

WORLD METEOROLOGICAL ORGANIZATION

COMMISSION FOR HYDROLOGY

ELEVENTH SESSION

ABUJA, 6–16 NOVEMBER 2000

ABRIDGED FINAL REPORT WITH RESOLUTIONS AND RECOMMENDATIONS

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WMO-No. 921

Secretariat of the World Meteorological Organization - Geneva - Switzerland

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**Secretariat of the World Meteorological Organization - Geneva - Switzerland
2001**

REPORTS OF RECENT WMO SESSIONS

Congress and Executive Council

- 867 — **Executive Council**. Forty-ninth session, Geneva, 10–20 June 1997.
880 — **Twelfth World Meteorological Congress**. Proceedings, Geneva, 30 May–21 June 1995.
883 — **Executive Council**. Fiftieth session, Geneva, 16–26 June 1998.
902 — **Thirteenth World Meteorological Congress**. Geneva, 4–26 May 1999.
903 — **Executive Council**. Fifty-first session, Geneva, 27–29 May 1999.
915 — **Executive Council**. Fifty-second session, Geneva, 16–26 May 2000.

Regional associations

- 851 — **Regional Association II** (Asia). Eleventh session, Ulaanbaatar, 24 September–3 October 1996.
868 — **Regional Association IV** (North and Central America). Twelfth session, Nassau, 12–21 May 1997.
874 — **Regional Association III** (South America). Twelfth session, Salvador, 17–26 September 1997.
882 — **Regional Association VI** (Europe). Twelfth session, Tel Aviv, 18–27 May 1998.
890 — **Regional Association V** (South–West Pacific). Twelfth session, Denpasar, 14–22 September 1998.
891 — **Regional Association I** (Africa). Twelfth session, Arusha, 14–2 October 1998.

Technical commissions

- 852 — **Commission for Hydrology**. Tenth session, Koblenz, 2–12 December 1996.
854 — **Commission for Basic Systems**. Eleventh session, Cairo, 28 October–7 November 1996.
860 — **Commission for Marine Meteorology**. Twelfth session, Havana, 10–20 March 1997.
870 — **Commission for Climatology**. Twelfth session, Geneva, 4–14 August 1997.
879 — **Commission for Atmospheric Sciences**. Twelfth session, Skopje, 23 February–4 March 1998.
881 — **Commission for Instruments and Methods of Observation**. Twelfth session, Casablanca, 4–12 May 1998.
893 — **Commission for Basic Systems**. Extraordinary session, Karlsruhe, 30 September–9 October 1998.
899 — **Commission for Aeronautical Meteorology**. Eleventh session, Geneva, 2–11 March 1999.
900 — **Commission for Agricultural Meteorology**. Twelfth session, Accra, 18–26 February 1999.

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Regional Association IV	— English, Spanish
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These include manuals, guides, training materials, public information and the WMO *Bulletin*.

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GENERAL SUMMARY OF THE WORK OF THE SESSION

1. OPENING OF THE SESSION (agenda item 1)

1.1 The eleventh session of the Commission for Hydrology (CHy) was opened at 10 a.m. on 6 November 2000 in the Nicon Hilton Hotel in Abuja, Nigeria.

1.2 The opening ceremony also encompassed the opening of the Sixth Technical Conference on Management for Development of Meteorological Services in Africa, which was held in Abuja from 6 to 10 November 2000. The Secretary to the Federal Government of Nigeria, presented an address on behalf of His Excellency Chief Olusegun Obasanjo, Grand Commander of the Federal Republic, President of Nigeria in which he welcomed delegates to the country and in particular to the city of Abuja. He spoke of the challenge of alleviating poverty and of achieving sustainable development in Africa and the need to strengthen water resource assessment activities in Nigeria. The President referred to a number of activities of the World Meteorological Organization (WMO) in West Africa, most notably the west and central Africa Hydrological Cycle Observing System (AOC-HYCOS), and called for Africa to strive to keep pace with technical developments in the rest of the world and apply them for the benefit of its people.

1.3 The Federal Minister of Water Resources, Colonel Muhammadu Bello Kaliel (Retd.) thanked WMO for providing Nigeria with the privilege of hosting the first session of CHy to be held in Africa. He expressed confidence that the Commission would develop concrete proposals and solutions which would ensure the effective application of hydrological science to overcome the many problems faced by developing countries. A statement of welcome was also read on behalf of the Minister of the Federal Capital Territory.

1.4 In his opening address, the Secretary-General of WMO, Professor G. O. P. Obasi expressed the deep appreciation of WMO to the President and people of Nigeria for hosting the present session of the Commission. He thanked in particular the Permanent Representative and the Hydrological Adviser of Nigeria for the excellent arrangements they had made to ensure the success of the meeting. He referred to the recent United Nations Millennium Summit which had resolved that countries should cease the unsustainable exploitation of water resources and should intensify cooperation to reduce the number and effects of natural and man-made disasters.

1.5 Professor Obasi noted that WMO had been playing an active role in addressing major freshwater issues at both the regional and global levels, in collaboration with other international and regional organizations. In that regard, he made mention of Resolutions 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, and 25 (Cg-XIII) — Exchange of hydrological data and

products, and expressed concern for the potential impact of climate change. He encouraged the Commission to take the recent change in its terms of reference as a basis for the renewal of its programme and to look again at how the hydrological community could best contribute to WMO's objectives. He expressed the hope that WMO and UNESCO could find ways of coordinating, even combining, more of their activities in freshwater, as was the case in the field of oceanography and marine meteorology.

1.6 Finally, he paid tribute to Professor K. Hofius, president of CHy, for leading the Commission so ably over the previous eight years and to the vice-president for his support as well as to the chairpersons and members of the working groups of the Commission.

1.7 At the close of the opening ceremony, Professor Hofius announced the award of a certificate for outstanding service to Mr M. Kohler (United States), the first president of the Commission. He recalled the high esteem in which Mr Kohler was held by the international hydrological community and the untiring efforts he had made during the 1950s to ensure the establishment of the predecessor of the present CHy. As Mr Kohler was unable to travel to Abuja, the Secretary to the Federal Government of Nigeria handed the certificate to the principal delegate of the United States to CHy-XI.

1.8 In his address at the opening session, Professor Hofius welcomed the delegates and the representatives of other international organizations and extended his thanks to Nigeria for hosting the session.

2. ORGANIZATION OF THE SESSION (agenda item 2)

2.0.1 The documents for the session were reproduced in all six working languages of WMO, namely Arabic, Chinese, English, French, Russian and Spanish. Simultaneous interpretation was provided in all six working languages.

2.0.2 A total of 93 participants attended the session, representing 50 Members of WMO and nine international organizations. The list of participants is given in Appendix A to this report.

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

At the request of the president, the representative of the Secretary-General presented a list of the delegations present, including the capacities in which they were attending the session, whose credentials had been found to be in order. The list was accepted as the report on credentials.

2.2 ADOPTION OF THE AGENDA (agenda item 2.2)

The provisional agenda was adopted with one minor amendment: the addition of the words "estimation and" to the title of agenda item 12.2. The final agenda is given in Appendix B to this report.

2.3 ESTABLISHMENT OF COMMITTEES (agenda item 2.3)

2.3.1 A Nomination Committee was established, consisting of the following delegates:

- RA I: J. Wellens-Mensah (Ghana)
- RA II: Liu Heng (China)
- RA III: V. S. Guimarães (Brazil)
- RA IV: T. R. Yuzyk (Canada)
- RA V: B. J. Stewart (Australia)
- RA VI: P. Givone (France)

Mr J. Wellens-Mensah (Ghana) was elected chairperson of the Nomination Committee.

2.3.2 A Selection Committee for nominating CHy experts and members of CHy working groups was also established, consisting of:

- RA I: E. D. Udoeka (Nigeria)
- RA II: A. Maximov (Russian Federation)
- RA III: A. Bermeo (Ecuador)
- RA IV: T. R. Yuzyk (Canada)
- RA V: B. J. Stewart (Australia)
- RA VI: H. Liebscher (Germany)

Mr B. J. Stewart (Australia) was elected chairperson of the Selection Committee.

2.3.3 Two working committees were established to examine in detail certain agenda items, as followed:

- Committee A: items 6, 7, 8, 9, 11, 13 and 18;
- Committee B: items 10, 12, 14, 15, 16 and 19.

Items 3, 4, 5 and 17 were examined in the Committee of the Whole and items 1, 2 and 20 to 25 were taken up only in plenary.

2.3.4 The following delegates were elected to chair the working committees:

Committee A: Mr D. Rutashobya (Tanzania) and Ms G. Wennerberg (Sweden), as chairperson and vice-chairperson, respectively;

Committee B: Messrs B. J. Stewart (Australia) and A. Terakawa (Japan), as chairperson and vice-chairperson, respectively.

