretariat and the CCl Management Group to include the recommendations into the intersessional workplan (see Annex III to the present report).

9.7 INTERNATIONAL POLAR YEAR (IPY) (2007–2008) (agenda item 9.7)

9.7.1 Fourteenth Congress and the Executive Board of the International Council for Science approved the holding of the International Polar Year 2007–2008 (IPY). The Commission noted that IPY should result in an intensive burst of internationally coordinated, interdisciplinary research and observations focused on the polar regions, and stressed the importance of the establishment of a comprehensive database of polar climate data for specialized studies of current, and assessment and projection of future, climate change in polar regions. All Members with polar interests were urged to support that goal through their national initiatives. IPY projects would also increase understanding of the teleconnections between polar regions and the lower latitudes, which should improve implementation of climate prediction, through CLIPS, for more populated areas. The Commission stressed that observing networks established or improved during IPY should be kept in operational mode for as many years as possible to provide data for detection and projection of climate change.

9.7.2 The Commission noted the importance of climatological zoning, particularly for large countries in the temperate and high latitudes. It thus noted with satisfaction the work done on the climatological zoning of the Russian Federation according to the degree of climate comfort. The aims of that work would be in great demand in the various branches of the economy and medicine.

9.7.3 The Intercommission Task Group (ITG) on IPY, established by the Executive Council at its fifty-sixth session, to coordinate WMO IPY activities, had held its first session in Geneva (April 2005). The Commission considered the recommendations which ITG had addressed to it and agreed to:

(*a*) Establish a comprehensive database of polar climate data to support the assessment of current climate change in the polar regions, and to project future change beginning during the International Polar Year and continuing in operational mode thereafter for as many years as possible;
(*b*) Promote the development of specialized activities for polar regions through Regional Climate Centres and the CLIPS RCOF process, especially in RAs II, IV and VI, and to arrange user feedback on those activities;
(*c*) Consider the development of specific projects, in collaboration with NMHSs and other agencies, perhaps in conjunction with EU COST Action 725, using phenological data for polar climate and climate change studies;
(*d*) Consider the development of specific applications of the Universal Thermal Climate Index, perhaps in conjunction with the EU COST Action 730, to support provision of information and products on thermal extremes for residents and travellers;
(*e*) Investigate DARE projects to support data gaps identified by IPCC, NMHSs and IPY in polar climate databases;
(*f*) Extend to NMHSs and IPY national committees all accumulated information and expertise on data and metadata policies, principles and management, relevant to IPY themes;
(*g*) Motivate and support with scientific and practical information all NMHSs to envisage the importance of polar research and specifics of the climate change at high latitude and altitudes for their stakeholders, with special emphasis on those countries that were not directly involved in polar research.

9.8 STATUS OF THE THIRD EDITION OF THE WMO *GUIDE TO CLIMATOLOGICAL PRACTICES* (agenda item 9.8)

9.8.1 The third edition of the *Guide to Climatological Practices* (WMO-No. 100) had been developed in two steps. As previously planned, Part I covered basic principles and practices, including the following: introduction; climate observations, stations and networks; climate data management; and services and products. Part II was to have provided details on methodologies and techniques, including network design methods, quality control tests, data handling methods, statistical techniques and packages, climate

products including mapping, downscaling methods including interpolation techniques, climate summaries and sample publications.

9.8.2 At a recent meeting of the Expert Team and after reviewing the contributions for Part II, it had been decided to merge the existing Part I with the contributions for Part II, and to produce a single unified *Guide*. It was believed that that would create a more useful, easier-to-read resource, for NMHSs in both developed and developing countries. Following that, an outline for the complete *Guide* had been developed, respecting the previous guidance provided by the Commission on Parts I and II. The original chapter titles for the third edition of the *Guide* had been slightly modified as follows:

1. Introduction
2. Climate Observations, Stations and Networks
3. Climate Data Management
4. Characterizing Climate
5. Climate Data Analysis
6. Climate Services and Products
7. National Climate Services Programmes

9.8.3 It was recognized that some additional material would be needed. The value of Chapter 5 — Statistics in Climatology of the second edition of the *Guide* was recognized, and it was decided to retain most of that content in the new Chapter 4 — Characterizing Climate. As the *Guide* needed to be published with the minimum delay, the Expert Teams were requested to submit contributions by mid-2006. The Secretary-General was requested to facilitate, as a matter of priority, the finalization and distribution of the third edition of the *Guide*, with the least possible delay.

9.9 Enhancement of the role of women and developing countries in the work of the Commission (agenda item 9.9)

9.9.1 The Commission noted the recommendation of the Second WMO Conference on Women in Meteorology and Hydrology (Geneva, 24–27 March 2003) that technical commissions and regional associations appoint and support gender focal points from among women with appropriate expertise, and report regularly on progress on gender issues to Congress and Executive Council. The Commission agreed to appoint a gender focal point for CCl, and proposed that the expert report directly to the CCl Management Group.

9.9.2 In the thirteenth intersessional period, 17 women had served on various CCl Expert Teams and Implementation/Coordination Teams (ICTs), including two as ET chairpersons. Three women had also served as individual rapporteurs and one had served on the CCl Management Group.

9.9.3 In the same time frame, the CCl Management Group and the chairpersons and co-chairpersons of each of the OPAGs included representatives of developing countries. Experts from developing countries led seven Expert Teams. By design of the OPAG structure, the ICTs were balanced regionally, and representation of developing countries was required.

9.9.4 The Commission commended those results and agreed to continue to place high priority on the inclusion of women and developing countries in the work of the Commission. The Commission noted that Resolution 18 (CCl-XII) — Participation of women in the work of the Commission was still in force, as modified by Resolution 5 (CCl-XIV).

9.10 Improving CCl involvement in WCP-Water (agenda item 9.10)

9.10.1 The Commission recognized the value of the work of WCP-Water in improving knowledge of hydrological and water resource conditions, over a variety of time- and space scales, in a climate context. Opportunities for better integration of climate and water activities between the Commission and the WCP-Water Programme included development and analysis of homogeneous, gap-free research data sets, joint workshops and training, and collaboration in many applications areas, including the roles of climate and water in waterborne diseases, agricultural productivity, energy generation (especially renewable energy), and in the prevention and mitigation of disasters related to hydrometeorological hazards. The Commission urged the Secretary-General to ensure that adequate resources were earmarked for the implementation of such new climate and water cross-cutting activities. The Commission also recognized the importance of strengthening the linkages between climate and hydrological programmes in NMHSs, and between CCl and CHy for steering and guidance.

9.10.2 The Commission noted that the Fourth Meeting of the WCP-Water Steering Committee (SC) (Wallingford, UK, 13–15 June 2005) had welcomed the interest of CCl in improving interaction with WCP-Water, supported development of a number of joint activities and invited the Commission to nominate a representative to the WCP-Water SC. The SC also had proposed a greater emphasis on capacity-building in developing countries in matters of climate and water, noted the importance of maintaining and improving the monitoring networks, and urged development of stronger linkages between WCP, HWR, WHYCOS, GCOS, and FRIEND and HELP programmes of the United Nations Educational, Scientific and Cultural Organization (UNESCO), and with agencies from other disciplines such as FAO, WHO and UNEP.

9.10.3 The Commission recognized the importance of better integration of climate and water issues in the regular activities of the United Nations Commission on Sustainable Development, and urged the Secretary-General to promote development of a CCl/WCP, CHy/HWR, WCP-Water, GCOS side event on energy, climate, water and hydrometeorological extremes for the fourteenth session of the Commission on Sustainable Development (New York, May 2006). Members agreed that the Commission should collaborate with CHy to support the fourth World Water Forum (Mexico, 16–22 March 2006), the Fifth FRIEND World Conference (Havana, Cuba,

27 November–1 December 2006) and the Third International Conference on Climate and Water (Finland, September 2007), and urged that WMO support appropriate participation in the sessions. The Commission agreed to nominate a representative to the WCP-Water Steering Committee, in order to ensure a strong future collaboration.

9.11 UPDATE ON THE DEVELOPMENT OF CCL-RELATED GUIDELINES AND REVISED TECHNICAL NOTES (agenda item 9.11)

The Commission noted that the core CCl Management Group, at its second meeting, held in Geneva, from 31 January to 2 February 2005, had decided to review and update Volumes I, II and III of the *Technical Regulations* (WMO-No. 49) as far as climate activities and services were concerned. The Commission requested that the Secretariat make available those and other technical documents on the CCl website as part of a virtual electronic library. The Management Group assigned the chairpersons of OPAGs 1 and 3 as well the representative of RA V to review the publication. The Commission considered the technical proposals for amendments and approved Recommendation 1 (CCl-XIV).

9.12 ACTIONS PERTINENT TO THE CROSS-CUTTING NATURAL DISASTER PREVENTION AND MITIGATION PROGRAMME (agenda item 9.12)

9.12.1 The Commission recalled Resolution 29 (Cg-XIV) — Natural Disaster Prevention and Mitigation Programme by which Fourteenth Congress (Geneva, May 2003) had decided to initiate a major cross-cutting Programme on Natural Disaster Prevention and Mitigation (DPM). The Commission further noted that the Executive Council at its fifty-seventh session, held in Geneva in June 2005, had adopted the Revised Implementation Plan of the DPM Programme, which had several implications for the Commission.

9.12.2 The Commission noted the significant contributions of WMO to the successful preparation and outcomes of the World Conference on Disaster Reduction, held in Kobe, Hyogo, Japan, from 18 to 22 January 2005. The Commission acknowledged the outcomes of the Conference reflected in the Hyogo Declaration and Hyogo Framework for Action 2005–2015: Building the Resilience of Nations and Communities to Disasters to provide a vehicle to expand international recognition of the importance of weather-, climate- and water-related information and services to disaster risk reduction. The Commission noted that the Framework for Action called for an integrated, multi-hazard approach to disaster risk reduction, providing five high-priority action areas, one of which included identification, assessment and monitoring of disaster risks and enhancement of early warnings. In that regard, the Commission acknowledged that WMO and NMHSs were in an excellent position to take a leadership role at international to national levels.

9.12.3 The Commission acknowledged the establishment of DPM focal points and that as at September 2005, 121 nominations had been received. The Commission urged that the network be liaised with the CLIPS Focal Point network.

9.12.4 The Commission acknowledged that the DPM Programme office, in close collaboration with all relevant WMO Programmes, regional associations, technical commissions and National DPM Focal Points, would execute the Revised DPM Implementation Plan, and noted that with the highest priority the DPM Programme was pursuing:

(*a*) Integration of cross-cutting activities of all relevant WMO Programmes to address systematically and sustainably priorities and gaps in disaster prevention and mitigation in WMO Regions;
(*b*) Facilitation of strategic partnerships;
(*c*) Development of hazard mapping and risk assessment capabilities for hazards related to weather, climate and water and contributing to mainstreaming risk assessment as part of the national development and disaster prevention and mitigation policies.

9.12.5 The Commission noted that a set of DPM performance measures would be developed through multidisciplinary expert teams to monitor the implementation and success of the projects. The Commission stressed its role, particularly related to providing feedback in the development of survey templates, providing information in support of the survey execution and participation in the expert teams and working with the Secretariat to establish specific priorities and performance measures, particularly on issues related to climate disasters.

9.12.6 The Commission noted that the DPM Programme would initiate a project on "Cataloguing of Weather-, Climate- and Water-related Hazards and their Impacts" to develop a standard methodology for the collection of information about hazardous events causing damage. The Commission noted its critical role in contributing to that activity by providing expertise and information on climate-related hazards.

9.12.7 The Commission noted that the DPM Programme, together with relevant partners, would be initiating a project on "Methodologies for Hydrometeorological Hazard Mapping and Risk Assessment," to identify a portfolio of hazard mapping and risk assessment methodologies for weather-, climate- and water-related hazards. The Commission noted its critical role in contributing to that activity. The Commission noted the extensive body of work through OPAGs 1 and 2 on data quality, metadata and data homogeneity, and through OPAG 3 related to the use of data for application. It stressed the need for collaboration on data requirements for hazard mapping and risk assessment and the development of guidelines on data improvements and methodologies related to hazard mapping and risk assessment for the NMHSs.

9.12.8 The Commission stressed that there was a need for integration of climate forecast products in the disaster prevention and mitigation decision process. The Commission, however, stressed that there was also a need for improvement of climate forecasting capabilities through new research and development of relevant products and through better understanding of the needs of the disaster management community.

9.12.9 The Commission noted the leading role of WMO in participating in the Third International Early Warning Conference (EWC III) sponsored by the Government of Germany, to be held in Bonn in March 2006, and urged the DPM Programme and WCP to work together to ensure that pertinent results and outcomes of EWC III were provided to the president of the Commission. The meeting noted the importance of holding an International Conference on problems of Hydrometeorological Safety (Forecasting and Adaptation of Society to Climatological Changes) in the Russian Federation in September 2006.

9.12.10 The Commission decided to nominate at least one rapporteur within its Management Group with extensive experience in the data, applications and research aspects of climate-related hazards and extremes, to liaise with the DPM Programme in the execution of the Programme's Revised Implementation Plan.

9.12.11 The Commission stressed the importance of its active participation in DPM, especially in the development of a standard methodology for the collection of statistical information on extreme weather events causing damage.

9.13 Cooperation with the World Climate Research Programme (WCRP) (agenda item 9.13)

9.13.1 The Commission recalled that WCRP, sponsored by WMO, ICSU and IOC of UNESCO, had been established as a principal component of the World Climate Programme in 1980 with two major objectives: to determine the extent to which climate could be predicted and to determine the extent of human influence on climate.

9.13.2 The Commission recognized that WCRP had been instrumental in promoting and supporting the ECMWF, National Centers for Environmental Prediction (NCEP) and Japan Meteorological Agency reanalyses. It had also cooperated with GCOS, Integrated Global Observing Strategy (IGOS)-P and GEO to formulate science-based requirements for climate observations and applications. Additionally, WCRP had significantly advanced the skill of seasonal prediction based on ensemble simulations, and continued its direct and strong input to the IPCC assessments.

9.13.3 The Commission was informed of, and endorsed with enthusiasm, the new WCRP strategic framework "Coordinated Observation and Prediction of the Earth System". It agreed that the framework could serve as the "road map" towards the successful conversion of WCRP achievements into practical applications of direct relevance and interest to WCP.

9.13.4 The Commission noted the establishment in 2001 of the Earth System Science Partnership (ESSP), composed of WCRP, International Geosphere-Biosphere Programme (IGBP), International Human Dimensions Programme on Global Environmental Change (IHDP) and DIVERSITAS. It agreed that the four initial joint projects of ESSP, on Carbon, Food Systems, Water and Human Health, offered unprecedented opportunities for cooperation with WCP. The Commission was informed that an ESSP Open Science Conference was being organized in Beijing, 9–12 November 2006. It urged its Members to participate in that Conference.