2.3.5 A Coordination Committee was established, consisting of the president and vice-president of the Commission, the chairpersons of Committees A and B, and the representative of the Secretary-General. The vice-chairpersons of Committees A and B were invited to attend meetings of the Coordination Committee.

2.3.6 Four working parties were established to consider in more detail the following topics:

- (a) *Guide to Hydrological Practices* (WMO-No. 168) and *Technical Regulations* (WMO-No. 49) — P. Givone (France), chairperson;
- (b) WHYCOS — S. Van Biljon (South Africa), chairperson;
- (c) Future Programme of Work of the Commission — P. J. Pilon (Canada), chairperson;
- (d) Long-term Planning as Related to the Commission's Activities — J. Wellens-Mensah (Ghana), chairperson.

2.4 ORGANIZATIONAL QUESTIONS (agenda item 2.4)

2.4.1 The working hours adopted were 9.30 a.m. to 12.30 p.m. and 2.30 p.m. to 5.30 p.m. The Commission agreed that no minutes should be prepared at the session.

2.4.2 It was noted that all the material submitted by the Secretary-General was presented in one document,

as the report of the Secretary-General. The Commission considered the information and the proposals contained in each part of the document during discussions under the relevant agenda items. A full list of documents presented at the session is contained in Appendix B.

3. REPORT BY THE PRESIDENT OF THE COMMISSION (agenda item 3)

3.1 The president introduced his report by reviewing the past history of the Commission, referring to the dedication of the many individuals who had worked to support it over the years. He then spoke of the serious challenges facing countries as they sought to manage their freshwater resources and protect their populations from the threats of flood and drought. In that regard, he made reference to the relevant issues highlighted by past high-level international conferences.

3.2 The Commission was informed by its president of the activities of CHy since its tenth session (Koblenz, December 1996) and of the outcome of the discussion held on the in-depth report on those activities that he had submitted to the fifty-second session of the Executive Council in May 2000. In his report, the president noted that the activities of CHy had been mainly concerned with the execution of the tasks established by CHy-X within the Hydrology and Water Resources Programme (HWRP). The president also highlighted the activities undertaken by the CHy Advisory Working Group (AWG), both as the coordinating body for CHy affairs and as the Steering Committee for the Hydrological Operational Multipurpose System (HOMS). In that context, the Commission noted the actions taken by members of the AWG responsible for specific matters such as the liaison with regional associations; hydrological technology; global hydrological and environmental issues; the *Guide to Hydrological Practices* (WMO-No. 168) and *Technical Regulations* (WMO-No. 49); and water resources assessment.

3.3 The president noted that the membership of the Commission now stood at 290 from 145 Members of WMO, a decrease of 23 individual members and four countries as compared to the situation four years earlier.

3.4 He noted that, over the past 30 years, the HWRP had developed into a major programme of the Organization which was now in a position to offer valuable assistance to National Hydrological Services (NHSs) in their efforts to respond to the increasing demands made upon them.

3.5 He referred to the work of the AWG in overseeing the activities of the two subject-oriented working groups and the development of the Congress resolution on the exchange of hydrological data and the preparation of associated material.

3.6 In presenting that, his last report to the Commission, he recalled with pleasure the progress that had been achieved over the previous eight years in enhancing the position of hydrology within WMO and expressed his thanks to all who had worked with him in that time. He regretted, however, that the financial and

staff resources available to the HWRP were still not at a level he felt to be adequate for fulfilling its important role.

3.7 Finally, he presented the proposals of the AWG for the future structure of the work of the Commission which were then discussed under agenda item 17.

3.8 The Commission thanked the president for his report. In respect to the various matters he raised, the Commission recalled the earlier words of the Secretary-General and expressed the wish that WMO and UNESCO find ways to work more closely together. It shared the president's concern at the lack of resources available to the HWRP and agreed that that meant that priorities would need to be set for the future work of the Commission that led to activities with clearly defined objectives and outputs. In that regard, focus should be on those areas where WMO had specific expertise, clear examples being hydrological data collection and forecasting.

3.9 The Commission strongly supported the activities of the president with regard to the position of hydrology and water resources within WMO and was disappointed to learn of Congress' decision not to reflect hydrology within the name of the Organization. The Commission noted that, at the request of Congress, there remained a chance that hydrology could be reflected in a subtitle and recommended that the AWG continue to pursue that initiative so that the president might be able to present possible texts to a future session of the Council.

4. DECISIONS OF CONGRESS AND THE EXECUTIVE COUNCIL OF RELEVANCE TO THE HYDROLOGY AND WATER RESOURCES PROGRAMME (agenda item 4)

4.1 The Commission noted the action taken by the Executive Council on the recommendations of CHy-X and the oversight it had given to the finalization of the resolution which was finally adopted by Congress as Resolution 25 (Cg-XIII) — Exchange of hydrological data and products.

4.2 The Commission was informed through the reports of the president and the Secretary-General of the decisions of Thirteenth Congress, held in May 1999, relating to the HWRP. It was noted that Congress had, as at past sessions, established a subcommittee on hydrology, attended by representatives of Hydrological and Hydrometeorological Services.

4.3 Congress had recognized the increasing pressure being put on the world's limited resources of freshwater and the major long-term role that WMO should play in responding to that problem and in alleviating the consequences of water-related hazards. Congress' review of past work of the Commission had led it to encourage CHy to maintain its very pragmatic approach and to seek to complete its work programme before CHy-XI. The Commission was informed of the decision of Congress, based on a recommendation of CHy-X, to amend the Commission's terms of reference.

4.4 Following from discussions initiated at Twelfth Congress and continued at CHy-X and at sessions of the Executive Council, Congress had considered proposals

by the president of CHy for an enhanced role for WMO in the resolution of global water issues. The Commission noted with appreciation that as a consequence:

- (a) Regional Hydrological Advisers (RHAs) were now invited to attend full time all sessions of the Executive Council, except the one following Congress;
- (b) The Executive Council had included hydrologists as members of some of its subsidiary bodies;
- (c) Two new component programmes were now included in the HWRP, namely, capacity building in hydrology and water resources and sustainable development of water resources.

While welcoming the increased inclusion of hydrological expertise within the governance of the Organization, the Commission was concerned that there continued to remain insufficient representation within certain areas, notably the Executive Council. Increasing such representation would augment the significance of hydrology and water resources within the Organization and help it to establish and fulfil clearly its position in relation to the development of new, and the expansion of, other international organizations, thus decreasing the potential for overlapping mandates.

4.5 The Commission noted that Thirteenth Congress had been advised of the work of CHy and regional association (RA) working groups and experts and had offered advice on a number of matters which had been transmitted to the appropriate bodies for consideration. The attention of the Commission was drawn to the fact that Thirteenth Congress had kept in force the resolutions adopted by Twelfth Congress on WHY-COS, on the Global Runoff Data Centre (GRDC) and on the monitoring and assessment of water resources of Africa, thereby confirming its continued support for those activities.

4.6 The Commission joined Congress in expressing appreciation to France, Japan and Sweden for seconding experts to assist the WMO Secretariat in its work in support of the HWRP and regretted the fact that few contributions had been made to the Hydrology and Water Resources Trust Fund set up by the forty-eighth session of the Executive Council.

4.7 The Commission took note of the relevant comments and proposals of the fifty-second session of the Executive Council when laying plans for its future activities. The comments of the Council as regarded other activities of WMO were considered under the relevant agenda items.

5. WMO REGIONAL ACTIVITIES IN RELATION TO THE HYDROLOGY AND WATER RESOURCES PROGRAMME (agenda item 5)

5.1 The Commission was informed of the extensive technical and administrative support that had been provided by the Secretariat to the six Working Groups on Hydrology (WGH) of the regional associations in the implementation of their activities and in the organization of their sessions. It noted that, for some associations, hydrology and water resources was one of

the major areas of interest and concern. During their respective twelfth sessions (RA IV (Nassau, Bahamas, May 1997), RA III (Salvador, Brazil, September 1997), RA VI (Tel Aviv, Israel, May 1998), RA V (Denpasar, Indonesia, September 1998), RA I (Arusha, United Republic of Tanzania, October 1998) and RA II (Seoul, Republic of Korea, September 2000)), all the regional associations had re-established their WGH which were open to representatives of Hydrological, Meteorological and Hydrometeorological Services of Members of the Regions and chaired by the respective RHA. The collective membership of those groups currently stood at 169 of which 44 had been assigned specific tasks as rapporteurs or subregional/subgroup coordinators. Those groups had subsequently developed work programmes which had become increasingly project oriented.

5.2 The Commission was informed of the sessions of the regional working groups, all of which had met once during the past inter-sessional period, namely: WGH of RA I (Lilongwe, Malawi, 1998), of RA II (Tsukuba, Japan, 1999), of RA IV (Tegucigalpa, Honduras, 1999) of RA V (Brisbane, Australia, 1997) and of RA VI (Helsinki, Finland, 1997). On each occasion they identified the particular priorities for action in their respective Regions. Those included such topics as education and training, forecast and warning systems, integrated water resources management and water quality monitoring. Cooperation with other regional programmes was always among the main topics for discussion.

5.3 The Commission noted the considerable expertise available in the WGH and recognized the benefits which could accrue from cooperation between CHy and the regional associations. In that regard, it appreciated the efforts of the vice-president of CHy who had been entrusted with the task of ensuring liaison with the WGH. Of particular relevance was a meeting which had been held in the WMO Secretariat in April 1999 that brought together the vice-president and four of the six RHAs to consider that matter. That meeting had agreed on areas of cooperation and possible ways of improving collaboration. Such collaboration was seen as being very important, although it was recognized that it was not easy to undertake joint activities because of the different levels of activity of the various regional association working groups and the associations' different time schedules. The Commission requested that, when an association commenced work in a particular area, consideration should be given to using the expertise available through CHy in support of that work.

5.4 The Commission was pleased to note that a number of CHy-related activities had been carried out in the Regions. Those included a series of regional workshops to promote the use of the methodology contained in the WMO/United Nations Educational, Scientific and Cultural Organization (UNESCO) publication *Water Resources Assessment: Handbook for Review of National Capabilities*. The Commission considered that *Handbook* and those workshops to be valuable contributions to WMO's regional activities and took up the discussion on future work in this regard under agenda item 8.

5.5 Turning to the broader area of regional cooperation between WMO and UNESCO, the Commission recognized the difficulty posed by the different regional divisions used by the two Organizations. However, a new opportunity for cooperation might soon be offered by the meetings of the National Committees of the International Hydrological Programme (IHP) that would be convened in all UNESCO regions in the coming months. The Commission therefore recommended that WMO participate in those meetings whenever possible.

5.6 The Commission noted that important developments by other regional bodies might need to be taken into account by WMO, such as the recent adoption by the European Union of a Water Framework Directive. It also expressed the wish that the regional associations, and in particular their working groups on hydrology, give due attention to groundwater which was for many regions the most important source of freshwater.

5.7 With a view to addressing the specific hydrological needs of the small island countries of the South West Pacific a meeting had been held in Nadi, Fiji in October 1999. A number of priority areas were identified for action. Those included the training of hydrological personnel and the development of a Pacific-HYCOS, both areas on which the Secretariat had acted immediately in preparing draft project proposals.

6. STANDARDIZATION AND REGULATORY ACTIVITIES (agenda item 6)

6.0.1 The Commission recalled that, by its Resolution 1 (CHy-X) — Working groups and experts of the Commission for Hydrology, it had assigned to the AWG the responsibility for advising on the organization and structure and on amendments to and/or new material for inclusion in the *Technical Regulations* (WMO-No. 49), Volume III — Hydrology.

6.0.2 The Commission noted that, at the request of the AWG, one of its members, Mr P. Mosley (New Zealand) had prepared a report on the relationship between the *Technical Regulations* and the *Guide to Hydrological Practices* (WMO-No. 168) On the basis of that, it was noted that the *Technical Regulations* were inconsistent in both scope and depth of content. Concern had been expressed with respect to the purpose and need for the *Technical Regulations*. It was also noted that the *Guide* was inconsistent in the presentation of material and that correspondence between the two documents was not as obvious as had been thought.

6.0.3 The Commission was informed that, with a view to ascertaining the usefulness of the *Technical Regulations*, the AWG had recommended that a survey should be carried out among Hydrological Advisers. The survey was conducted during March–June 2000. The Commission noted that 57 replies had been received, representing 31 per cent of the addressees. Based on the replies received, the results of that survey clearly indicated that 40 per cent of the respondents used the *Technical Regulations* regularly. It showed also that 60 per cent used them in conjunction with other relevant regulations. Taking that

into consideration, the Commission recommended that the *Technical Regulations* be retained as guidance for Members. The Commission therefore requested the AWG to consider whether the annexes should be incorporated into the *Guide* or retained in the *Technical Regulations*, appropriately cross-referenced in either case.

6.0.4 With regard to improving the compatibility between the *Technical Regulations* and the *Guide*, the Commission recommended that that matter should be kept under review in preparing the sixth edition of the *Guide*, noting also that the *Guide* would be available in electronic form and that that would facilitate manipulation of the material.

6.1 *GUIDE TO HYDROLOGICAL PRACTICES (WMO-No. 168)* (agenda item 6.1)

6.1.1 The Commission was informed that the fifth edition of the *Guide to Hydrological Practices* had been published in four languages (English, French, Russian, and Spanish). The Commission noted that the *Guide* was also translated into national languages by some Members, notably Germany, Hungary and Italy. A proposal was made for the *Guide* to be translated into Chinese and it was suggested that WMO might seek assistance from China for that purpose.

6.1.2 The Commission recalled that its tenth session had recommended that advantage be taken of current electronic technology to improve the presentation of the *Guide*. Acting on that recommendation, the AWG at its first meeting (Geneva, December 1997) recommended the production of a CD-ROM version of the *Guide* and its access on the WMO Internet site.

6.1.3 The Commission was informed that with the assistance from Environment Canada a test version of the CD-ROM for the English version of the *Guide* had been produced. It contained a fully indexed PDF version of the *Guide*, the table of contents and a search tool. Chapters, paragraphs and subparagraphs, as well as figures and tables had been bookmarked for ease of use. The use of the CD-ROM was demonstrated during the session. The Commission further noted that the CD-ROM for the French version of the *Guide* should be available before the end of the year 2000 again thanks to the efforts of Environment Canada.

6.1.4 The Commission applauded the generous support provided by Canada. However, noting that it had already set up a process in producing the English and French versions, the Commission requested Canada to consider further assistance to produce the Spanish and Russian versions.

6.1.5 With a view to making the *Guide* more readily available to the hydrological community worldwide, there was a strong recommendation by the Commission that the WMO Secretariat should examine the possibility of providing the CD-ROM free of charge and authorize copying of the material for internal use.

6.1.6 The Commission noted the proposal of the AWG that the new edition of the *Guide* should consist of two parts: (a) a first part containing basic and well

established methodologies to be updated every five-to-six years and possibly made available for free downloading from the Internet; and (b) a second part containing new and state-of-the-art methodologies, to be released more frequently. The Commission also took note of the recommendation made by the AWG that the use of Web-based software for the presentation of the *Guide* was a viable and potentially valuable method of presenting the *Guide* but that a hard-copy was still required to be made available on an "as requested" basis.

6.1.7 In considering the sixth edition of the *Guide*, the Commission fully endorsed the proposals of the AWG contained in general summary paragraph 6.1.6. In doing so, it urged Members to provide relevant material such as photographs, videos and other graphic material which could improve the presentation of the *Guide* and make it more appealing to users. Furthermore, the Commission recommended that appropriate links should be made to HOMS, the *Technical Regulations*, the WMO/UNESCO *Glossary of Hydrology* and other published material.

6.1.8 The Commission noted that several experts had submitted proposals for amendments and additions to a number of chapters of the *Guide*, notably Messrs A. Bermeo (Ecuador) (Water-related aspects of environmental impact assessments), S. Borsch (Russian Federation) (Forecast of ice formation and break-up), T. Engman (United States) (Remote sensing applications in hydrology) and Ms Yang Xiaoqin (China) (Sediment measurement). Ms L. Borovikova (Uzbekistan) provided general suggestions for future improvements. The Commission requested the AWG to review the material and to decide on future action in relation to the sixth edition of the *Guide*. In doing so, it urged caution with respect to the above-mentioned material on environmental impact assessment, noting that it might be outside the scope of hydrological practices.

6.1.9 The Commission considered a proposal for the inclusion of new material on the applications in hydrology of such new technology as artificial intelligence, fuzzy logic and expert systems. It agreed that those tools should be exposed and should preferably be included in the existing chapters concerned with the specific use of such technology. The Commission welcomed the offer of Iran to provide the WMO Secretariat with appropriate source material and urged other countries to do the same. It agreed that the material could already exist or new reports would have to be prepared.

6.2 *TECHNICAL REGULATIONS (WMO-No. 49)* (agenda item 6.2)

6.2.1 The Commission noted that its proposals contained in Recommendation 3 (CHy-X) — Amendments to the *Technical Regulations*, Volume III — Hydrology, had been approved by Thirteenth Congress. The proposals comprised mainly a few new additions and replacement of definitions.

6.2.2 The Commission noted that, at the request of CHy-X, Ms Yang Xiaoqin (China), the Expert on Sediment, had revised material on sediment discharge

measurement for consideration as a new annex to the *Technical Regulations* on the subject. The material had been reviewed by two experts from the United States and the United Kingdom and their comments were taken into account in finalizing the material submitted. The Commission requested the AWG to consider the inclusion of a new annex on the basis of the advice of the above experts and in the context of the views expressed in general summary paragraphs 6.0.3 and 6.0.4.