10. Election of officers (agenda item 10)

10.1 Mr Pierre Bessemoulin (France) was unanimously elected president of the Commission.

10.2 Mr Wang Shourong (China) was unanimously elected vice-president of the Commission.

11. Review of CCl terms of reference and structure (agenda item 11)

11.1 Review and amendment of the terms of reference of the Commission, based on new issues and priorities (agenda item 11.1)

The CCl Management Group, at its second meeting (Geneva, 31 January–2 February 2005), had reviewed and proposed revisions to the terms of reference of the Commission that had been approved by the Commission at its thirteenth session. The Commission, in consideration of the priorities for the fourteenth intersessional period, adopted its terms of reference, as follows:

(*a*) Promoting, supporting and facilitating WMO activities relating to climate and its relationship with human well-being, human activities, natural ecosystems and sustainable development;

(*b*) Coordination and consolidation of general requirements for observations, data collection, supply and exchange for all components of the World Climate Programme and its associated activities;

(*c*) Identification of, and describing and encouraging best practices in, the rescue, collection, quality control, archiving, access to and further management of climate data, including near-real-time data, proxy data, remote sensing data and associated metadata;

(*d*) Development of statistical and other objective methods for analysing climate data;

(*e*) Development of best practices for the archiving of data sets from numerical analysis and prediction systems for climatological purposes;

(*f*) Provision of advice on matters relating to the access and availability of climatological data, information and services;

(*g*) Development of methods for climate data exchange and presenting climate information;
(*h*) Coordination and promotion of the analysis and monitoring of climate, its spatial and temporal variability and change, and the distribution of monitoring products for research, applications and impact assessments;
(*i*) Development and review of operational climate information and prediction services, and the promotion and support of applications research;
(*j*) Preparation of authoritative statements on climate;
(*k*) Capacity-building, raising awareness of climate information, services and technology transfer;
(*l*) Preparation of guidelines for preparing and presenting climatological information for use in the development and implementation of adaptation and mitigation responses to climate change, and for demonstrating the high cost-benefit ratio of climate services;
(*m*) Formalizing the role of the Commission with respect to the cross-cutting initiatives of WMO, and evaluating the implications for each OPAG and Expert Team.

The Commission had special responsibilities to advise and guide the World Climate Applications and Services Programme and the World Climate Data and Monitoring Programme, while providing support in collaboration with other WMO technical commissions and programmes, especially the Agricultural Meteorology Programme, GCOS, JCOMM, ESSP, WCRP and GEO as key programme partners and benefactors.

11.2 Review of existing and establishment of new CCl OPAGs, Expert Teams and special Rapporteurs, including terms of reference for each (agenda item 11.2)

11.2.1 The Commission evaluated its performance over the thirteenth intersessional period and noted that for the most part the new working structure had been effective but that there were a number of aspects that could be improved. For example, following the thirteenth session of the Commission, the new structure had taken much time to be finalized, especially in OPAG 3, which had a higher proportion of experts nominated from outside NMHSs. Not all ETs had been active and within those not all members had been equally productive. Most ET leaders believed that the productivity of their teams would have been improved had they been able to meet, particularly early on in the period. In all cases where ETs had met, it was noticed that the opportunity to interact directly was important, especially as many of the experts in the teams had not worked together previously. All the OPAG chairpersons noted that the Implementation/Coordination Teams had not been functional in that period, for various reasons. In some instances, the ICT had been given nothing to implement. In certain cases, however, an ET might have been very productive, such as CDMS, but implementation had been adequately carried out by small regional or national teams.

11.2.2 In consideration of its next steps, the Commission noted the importance of taking into consideration the WMO Long-term Plan in the roles and responsibilities of the OPAGs, ETs and Rapporteurs, its programme of work and key priorities, and the need to work as effectively as possible within the available resources.

11.2.3 In the light of those assessments and considerations, the Commission reviewed its working structure and the terms of reference for the OPAGs and Expert Teams and decided:

(*a*) To split OPAG 3 on Climate Applications, Information and Prediction Services into:
  (i) A new OPAG 3 on Climate Information and Prediction Services (CLIPS);
  (ii) A new OPAG 4 on Climate Applications and Services;

  but to encourage the two groups to maintain close linkages and to enhance integration between CLIPS and Applications wherever possible;
(*b*) To minimize the number of Expert Teams within the new structure and to update the terms of reference to reflect the upcoming priorities of the Commission;
(*c*) To concentrate the functions of rapporteurs on certain priorities, particularly for liaison on topics where another Commission had the lead (Agriculture (CAgM), Marine (JCOMM) and Water (CHy));
(*d*) To retain, as best possible, some existing ET members on teams that would continue into the fourteenth intersessional period, to make it possible to initiate ET activity soon after the fourteenth session of the Commission, and urged that NMHSs nominate and provide management support for the participation of experts with active experience in the field in question, for the remaining positions;
(*e*) To retain one Implementation/Coordination Team, reporting to the CCl Management Group, recognizing that other technical commissions had such bodies to ensure regional perspectives and that in the fourteenth intersessional period, it would be more likely that there would be implementation requirements from expert team activities.

The Commission therefore adopted Resolution 2 (CCl-XIV), including its annex, on the new working structure of the Commission, which replaced Resolution 1 (CCl-XIII). 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 including meetings, publications and the development and maintenance of CCl websites.

11.2.4 The work of the Commission was carried out through a number of mechanisms in addition to

the OPAGs. The Commission noted that a number of initiatives for cross-representation with CBS, CAgM, the Commission for Atmospheric Sciences (CAS), CHy, JCOMM, GCOS, GEO and WCRP CLIVAR had been effective, and Meetings of Presidents of Technical Commissions had fostered information sharing and collaborative projects between programmes. The Commission strongly encouraged that those activities be strengthened, particularly for the WMO cross-cutting themes of Disaster Prevention and Mitigation, Space/GEO and Least Developed Countries (also small island developing States), and for implementation of Regional Climate Centres (RCCs). The Commission requested its president to facilitate the continuation of active and appropriate representation of its interests on relevant expert teams in other technical commissions, but to manage that prudently, in collaboration with the Secretariat, and in keeping with the Long-term Plan, within available resources. Members further urged the continuation of the use of ad hoc task-focused teams of experts to manage particular issues or topics, and urged the continued use of inter-commission, inter-agency and interdisciplinary conferences and workshops, for example with key partners such as ISDR, the International Federation of Red Cross and Red Crescent Societies (IFRC), United Nations Development Programme (UNDP), UNEP, United Nations Human Settlement Programme (UN-HABITAT), World Health Organization, World Tourism Organization, International Association for Urban Climate (IAUC) and International Society of Biometeorology, to bring together and inform scientists and user community experts on climate matters. The Commission pointed out the need for the dissemination of relevant output from those mechanisms, for example reports and proceedings and recommendations and decisions, especially via the CCl web page.

11.2.5 To strengthen the role of regional associations and increase the effectiveness of regional input to the work of the Commission, the Members agreed that the chairpersons of the regional Working Groups on Climate-related Matters would actively participate in CCl ICT activities. That ensured the exchange of information on planned activities, reports, etc.

11.2.6 The Commission agreed to retain the principles for the work of the OPAGs, ETs and Rapporteurs, which had been in effect since its thirteenth session, that:

(*a*) The OPAGs and ETs work as much as possible through e-mail or other form of correspondence;

(*b*) Members of ETs and Rapporteurs be regularly consulted and informed of CCl activities by the OPAG chairpersons and through dedicated Internet sites;

(*c*) OPAG chairpersons and ET lead experts coordinate and guide the work described in the various terms of reference;

(*d*) Activities of each OPAG be supported by the WMO World Climate Programme Secretariat;

(*e*) Expert Teams had to be constituted so as to ensure that the highest level of scientific and technical expertise was available to serve the needs of users and current operational activities. Candidates for Expert Teams and Rapporteurs must therefore be selected based on the expertise needed, from within the Commission and other bodies, for developing proposed projects, solutions or outputs and for which specific knowledge would be required. Wherever possible, however, balance across representation by Region, gender and discipline would be taken into account, and the Commission noted that the second WMO Conference on Women in Meteorology and Hydrology had urged that Permanent Representatives nominate qualified women for roles in technical commissions;

(*f*) The four OPAGs liaise as appropriate with each other and ensure that each ET identified and liaised with relevant groups, some in other Commissions or other agencies, with shared interests, with a particular focus on developing and implementing WMO cross-cutting initiatives for DPM, Space/GEO and Least Developed Countries (including small island developing States);

(*g*) In the knowledge that CCl experts were all volunteers, each ET and Rapporteur review and evaluate its terms of reference, which, in general, were broad, long-term goals that constituted a framework to guide the work, and develop a workplan with specific deliverables and milestones in close relationship with the CCl Management Group, within six months of the fourteenth session. To the extent possible, each ET would set specific, measurable, achievable, realistic and time-bound goals consistent with that framework, for the fourteenth intersessional period;

(*h*) The Implementation/Coordination Teams reporting to the CCl Management Group ensure regional representation with a focus on operational and implementation aspects of the work of the Commission;

(*i*) Within the constraints of the programme and budget of the Organization, it would be very important for the Management Group, including the chairpersons of OPAGs, and ETs met as early in the fourteenth intersessional period as possible;

(*j*) OPAG chairpersons and co-chairpersons serve an initial term of two years renewable, with continuation to be based on workload and work requirements;

(*k*) Some ETs and Rapporteurs might be required for single or short-term activities, but not for the full intersessional period. Ad hoc groups could be established for such tasks by the CCl Management Group, or at the request of the president of the Commission;

(*l*) General Regulation 33 provided the appropriate guidance should an OPAG chairperson be unable to continue in that role.

11.2.7 The Commission agreed that some overarching activities would be the responsibility of the CCl Management Group, including the ET on the *Guide to Climatological Practices*, the Gender Focal Point, the Rapporteur on GEOSS and a Rapporteur on metadata. Such teams and rapporteurs would report directly to the CCl president or Management Group. In addition, in accordance with the DPM Implementation Plan, a member of the CCl Management Group would serve the Commission as Rapporteur on Climate-related Hazards.

11.2.8 The Commission identified the main elements of the work programme and agreed on the terms of reference of teams and rapporteurs of each OPAG as listed in Annex IV to the present report. The Commission also requested each of the OPAG chairpersons to ensure that specific work areas described in the present report would be adequately addressed. In addition, the Commission established at least partial membership of the Implementation/Coordination Team, Expert Teams and Rapporteurs as listed in Annex V to the present report. The Commission authorized the president, with assistance from the Management Group, Expert Team Leaders and the Secretariat, to complete or to determine, where required, additional appropriate membership and to initiate activities on a priority basis. The WMO Secretariat would develop and maintain a database of experts for the Commission, and would keep it up to date on the CCl Internet site.

11.2.9 The Commission reiterated the conclusions of its thirteenth session, and agreed that the CCl Management Group was responsible for integration of the CCl programme areas, evaluation of progress achieved, deciding upon priorities with regard to available resources, coordination of strategic planning and deciding on necessary adjustments to the working structure during the intersessional period. It further agreed to maintain the overall membership at not more than 10 persons, inclusive of the president, vice-president, chairpersons of the four OPAGs of the Commission, a number of regional representatives and a representative of the World Data Centres. The Commission established the new CCl Management Group by adopting Resolution 3 (CCl-XIV) and further agreed to establish the OPAGs, along with their chairpersons and co-chairpersons by adopting Resolution 4 (CCl-XIV). Those Resolutions replaced Resolutions 2 (CCl-XIII) and 3 (CCl-XIII) respectively.

11.2.10 The Commission urged that special efforts be made to explore extrabudgetary resources to support its work programme and asked that its Management Group develop explicit tactics towards a strategic plan for acquiring the required resources. The plan should consider the general WMO/GCOS thrust to build climate observational capacity and consider the World Bank Global Environment Facility as a potential source. Members further urged that all ETs and Rapporteurs minimize their requirements for travel, work as much as possible through electronic means and explore all possible options for stimulating the work under their terms of reference by initiating small individual tasks or by setting up an Internet forum for each ET to share interests, experience, progress reports, issues, documents, CVs and individual bibliographies, etc.

11.2.11 The Commission recognized that it had a responsibility to serve the greater good of the Members, and that all products and information developed were to be shared freely and in a timely manner with the Members for their use and development. The Commission urged the Secretary-General to support publication of CCl outputs, including reports, Guidelines, brochures and Technical Notes, and also support, with members' assistance, the translation of those products into as many of the working languages of the Organization as possible, and to seek the support of members for translation into other languages.

11.2.12 In order to optimize the exchange of up-to-date information on and products of the CCl and its OPAGs, Expert Teams and Rapporteurs, the Commission urged that the World Climate Programme, the CCl Management Group and the OPAG chairpersons develop a coordinated implementation plan to update/renovate the CCl web pages and all required linkages as soon as possible following the fourteenth session. Those web pages should provide clear information and easy access to relevant documents. The Commission agreed that a single, virtual document library, where all CCl documents, for example meeting reports, guidelines and brochures, could be accessed from a single web page, would be the most helpful approach.

12. SCIENTIFIC LECTURES (agenda item 12)

12.1 The Commission noted the Helmut Landsberg Memorial Lecture presented by Mr Hiroki Kondo, Senior Scientist, Frontier Research Center for Global Change (Yokohama, Japan), on the topic "High Resolution Climate Change Projection by the Earth Simulator". Mr Kondo outlined a number of outstanding climate research issues including the thermohaline circulation near Greenland, global net carbon uptake on land, the need for high-quality observations of high temporal and spatial resolution, and the need to understand and use feedback mechanisms from biogeochemical processes in the models. He described the Kyo-sei project (coexistence of human beings and nature) utilizing the Earth Simulator, the super-high-resolution global model and key research outcomes. In conclusion, Mr Kondo discussed regional cooperation projects and asked scientists around the world to participate in the research effort.

12.2 The Commission welcomed Mr Kondo's contribution to climatology and noted the potential to use the model data in catchment models, for evaluation of flooding risks. The Commission further highlighted the importance of the development of

uncertainty estimation for the climate model outputs, the need for high-resolution observations in the marine, atmospheric and terrestrial domain, and the vital need for the Commission to play a stronger role in the observation, management and analysis of oceanographic data, in order to support that cutting-edge research.