6.3 HYDROLOGICAL INFORMATION REFERRAL SERVICE (agenda item 6.3)

6.3.1 The Commission was informed of the difficulties experienced by the Secretariat in its recent attempts to update the information contained in the *Hydrological Information Referral Service (INFOHYDRO) Manual* (WMO-No. 683). In particular, an effort initiated in 1998 had only elicited responses from approximately 25 per cent of WMO Members. The Commission expressed its concern at that poor response. However, it was recognized that there were reasons behind that, such as the significant level of effort required to bring together the quite extensive body of information requested.

6.3.2 The Commission noted that some individuals and countries made regular use of INFOHYDRO and believed that it remained a useful source of network information. However, many countries felt that the information in the database was not reliable and therefore not useful. That raised the question of how best to continue the INFOHYDRO initiative.

6.3.3 The Commission was informed of the AWG's decision not to release an analysis of the INFOHYDRO database that sought to identify trends in the number of hydrological stations in recent years, as the current database was considered inadequate for such purposes. The Commission supported that decision.

6.3.4 The Commission concluded, however, that INFOHYDRO should continue to operate, but in a modified and reduced format. The Commission recommended that the AWG members with responsibility for INFOHYDRO and for regional activities, respectively, should:

- (a) Revise and reduce the level of information that was collected in the database, for example, the need to identify the relative elevation of precipitation recording sites. It was noted, however, that information on the length of record available at recording sites was indeed valuable. It was further noted that a standard information storage and presentation format should be adopted, especially if INFOHYDRO was to be regionalized;
- (b) Investigate the feasibility of a regional approach to the collection of the information, it being felt that a better response might be achieved by working through the regional WGH. That might include conducting regional assessments of networks, which should be reported on as soon as they were completed;
- (c) Consider the use of a selected number of countries from each region as examples, rather than

attempting to collect information from all locations in a region;

- (d) Investigate ways of using the Internet as a means of displaying the information in INFOHYDRO. An example of that approach was the "Hyperlinks in hydrology for Europe" maintained by the United Kingdom's Centre for Ecology and Hydrology in Wallingford on behalf of the Working Group on Hydrology of Regional Association VI (Europe);
- (e) Investigate ways of using e-mail to streamline the updating process;
- (f) Through the WMO Secretariat, urge Members of WMO to support fully any initiative to make INFOHYDRO a more targeted and valued information resource; and
- (g) Report back to CHy-XII on achievements/progress in the review of INFOHYDRO.

7. HYDROLOGICAL OPERATIONAL MULTIPURPOSE SYSTEM (agenda item 7)

7.1 The Commission noted that, following the recommendations of the Steering Committee for HOMS as well as those formulated by the Fifth UNESCO/WMO International Conference on Hydrology (Geneva, February 1999), the International Workshop on HOMS in the Twenty-first Century had been held in September 1999 in Geneva, with the participation of 29 representatives of HOMS National Reference Centres (HNRCs). The Workshop developed an Implementation Plan for HOMS in the twenty-first century, which was then reviewed and adopted by the Steering Committee. The Plan, which clearly set the guidelines for the further development and update of the system, had been distributed to all HNRCs.

7.2 The president reported on the recent preparation of promotional material on HOMS, in particular the slide presentation with related script and the HOMS pamphlet which had been produced. Both those items were available on the HOMS Web page and would soon be distributed on CD-ROM to all HNRCs. The Commission urged the HOMS Office to continue in the preparation of that kind of material, as unfortunately HOMS was not yet as widely used as it should be.

7.3 The process of updating the *HOMS Reference Manual (HRM)* had advanced according to schedule. In the first phase, HNRCs were asked to review the components for which they were responsible, with a view to updating their description or withdrawing them if they were out of date. As expected, that had led to a temporary reduction in the total number of components, from the initial 451 to 150. The new version of the *HRM* had been available on the HOMS Web site since July 2000.

7.4 The Commission noted that the Implementation Plan recommended that the AWG should monitor the impact of the wider access to *HRM* provided by Internet on the workload of the HNRCs. In that regard, it was decided that the HOMS Office should contact all HNRCs responsible for at least one component, to enquire about that matter and later report to the next session of the AWG. It was recognized that,

according to the replies received from the HNRCs, the system might change in the future. For example, it could include some means of limiting the access to the HOMS Web site, or to parts of it, to selected users on a temporary basis until such time as the automatic downloading of HOMS components became common place.

7.5 The Commission recognized as a priority in the second phase of the updating process, the replenishment of the *HRM* with new contributions in those technical areas identified by the International Workshop on HOMS in the Twenty-first Century as being the ones where the user community had the greatest need for technology transfer. In that regard, the Commission noted with pleasure the recent contributions made by a number of HNRCs.

7.6 Thirteenth Congress encouraged the preparation of the *HRM* in electronic form in additional languages. The Implementation Plan, recognizing that the World Wide Web version of the *HRM* had become that which was most widely used, stated that it was essential to have that version translated into additional languages. It was noted that financial constraints had prevented the Office for HOMS in the WMO Secretariat to follow those strong recommendations with the promptness desired, but that steps had been taken to remedy that situation. For instance, the Russian Federation had initiated work on the Russian version, while China was interested in updating the Chinese version and in making it available via CD-ROM.

7.7 The Commission was informed of recent efforts to disseminate the electronic version of the *HRM* via e-mail, in order to make it available to those countries where Web access was limited due to the communication costs associated with Internet connection. That e-mail version, which would be similar to an offline Web version, would be initially distributed before the end of 2000, and later regularly updated.

7.8 The Commission noted that the fifty-second session of the Executive Council had invited the Commission for Instruments and Methods of Observation (CIMO) to consider the facility offered by HOMS to publicize and distribute the information on instruments that it was compiling. The Commission supported the Executive Council's view that that would have the multiple benefit of strengthening HOMS and of enhancing the visibility and usefulness of both programmes.

8. WATER RESOURCE ASSESSMENT (agenda item 8)

8.1 The Commission was informed that WMO's activity in that field was concentrated mainly in promoting the use of the methodology contained in the WMO/UNESCO *Water Resources Assessment: Handbook for Review of National Capabilities*. The *Handbook* had been published in English, Spanish and Russian by WMO. UNESCO had published the French version and arranged for an Arabic translation. China was also translating the *Handbook* into Chinese and Iran into the Persian language, both for use at the national level.

8.2 The Commission appreciated the steps that had been taken by the WMO Secretariat in initiating a series

of regional workshops to promote the use of the *Handbook*. Those workshops had been held for Southern Africa (Lilongwe, July 1998), for the Pacific Islands (Fiji, October 1999), for the Arab States (Cairo, December 1999) and for the Russian-speaking countries of Central Asia (Tashkent, September 2000). The Commission welcomed the offers of Iran to host a training workshop on the *Handbook* for countries of the Asian region and that of Kenya for the countries of eastern Africa.

8.3 The Commission noted that training in the use of the *Handbook* could be beneficially added to the curricula of relevant training institutions. It therefore recommended that, as an initial step, the electronic version of the *Handbook* should be made available to regional training institutions which offered courses in hydrology and water resources and that appropriate training be organized for the trainers of those institutions.

8.4 The Commission noted that the CHy Expert on Water Use and Demand, Mr P. Herbertson, had prepared a draft annex on water use and demand for inclusion in the *Handbook*. It recommended that the material be first reviewed by other experts on the subject prior to its issue as a supplement to the *Handbook*.

8.5 The member of the AWG responsible for water resources assessment, Mr I. Shiklomanov, observed that a considerable amount of work in that general subject area was being carried out at the national and global levels within the framework of the WMO and UNESCO programmes. Particular reference was made to the water resources assessment of the world, prepared by Russian hydrologists, which would soon be published in English by Cambridge University Press.

9. SUSTAINABLE DEVELOPMENT (agenda item 9)

9.1 The Commission was informed of the actions which had taken place with regard to the recommendation of its tenth session that a new component programme on sustainable development of water resources be established under the HWRP. CHy-X had proposed that the new component programme should group a number of priority areas including:

- (a) Hydrology for the sustainable development of urban areas;
- (b) River basins with changing water quality and sediment regimes;
- (c) Hydrology in low-lying coastal areas and small islands;
- (d) Use and recharge of groundwater; and
- (e) Hydrology of arid and semi-arid areas.

9.2 The Commission was pleased to note that its recommendation for that new component programme had been endorsed by the fiftieth session of the Executive Council and approved by Thirteenth Congress. In welcoming the new initiative, Congress had considered it important that WMO work within its particular area of expertise and responsibility to support sustainable development through the provision of relevant hydrological data, products and information as a contribution to policy- and decision-making in water resources management.

9.3 The Commission appreciated the attention which had already been given to some of the priority areas identified. In particular, it welcomed the development of the HYCOS projects in the Caribbean and Pacific regions which addressed problems faced by small islands and coastal areas, as well as the work in support of the United Nations Convention to Combat Desertification which linked with the situation in the arid and semi-arid areas. The report of the Meeting of Experts on Hydrological Needs of Small Islands (see general summary paragraph 5.7) provided a detailed description of the range of common needs of the islands and served as the basis for planning WMO's water-related activities in the region.

9.4 In view of the very limited budget allocation for that programme over the coming three years, the Commission felt obliged to re-examine the future priorities that had been proposed and to advise on a clear long-term strategy for the implementation of the programme.

9.5 The discussion on a strategy for the Programme on Sustainable Development of Water Resources concluded that the long-term focus should continue to be those priority areas previously identified but with a modified order and expanded focus for item (c) below, namely:

- (a) Hydrology in low-lying coastal areas and small islands;
- (b) Hydrology for the sustainable development of urban areas;
- (c) River basins with changing water quantity, water quality and sediment regimes;
- (d) Use and recharge of groundwater; and
- (e) Hydrology of arid and semi-arid areas.

Work under (b) above would include, *inter alia*, the special problems posed by water supply and waste water treatment.

9.6 The Commission urged closer cooperation with UNESCO, including its Intergovernmental Oceanographic Commission (IOC), in the area of sustainable development of water resources in which WMO should focus on the operational aspects such as data collection and processing. In view of the constraints on resources to implement that subprogramme, the Commission recommended that WMO seek contributions from Members by inviting them to organize conferences or workshops on the priority areas identified.

10. CAPACITY BUILDING (agenda item 10)

10.0.1 The Commission was informed of the actions which had taken place with regard to the recommendation of its tenth session that a new component programme on capacity building in hydrology and water resources be established under the HWRP. The Commission noted that institutional weaknesses remained a major cause of concern regarding the effectiveness of many NHSs.

10.0.2 The Commission recalled that CHy-X had recommended an integrated approach which would best suit the implementation of the component programme mainly in four areas:

- (a) Incorporation of capacity building elements in the work plans of working groups and the terms of reference of experts of CHy;
- (b) Implementation through programmes and projects in the HWRP;
- (c) Implementation of programmes and projects coordinated by the regional associations;
- (d) Cooperation between the HWRP and the Technical Cooperation Programme.

10.0.3 The Commission was pleased to note that its recommendation for that new component programme had been endorsed by the fiftieth session of the Executive Council and had been approved by Thirteenth Congress. In welcoming the new initiative, Congress had seen that subject as one of the most important in relation to the aims of WMO. The Commission noted the recommendation of Congress that the new programme should focus on developing human resources in hydrology and the management of water resources. However, the Commission noted that, while Thirteenth Congress had welcomed the new initiative, the level of funding allocated was insufficient to meet the objectives of the programme.

10.1 HYDROLOGICAL SERVICES (agenda item 10.1)

10.1.1 The Commission recalled that that programme activity aimed at encouraging the rational organization and development of NHSs and at contributing to technical cooperation in hydrology and water resources, particularly in developing countries. In discussing that activity, the Commission agreed that implementation should focus on assistance in the organization and operation of NHSs, so that they might adequately fulfil their role in the sustainable social and economic development of their countries.

10.1.2 The Commission was informed that the draft report on the role and operation of NHSs had been prepared by Mr P. Mosley (New Zealand) in response to Resolution 3 (EC-LI) — EC Advisory Group on the Role and Operation of National Meteorological and Hydrological Services.

10.1.3 The Commission noted that that programme activity might best be implemented through well-defined technical cooperation projects executed by WMO which directly benefited from the expertise available within the Organization. The implementation of regional components of WHYCOS significantly contributed to capacity building and the technical and managerial development of NHSs, as well as to cooperation among NHSs in operational hydrology at the regional level.

10.1.4 The Commission recommended that the further development of activities within that programme should address the following aspects:

- (a) Structural and functional organization of selected NHSs;
- (b) Role of NHSs in national development plans;
- (c) Interaction mechanisms between NHSs and relevant governmental and non-governmental organizations on the national and international levels;

- (d) Public and specialized services of selected NHSs;
- (e) Approaches to development and strengthening of NHSs;
- (f) Funding sources and income generation;
- (g) Cost-benefit considerations in the operation of NHSs.

10.2 EDUCATION AND TRAINING (agenda item 10.2)

10.2.1 The Commission noted that the activities in education and training, implemented in close cooperation with the Education and Training Programme, encouraged the systematic review of staff and training needs of NHSs and supported various training events.

10.2.2 The Commission agreed that an integrated approach was necessary in the implementation of those activities. In that regard, the Commission noted that education and training courses needed to be responsive to the requirement for integrated water resources management and related managerial issues in the operation of NHSs. In particular, courses on project planning, development and execution were required at the national level in addition to technical training in state-of-the-art hydrological observations, means of communication, modelling and forecasting. The Commission suggested that future regional courses sponsored by WMO should take that into consideration.

10.2.3 The Commission was informed that the Executive Council Panel of Experts on Education and Training last met in May 2000 and noted with appreciation that a volume on hydrology was being prepared for inclusion in the *Guidelines for the Education and Training of Personnel in Meteorology and Operational Hydrology* (WMO-No. 258) with the assistance of experts nominated by CHy and by UNESCO.

10.2.4 The Commission was informed that WMO had organized or co-sponsored a number of courses and workshops in hydrology and water resources during the past inter-sessional period. Those activities included Courses on Hydrology (Kranjska Gora, Slovenia, September 1997), on Sedimentology in Fluvial Streams (Montevideo, Uruguay, November 1997) and on Hydrometry and Telemetry (Itajuba, Brazil, November/December 1998). Three regular training courses were also supported by WMO, their most recent venues and dates being:

- (a) The Latin American Course on Operational Hydrology (Caracas, Venezuela, March 2000);
- (b) The Ninth International Postgraduate Course on Applied Hydrology and Information Systems for Water Management (Nairobi, Kenya, March–December 2000);
- (c) The course on Hydrological Forecasting (Silver Spring, United States, October 2000).

10.2.5 The Commission was informed about the existence of several regional training centres and other initiatives at the national level, notably the training and education facilities in Kenya, Russia and the South American Training Centre of Applied Hydrology. The Commission recognized that education and training could also be achieved through “train the trainer” courses and regional roving seminars.

10.2.6 The Commission noted the potential for extended collaboration between UNESCO and WMO in their education and training activities, in particular with respect to the training of technical staff. In that regard, the Commission noted with appreciation the offer made by Canada to provide training material for hydrometric technologists as a HOMS component. That material might be made available on CD-ROM and through the Internet.

10.2.7 The Commission further noted the offer made by the Russian Federation to develop a methodology for water resources assessment based on the past experience of the State Hydrological Institute.

10.2.8 The Commission agreed that further actions were necessary and recommended that the following be considered:

- (a) Preparation of state of the art standard sets of instructional material for selected topics in hydrology such as hydrological forecasting, discharge measurement in large rivers, sediment transport monitoring, water resources assessment, supply and demand management, modelling, communication and the use of modern communication media and the increased application of the geographical information system (GIS) in hydrology;
- (b) Development of training material for integrated water resources management;
- (c) Promotion of good practices and approaches to the management of NHSs;
- (d) Development of approaches and models for communication between NHSs and the general public.

10.3 PRODUCT DELIVERY AND PUBLIC AWARENESS (agenda item 10.3)

10.3.1 It was noted that that programme activity aimed at raising the profile of NHSs by improving their ability to provide products required by the community and at increasing public awareness of the importance of hydrology to meet societal needs.

10.3.2 In discussing that, the Commission recognized the changing role of NHSs from data collection and dissemination organizations to proactive service providers. It was recognized that many services were not yet fully prepared to adapt to that new role. The Commission recommended, therefore, that NHSs be assisted by the Commission and the WMO Secretariat to assume that new role. The successful implementation of that programme activity was seen as crucial to enhance the profile of services in the overall context of national development activities.

10.3.3 The Commission recognized that effective product delivery and public awareness of NHSs should be embedded in a well-defined legislative, economic and institutional framework. In that regard, the Commission was informed of the success of certain NHSs, based on new legislation that permitted them to meet the needs of their users and generate additional revenue.

10.3.4 The Commission agreed that the following tasks should be undertaken as a principal step to initiating activity under the present programme:

- (a) Investigation of sector requirements for hydrological products, such as forecasts of floods and droughts, balances of water demand and availability, hydrological risks, general-purpose statistics and dynamic GIS applications. Urban areas might be given special attention;
- (b) Compilation of good practices to create public awareness of the benefits of NHSs to serve the public, decision makers and to provide assistance for disaster preparedness and mitigation;
- (c) Studies of different approaches (case studies) of NHSs which were successful in product delivery and the creation of public awareness;
- (d) Development of a strategic methodology which could be used by national NHSs to enhance their capacity in product delivery and public awareness.