13. NOMINATION OF OPAG CHAIRPERSONS, MANAGEMENT GROUP MEMBERS, EXPERT TEAM LEADERS AND MEMBERS, AND RAPPORTEURS (agenda item 13) ,

To carry out its programme during the intersessional period, the Commission established the Commission for Climatology Management Group, an Implementation/Coordination Team, four OPAGs and Expert Teams, nominated members of those groups and appointed Rapporteurs, as discussed under agenda item 11.

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 fourteenth session. It also examined those Executive Council resolutions based on previous recommendations of the Commission that were still in force. The decisions of the Commission were incorporated in Resolution 5 (CCl-XIV) and Recommendation 2 (CCl-XIV).

15. ANY OTHER MATTERS (agenda item 15)

Other items of concern to the fourteenth session of the Commission were discussed under agenda item 9.

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

The Commission noted with appreciation that the delegate from Turkey had expressed to WMO the interest of his Government in hosting the fifteenth session of the Commission, to be held in 2009. The Commission noted that the date and place of its fifteenth 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 China and the China Meteorological Administration, particularly its Head, Mr Qin Dahe, 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 Pierre Bessemoulin and Mr Wang Shourong on their election as president and vice-president, respectively, of the Commission for the next intersessional period. He also congratulated the new OPAG chairpersons and experts and wished them the very best.

RESOLUTIONS ADOPTED BY THE SESSION

RESOLUTION 1 (CCl-XIV)

SUPPORT FOR THE CONFERENCE ON LIVING WITH CLIMATE VARIABILITY AND CHANGE

THE COMMISSION FOR CLIMATOLOGY,

NOTING:

(1) The *Abridged Final Report with Resolutions of the Fifty-seventh Session of the Executive Council* (WMO-No. 988), general summary paragraph 3.2.2.10 (*c*) iii,

(2) The *Abridged Final Report with Resolutions of the Fourteenth World Meteorological Congress* (WMO-No. 960), general summary paragraph 3.2.5.7,

RECOGNIZING:

(1) That climate can no longer be taken for granted and there is a need for more urgent and purposeful adaptation to climate conditions and management of climate-related risks,

(2) That the world's communities are becoming increasingly interdependent and that few societies today are solely dependent on maintaining their respective livelihoods by what can be produced locally,

(3) That the climate system is changing and that human activities are expected to contribute noticeably to further shifts in the variability of regional rainfall and temperature regimes beyond the ranges to which we are currently accustomed,

(4) That losses associated with climatic hazards are rising and that events such as storms, droughts, heatwaves, sea level rise, storm surges, waves, floods, rainfall-triggered landslides and climate-related outbreaks of infectious disease are interfering with efforts to eradicate poverty and hunger, and are impeding economic development,

CONSIDERING:

(1) How climate information can be used to assist in the management of risk across social, environmental and economic planning, encompassing all planning horizons relating to climate variability and change,

(2) The data and information requirements to enable societies to assess and manage risk across multiple planning horizons and spatial scales,

(3) The need for greater awareness of how to incorporate or improve on the management of the risks associated with climate variability and change, in the context of capacity constraints and competing priorities, and hence the need for a critical assessment of the role of climate information in supporting climate risk management,

(4) The need to identify research and operational requirements for reducing climate-related risks by developing and establishing appropriate early warning systems within the general context of overall risk management strategies and techniques for climate variability and change,

(5) The practical techniques and challenges associated with the integration and blending of cross-disciplinary data and information for planning, making decisions and managing risks,

(6) The need for concrete proposals for better promotion of the systematic integration of climate information from the marine, terrestrial and atmospheric domains into development planning at regional and national scales, for instance through a partnership network among key actors,

NOTING the extensive and thorough preparations under way to convene a WMO Conference on Living with Climate Variability and Change: Understanding the uncertainties and managing the risks (LWCVC), in Espoo, Finland, from 17 to 21 July 2006,

EXPRESSES its appreciation:

(1) To the Government of Finland for its agreement to host the Conference;

(2) To the International Research Institute for Climate and Society for its collaboration and support in organizing the Conference;

ENCOURAGES members of the Commission to participate in the Conference and to promote the Conference widely amongst sectors sensitive to climate variability and change, including agriculture and food security, water resources, health and disease control, disasters and early warning, energy production and the built environment;

REQUESTS the Secretary-General to seek support from WMO Members and other potential donors for the Conference, including support for national delegates and for delegates from developing countries, and to continue to provide Secretariat support for the organization and conduct of the Conference.

RESOLUTION 2 (CCl-XIV)

WORKING STRUCTURE OF THE COMMISSION FOR CLIMATOLOGY

THE COMMISSION FOR CLIMATOLOGY,

NOTING:

(1) The adoption by the Commission at its thirteenth session in 2001 of a structure for the Commission, consisting of a Management Group and three Open Programme Area Groups (OPAGs) as described in Resolution 1 (CCl-XIII) — Working structure of the Commission for Climatology,

(2) The overall success of this approach in terms of the enhanced participation of experts from National Meteorological and Hydrological Services and from other bodies with relevant climate interests, and strong participation of experts from developing countries and of women in the work of the Commission,

(3) The improved linkages with the regional associations through the activities of the Working Groups on Climate-related Matters and through regional representation on the CCl Management Group,

CONSIDERING the need to:

(1) Distribute more equitably the number of Expert Teams (ETs) amongst the OPAGs,

(2) Reduce the numbers of ETs so as to provide the most favourable environment for completion and dissemination of successful results, within the available resources,

(3) Maintain and improve the role of the regional associations in decisions of the Commission,

(4) Improve the flow of technical information concerning the activities of the Commission to all Members,

DECIDES to amend the working structure of the Commission, as given in the annex to this resolution, with immediate effect;

AUTHORIZES the president to activate the work of the Implementation/Coordination Team, the Expert Teams and Rapporteurs in accordance with priorities agreed by the Commission and the Management Group, and taking into account the availability of necessary resources;

AUTHORIZES FURTHER the president, with the assistance of the Management Group, to establish during the intersessional period, Expert Teams and Rapporteurs, additional to those agreed by the Commission, if a requirement has been established;

REQUESTS the president of the Commission, with the assistance of the 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 to the next session of the Commission;

REQUESTS FURTHER the Secretary-General to arrange, within available resources, a level of support for the amended structure that will facilitate the participation of the members of the OPAGs, the Implementation/Coordination Team, Expert Teams and of the Rapporteurs.

ANNEX TO RESOLUTION 2 (CCl-XIV)

WORKING STRUCTURE OF THE COMMISSION FOR CLIMATOLOGY

1. The Commission agreed that the working structure adopted at its thirteenth session by Resolution 1 (CCl-XIII) was largely effective, and that with some modification it would be improved as a flexible and responsive means of carrying out the work of the Commission.

2. The activities of the Commission shall be grouped under the following programmatic areas for the next intersessional period:

(*a*) Climate data and data management;

(*b*) Monitoring and analysis of climate variability and change;

(*c*) Climate information and prediction services (CLIPS);

(*d*) Climate Applications and Services.

Open Programme Area Groups, the members of which will be regularly consulted and informed by correspondence, shall handle the activities under each of these programme areas. Each OPAG shall be structured with one or more Expert Teams and Rapporteurs. This achieves a broad ownership of the plans, concepts, procedures and outputs developed by the Commission through the active involvement of a large number of individual experts from among its members. The chairperson of each OPAG is also the coordinator of the work of the small teams and rapporteurs related to that specific programme area.

CCl Management Group

3. The Management Group shall consist of the president and vice-president, the chairpersons of the OPAGs, along with the minimum additional members needed to ensure regional representation. The number of official members of the Group shall not normally exceed 10, but the president may invite to its sessions individual Rapporteurs that report to the CCl Management Group, and/or experts on specific major issues, subject to the agenda and to available funding. One member of the Management Group will be selected to serve as a Rapporteur for Climate-related Hazards, as agreed by WMO Members in the Implementation Plan for Natural Disaster Prevention and Mitigation (DPM). The CCl Management Group has a strong, active and pivotal role in guiding the Commission's activities between sessions. It is responsible for ensuring the integration of the programme areas, for strategic planning issues, for the evaluation of the progress achieved in the agreed work programme, for related necessary adjustments to the working structure in the intersessional period and for guiding the work of the Implementation/Coordination Team and of any Rapporteurs that report directly to the Management Group. Given necessary resources, the Management Group should meet twice in the intersessional period but will carry out its work by correspondence or by teleconference whenever possible. The Commission, by means of a resolution, decides the terms of reference for the Management Group. The reports of the sessions of the Management Group will be distributed in a timely manner to members of the Commission.

Open Programme Area Groups

4. The Commission shall define, by a resolution, the number and scope of activities of each OPAG to be established for the following intersessional period. The terms of reference, terms of office and designation of the chairpersons and co-chairpersons of the OPAGs are also decided by CCl by means of a resolution. The terms of reference for the OPAGs are normally of a general nature. The chairpersons will submit their reports to each session of the Management Group and to the next session of the Commission. Provision exists for a change of chairperson or co-chairperson to be authorized by the president, with guidance from the Management Group, in the intersessional period, for example because of workload.

5. The OPAGs do not hold sessions and their members are consulted and informed, in particular about the activities and progress of the CCl Management Group, the Implementation/Coordination Team and Expert Teams, through correspondence. The information flows from the chairpersons to the members through suitable means of distribution such as circular letters from the president of the Commission or the chairpersons, and the WMO website.

Implementation/Coordination Team, Expert Teams and Rapporteurs

6. An Implementation/Coordination Team (ICT) focuses on coordinating operational and implementation aspects of the work of the Commission, and provides regional oversight and guidance. An Expert Team (ET) develops solutions to scientific/technical problems and studies issues for which specific expert knowledge is needed. A Rapporteur can be considered as a "one-member" ET, for providing expert guidance or input or for enhancing the reporting of regional issues and implementation, for example. Use of rapporteurs may be the optimal way to deal with issues for which a full ET is not required, particularly in cases where a mandate is shared with another technical commission, for example climate and agriculture with the Commission for Agricultural Meteorology. Such individual rapporteurs shall provide specific outputs identified by the Commission, and the numbers established by the Commission will take account of the role and membership of the Teams and of the resources available to provide them with proper guidance and coordination.

7. The activities of the Expert Teams and Rapporteurs of the OPAGs will be guided by terms of reference that will for the most part be established by the session of the Commission. However, the president, under guidance from the CCl Management Group, may revise the terms of reference for an ET, or create a new or ad hoc ET, when a substantiated new need arises. As noted in paragraph 11.2.6(*g*), Expert Teams and Rapporteurs are requested to evaluate their long-term terms of reference and, in consultation with the CCl Management Group, within the first six months of the intersessional period, to ensure development of workplans with specific, measurable, achievable, realistic and time-bound goals within that framework.

8. For the fourteenth intersessional period, there will be one ICT, reporting to the CCl Management Group. The leader of the ICT will normally be the vice-president of the Commission, or the leader may be designated by the president of the Commission. Members will include the co-chairpersons of the OPAGs, and ideally, the regional members would be the chairpersons of the Working Groups on Climate–related Matters in each Region. If a region does not have a Working Group on Climate-related Matters, the president of the regional association may propose a regional representative for this role. Up to two additional members may be invited by the ICT leader on an ad hoc basis, as a source of expertise on major technical issues. The team leader, in consultation with the ICT members, may designate another two members from developing countries as a capacity-building measure. There should be a total of 11 regular members.

9. The leaders of the ETs are normally designated by the Commission at one of its sessions. If

this is not possible, or if a change is required during the intersessional period, then the team leaders will be designated by the president upon a recommendation from the chairperson of the OPAG concerned. Members of the ETs will be designated by their team leaders in consultation with the chairperson of the OPAG, or if this is not possible by an alternative mechanism agreed by the president. This will be done as far as possible at the session of the Commission, based on the proposals made by the Permanent Representatives in advance of or during the session. The chairperson of the OPAG will take full account of the need to invite suitable experts from other interested bodies to participate in CCl teams, and will, where experts of equal experience and expertise are available, give consideration to representation from developing countries, and of women candidates. As an approximate guide, the total number of members of an Expert Team should not exceed eight.

10. The Implementation/Coordination Team, Expert Teams and Rapporteurs agree to perform specific tasks and to provide related outputs within a specific time period. Once established and activated, the teams will perform their tasks and provide their reports to their parent body. Much of the work is expected to be achieved through correspondence. The nature and the urgency of the tasks entrusted to the teams and the availability of funds will to a large extent determine whether meetings are feasible. It is expected that the ICT would have at least one meeting during an intersessional period. Activation of teams established by a session of the Commission and the timing of any meetings will be decided by the Management Group in consultation with the Secretariat. Team reports will generally be accessible through the WMO website and be distributed by regular mail, as necessary.

LIAISON BETWEEN CCL AND THE REGIONAL ASSOCIATIONS, AND THE ROLES OF DEVELOPING COUNTRIES AND WOMEN IN THE WORK OF THE COMMISSION

11. This working structure is designed to foster effective links to the regional associations and ensure their involvement in the planning, implementation and coordination of the World Climate Programme at the regional level. It is intended to build consensus, promote regional participation in the CCl decision-making process and improve the flow of information to and from the Regions. Effective liaison between the Working Groups on Climate-related Matters in each Region and the CCl Management Group will be enhanced by having the chairpersons of the regional Working Groups on Climate-related Matters serve as ICT members.

12. The Commission recognizes the importance of the involvement of experts from developing countries and women in its activities, from the perspectives of strengthening knowledge and capacity, but more importantly because of the unique and important experience and perspectives offered by these experts.

RESOLUTION 3 (CCl-XIV)

MANAGEMENT GROUP OF THE COMMISSION FOR CLIMATOLOGY

THE COMMISSION FOR CLIMATOLOGY,

NOTING:

(1) The *Abridged Final Report with Resolutions of the Fifty-second Session of the Executive Council* (WMO-No. 915), general summary paragraph 4.1.6,

(2) The *Abridged Final Report with Resolutions of the Thirteenth World Meteorological Congress* (WMO-No. 902), general summary paragraph 6.4.3,

RECOGNIZING:

(1) That the effectiveness of the Commission depends to a large extent on the effective management of its activities between sessions,

(2) That an ongoing management function is required to ensure the integration of programme areas, decide upon priorities taking account of the availability of resources, evaluate the working progress achieved, coordinate strategic planning, and decide on necessary adjustments to the working structure of the Commission during the intersessional period,

DECIDES:

(1) To establish the CCl Management Group with the following terms of reference:

(*a*) Advise the president on all matters related to the work of the Commission;

(*b*) Keep under review the internal structure and working methods of the Commission and make necessary adjustments to the working structure in the intersessional period;

(*c*) Ensure the overall integration of the programme areas and coordinate strategic planning issues;

(*d*) Monitor the implementation of the World Climate Applications and Services Programme and the World Climate Data and Monitoring Programme in relation to the WMO Long-term Plans and advise the president on appropriate actions;

(*e*) Review and decide upon priorities and schedules for the activation of the Open Programme Area Groups (OPAGs), the Implementation/Coordination Team and Rapporteurs reporting directly to the Management Group, taking into account the requirements expressed at the session of the Commission, and assess and evaluate the progress achieved and provide continuing guidance on timescales for their work and outputs;

(*f*) Advise the president of the Commission on matters related to cooperation with other technical commissions and support to other WMO and related programmes;

(*g*) Advise the president of the Commission on requirements arising between its sessions for new appointments of OPAG chairpersons and co-chairpersons, the Implementation/Coordination Team members, the establishment or activation of teams and rapporteurs, and the designation of team leaders;

(*h*) Work with WMO to develop specific tactics towards acquiring extrabudgetary resources that are required to support the work programme of the Commission;

(2) That the composition of the Management Group, normally not to exceed 10 members in total, shall be as follows:

President of CCl (chairperson):
Pierre Bessemoulin (France)
Vice-president of CCl:
Wang Shourong (China)
Chairpersons from each of the four OPAGs:
Raino Heino (Finland) – OPAG 1;
Thomas Peterson (USA) – OPAG 2;
Abdalah Mokssit (Morocco) – OPAG 3;
Dong Wenjie (China) – OPAG 4;
and a minimum additional number of Members to ensure representation from each Region, and from the World Data Centres as follows:
Region III – Luis Molion (Brazil)
Region V – Michael Coughlan (Australia)
World Data Centres – Aleksandr Sterin (Russian Federation);
additional members, as required, to provide advice on specific major issues, as follows:
(to be decided);

(3) That the Management Group, subject to available resources, should meet at least twice during the intersessional period and that the members of the Commission shall be informed of its decisions within eight weeks following its meetings.

RESOLUTION 4 (CCl-XIV)

OPEN PROGRAMME AREA GROUPS OF THE COMMISSION FOR CLIMATOLOGY

THE COMMISSION FOR CLIMATOLOGY,

CONSIDERING the need for continued development and coordination of activities within WMO relating to:

(1) Climate data and data management,

(2) Monitoring and analysis of climate variability and change,

(3) Climate information and prediction services,

(4) Climate applications and services,

DECIDES:

(1) To establish the Open Programme Area Group (OPAG) on Climate Data and Data Management with the following terms of reference:

(*a*) To maintain an active and responsive overview of all activities related to climate data and data management, including the implementation of climate networks, climate observing requirements and standards, the implementation of climate data management systems, the rescue, preservation and digitization of climate records, and metadata for climate applications;

(*b*) To ensure that the subsidiary bodies of the OPAG are well informed of global and regional activities within the areas of responsibility of the OPAG;

(*c*) To monitor the roles, activities and priorities of Expert Teams and Rapporteurs established by the Commission under the responsibility of the OPAG, to ensure coordination of work between the Teams and to advise on changes;

(2) To establish the OPAG on Monitoring and Analysis of Climate Variability and Change with the following terms of reference:

(*a*) To maintain a complete and responsive overview of all activities related to the analysis of climate variability and change, including climate system monitoring, data set assembly and cataloguing, climate change and variability detection processes, including the assessment of homogeneity, climate change indices, and the role of satellite systems;

(*b*) To ensure that the subsidiary bodies of the OPAG are well informed of global and regional activities within the areas of responsibility of the OPAG;

(*c*) To monitor the roles, activities and priorities of Expert Teams and Rapporteurs established by the Commission under the responsibility of the OPAG, to ensure coordination of work between the teams and to advise on changes;

(3) To establish the OPAG on Climate Information and Prediction Services (CLIPS) with the following terms of reference:

(*a*) To maintain an active and responsive overview of all activities related to climate information and prediction services, and the CLIPS project, including research needs; operations, verification and application services; El Niño and La Niña; climate and water; climate and agriculture; and cross-cutting activities including capacity-building, training and natural hazards;

(*b*) To ensure that the subsidiary bodies of the OPAG are well informed of global and regional activities within the areas of responsibility of the OPAG;

(*c*) To monitor the roles, activities and priorities of Expert Teams and Rapporteurs established by the Commission under the responsibility of the OPAG, to ensure coordination of work between the teams and to advise on changes;

(4) To establish the OPAG on Climate Applications and Services with the following terms of reference:

(*a*) To maintain an active and responsive overview of all activities related to climate applications (WCASP), including applications of climatology to human health, energy, tourism, and urban and building climatology;

(*b*) To ensure that the subsidiary bodies of the OPAG are well informed of global and regional activities within the areas of responsibility of the OPAG;

(*c*) To monitor the roles, activities and priorities of Expert Teams and Rapporteurs established by the Commission under the responsibility of the OPAG, to ensure coordination of work between the teams and to advise on changes;

(5) To appoint a chairperson and co-chairperson(s) of each OPAG with the following terms of reference:

(*a*) To facilitate and assist the work of the OPAG in particular with respect to providing overall guidance to, monitoring and coordinating of, the work of the teams and the rapporteurs, in liaison with the team leaders;

(*b*) In consultation with the president and the Management Group, establish priorities for the activation of Expert Teams and Rapporteurs, taking account of decisions of the previous session of the Commission, and schedules for their outputs;

(*c*) To act upon matters referred to the OPAG by the president of the Commission or by the chairpersons of other OPAGs on matters of joint concern, and to advise the president on the composition of teams established between sessions of the Commission, including their leadership;

(*d*) To provide advice to team leaders on the membership (designation and numbers) of their teams, including representation of other interested bodies;

(*e*) To provide feedback to the members of the OPAG including an activity report by the end of calendar years in the intersessional period;

(*f*) To submit reports for Management Group meetings and for the next session of the Commission;

(6) To select, in accordance with General Regulation 32, a chairperson and co-chairperson for each OPAG as follows:

(*a*) For OPAG 1 on Climate Data and Data Management, Raino Heino (Finland) and Peter Ambenje (Kenya);

(*b*) For OPAG 2 on Monitoring and Analysis of Climate Variability and Change, Thomas Peterson (USA) and Manola Brunet India (Spain);

(*c*) For OPAG 3 on Climate Information and Prediction Services, Abdalah Mokssit (Morocco) and (to be decided);

(*d*) For OPAG 4 on Climate Applications and Services, Dong Wenjie (China) and Mohammed Kadi (Algeria).

Notes:

(1) The chairperson and co-chairperson of each OPAG will be expected to divide the tasks specified above on an equitable basis.

(2) The terms of office of the chairperson and co-chairperson of each OPAG will normally be two years, with the option of renewal for the full intersessional period.

RESOLUTION 5 (CCl-XIV)

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 but one of its previous resolutions are now obsolete,

DECIDES:

(1) Not to keep in force Resolution 4 (CCl-XIII), except the following paragraph of the Resolution:

DECIDES:

(1) To keep in force Resolution 18 (CCl-XII) — Participation of women in the work of the Commission, except the paragraph under **URGES**, and with modification of the paragraph under **URGES FURTHER** to read as follows:

"Members who have not yet identified focal points in their NMHSs for this activity to do so and communicate the information to WMO";

(2) Not to keep in force other resolutions adopted prior to its fourteenth session;

(3) That the recommendations of its previous sessions are now redundant.

RECOMMENDATIONS ADOPTED BY THE SESSION

RECOMMENDATION 1 (CCl-XIV)

AMENDMENTS TO THE WMO *TECHNICAL REGULATIONS* (WMO-No. 49), VOLUMES I, II AND III

THE COMMISSION FOR CLIMATOLOGY,

NOTING the report of the Rapporteurs of the Core Management Group on WMO Technical Regulations (WMO-No. 49), Volumes I, II and III,

CONSIDERING the requirement for amendments to definitions and new applications of climate-related terms in chapters B.1 and C.3.2,

RECOMMENDS that the amendments to the WMO *Technical Regulations* (WMO-No. 49), Volumes I, II and III, defined in the annex to this recommendation, be adopted for use as from 10 November 2006;

REQUESTS the Secretary-General to arrange for the inclusion of these amendments in Volumes I, II and III of the WMO *Technical Regulations* (WMO-No. 49).

ANNEX TO RECOMMENDATION 1 (CCl-XIV)

AMENDMENTS TO THE WMO *TECHNICAL REGULATIONS* (WMO-No. 49), VOLUMES I, II AND III

VOLUME I – GENERAL METEOROLOGICAL STANDARDS AND RECOMMENDED PRACTICES

Definitions

Amend "Land station" to read "A meteorological observing station situated on land."

Add definitions for GCOS, GSN, GUAN, GAW, RBCN, Re-analysed data, Station metadata and Climatological data.

Requirements for the international exchange of observational data and products to meet the needs of WMO Programmes

Replace "Relative humidity" with "Water vapour" or "Dew point" in Tables 1 and 2.

Add two columns in Table 3, one for "Delay" and one for "Uncertainty" so that there is reference to a broader set of requirements developed by GCOS (for example for numerical weather prediction).

Add "Subsurface ocean", "Outgoing long-wave radiation" and "Rainfall deficiency (or drought)" under "Analysis" in Section B: Products.

Chapter B.1 – Climatology

Add "Second edition" after "*Guide to Climatological Practices* (WMO-No. 100)" in [B.1.] 1.1 NOTE.

Add a statement about the need to record metadata sufficient to interpret data and ensure data homogeneity, both station metadata and metadata, on data sets, data processing, etc. in [B.1.] 1.1.

Add "and *Handbook on CLIMAT and CLIMAT TEMP Reporting* (WMO/TD-No. 1188)" after "*Manual on Codes* (WMO-No. 306)" in [B.1.] 3.1.1.

Replace "punch-cards" with "digital media" in [B.1.] 3.1.4.

Replace "sums and averages of data" with "sums, averages, anomalies and percentages of normal of data" in [B.1.] 4.2.3.1.

Add "and geodetic system WGS 84 (reference for GPS)" in [B.1.] 5.2.2.2 (*a*).

Replace "data of upper-air observations" with "data from upper-air observations" in [B.1.] 5.3.1 and [B.1.] 5.3.2.

Chapter B.2 – Global Atmosphere Watch (GAW)

Add a reference to the *Global Atmosphere Watch Measurements Guide* (WMO/TD-No. 1073), 2001.

Chapter C.2 – Meteorological Services for Agriculture

Add "seasonal to interannual climate predictions of the likelihood of climatic anomalies, including temperature, rainfall and other climate variables" after "and foresters" in [C.2.] 3.1.2 (*a*).

VOLUME II – METEOROLOGICAL SERVICE FOR INTERNATIONAL AIR NAVIGATION

Chapter C.3.2 – Aeronautical climatology

Add "at 10 m above ground level, and at different altitude levels when wind profiler climatological data are available" after "Frequencies of specified wind directions and speeds" in [C.3.2.] 2.2.

Replace "(in 30° sectors)" with "(16 (22.5°) or 18 (20°) directions)" in [C.3.2] 3.2.

VOLUME III – HYDROLOGY

Chapter D.2 – Meteorological services for hydrology

Replace "Relative humidity" with "Water vapour" or "Dew point" in [D.2.] 4.3 (*b*).

RECOMMENDATION 2 (CCl-XIV)

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: Resolutions 6 (EC-XXXVI), 4 (EC-XL), 6 (EC-XLI), 14 (EC-XLIV), 15 (EC-XLIV), 7 (EC-XLV), 3 (EC-LII), 1 (EC-LIV), 18 (EC-LV) and 1 (EC-LVI);

(2) That Resolution 2 (EC-LIV) be replaced by a new resolution, relating to the report of the fourteenth session of the Commission.

ANNEXES

ANNEX I (CCl-XIV)
Annex to paragraph 7.2.3 of the general summary

IMPLEMENTATION PLAN FOR THE GLOBAL OBSERVING SYSTEM FOR CLIMATE IN SUPPORT OF THE UNITED NATIONS FRAMEWORK CONVENTION ON CLIMATE CHANGE

Actions and "agents for implementation" for which agents involve technical commissions in general and CCl in particular

Actions	*Agents for implementation*
Actions including technical commissions in general (total: 5)	
C11 Prepare the data sets and metadata, including historical data records, for climate analyses and reanalyses.	Parties with the International Data Centres, for example World Data Centres, working together with technical commissions and the scientific community.
C18 Develop standards and procedures for metadata and its storage and exchange.	International technical commissions with scientific advisory bodies.
C19 Ensure timely, efficient and quality-controlled flow of all Essential Climate Variables (ECV) data to International Data Centres.	Parties with coordination by appropriate technical commissions and international programmes.
C20 Ensure that data policies facilitate the exchange and archiving of all ECV data.	Parties, international agencies, appropriate technical commissions and international programmes.
C21 Develop modern distributed data services that can handle the increasing volumes of data and which can allow feedback to observing network management.	Parties' national services committing to International Data Centre operation and high data volume providers such as Space agencies through appropriate technical commissions and international programmes.
Actions including the Commission for Climatology explicitly (total: 5)	
C14 Collect, digitize and analyse the historical atmospheric, oceanic and terrestrial data records from the beginning of instrumental observations in a region and submit to International Data Centres.	Parties, working through the WMO Commission for Climatology (CCl), the WMO Commission for Hydrology (CHy), other appropriate coordinating bodies (for example, GCOS and GTOS), the appropriate national agencies, and designated International Data Centres.
A2 Obtain major progress in implementation and systematic operation of the full WWW/GOS RBSN in compliance with the GCOS Climate Monitoring Principles (GCMPs).	National Meteorological Services, in cooperation/coordination with WMO CBS, WMO CCl, WMO RAs and WMO WWW.
A3 Apply GCMPs to all surface climate networks.	National Meteorological Services, in coordination with WMO CBS, WMO CCl, WMO RAs and the GCOS Secretariat.
A4 Develop guidelines and procedures for the transition from manual to automatic surface observing stations that incorporate GCMPs.	WMO CIMO in cooperation with WMO CCl, WMO CBS, and GCOS GSN Monitoring Centres through AOPC and the GCOS Secretariat.
A6 Submit precipitation data from national networks to the International Data Centres.	National Meteorological Services with coordination through the WMO CCl.