11. BASIC SYSTEMS (agenda item 11)

11.0.1 The Commission noted that the first sessions of the two subject-oriented working groups were held as joint and parallel meetings during the same period in the WMO Secretariat from 17 to 21 November 1997. That was the first time that such joint meetings had been held. It provided an opportunity for the experts — members of the two groups — to meet together and discuss many items of common interest and to agree on collaboration needed to implement the individual programmes of work.

11.0.2 Under the present agenda item, the Commission considered the report of the Working Group on Basic Systems. That group was established by Resolution 1 (CHy-X) — Working Groups and Experts of the Commission for Hydrology, and consisted of a chairperson, Mr B. J. Stewart (Australia), and 10 experts.

11.0.3 The Commission noted that the Working Group had agreed not to hold a second session for which funds were available but instead to use the resources to support the work that was being carried out by the individual experts. The report on the work carried out by the Group was summarized below.

11.1 WATER USE AND DEMAND (agenda item 11.1)

11.1.1 The Commission considered the report of Mr P. Herbertson (United Kingdom), Expert on Water Use and Demand. Mr Herbertson had compiled a draft report on the subject which identified the requirements for water demand and use management and provided case studies of water use and demand evaluation in both developing and developed countries. Much of the material for that report had been taken from the Workshop on Demand Management in Small Islands (Jamaica, July 1999), attended by Mr Herbertson, and from the Workshop on Tools for Water Use and Demand Management (Harare, October 1999), organized and conducted by the Expert and his associates.

11.1.2 Mr Herbertson had also contributed a new draft annex on water use and demand to the WMO/UNESCO *Handbook on Water Resources Assessment: Review of National Capabilities*. The need for that material was recognized at the regional Workshop on Water Resources

Assessment: Evaluation of National Capabilities (Lilongwe, Malawi, July 1998) to promote the use of the *Handbook*.

11.1.3 The Expert also provided comments and suggestions for updating the INFOHYDRO database to include water use and demand/water management data and had contributed to the project Hydrology for the Environment, Life and Policy (HELP) (see general summary paragraph 19.1.8).

11.1.4 The Commission noted that it was the first time that emphasis was being placed on that important area of water use and demand. It recognized that those, as well as water use efficiency, were essential parameters for current and future water demand management, including those of international basins. The Commission therefore agreed that work in that area should be included in future programmes.

11.1.5 The Commission further recognized that its activities relevant to water resources assessment had concentrated on the review of national capabilities and not on the actual assessment of the resource. It noted that the methodology for that latter work had been developed in the Russian Federation and requested the Russian Federation to consider sharing the technology with other countries, possibly through HOMS.

11.2 WATER QUANTITY DATA (agenda item 11.2)

11.2.1 The Commission considered the report of Mr V. S. Guimarães (Brazil), Expert on Water Quantity Data. It noted that his main activity had been focused on HYCOS projects in South America. He had prepared draft project proposals for the development of an Amazon-HYCOS and a Plata-HYCOS. The proposals were being reviewed by the WMO Secretariat and by the RA III Working Group on Hydrology. The implementation of a Plata-HYCOS would aim at meeting the obligations of the International Treaty of the Plata Basin. In addition, Mr Guimarães had collected information on water quantity measurement in large transboundary river basins. The information collected had been compiled into five large volumes based on WMO regions (Africa, Asia and Oceania, Europe, North and Central America, and South America) and was also available on a CD-ROM.

11.2.2 The Commission noted that Mr Guimarães had established a group of national experts to assist him in carrying out his assignment. A similar approach had been taken by Ms Yang Xiaoqin (China) (see general summary paragraph 11.4.1). The Commission commended that novel approach and recommended it as a useful way of carrying out future work. It also recorded its appreciation for the additional support provided to the Experts by the Governments of Brazil and China.

11.3 WATER QUALITY DATA (agenda item 11.3)

11.3.1 The Commission noted that the Experts on Water Quality Data, Messrs P. Literathy (Hungary) and N. Filizola (Brazil) and the Expert on Water Quality Assessment, Mr H. van Vliet (South Africa), assisted by three water quality experts from Canada, India and

Nigeria had compiled an outline for a draft technical report on water quality monitoring and assessment and had agreed on the respective contributions of the various experts. That had been arranged at a meeting of the six experts held in Geneva in December 1999.

11.3.2 The Commission noted that work on the report was progressing and that a first draft was expected by June 2001.

11.4 SEDIMENT (agenda item 11.4)

11.4.1 The Commission noted that the Expert on Sediments (Ms Yang Xiaoqin, China) had prepared, with the assistance of a team of experts from China, a draft revised manual on sediment management and measurement. A meeting had been convened in Beijing, China in December 1999, with the participation of two international experts, Messrs D. Glysson (United States) and G. Leeks (United Kingdom), to review the first draft of the manual. A second draft of the manual was subsequently prepared for consideration by the Commission.

11.4.2 The Commission underlined the importance of sediment management and the need for international guidelines on the subject, and in particular on the management of contaminated sediments.

11.5 WATER QUALITY ASSESSMENT (agenda item 11.5)

The Commission noted that the Expert on Water Quality Assessment, Mr H. van Vliet (South Africa), had cooperated with the Experts on Water Quality Data in preparing the outline and inputs to the report on water quality monitoring and assessment (see general summary paragraph 11.3.1).

11.6 REMOTE SENSING (agenda item 11.6)

11.6.1 The Commission considered the report of Messrs T. Engman (United States) and M. Lointier (France), Experts on Remote Sensing. It noted that the Experts had prepared a proposal for training in the application of remote sensing techniques in operational hydrology. Furthermore, in collaboration with a number of associate experts, material on remote sensing applications in hydrology had been prepared for consideration for the sixth edition of the *Guide to Hydrological Practices* (WMO-No. 168).

11.6.2 The Commission was of the view that that important area of remote sensing applications was not sufficiently used by hydrologists. It recognized the need for continuous training in the use of the available facilities, especially those provided by the European Organization for the Exploitation of Meteorological Satellites (EUMETSAT) and to facilitate access to remotely sensed data. The various Regional Meteorological Training Centres (RMTCs) were seen as one possible venue where training in remote sensing techniques could be done.

11.7 NETWORK DESIGN (agenda item 11.7)

11.7.1 The Commission considered the report of Messrs C. Pearson (New Zealand) and G. Alé (Benin), Experts on Network Design. It noted that a report on network design techniques and case studies on the

application of network design in critical areas had been prepared.

11.7.2 The Commission noted that Mr C. Pearson, in his capacity as Expert on Network Design, also contributed to the WMO/World Bank water projects in Tanzania and Mexico and had acted as a resource person at the Workshop on Water Resources Assessment: Evaluation of National Capabilities and the Meeting of Experts on Needs of Small Islands in Nadi, Fiji in October 1999.

11.8 DATA MANAGEMENT (agenda item 11.8)

11.8.1 The Commission considered the report of Mr A. Terakawa (Japan), Expert on Data Management. It noted that the Expert had prepared a report on hydrological data management which addressed the present status and trends in hydrological databases, with several practical examples including software and hardware, data collection standards, codes for the exchange of data and metadata requirements. The report also covered present trends in applying GIS as a tool for database management.

11.8.2 The Commission was informed that during the past two years, based on discussions held at the fifth UNESCO/WMO International Conference on Hydrology, held in Geneva in February 1999 (see general summary paragraph 19.1.7), some consideration had been given to the establishment of a global metadata-base. In that connection, the German delegation proposed the setting-up of a pilot project to develop an Internet-based metadata information system. Such a system should consist of information on the physical and topographic features of the basin, land use and hydrology (datasets, equipment, responsible agencies). The Commission requested the GRDC to consider setting up such a meta-database, starting with about 200 discharge stations on major rivers flowing to the oceans. Some information on that subject was available in the monograph prepared by Mr I. Shiklomanov and entitled *World Water Resources at the Beginning of the Twenty-first Century*, which would be published by UNESCO.

12. APPLICATIONS OF HYDROLOGY (agenda item 12)

12.0.1 Under the present agenda item, the Commission considered the report of the chairperson of the Working Group on Applications. The chairperson reported on the activities of the working group members during the inter-sessional period and the recommendations they had made with respect to the future work programme.

12.0.2 The Commission was informed that the chairperson of the Group had represented WMO at the Symposium on Flood Forecasting for the Americas, held in Brasilia, Brazil from 16 to 19 November 1999 and that he had chaired that Conference.

12.0.3 The Commission noted that, in that general topic area, useful work had been undertaken in the past under the hydrological component of WMO's Tropical Cyclone Programme, but endorsed the call by the fifty-second session of the Executive Council that that component now needed to be strengthened.

12.0.4 The Commission noted with appreciation the efforts of the chairperson and the members of the Working Group both in fulfilling their terms of reference and in providing a framework for future activities.