ANNEX II (CCl-XIV)
Annex to paragraph 9.4.6 of the general summary

GCOS CLIMATE MONITORING PRINCIPLES

Effective monitoring systems for climate should adhere to the following principles:[1]

1. The impact of new systems or changes to existing systems should be assessed prior to implementation;
2. A suitable period of overlap for new and old observing systems is required;
3. The details and history of local conditions, instruments, operating procedures, data-processing algorithms and other factors pertinent to interpreting data (i.e. metadata) should be documented and treated with the same care as the data themselves;
4. The quality and homogeneity of data should be regularly assessed as a part of routine operations;
5. Consideration of the needs for environmental and climate-monitoring products and assessments, such as IPCC assessments, should be integrated into national, regional and global observing priorities;
6. Operation of historically uninterrupted stations and observing systems should be maintained;
7. High priority for additional observations should be focused on data-poor regions, poorly-observed parameters, regions sensitive to change and key measurements with inadequate temporal resolution;
8. Long-term requirements, including appropriate sampling frequencies, should be specified to network designers, operators and instrument engineers at the outset of system design and implementation;
9. The conversion of research observing systems to long-term operations in a carefully planned manner should be promoted;
10. Data management systems that facilitate access, use and interpretation of data and products should be included as essential elements of climate monitoring systems.

Furthermore, satellite systems for monitoring climate need to:

(*a*) Take steps to make radiance calibration, calibration monitoring and satellite-to-satellite cross-calibration of the full operational constellation a part of the operational satellite system;

(*b*) Take steps to sample the Earth system in such a way that climate-relevant (diurnal, seasonal and long-term interannual) changes can be resolved.

Thus, satellite systems for climate monitoring should adhere to the following specific principles:

11. Constant sampling within the diurnal cycle (minimizing the effects of orbital decay and orbit drift) should be maintained;
12. A suitable period of overlap for new and old satellites should be ensured for a period adequate to determine inter-satellite biases and maintain the homogeneity and consistency of time-series observations;
13. Continuity of satellite measurements (i.e. elimination of gaps in the long-term record) through appropriate launch and orbital strategies should be ensured;
14. Rigorous pre-launch instrument characterization and calibration, including radiance confirmation against an international radiance scale provided by a national metrology institute, should be ensured;
15. On-board calibration adequate for climate system observations should be ensured and associated instrument characteristics monitored;
16. Operational production of priority climate products should be sustained and peer-reviewed new products should be introduced as appropriate;
17. Data systems needed to facilitate user access to climate products, metadata and raw data, including key data for delayed-mode analysis, should be established and maintained;
18. Use functioning baseline instruments that meet the calibration and stability requirements stated above should be maintained for as long as possible, even when these exist on de-commissioned satellites;
19. Complementary in situ baseline observations for satellite measurements should be maintained through appropriate activities and cooperation;
20. Random errors and time-dependent biases in satellite observations and derived products should be identified.

1 The 10 basic principles were adopted by the Conference of the Parties (COP) to the United Nations Framework Convention on Climate Change through decision 5/CP.5 at COP 5 in November 1999. The present, complete set of principles was adopted by Fourteenth Congress in May 2003 through Resolution 9 (Cg-XIV) — GCOS climate monitoring principles; agreed by the Committee on Earth Observation Satellites (CEOS) at its Seventeenth Plenary in November 2003; and adopted by COP through decision 11/CP.9 at COP 9 in December 2003.

ANNEX III (CCl-XIV)
Annex to paragraph 9.6.4 of the general summary

TECHNICAL CONFERENCE ON CLIMATE AS A RESOURCE, BEIJING, 1–2 NOVEMBER 2005

SUMMARY REPORT: FACT FINDINGS AND RECOMMENDATIONS

GENERAL INTRODUCTION

WMO, in collaboration with the China Meteorological Administration (CMA), organized the international Technical Conference on Climate as a Resource back-to-back with the fourteenth session of the Commission for Climatology, in Beijing, China, on 1 and 2 November 2005. The high degree of participation, totalling 122 participants from 71 countries from all WMO Regions and 21 high-level lectures and 29 posters, made this Conference one of the most successful organized. The following gives a brief list of "fact findings" and specific recommendations raised during the Conference to be presented as recommendations for consideration by the Commission. The full report including opportunities, challenges and recommendations, sector by sector, will be provided in the final proceedings to be published in 2006.

PART I: FACT FINDINGS

The Conference:

1. Recognized the importance of climate as a resource for meeting sustainable development criteria;
2. Recognized the importance of the partnership between the climate scientific community and the various socio-economic sectors, such as food, water resources, tourism, health, energy, urban planning and risk management;
3. Acknowledged the great level of participation in the Conference with outstanding participants from various regions and fields of interest;
4. Highlighted the outstanding contributions from various lectures and posters presented during the Conference;
5. Acknowledged the pleasure of participants to have received, at an early stage, a high value abstract document. CMA also compiled all presentations in a much appreciated CD-ROM which was distributed at the end of the Conference.

PART II: SPECIFIC RECOMMENDATIONS FROM THE CONFERENCE TO THE FOURTEENTH SESSION OF THE COMMISSION FOR CLIMATOLOGY

1. Participants agreed on the importance of holding the Conference back to back with the fourteenth session of the Commission, and recommended a similar strategy for the fifteenth session.
2. Participants agreed on the importance of strengthening partnerships between the Commission and socio-economic sectors to further develop climate applications incorporating risk management in food, water, tourism, health, energy and urban planning. In that respect, it was recommended that:

(*a*) CCl consider various ways and mechanisms that allow experts from various socio-economic sectors to contribute within various CCl expert teams especially in the OPAG dealing with applications;

(*b*) CCl consider possible actions in the short, medium and long terms including joint projects, including pilots to explore potential new application products, workshops and conferences, and publications with each sector separately to focus on specific needs;

(*c*) CCl consider ways to promote matching of meteorological data with data forms from socio-economic sectors to assist advancement of impact studies;

(*d*) CCl consider actions to strengthen use of emerging meteorological and other environmental data forms (remotely sensed, reanalysis) to complement traditional data forms that can be brought to bear on applications, especially increasing resolutions and providing interpolation, as well as consider the assessment of climate products including the skill of the seasonal forecast and their use in various applications.

RECOMMENDATIONS FOR SHORT- AND MEDIUM-TERM ACTIONS

1. Publication of the proceedings of the Conference in the course of 2006, to be distributed to all participating institutions, NMHSs and individuals;
2. Organization by WMO/WCP/CCl of a scoping workshop in the course of 2007 on climate as a resource and its application in a specific sector with potential for enhanced use of climate information. The workshop would bring together climate application scientists, relevant sector scientists, practitioners and representatives of institutions. As a topic for such a workshop, there was enthusiasm expressed for unexplored opportunities within the tourism sector.

ANNEX IV (CCl-XIV)
Annex to paragraph 11.2.8 of the general summary

OPAG TEAMS AND RAPPORTEURS AND THEIR TERMS OF REFERENCE

1. OPAG 1: Climate Data and Data Management

1.1 Expert Team for Climate Data Management including Metadata

(*a*) To identify and specify new requirements for CDMSs, including standard applications software;
(*b*) To monitor "in-service" capabilities and utilization of computer and manual systems in meeting the requirements of Members;
(*c*) To manage and report on the continued evaluation, installation, commissioning and training for the next-generation CDMSs, especially in meeting the needs of developing countries;
(*d*) To determine and specify the needs for further operational support of, and migration from, the CLICOM system;
(*e*) To develop guidance on the management of climate data, including on new data types and quality management, with particular emphasis on developing countries;
(*f*) To provide guidance on the requirements for metadata, particularly with regard to station metadata for climate change detection;
(*g*) To establish standards for the exchange of metadata and/or their deposition in major data centres, with particular reference to the needs of the WMO Information System (WIS);
(*h*) To coordinate and collaborate with other OPAG members, CBS, JCOMM, CIMO, GEOSS, GCOS, WCRP, for example on polar data for the IPY, and other groups as required or as opportunities arise;
(*i*) To explore, document and make recommendations for addressing the needs for capacity-building in each region, pertinent to this topic;
(*j*) To submit reports in accordance with timetables established by the OPAG chairperson and/or Management Group.

1.2 Expert Team on Observing Requirements and Standards for Climate

(*a*) To review and make recommendations regarding the adequacy and choice of observing instruments and sensors to meet climate needs, including in situ, remote sensing systems and automated methods;
(*b*) To review and develop recommendations on procedures and practices necessary to support the long-term homogeneity of climate data, including:
  (i) Procedures to be carried out in the migration from manual to automated measurements, and during changes to sensors and site;
  (ii) Procedures to be carried out during instrument maintenance and calibration;
  (iii) Instrument comparisons to identify biases, drift and sensitivity;
  (iv) Maintenance, monitoring and reporting on observing environments including instrument exposure;
(*c*) To specify the basic characteristics and standards of national and regional climate networks and their observations, including AWSs and remote sensing platforms, needed in support of climate activities;
(*d*) To help ensure that guidance and procedures are developed to assist with improved data exchange, particularly with regard to satisfying the requirements of the Reference Climate Stations, Regional Basic Climatological Stations and the relevant GCOS networks;
(*e*) To coordinate and collaborate with the OPAG Rapporteurs, CBS, JCOMM, CIMO, GEOSS, GCOS, WCRP, for example on polar data for the IPY, and other groups as required or as opportunities arise;
(*f*) To explore, document and make recommendations for addressing the needs for capacity-building in each region, pertinent to this topic;
(*g*) To submit reports in accordance with timetables established by the OPAG chairperson and/or Management Group.

1.3 Expert Team on the Rescue, Preservation and Digitization of Climate Records

(*a*) To establish and record, through contact with interested parties including data users and data centres, general and specific needs for the rescue of historical observational data and metadata records;
(*b*) To investigate and document, under the DARE/ARCHISS Project, the existence and content of undigitized records in the archives of NMHSs, public archives and private collections;
(*c*) To develop and present specific proposals for data rescue projects and to investigate associated synergies across different regions;
(*d*) To develop a coherent strategy for the use of electronic means for data recording and collection and for migration to digitized archives;
(*e*) To promote, monitor and report on the success of projects to rescue and digitize manuscript records and incorporate these data into long-term data sets;
(*f*) To coordinate and collaborate with the OPAG Rapporteurs, GCOS, WCRP, for example on polar data for the IPY, and other groups as required or as opportunities arise;
(*g*) To explore, document and make recommendations for addressing the needs for capacity-building in each region, pertinent to this topic;

(*h*) To submit reports in accordance with timetables established by the OPAG chairperson and/or the Management Group.

2. OPAG 2: Monitoring and Analysis of Climate Variability and Change

2.1 Joint CCl/CLIVAR/JCOMM Expert Team on Climate Change Detection and Indices[1]

(*a*) To provide international coordination and help organize collaboration on climate change detection and indices relevant to climate change detection;

(*b*) To further develop and publicize indices and indicators of climate variability and change from the surface and subsurface ocean to the stratosphere;

(*c*) To encourage the comparison of modelled data and observations, perhaps via the development of indices appropriate for both sources of information;

(*d*) To coordinate these and other relevant activities the ET chooses to engage in (such as perhaps observing system experiments that help determine where observations are needed for climate change detection) with other appropriate working bodies, such as GCOS, CBS, CIMO, CAgM, CHy, IPCC and START, as well as with the joint WCRP JSC/CLIVAR Working Group on Coupled Modelling, the WCRP Observations and Assimilation Panel and regional associations;

(*e*) To explore, document and make recommendations for addressing the needs for capacity-building in each region, pertinent to this topic;

(*f*) To submit reports in accordance with timetables established by the OPAG chairperson and/or Management Group.

2.2 Expert Team on Climate Monitoring including the Use of Satellite and Marine Data and Products

(*a*) To review and advise on the development of the WMO annual state of the climate report and to facilitate coordination of global and regional climate monitoring activities for the benefit of all organizations engaged in this work;

(*b*) To review and contribute to the generation of optimized integrated satellite and in situ data sets for marine, terrestrial and atmospheric climate monitoring;

(*c*) To take actions as deemed appropriate to assess and improve the interoperability, availability and homogeneity of data used for global and regional climate monitoring;

(*d*) To coordinate with GCOS and GEOSS, as appropriate, and with the WMO Space/GEO programme on cross-cutting initiatives;

(*e*) To promote and coordinate the processing of remotely sensed data, such as satellite and radar, and archiving them in a format suitable for climate monitoring;

(*f*) To coordinate monitoring activities of institutions that are monitoring global, regional and/or national climate conditions and to share data, information and/or data assimilation techniques to integrate remotely-sensed data and in situ data that would help improve the monitoring of climate variability and change;

(*g*) To identify the needs and requirements for global and regional long-term reanalysis projects to ensure they are suitable for monitoring climate variability and change;

(*h*) To create guidelines and information on verification of national and global extremes;

(*i*) To coordinate and manage a global extremes database, updated annually;

(*j*) To ensure effective collaboration with relevant partners including the JCOMM Expert Team on Marine Climatology;

(*k*) Liaise as required with the CBS Expert Team on Satellite Systems (OPAG on Integrated Observing Systems), which has similar responsibilities, so as to maximize complementarity and minimize duplication;

(*l*) To develop and provide guidelines on the implementation, use and evaluation of satellite data and products in climate monitoring and climate change detection;

(*m*) To establish a feedback mechanism with satellite data and product producers, on practical needs and improvements in the use of these data and products in climate monitoring and climate change detection;

(*n*) To explore, document and make recommendations for addressing the needs for capacity-building in each region, pertinent to this topic;

(*o*) To submit reports in accordance with timetables established by the OPAG chairperson and/or Management Group.

3. OPAG 3: Climate Information and Prediction Services (CLIPS)

3.1 Expert Team on Research Needs for Intra-seasonal, Seasonal and Interannual Prediction, including the Application of these Predictions

(*a*) To appraise and report on current intraseasonal, seasonal and interannual prediction systems, and their ability to meet the requirements of specific applications areas, and to provide an assessment of the likely capabilities achievable by the years 2010 and 2015;

(*b*) To produce a critical review of the methodologies for the creation and the presentation to users of intraseasonal, seasonal and interannual products, including consensus methodology and downscaling, and to recommend improvements to the methods used;

(*c*) To look at the relative value of dynamical downscaling methods against empirical methods;

1 This team will have one third of the members from CCl, one third from CLIVAR and one third from JCOMM, with CLIVAR and CCl co-chairpersons.

(*d*) To promote the Climate Predictability Tool (CPT) of the International Research Institute for Climate and Society (IRI) as an applications tool (this tool can downscale empirically large-scale forecast fields to specific sites for climate and applications forecasting);
(*e*) To make recommendations on research and development activities needed in the areas of forecast systems, presentation of products, applications and to support user decision processes (this includes marine, atmospheric and terrestrial data provision);
(*f*) To coordinate research needs with WCRP;
(*g*) To incorporate the WMO cross-cutting themes (on Disaster Prevention and Mitigation, Space/GEO and Least Developed Countries) into planning and activities of the ET, and to collaborate as needed with experts (across all related disciplines) in other CCl ETs, members of other WMO technical commissions and in relevant external organizations;
(*h*) To explore, document and make recommendations for addressing the needs for capacity-building in each region, pertinent to this topic;
(*i*) To submit reports in accordance with timetables established by the OPAG chairperson and/or Management Group.

3.2 Expert Team on CLIPS Operations, Verification and Application Services[1]

Terms of reference of the CCl-XIII OPAG 3 on CLIPS Operations, including Product Generation, with Emphasis on Countries in Need

(*a*) To keep under review and update the list of NMHSs, Regional Climate Centres (RCCs) and other regional specialized climate centre requirements, as listed in the *General Summary of the Session of the Intercommission Task Team on Regional Climate Centres* (WMO/TD-No. 1070, WCASP-52) for input for dynamic and statistical forecasts, observational data and training activities, to enable the generation of climate outlook products;
(*b*) To assess the skill of monthly, seasonal to interannual predictions to ensure a common understanding of the current skill among the Global Producing Centres, RCCs, NMHSs and users;
(*c*) To consider the implication and implementation of research recommendations, especially relating to consensus forecast methodology, downscaling and multi-ensemble modelling, and provide appropriate guidance on the development of improved methods for climate forecasts to support climate applications;
(*d*) To assess continuously the status, including adequacy and availability, and opportunities of climate prediction activities on different scales, and their potential to meet user requirements;
(*e*) To make recommendations on the preparation and provision of both deterministic and probabilistic climate prediction information for sector-specific uses, including formats used;
(*f*) To develop definitions of terminology used in operational climate prediction in order to facilitate understanding of these terms;
(*g*) To produce and update a guide on best operational practices in the generation of climate information and prediction products for users, with an emphasis on countries in need;
(*h*) To advise the Implementation/Coordination Team and submit reports in accordance with timetables established by the OPAG chairperson and/or Management Group;
(*i*) To explore, document and make recommendations for addressing the needs for capacity-building in each region, pertinent to this topic;
(*j*) To maintain close links with CBS on the issues involved.

Terms of reference of the CCl-XIII OPAG 3 on Verification

(*a*) To identify requirements of RCCs, NMHSs and users for verifying information on intraseasonal, seasonal and interannual predictions from the perspectives of both deterministic and probabilistic forecasts, including its presentation;
(*b*) To identify requirements of users in different applications sectors for verifying information on products they receive;
(*c*) To produce:
  (i) A critical review of the methods of forecast verification currently used in both deterministic and probabilistic intraseasonal, seasonal and interannual prediction;
  (ii) An appraisal of the information content of these methods from the perspective of applications;
  (iii) A review of the methods by which forecast skill is currently presented to NMHSs and users; and to generate advice on the suitability of these methods from the perspective of both NMHSs and the users;
(*d*) To identify and develop, as necessary, appropriate verification techniques for seasonal to interannual predictions, as well as methods for their presentation in order to satisfy user requirements;
(*e*) To promote the use of both standardized and recommended techniques through the development of verification intercomparison projects;
(*f*) To develop definitions of terminology used in verification in order to facilitate user understanding of these terms;
(*g*) To maintain close links with the CBS ET on Verification;

1 This ET is the result of merging the activities of the CCl-XIII ETs in section 3.2, and will take responsibility for the key priorities from amongst these previous terms of reference. It may be necessary to invoke ad hoc subteams to take on a number of tasks. The ET will have three co-chairpersons representing CLIPS Operations, Verification and User Liaison, but one will serve as overall coordinator.

(*h*) To prepare a review of methods for the assessment of forecast skill and to recommend methods for verifying intraseasonal, seasonal and interannual forecasts;
(*i*) To incorporate the WMO cross-cutting themes (on Disaster Prevention and Mitigation, Space/GEO and Least Developed Countries) into planning and activities of the ET, and to collaborate as needed with experts (across all related disciplines) in other CCl ETs, in ETs of other WMO technical commissions and in relevant external organizations;
(*j*) To explore, document and make recommendations for addressing the needs for capacity-building in each region, pertinent to this topic;
(*k*) To submit reports in accordance with timetables established by the OPAG chairperson and/or Management Group.

Terms of reference of the CCl-XIII OPAG 3 on End-user Liaison

(*a*) To provide guidance on, and make recommendations for, the design and conduct of specific demonstration and pilot projects, including the calculation of cost/benefits and value of climate predictions from the user point of view;
(*b*) To give guidance on the assessment and management of user needs, as well as to draft a guide on the best practices in user liaison in consultation with users;
(*c*) To monitor current impacts of climate services on user decision processes, including those related to monthly to seasonal predictions and to quality-checked minimum-delay data sets;
(*d*) To develop, in conjunction with OPAG 2, guidelines for interaction between NMHSs and the user community to establish and use Climate Watches and/or climate Early Warning Systems;
(*e*) To complete the update to Technical Note 145, now entitled "The Socio-economic benefits of climatological Services";
(*f*) To incorporate the WMO cross-cutting themes (on Disaster Prevention and Mitigation, Space/GEO and Least Developed Countries) into planning and activities of the ET, and to collaborate as needed with experts (across all related disciplines) in other CCl ETs, in ETs of other WMO technical commissions and in relevant external organizations;
(*g*) To explore, document and make recommendations for addressing the needs for capacity-building in each region, pertinent to this topic;
(*h*) To submit reports in accordance with timetables established by the OPAG chairperson and/or Management Group.

3.3 Expert Team on El Niño and La Niña

(*a*) To complete, if necessary, the work of the ad hoc team (on El Niño Definitions and Indices) to finalize the catalogue of El Niño Definitions and Indices as used operationally by the different WMO Members around the world, by major Global Climate Producing Centres (GPCs), and by GPCs contributing to the WMO ENSO update;
(*b*) To develop a strategy and common language for public communiqués, and recommend Guidelines for Members and relevant organizations to follow to improve collaboration on information and predictions of El Niño and La Niña;
(*c*) To collaborate with the CCl ET on Research Needs, OPAG 2 ETs, WCRP CLIVAR WGSIP, the Global Producing Centres, research institutes including IRI, ECMWF, CIIFEN and other relevant institutions in their ongoing investigations of the potential for development of an internationally uniform approach to communication on the ENSO phenomenon;
(*d*) To produce Guidelines on interoperability between the various definitions of El Niño and La Niña and their monitoring and impacts for the use in an early warning systems for drought management and flood protection and other climate-related hazards management;
(*e*) To produce a Version 0 of an Atlas of regional ENSO impacts in map format by beginning to collect and assess regional ENSO impacts on various climate parameters and phenomena, to be used by decision makers and policymakers and its interaction with other atmospheric and oceanic phenomena, such as the North Atlantic Oscillation and Pacific Decadal Oscillation;
(*f*) To incorporate the WMO cross-cutting themes (on Disaster Prevention and Mitigation, Space/GEO and Least Developed Countries) into planning and activities of the ET, and to collaborate as needed with experts (across all related disciplines) in other CCl ETs, in ETs of other WMO technical commissions and in relevant external organizations;
(*g*) To explore, document and make recommendations for addressing the needs for capacity-building in each region, pertinent to this topic;
(*h*) To submit reports in accordance with timetables established by the OPAG chairperson and/or Management Group.

3.4 Rapporteur on Climate and Water to liaise with CHy

(*a*) To build strong linkages with relevant hydrology initiatives of CHy that are not covered by the mandate of the WCP-Water Programme;
(*b*) To serve as CCl representative on the Steering Committee for WCP-Water;
(*c*) To review relevant methods developed for the use of climate prediction (seasonal to interannual) and projections of climate change in water resource management and develop Guidelines on better integration of climate information to support decision-making for the water sector;
(*d*) To address climate and hydrological issues and associated hazards such as droughts and floods;
(*e*) To develop joint training initiatives and development of curricula;

(*f*) To develop networks for cooperation for countries where water and climate are handled by different agencies;
(*g*) To incorporate the WMO cross-cutting themes (on Disaster Prevention and Mitigation, Space/GEO and Least Developed Countries) into planning and activities of this position, and to collaborate as needed with experts (across all related disciplines) in other CCl ETs, in ETs of other WMO technical commissions and in relevant external organizations;
(*h*) To provide guidance on, and make recommendations for, the design and conduct of specific demonstration and pilot projects, including the calculation of cost/benefits and value of climate predictions from the user point of view;
(*i*) To explore, document and make recommendations for addressing the needs for capacity-building in each region, pertinent to this topic;
(*j*) To submit reports in accordance with timetables established by the OPAG chairperson and/or Management Group.

3.5 Rapporteur on Climate and Agrometeorology to liaise with CAgM

(*a*) To maintain liaison with CAgM on developments in the fields of climate monitoring, services and prediction that may have impacts on agrometeorological practices and services;
(*b*) To identify and report on the scope for, and use of, seasonal predictions and scenarios of climate change in agricultural production and food security systems, especially taking account of end-user liaison;
(*c*) To recommend enhancements to climate services in support of agriculture and food security;
(*d*) To provide guidance on, and make recommendations for, the design and conduct of specific demonstration and pilot projects, including the calculation of cost/benefits and value of climate predictions from the user point of view;
(*e*) To explore, document and make recommendations for addressing the needs for capacity-building in each region, pertinent to this topic;
(*f*) To submit reports in accordance with timetables established by the OPAG chairperson and/or Management Group.

4. OPAG 4: Climate Applications and Services

4.1 Expert Team on Climate and Health

(*a*) To improve the knowledge of relationships between environmental factors (meteorological parameters, air pollution, housing, etc.) and reactions of the human organism;
(*b*) To complete and distribute the WMO/WHO Guidelines on Heat-Health Warning Systems and health-related assessments of the thermal environment, which will include procedures that could be used worldwide by both climate and health specialists to develop and operate heat/health and cold-spell/health warning systems, and to make recommendations on regional workshops for implementation of the new procedures;
(*c*) To recommend further actions to make health-related warning systems a fully integrated part of CLIPS operations, Climate Watch and Disaster Prevention and Mitigation systems;
(*d*) To identify the needs of the health sector for climate information including monthly to seasonal predictions (for planning and in early warning systems) and considerations of climate change, particularly focusing on climate information relevant to increased risks of infectious diseases, for example yellow fever, cholera, West Nile fever, malaria, dengue fever, influenza, meningitis and possibly severe acute respiratory syndrome (SARS) and avian influenza);
(*e*) To consider possible coincidences between temperature extremes and air quality extremes in the different climate regions, and to study health effects of these multiple stress events;
(*f*) To develop, in partnership with NMHS climate services programmes, WMO regional associations and relevant partners in the health sector, useful and understandable tailored climate products for application to health, including specific attention to high latitudes (role of climate variability and change on health of people and in communities in polar regions);
(*g*) To identify international and national groups, for example WHO, the International Society of Biometeorology, the International Association of Urban Climatology, and including programmes within NMHSs and in WMO such as Public Weather Services on biometeorology, and the AREP GAW Urban Research Meteorology and Environment (GURME) project, with active programmes on climate and health, in order to gather information on their areas of interest and expertise, and then to investigate potential synergies and projects with these groups;
(*h*) To incorporate the WMO cross-cutting themes (on Disaster Prevention and Mitigation, Space/GEO and Least Developed Countries) into planning and activities of the ET, and to collaborate as needed with experts (across all related disciplines) in other CCl ETs, in ETs of other WMO technical commissions and in relevant external organizations;
(*i*) To provide guidance on, and make recommendations for, the design and conduct of specific demonstration and pilot projects, including the calculation of cost/benefits and value of climate predictions from the user point of view;
(*j*) To explore, document and make recommendations for addressing the needs for capacity-building in each region, pertinent to this topic;
(*k*) To submit reports in accordance with timetables established by the OPAG chairperson and/or Management Group.

4.2 Expert Team on Climate and Energy

(*a*) To report on case studies that demonstrate the benefits of, and problems related to, the use of climate information and predictions in support of energy operations, taking special account of end-user liaison;

(*b*) To recommend enhancements to climate services in support of energy development and operations, paying particular attention to the needs of developing countries for making use of renewable energy;

(*c*) To review and recommend related training material, including distance-learning packages;

(*d*) To prepare a status report on climate data needs for supporting wind and solar energy development, on the adequacy of WMO-specified instruments and observing practices to supply these, and on opportunities to use modelling, data interpolation methods and satellite observations to overcome problems in providing site-specific information;

(*e*) To update Technical Notes 172 and 175 on "Meteorological Aspects of the Utilization of Solar Radiation as an Energy Source" and "Meteorological Aspects of the Utilization of Wind as an Energy Source", respectively, as a single document entitled "Meteorological Aspects of Utilization of Renewable Energy Sources";

(*f*) To continue to work on applications of climate as a resource for renewable energies, and to arrange for closer cooperation with the World Climate Impact Assessment and Response Strategies Programme and UNEP on renewable energy, for example UNEP's Solar and Wind Energy Resource Assessment (SWERA) project, and on energy as part of the Millennium Development Goals and sustainable development;

(*g*) To scope which organizations are active in climate and energy, at national and international levels, both within and external to NMHSs, to foster development of collaborations and promote shared projects, and to minimize duplication of activity;

(*h*) To develop, in partnership with climate services programmes of NMHSs, WMO regional associations and CLIPS Focal Points, tailored climate products for application to the energy sector, including special attention to services at high latitudes;

(*i*) To incorporate the WMO cross-cutting themes (on Disaster Prevention and Mitigation, Space/GEO and Least Developed Countries) into planning and activities of the ET, and to collaborate as needed with experts (across all related disciplines) in other CCl ETs, in ETs of other WMO technical commissions and in relevant external organizations;

(*j*) To provide guidance on, and make recommendations for, the design and conduct of specific demonstration and pilot projects, including the calculation of cost/benefits and value of climate predictions from the user point of view;

(*k*) To explore, document and make recommendations for addressing the needs for capacity-building in each region, pertinent to this topic;

(*l*) To submit reports in accordance with timetables established by the OPAG chairperson and/or Management Group.