12.1 HYDROLOGICAL MODELS FOR FORECASTING (agenda item 12.1)

12.1.1 CHy-X had appointed two Experts on that topic, Messrs P. Serban (Romania) and K. Georgakakos (United States). At its first session, the Working Group had decided to divide the activities into two separate topics: streamflow monitoring techniques (Mr P. Serban) and distributed models (Mr K. Georgakakos).

12.1.2 The Commission noted the report of Mr P. Serban and the report prepared by two associated experts, Messrs N. Crookshank and D. Willis (both Canada). The Commission further noted that those experts had been assisted in their work by the International Association of Hydraulic Engineering and Research (IAHR).

12.1.3 The Commission was informed of the work carried out by Mr K. Georgakakos with respect to the organization of a workshop related to a flash flood threshold pilot project (FFTPP), planned in coordination with representatives of the RAs III and IV Working Group on Hydrology. The Commission was also informed that the Expert had published a paper entitled "National threshold runoff estimations utilizing GIS in support of operational flash flood warning systems" in the *Journal of Hydrology*, Volume 224 (1-2), pp. 21-44.

12.1.4 The Commission considered the FFTPP proposal provided by the Expert and recommended its inclusion in the future work programme of the Commission. However, the Commission noted that such a project could only succeed with the direct support of one or more Member countries and encouraged WMO Members to consider providing such support through the appropriate Working Group.

12.2 FLOOD ESTIMATION AND FORECASTING (agenda item 12.2)

12.2.1 The Commission had asked the Expert on Flood Forecasting, Mr R. Krzysztofowicz (United States), to prepare a report on the subject. The Commission was informed that two special editions of the *Journal of Hydrology* on the subject were in the process of being published with the Expert as overall editor.

12.2.2 The Commission noted with appreciation the efforts undertaken by China in reviewing and further developing methods of estimating probable maximum precipitation (PMP) and probable maximum flood (PMF). The Commission agreed that the review and development of international guidance on that subject should be included in the future work programme of the Commission.

12.3 MEDIUM- TO LONG-TERM FORECASTING (agenda item 12.3)

The Commission had asked the Expert on Medium- to Long-term Forecasting, Ms L. Borovikova

(Uzbekistan), to prepare a report on the subject. A report on modern methods for medium- to long-term forecasting was prepared with the cooperation of an associate expert.

12.4 OPERATIONAL FORECASTING (agenda item 12.4)

12.4.1 The Commission noted the technical report of Messrs S. Borsch (Russian Federation) and G. Rodriguez Basto (Colombia), Experts on Operational Forecasting. The report provided detailed guidance material and technology for use by hydrological forecasting centres to forecast dangerous hydrological phenomena. The Commission was informed that the contents of the report had been extensively published in journals and on the occasion of symposia and conferences. The Commission noted that Chapter 46 of the *Guide to Hydrological Practices*, entitled "Forecasts of ice formation and break-up", had been updated by the Experts.

12.4.2 The Commission noted with appreciation the offer made by the delegation of Iran to establish a regional hydrological forecasting centre and urged Members to consult with Iran as to how that might be established and managed. It was seen as important to involve the RA II Working Group on Hydrology in that process as well as the appropriate expert of the Working Group on Hydrological Forecasting and Prediction (see general summary paragraph 17.9).

12.5 GROUNDWATER MODELLING (agenda item 12.5)

12.5.1 The Commission had appointed an Expert on Groundwater Modelling, Mr D. El Quosy (Egypt), who had attended the first session of the working group and had been invited by WMO to participate in the Conference "Modflow 98" held in Golden, Colorado, United States, in October 1998. Prior to that Conference, the Expert had visited Geneva to discuss with the chairperson and the Secretariat his future work. After the Conference, he had been invited by WMO to work with the United Nations in New York on the improvement of a software package on groundwater.

12.5.2 The Commission was informed that, during the second session of the working group (December 1999), three associated experts on that topic had prepared an initiative for the establishment of an international groundwater resources assessment centre. That derived from a proposal made at the fifth UNESCO/WMO International Conference on Hydrology (Geneva, February 1999) and had been further developed in a meeting held in UNESCO's Headquarters in Paris in March 2000.

12.5.3 The Commission noted with appreciation the information provided by the delegation of The Netherlands on progress made with the proposal to establish the International Groundwater Resources Assessment Centre (IGRAC).

12.5.4 The Commission also noted that the Fourteenth Intergovernmental Council of the IHP of UNESCO, at its session in June 2000, had passed a resolution concerning the establishment of IGRAC.

12.5.5 The Commission recorded its support for that initiative by adopting Recommendation 1 (CHY-XI) for the establishment of IGRAC.

12.6 SUSTAINABLE DEVELOPMENT (agenda item 12.6)

12.6.1 The Commission had asked the Experts on Sustainable Development, Messrs A. Bermeo (Ecuador) and J. O. Bassey (Nigeria) to prepare a report on that subject. Mr Bermeo had prepared a study on the capacity of Hydrological Services to evaluate environmental impacts and indices of sustainability of water resource management. The Commission noted that the report, which covered many countries of Region III, also dealt with institutional requirements for the valuation of hydrological information.

12.6.2 Recognizing the importance of close collaboration between NHSs and the agricultural community to ensure food security, risk management and for issuing effective early warnings, the Commission called for coordinated action by CHy and the Commission for Agricultural Meteorology (CAgM).

12.7 LARGE-SCALE HYDROLOGICAL STUDIES (agenda item 12.7)

The Commission noted the report of Mr A. Hall (Australia), Expert on Large-scale Hydrological Studies, who had prepared a report on the subject. The report covered experiences gained in the Global Energy and Water Cycle Experiment (GEWEX), in particular with continental-scale hydrological modelling. The Expert had updated the publication entitled *The GEWEX Continental-scale and Large-scale Hydrological Studies and their Relevance to Water Resources Agencies* (Technical Reports in Hydrology and Water Resources No. 68, WMO/TD-No. 924) which had been prepared for CHy-X. The Commission was informed that the Expert had assisted in the planning and implementation of GEWEX Model Parameter Estimation Experiment (MOPEX), which focused on the calibration of the parameters of land surface models in atmospheric models.

12.8 CLIMATE VARIABILITY AND WATER RESOURCES (agenda item 12.8)

12.8.1 The Commission noted the report prepared by Mr Van Tuan Vu (Viet Nam), Expert on Climate Variability and Water Resources, entitled "Climate variability and change: impact on water resources". The report outlined the requirements for the use and future needs of hydrological data in the context of climate variability and climate change, and documented climate change scenarios on a global and selected regional basis, including North America, Europe and China.

12.8.2 The Commission was informed that the Expert had been invited by WMO to participate in the Conference on the World Climate Research Programme: Achievements, Benefits and Challenges, held in Geneva in August 1997.

13. WORLD HYDROLOGICAL CYCLE OBSERVING SYSTEM (agenda item 13))

13.1 The Commission was informed of the progress with the development and implementation of WHYCOS. It was pleased to note that WHYCOS was responding to the recommendations of Agenda 21, Chapter 18 — Protection of the quality and supply of freshwater resources: application of integrated approaches to the development, management and use of water resources, on freshwater and those of the International Conference on Water and the Environment (Dublin, 1992). It also responded to the call from the United Nations Commission on Sustainable Development (CSD) to strengthen efforts towards a comprehensive and continuous assessment of freshwater resources as well as to the findings of a number of regional surveys of hydrological activities, such as the Sub-Saharan Hydrological Assessment. The Commission noted that WHYCOS continued to generate considerable interest in the hydrological community around the world, as reflected by the references to it in a number of key documents and resolutions on freshwater issues. Those included the report of the United Nations Secretary General to CSD 5 (1997) and CSD 7 (1999), and the Global Water Partnership's (GWP) "Towards water scarcity: a framework for action" presented at the Second World Water Forum (The Hague, March 2000).

13.2 The Commission recalled that some of the primary objectives of WHYCOS were data collection, capacity building and the promotion of cooperation on water-related issues at the river basin, regional and global levels. It therefore appreciated, in particular, the level of cooperation that had already been achieved in those projects that were being implemented. It further noted that WHYCOS should continue to forge valuable links with other WMO Programmes, especially the World Weather Watch (WWW) and the water-related activities of the Global Climate Observing System (GCOS) and to make maximum use of the capabilities offered by those programmes, especially those of the Global Telecommunication System (GTS).

13.3 The Commission recommended that the specific objective of each HYCOS project should be identified as a basis for its development. That would influence the network design, the choice of variables to be measured, and the data collection and dissemination methods. The Commission stressed that, in addition to the utilization of HYCOS data for regional purposes, NHSs were expected to play a leading role and thus must derive the full benefits from the project. Systems should be modular in design so as to facilitate upgrading and sustainability.