4.3 Expert Team on Climate and Tourism

(*a*) To develop methodologies to establish statistical relationships between meteorological conditions and tourist frequentation and destination;

(*b*) To assess the impact of climate variability and climate change on the tourism industry, especially in sensitive areas such as coastal zones and mountains, with a view to supporting sustainable tourism, for example evaluation of changes in precipitation patterns that can lead to water shortages for major tourist destinations; changes in sea temperatures that can lead to coral bleaching episodes; investigation of thermal and precipitation extremes in mountainous zones; sea level rise; shifts in seasonality; the role of climate in infrastructure damage, biodiversity change, storm surge waves and their impacts, erosion of shores and beaches, disruption to core services for water, energy and food;

(*c*) To investigate the impact of tourism activity (air traffic, energy consumption, etc.) on climate, that is, to explore whether tourism can exacerbate climate change;

(*d*) To develop, in partnership with UNWTO, climate services programmes of NMHSs, WMO regional associations and tourism professionals, tailored climate products for application to tourism, including for destinations at high latitudes;

(*e*) To develop templates for climate-related brochures and outreach products, to show to tourists (travelers) the work of the local NMHSs;

(*f*) To develop information and methodologies for NMHSs in risk assessment, including to follow on from the WMO/UNWTO *Handbook on natural disaster reduction in tourism areas,* in collaboration with the WMO DPM Programme;

(*g*) To develop information related to climate as a resource, and not just as a hazard, for WMO web pages and publications;

(*h*) To investigate climatotherapy, in conjunction with the ET on Climate and Health;

(*i*) To incorporate the WMO cross-cutting themes (on Disaster Prevention and Mitigation, Space/GEO and Least Developed Countries) into planning and activities of the ET, and to collaborate as needed with experts (across all related disciplines) in other CCl ETs, with other WMO technical commissions and in relevant external organizations including UNWTO and the Intergovernmental Oceanographic Commission of UNESCO, and regional economic groups, such as the Southern African Development Community (SADC), Intergovernmental Authority

on Development (IGAD) and New Partnership for Africa's Development (NEPAD);

(*j*) To provide guidance on, and make recommendations for, the design and conduct of specific demonstration and pilot projects, including the calculation of cost/benefits and value of climate predictions from the user point of view;

(*k*) To explore, document and make recommendations for addressing the needs for capacity-building in each region, pertinent to this topic;

(*l*) To submit reports in accordance with timetables established by the OPAG chairperson and/or Management Group.

4.4 Expert Team on Urban and Building Climatology

(*a*) To develop the urban and building climatology science that is used by staff of NMHSs and the users of their services, including:
  (i) To develop and promote guidelines for standardization of scientific communication on urban climate issues;
  (ii) To aid in the improvement of models of urban surface atmosphere exchanges through collaboration with other key organizations, for example to facilitate the development of a directory of models; model intercomparisons; and an inventory of climatologically significant characteristics of the world's cities;
  (iii) To assess the effect of the built environment and urbanization on the archived long-term climate data records;
  (iv) To collaborate with relevant scientific organizations, for example the International Association for Urban Climate (IAUC), the International Council for Research and Innovation in Building and Construction (CIB) and IPCC, and their activities;

(*b*) To further the application of the urban and building climatology science, including:
  (i) To develop and disseminate reference materials, for example Technical Notes and bibliographies;
  (ii) To improve communication, coordination and collaboration with relevant international agencies and science programmes, NMHSs and WMO scientific programmes, for example through CAS, CBS and CHy, the World Climate Research Programme and the Global Energy and Water Cycle experiment (WCRP/GEWEX);
  (iii) To develop a WMO "vision" of the role of urban climate, for example to include the cross-cutting themes related to the Millennium Development Goals, sustainable development, poverty reduction, reduction of risk from natural hazards, and the potential impacts of current and changing climates on the social, economic and environmental "health" of urban areas;

(*c*) To facilitate training of staff of NMHSs, which will help them better interact with and serve the end users of urban meteorological, climatological and hydrological services, for example urban managers, urban planners, urban landscape architects and building design professionals, including:
  (i) To gather and further develop training materials;
  (ii) To organize a series of regional training workshops, particularly to support capacity-building in developing countries;
  (iii) To produce and maintain guidance materials that relate to the built environment and climate, for specific end-user applications, for example Technical Notes, web resources and training curricula and materials for meteorological personnel;
  (iv) To explore the most efficient and cost-effective methods by which to deliver the training and related materials and tools;

(*d*) To identify and respond to other relevant activities in OPAGs 3 and 4 on CLIPS and Climate Applications and Services;

(*e*) To incorporate the WMO cross-cutting themes (on Disaster Prevention and Mitigation, Space/GEO and Least Developed Countries) into planning and activities of the ET, and to collaborate as needed with experts (across all related disciplines) in other CCl ETs, in ETs of other WMO technical commissions and in relevant external organizations;

(*f*) To provide guidance on, and make recommendations for, the design and conduct of specific demonstration and pilot projects, including the calculation of cost/benefits and value of climate predictions from the user point of view;

(*g*) To explore, document and make recommendations for addressing the needs for capacity-building in each region, pertinent to this topic;

(*h*) To submit reports in accordance with timetables established by the OPAG chairperson and/or the Management Group.

5. Expert Teams and Rapporteurs reporting directly to the president and/or the Management Group

5.1 Rapporteur on Climate-related Hazards (from within the CCl Management Group)

(*a*) To develop guidance materials on establishment of national databases on climate-related hazards, including statistics, information on patterns and trends, and impacts information including sources, in close collaboration with the WMO Natural Disaster Prevention and Mitigation Programme on requirements;

(*b*) To develop mechanisms for incorporation, where feasible, of seasonal to interannual climate predictions, climate change information and associated products into Early Warning Systems and initiatives;

(*c*) To develop outreach products, such as brochures and hazard maps, on natural hazards, the risks they pose and measures that should be taken by communities and individuals to protect themselves from harm; and to work with WMO DPM to develop templates that NMHSs could use for print and web-based information sharing on local hazards;
(*d*) To collaborate with WMO DPM in the development of guidelines on risk assessment techniques and on risk reduction measures; to look into the role of climate extremes on various socio-economic sectors, and to develop guidelines to help NMHSs plan and conduct case studies;
(*e*) To assure liaison between CCl and the CLIPS Focal Point network and the WMO DPM global network of DPM Focal Points and to coordinate the DPM activities of all CCl ETs for submission/support to the WMO DPM Programme and WCP;
(*f*) To incorporate the other WMO cross-cutting themes (Space/GEO and Least Developed Countries) into planning and activities of the ET, and to collaborate as needed with experts (across all related disciplines) in other CCl ETs, in ETs of other WMO technical commissions and in relevant external organizations;
(*g*) To explore, document and make recommendations for addressing the needs for capacity-building in each region, pertinent to this topic;
(*h*) To submit reports in accordance with timetables established by the CCl Management Group.

5.2 Expert Team on the *Guide to Climatological Practices*

(*a*) To follow up on the results of the meeting of the Expert Team on the *Guide to Climatological Practices* (Toulouse, France, 19–23 September 2005) to develop any outstanding text and to compile a full integrated draft text, including annexes, of the third edition of the *Guide to Climatological Practices (*WMO-No. 100), within the agreed-upon timeframe (by mid-2006);
(*b*) To consult with experts in NMHSs, regional associations and relevant bodies, as required, in the development of the text, and to ensure regional balance in the examples used;
(*c*) To work with the WMO Secretariat on matters of acquisition of high-quality illustrations and photographs, as needed; editing; peer review; CCl and WMO approvals; translation; graphics development and layout; publishing; and development of web-based selections from the final version;
(*d*) To submit reports in accordance with timetables established by the CCl Management Group.

5.3 Gender Focal Point

(*a*) To review and document details of the role of women in the work of the Commission (i.e. collect statistics on the number of women in the CCl Management Group, as ET leaders, on ETs, as Rapporteurs, as CLIPS Focal Points, attending workshops, training, etc.);
(*b*) To liaise with the WMO Gender Focal Point on related issues, and to jointly collect and disseminate information including studies and policies on the role of women in science, especially climate science;
(*c*) To collaborate with women's networks established by the regional associations;
(*d*) To explore, document and make recommendations for addressing the needs for capacity-building in each region, pertinent to this topic;
(*e*) To submit reports in accordance with timetables established by the CCl Management Group.

5.4. Rapporteur on GEOSS

*(*Terms of reference to be decided. The Commission recognized that this would be a cross-cutting activity that considers integrated data products serving the ocean, land and atmosphere, and, specifically, how the new generation of satellite data records can be merged in a homogeneous manner, while taking advantage of new capabilities. Additional priority would be to work with the Commission and its OPAGs, and with those within other Commissions that have similar responsibilities towards influencing and contributing to GEO, with the aim of assisting WMO in its efforts to enhance GEO.)

5.5 Rapporteur on Metadata

*(*Terms of reference to be decided. The Commission agreed that the priority for this role will be to ensure that climate metadata standards are fully conforming to established international standards for geospatial information, such as the Federal Geographic Data Committee initiatives in the USA and the standards of the International Organization for Standardization. Associated priority items are harmonization and interoperability between metadata standards. The Commission further agreed that priorities would include evaluation of metadata requirements that support the needs of the community as we move to a mix of in situ, remote sensing and space-based monitoring systems.)

6. Experts reporting directly to the appropriate OPAG chairperson

6.1 CCl experts serving on teams of other technical commissions:

(*a*) To determine actively the views of CCl on issues relating to climatology that are being addressed by working bodies of other WMO technical commissions;
(*b*) To transmit these views at meetings of other technical commissions, as appropriate;
(*c*) To communicate CCl recommendations for addressing the needs for capacity-building in each region, pertinent to the topics related to the other technical commissions;
(*d*) To work positively with their working bodies in developing guidance and implementation

programmes that meet the overall needs of Members.

7. Implementation/Coordination Team reporting to the CCl Management Group

(*a*) To review and coordinate the activities of the OPAGs, as well as additional related activities of priority to the Commission, in order to ensure their effective implementation and adoption within the regions and Member countries;
(*b*) To assist the WCP Department in the development, resource mobilization and, where appropriate, implementation of activities in the regions, including training;
(*c*) To raise awareness of the work of the OPAGs;
(*d*) To ensure effective collaboration and coordination between the OPAGs and WMO technical commissions and programmes, relevant international and regional agencies and users in order to ensure an effective coordination and implementation of CCl-relevant activities within the regions and Members;
(*e*) To analyse ways to effectively implement the OPAG findings in the regional associations for the benefit of Members;
(*f*) To actively exchange experience and expertise of regional associations with respect to joint or similar efforts;
(*g*) To feed regional requirements and expertise into the work of the OPAGs;
(*h*) To provide a platform for coordinating the full implementation of RCC services where required;
(*i*) To accommodate continual scientific developments on climate change as mediated by IPCC, etc., and to make adjustments to all CCl documentation as required;
(*j*) To explore, document and make recommendations for addressing the needs for capacity-building in each region, pertinent to implementation efforts;
(*k*) To submit reports in accordance with timetables established by the CCl Management Group.

ANNEX V (CCl-XIV)
Annex to paragraph 11.2.8 of the general summary

MEMBERSHIP OF OPAG TEAMS AND RAPPORTEURS

This list represents the decisions in place at the end of the fourteenth session of the Commission, and therefore is not definitive. An asterisk denotes that approval of the Permanent Representative was pending. During the fourteenth intersessional period, up-to-date information will be posted on the Commission's web page.

1. OPAG 1: Climate Data and Data Management

Chairperson: Raino Heino (Finland)
Co-chairperson: Peter Ambenje (Kenya)*

1.1 Expert Team for Climate Data Management including Metadata

Lead: Radim Tolasz (Czech Republic)
Experts: A. Besprozvannyh (Russian Federation)
Xiong An'yan (China)
Francis Olajide Adefuye (Nigeria)*
Jeff Arnfield (USA)
Lim Boon Seng (Malaysia)
Juan Quintana (Chile)*
Dennis Stuber (France)

1.2 Expert Team on Observing Requirements and Standards for Climate

Lead: William Wright (Australia)
Experts: Brian Howe (Canada)
Redda Ali Hassan (Egypt)
Micheline Coelho (Brazil)*
Hiroshi Nakamigawa (Japan)
Constanta Boroneant (Romania)
Mesut Deuircan (Turkey)

1.3 Expert Team on the Rescue, Preservation and Digitization of Climate Records

Lead: Joe Elms (USA)
Experts: M. Adama Diallo (Mali)
Wolker Lozada (Peru)*
Rod Hutchinson (Australia)
Aryan F.V. van Engelen (Netherlands)
Xiao Cunde (China)
Rajaevan Madhavan Nair (India)

2. OPAG 2: Monitoring and Analysis of Climate Variability and Change

Chairperson: Thomas Peterson (USA)
Co-chairperson: Manola Brunet India (Spain)

2.1 Joint CCl/CLIVAR/JCOMM Expert Team on Climate Change Detection and Indices

CCl Co-lead:	Albert Klein Tank (Netherlands)
CLIVAR Co-lead:	(to be decided)
Experts:	(to be decided, but to have one third CCl, one third CLIVAR and one third JCOMM representation)
CCl:	Xuebin Zhang (Canada)
CCl:	Rupa Kumar Kolli (India)
CCl:	Blair Trewin (Australia)
CLIVAR:	(to be decided)
JCOMM:	(to be decided)

2.2 Expert Team on Climate Monitoring, including the Use of Satellite and Marine Data and Products

Lead:	Zhang Zuqiang (China)
Experts:	Jay Lawrimore (USA)
	Craig Donlon (UK)
	Xiaolan Wang (Canada)
	Rainer Hollman (Germany)
	Rachid Sebbari (Morocco)
	Expedito Rebello (Brazil)*
	Wan Azli Wan Hassan (Malaysia)

3. OPAG 3: Climate Information and Prediction Services (CLIPS)

Chairperson:	Abdalah Mokssit (Morocco)
Co-chairperson:	(to be decided)

3.1 Expert Team on Research Needs for Intraseasonal, Seasonal and Interannual Prediction, including the Application of these Predictions

Lead:	Jean-Pierre Céron (France)
Experts:	Subramaniam Moten (Malaysia)
	Paulo Nobre (Brazil)*
	Wassila Thaiw (USA)
	Cherif Diop (Senegal)
	Yun Wan-tae (People's Republic of Korea)
	Jim Renwick (New Zealand)
	Tomoaki Ose (Japan)

3.2 Expert Team on CLIPS Operations, Verification and Application Services

Operations co-lead:	Philbert Tibaijuka** (United Republic of Tanzania)
Verification co-lead:	Simon Mason (USA)
User Liaison co-lead:	Jaakko Helminen (Finland)
Experts:	Holger Meinke (Australia)
	Matilde Rusticucci (Argentina)*
	Alphonse Kanga (Congo)*
	Gao Hui (China)
	Vyacheslav Razuvaev (Russian Federation)*

** Will serve as overall ET coordinator

3.3 Expert Team on El Niño and La Niña

Lead:	Luc Maitrepierre (New Caledonia)
Experts:	Vernon Kousky (USA)
	Ravind Kumar (Fiji)
	P. Booneeady (Mauritius)
	Zhai Panmao (China)
	Humberto Enriquez (Ecuador)*
	Brett Mullan (New Zealand)

3.4 Rapporteur on Climate and Water to liaise with CHy

Rapporteur:	Tosiyuki Nakaegawa*** (Japan)

*** Will also serve as the CCl representative to the Steering Committee for WCP-Water

3.5 Rapporteur on Climate and Agrometeorology to liaise with CAgM

Rapporteur:	Roger Stone (Australia)

4. OPAG 4: Climate Applications and Services

Chairperson:	Dong Wenjie (China)
Co-chairperson:	Mohammed Kadi (Algeria)*

4.1 Expert Team on Climate and Health

Lead:	Glenn McGregor (UK)
Experts:	Wing-mo Leung (Hong Kong, China)
	Robin Hicks (Australia)
	Ortiz Bulto (Cuba)
	Ulisses Confalonieri (Brazil)*
	Larry Kalkstein (USA)
	A. Ouldbba (Morocco)

4.2 Expert Team on Climate and Energy

Lead:	Dennis Elliott (USA)
Experts:	Zhu Rong (China)
	Sandra Robles Gil (Mexico)*
	Samwel Marigi (Kenya)*
	David Wratt (New Zealand)
	Franklin Ruiz (Colombia)*
	Elena Akentyeva (Russian Federation)

4.3 Expert Team on Climate and Tourism

Lead:	Dan Scott (Canada)*
Experts:	Tanja Cegnar (Slovenia) [alternate lead]
	Mamina Camara (Senegal)*
	Roger Pulwarty (USA)
	Mohammed H. Papoli Yazdi (Islamic Republic of Iran)
	Susanne Becken (New Zealand)*
	Maximiliano Henriquez (Colombia)*

4.4 Expert Team on Urban and Building Climatology

Lead:	Sue Grimmond (USA) [moving to the UK in December 2005]
Experts:	Tim Oke (Canada)
	B.K. Dje (Côte d'Ivoire)

Song Lian Chun (China)*
Ena Maria Jaimes Espinoza (Peru)
Bob Bornstein (USA)
Ildiko Dobi (Hungary)

5. Expert Teams and Rapporteurs reporting directly to the president and/or the Management Group

5.1 Rapporteur on Climate-related Hazards (from within the CCl Management Group)
Rapporteur: To be decided at the first meeting of the CCl Management Group in 2006

5.2 Expert Team on the *Guide to Climatological Practices*
Lead: Ned Guttman (USA)
Experts: Ian Barnes-Keoghan (Australia)
Aleksandr Sterin (Russian Federation)

5.3 Gender Focal Point
Lead: Juliana Ukeje (Nigeria)*

5.4 Rapporteur on GEOSS
Rapporteur: Stephan Roesner (Germany)*

5.5 Rapporteur on Metadata
Rapporteur: John Shortridge (Australia)*

6. Experts reporting to the appropriate OPAG Chairperson

6.1 CCl experts serving on teams of other technical commissions
Experts: (to be decided)

7. Implementation/Coordination Team reporting to the CCl Management Group
Chairperson:
CCl vice-president, Wang Shourong (China)
Co-Chairperson of OPAG 1:
Peter Ambenje (Kenya)*
Co-Chairperson of OPAG 2:
Manola Brunet India (Spain)
Co-Chairperson of OPAG 3:
(to be decided)
Co-Chairperson of OPAG 4:
Mohammed Kadi (Algeria)*

Chairperson of RA I WG on Climate-related Matters:+
(to be decided)
Chairperson of RA II WG on Climate-related Matters:+
(to be decided)
Chairperson of RA III WG on Climate-related Matters:+
(to be decided)
Chairperson of RA IV WG on Climate-related Matters:+
(to be decided)
Chairperson of RA V WG on Climate-related Matters:+
(to be decided)
Chairperson of RA VI WG on Climate-related Matters:+
(to be decided)

+ If a regional association does not have a Working Group on Climate-related Matters, then a representative of the regional association can be appointed by the president of the regional association.

CCl Management Group
President: Pierre Bessemoulin (France)
Vice-president: Wang Shourong (China)
Chairperson OPAG 1: Raino Heino (Finland)
Chairperson OPAG 2: Thomas Peterson (USA)
Chairperson OPAG 3: Abdalah Mokssit (Morocco)
Chairperson OPAG 4: Dong Wenjie (China)

Members from the following Regions (as needed to represent all regions on the CCl Management Group) and representatives of the World Data Centres:

Region III: Luiz Molion (Brazil)*
Region V: Michael Coughlan (Australia)
World Data Centres: Aleksandr Sterin (Russian Federation)

APPENDIX A

LIST OF PERSONS ATTENDING THE SESSION

A. Officers of the session

Y. Boodhoo	President
(vacant)	Vice-president

B. Representatives of WMO Members

Member	Name	Capacity
Algeria	A. Saci	Principal Delegate
	N. Talbi	Delegate
Australia	N. Plummer	Principal Delegate
	R. Stone	Delegate
	R. Hicks	Delegate
Austria	E. Rudel	Principal Delegate
Bahamas	B.A. Dean	Principal Delegate
Botswana	P. Lesolle (Ms)	Principal Delegate
Bulgaria	A. Bratoeva (Ms)	Principal Delegate
Cameroon	P. Azanbou	Delegate
Canada	R. Street	Principal Delegate
	A. Fenech	Alternate
	P. Whitfield	Delegate
	Y. Yin	Delegate
China	Wang Shourong	Principal Delegate
	Li Bai	Delegate
	Zhai Panmao	Delegate
	Liu Haibo	Delegate
	Chao Qingchen (Ms)	Delegate
	Chen Zhenlin	Delegate
	Li Jiming	Delegate
	Xiong An'yuan	Delegate
	Dong Wenjie	Delegate
	Zhao Ping	Delegate
	Song Lianchun	Delegate
Colombia	M. Henríquez	Principal Delegate
Congo	P. Ondongo	Principal Delegate
Côte d'Ivoire	K.B. Dje	Principal Delegate
	K.F. Tobokoue	Delegate
	K. Konan	Delegate
	M. Agnero	Alternate
Croatia	I. Čačić	Principal Delegate
	Z. Katušin	Delegate
Cuba	R. Pérez Suárez	Principal Delegate
Denmark	C. Kern Hansen	Principal Delegate
Egypt	M.A. Abbas	Principal Delegate
	M.Y.A. Youssef	Alternate
Finland	R. Heino	Principal Delegate
	A. Venäläinen	Delegate
	J. Helminen	Delegate
France	P. Bessemoulin	Principal Delegate
	J.-P. Céron	Delegate
	C. Blondin	Delegate
Gambia	I.J. Gaye (Ms)	Principal Delegate
Germany	M. Werscheck	Principal Delegate
	P. Hechler	Delegate
Greece	N. Karatarakis	Delegate
Guinea	A. Diallo	Principal Delegate
Hong Kong, China	Wing-Mo Leung	Principal Delegate
Hungary	J. Mika	Principal Delegate
Iran, Islamic Republic of	A.M. Noorian	Principal Delegate
	M.H. Nokhandan	Delegate
	V. Ezzatian (Ms)	Delegate
	M. Seif (Ms)	Delegate
Iraq	F. Assaf	Principal Delegate
	S.H. Obeed (Ms)	Delegate
	S.K. Abd (Ms)	Delegate
	I. Abdou	Delegate
	K. Mahdi	Delegate

Member	Name	Capacity
Ireland	T. Sheridan	Principal Delegate
Israel	A. Furshpan	Principal Delegate
Italy	A. Giuffrida	Principal Delegate
	F. Mangianti	Delegate
	de Angelis (Ms)	
	M. Baldi (Ms)	Delegate
Japan	S. Yamada	Principal Delegate
	M. Sugi	Delegate
Liberia	A.D. Kpadeh	Principal Delegate
Libyan Arab Jamahiriya	A.K. Etumi	Delegate
Macao, China	Tong Si Man	Principal Delegate
Malaysia	Tan Lee Seng	Principal Delegate
Mali	M.A. Diallo	Principal Delegate
Mauritius	Y. Boodhoo	Principal Delegate
	A.Y.L. Chiou Yee	Alternate
	F. Prele (Ms)	Delegate
Mexico	M. Cortez	Delegate
	S. Robles-Gil (Ms)	Alternate
Morocco	A. Mokssit	Principal Delegate
Netherlands	A. van Engelen	Principal Delegate
New Zealand	D. Wratt	Principal Delegate
Nigeria	T. Obidike	Principal Delegate
	F.O. Adefuye	Delegate
	J. Ukeje (Ms)	Delegate
Norway	E. Førland	Principal Delegate
Oman	S.H. Alsarmi	Principal Delegate
	M. Al-Shahri	Delegate
	H. Al-Lawati	Delegate
Peru	J. Oviedo	Principal Delegate
Poland	J. Zielinski	Principal Delegate
	R. Klejnowski	Alternate
	R. Skapski	Delegate
Republic of Korea	Byung-Sun Kim	Principal Delegate
	Won-Tae Yun	Delegate
	Yun-Ang Chung	Delegate
	Dong-Chul Shin	Delegate
	Yong Seob Lee	Delegate
Romania	I.V. Pescaru	Principal Delegate
Russian Federation	V. Trenin	Principal Delegate
	M. Shaimardanov	Delegate
Senegal	M. Ndiaye	Principal Delegate
Serbia and Montenegro	R. Vuckovic	Principal Delegate
Slovakia	P. Šťastný	Principal Delegate
Slovenia	T. Cegnar (Ms)	Principal Delegate
Spain	C. Almarza Mata	Principal Delegate
Sudan	M.A. Yousif	Principal Delegate
Sweden	H. Alexandersson	Principal Delegate
Switzerland	C. Appenzeller	Principal Delegate
Thailand	N. Ouprasitwong (Ms)	Principal Delegate
Turkey	K. Künkül	Principal Delegate
	A. Ceylan	Delegate
Uganda	A. Asalu	Principal Delegate
United Arab Emirates	Y.N.M. Alkelbani	Principal Delegate
	H.R. Sayed	Delegate
United Kingdom of Great Britain and Northern Ireland	D. Griggs	Principal Delegate
	C. Donlon	Alternate
	D. Parker	Delegate
United Republic of Tanzania	E.J. Mpeta	Principal Delegate
United States of America	T.C. Peterson	Principal Delegate
	W. Bolhofer	Alternate
	D. Perfect (Ms)	Delegate
Uzbekistan	F.M. Askamov	Principal Delegate
Yemen	A. Almikhlafy	Principal Delegate

C. Invited Experts

H. Kondo	(Japan)
E. Koch (Ms)	(Austria)
L.C.B. Molion	(Brazil)
N. Kobysheva (Ms)	(Russian Federation)

D. Representatives of international organizations

The Arab Center for the Studies of Arid Zones and Dry Lands (ACSAD)	F. Fares I. Hamad (Ms)
European Space Agency (ESA)	E. Oriol-Pibernat (Ms)
International Research Institute for Climate and Society (IRI)	N. Ward

E. Other participants

Afghanistan, Interim Administration of Afghanistan	S. Saifurrehman
Sugarcane Research Centre, Fiji	J. Gawander
H. Melkonyan	(Armenia)
K.H. Yaseen	(Bahrain)
R. Tolasz	(Czech Republic)
H.E. Davila	(Ecuador)
L. Kartvelishvili (Ms)	(Georgia)
C.L. Mendes	(Guinea-Bissau)
N. Aliyakbarova (Ms)	(Kazakhstan)
P.G. Ambenje	(Kenya)
D.R. Kamdonyo	(Malawi)
G. Rasul	(Pakistan)
D. Baidulloeva (Ms)	(Tajikistan)
R. Tigona	(Vanuatu)

APPENDIX B

ABBREVIATIONS

ACMAD	African Centre of Meteorological Applications for Development
AOPC	Atmospheric Observation Panel for Climate (AOPC)
AREP	Atmospheric Research and Environment Programme
AWS	Automatic weather station
CAgM	Commission for Agricultural Meteorology
CAS	Commission for Atmospheric Sciences
CBS	Commission for Basic Systems
CCl	Commission for Climatology
CDMS	Climate Database Management System
CHy	Commission for Hydrology
CIIFEN	International Research Centre on El Niño
CIMO	Commission for Instruments and Methods of Observation
CLICOM	Climate Computing
CLIPS	Climate Information and Prediction Services
CLIVAR	Climate Variability and Predictability
CMA	China Meteorological Administration
COP	Conference of the Parties
CPA	Communication and Public Affairs
DARE	Data Rescue
DPM	Disaster Prevention and Mitigation
EC	Executive Council
ECMWF	European Centre for Medium-Range Weather Forecasts
ENSO	El Niño/Southern Oscillation
ESSP	Earth System Science Partnership
ET	Expert Team
ETR	Education and Training
EU	European Union
FAO	Food and Agriculture Organization of the United Nations
GAW	Global Atmosphere Watch
GCOS	Global Climate Observing System
GEO	Group on Earth Observations
GEOSS	Global Earth Observation System of Systems
GIS	Geographic Information System
GPC	Global Climate Producing Centre
GSN	GCOS Surface Network
GTOS	Global Terrestrial Observing System
GUAN	GCOS Upper-air Network
HWR	Hydrology and Water Resources
ICPAC	IGAD Climate Prediction and Application Centre
ICSU	International Council for Science
ICT	Implementation/Coordination Team
IOC	Intergovernmental Oceanographic Commission (UNESCO)
IPCC	Intergovernmental Panel on Climate Change
JCOMM	Joint WMO/IOC Commission for Oceanography and Marine Meteorology
JMA	Japan Meteorological Agency

JSC	Joint Scientific Committee
MDG	Millennium Development Goal
MG	Management Group
NOAA	National Oceanic and Atmospheric Administration
NMHSs	National Meteorological and Hydrological Services
OPAG	Open Programme Area Group
PWS	Public Weather Services
RA	Regional Association
RBCN	Regional Basic Climatological Network
RCC	Regional Climate Centre
RCOF	Regional Climate Outlook Forum
SBI	Subsidiary Body for Implementation
SBSTA	Subsidiary Body for Scientific and Technological Advice
SIDS	Small Island Developing States
START	System for Analysis, Research and Training
UNEP	United Nations Environment Programme
UNESCO	United Nations Educational, Scientific and Cultural Organization
UNFCCC	United Nations Framework Convention on Climate Change
UNWTO	World Tourism Organization
VCP	Voluntary Cooperation Programme
WCASP	World Climate Applications and Services Programme
WCDMP	World Climate Data and Monitoring Programme
WCP	World Climate Programme
WCRP	World Climate Research Programme
WGSIP	CLIVAR Working Group on Seasonal to Interannual Prediction
WHO	World Health Organization
WHYCOS	World Hydrological Cycle Observing System
WIS	WMO Information System
WWW	World Weather Watch