13.4 The Commission noted that, apart from a need for global hydrological datasets, national and regional needs existed, such as for flood warning, flood forecasting, flood management as well as operational tools for water resources management. The need to develop analytical tools such as flow forecasting modules termed hydrological forecasting (HYCAST), as part of a complete information system, was acknowledged. The objective of

inclusion of a particular gauging site within the HYCOS network should be well motivated so as to assist in the procurement and utilization of appropriate instrumentation to complement the existing national data collection network.

13.5 The Commission noted the status of implementation of the two first HYCOS projects, namely, the MED-HYCOS and SADC-HYCOS in the Mediterranean and southern African subregions, respectively. It noted the emphasis which had been placed on the development of databases and corresponding management tools in MED-HYCOS and that that technology was being shared with other HYCOS projects. The installation of the greater part of the network of data collection platforms (DCPs) had been completed. The Commission recommended that experience gained in the implementation of HYCOS projects should continue to be shared with those being developed.

13.6 The Commission was further informed that a two-year pilot phase of the AOC-HYCOS project (west and central Africa) had been launched in January 2000 with funding from France. The primary aim of that pilot phase was to transfer to WHYCOS the regional hydrological observing system for western and central Africa (OHRAOC) which had been established and operated by France in the subregion.

13.7 The Commission acknowledged the valuable financial support provided by the World Bank, the European Commission and the Government of France for the implementation of those projects, as well as the dedication of the participating countries in getting the projects operational. The Commission also stressed the importance of securing stable funding and thus of ensuring the long-term sustainability of those initiatives.

13.8 The Commission was pleased to note that the Technical Advisory Committees of the GWP for southern Africa and for the Mediterranean had recently presented proposals for new phases of SADC-HYCOS and MED-HYCOS, respectively, for consideration by its financial advisory body. The Commission saw those proposals, which were the collective requests of national water agencies of the respective subregions, as clear recognition of the benefits of WHYCOS.

13.9 The Commission was informed that, at the request of the participating countries, a substantial number of HYCOS projects were being developed and were at various stages. Those projects were classified into three groups: (a) those with project documents already developed, namely Congo-HYCOS (Congo River Basin), IGAD-HYCOS (eastern Africa), Baltic-HYCOS (Baltic Sea Basin), and the Carib-HYCOS (Caribbean Sea Basin); (b) those with a project being developed, namely Danube-HYCOS (Danube River Basin), Pacific-HYCOS (South Pacific Islands) and Aral-HYCOS (Aral Sea Basin); and (c) those projects that were still under consideration. The last category of projects covered the Caspian Sea, Black Sea, Nile, Plata and Amazon Basins, as well as the Arctic and Himalayan regions. The Commission was pleased to note that the European Commission, which had funded the preparation of Congo-HYCOS and IGAD-HYCOS

project documents, was also considering possible support for their implementation.

13.10 The Commission noted with satisfaction that the WHYCOS coordination mechanism, which it had recommended at its last session, had been established by the Secretary-General in 1998. The mechanism served as a vehicle for reviewing the programme activities and for developing future plans.

13.11 The Commission expressed general satisfaction with the development and implementation of the WHYCOS programme. It was seen as providing opportunities for capacity building with respect to infrastructure development and training and for promoting regional and international cooperation for the development and use of water resources information systems. In the case of transboundary water bodies, the sharing of data within the framework of the projects provided a transparent basis for the equitable use of the water resources. Noting that the global concept should be further developed, the Commission requested the WHYCOS International Advisory Group to examine that question further. The Commission saw as pragmatic, the current approach of implementing the programme through regional components to achieve the ultimate global coverage.

13.12 Within the context of the exchange of hydrological data and products, the Commission was of the view that WHYCOS projects must embrace the principles and intent of Resolution 25 (Cg-XIII) — Exchange of hydrological data and products, by making available the hydrological data and supporting metadata beyond the bounds of the particular HYCOS initiatives which included the appropriate WMO global data centres in accordance with agreed standards.

14. EXCHANGE OF HYDROLOGICAL DATA AND PRODUCTS (agenda item 14)

14.1 The Commission noted the ever-growing need both to assess and manage water resources on a regional basis involving, in particular, rivers and other bodies of freshwater which extended across international borders, and to call upon international cooperation in the forecasting and control of floods. It therefore welcomed the adoption of Resolution 25 (Cg-XIII) — Exchange of hydrological data and products, as a basis for increased cooperation between countries in the exchange of hydrological data and products. It recalled that that resolution was based on the draft that had been prepared by CHy-X and attached as Annex I to the report of that session.

14.2 The Commission was advised of the request made by Thirteenth Congress to the Executive Council, contained in Resolution 25 (Cg-XIII), for it to invite the Commission “to provide advice and assistance on technical aspects of the implementation of the practice on the international exchange of hydrological data and products” and the request that the Commission investigate further “the definition of the types of data that were essential to exchange without conditions and those that might be exchanged under certain conditions” (general summary paragraph 7.1.29 of the *Abridged Final Report*

with *Resolutions of the Thirteenth World Meteorological Congress* (WMO-No. 902). It noted that the fifty-first session of the Executive Council had also invited CHy to provide such advice and assistance and that, as a result, the CHy AWG had prepared a brochure on the resolution and a technical note on the types of data that were exchanged, for which it expressed its appreciation specifically to Messrs P. J. Pilon (Canada) and P. Mosley (New Zealand), respectively.

14.3 It was recognized that the first step in implementing the resolution was to ensure that everyone in the position to apply it or benefit from it should be aware of its adoption and of the policy that it had established. It was therefore recommended that the brochure be published as soon as possible in as many languages as possible, and that it be distributed widely. Multiple copies should be sent to permanent representatives and hydrological advisers, members of the Commission and all intergovernmental and non-governmental bodies with an interest, even if only slight, in the collection, distribution and use of hydrological data.

14.4 As a second step, opportunities should be sought to write articles on the practice established by Resolution 25 (Cg-XIII) for printing in a range of scientific and technical journals and other publications. The aim should not only be to publicize the existence of the policy, but also to encourage a wider international dissemination of data. To this end, it may be necessary to describe the practice in different terms for different users, such as for example, the scientific community or those responsible for real-time forecasting. The most powerful means of raising awareness would be to apply the policy to some well-known field projects in developed and developing countries and to investigate the extent to which it was already applied or would be applied by various regional river, lake and aquifer authorities.

14.5 As regarded the technical aspects of the international exchange of data and the types of data to be exchanged, the Commission confirmed the opinion expressed earlier by its AWG that it was not possible to draw up lists of data such as that contained in Annex 1 to 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. Nevertheless, as the aim was to encourage the implementation of the practice, it was important to respond to the requests of Congress and the Executive Council to provide advice as to what data were expected to be exchanged. The Commission therefore recommended that the various needs for the exchange of hydrological data be identified, together with their associated time- and space-scales, leading to a general description of types of data transferred for each. A case study approach was then proposed so as to illustrate in concrete terms what data were actually exchanged under a variety of circumstances.

14.6 Noting that that was the approach taken by Mr P. Mosley in preparing the technical note referred to under general summary paragraph 14.2, the Commission awaited with interest the views of the

Executive Council and its Advisory Group on the International Exchange of Data and Products on the current text and requested its president, with the support of the AWG, to assist in finalizing it for publication. The resulting technical note should be widely disseminated, if possible in several languages.

14.7 Pursuing the matter further, it was suggested that information be sought from NHSS, river basin authorities and global data centres on their policies, practices and experiences at the national, regional and global levels, respectively. It would not be possible to monitor all transfers of hydrological data at the different levels, but the above survey could be used to establish a mechanism for systematic sampling of the flows of data over time so as to be able to judge developments with time and hence, at least potentially, the response to the implementation of Resolution 25 (Cg-XIII).

14.8 Moving to the general topic of data transfer and exchange, the Commission noted the need for that to be improved even at the national level because of the number of agencies involved within most countries. The need for international transfer was far less for hydrological than for meteorological data and was usually focused on particular river basins or aquifers. In addition, in some cases, such as within Europe, regional agreements existed which required the exchange of certain data.

14.9 The statements of various delegations illustrated the range of national practices for the dissemination of hydrological data, which presented a real challenge as regarded the application of the policy set out in Resolution 25 (Cg-XIII). One other important factor noted was the need to identify the source of all data so that, as mentioned in general summary paragraph 19.1.19, advice as to their collection, distribution and quality could be obtained and appropriate credit given to the agency that collected them. Finally, the Commission reiterated its intent to support vigorously the implementation of Resolution 25 (Cg-XIII) and requested its AWG to take all steps to ensure that CHy played its full role in that important task.

15. PUBLICATIONS AND SYMPOSIA (agenda item 15)

15.1 PUBLICATIONS (agenda item 15.1)

15.1.1 The Commission noted the report of the Secretary-General on the publication of guidance and other material in the field of hydrology and water resources. During the period 1997–1999 four of the five reports approved by CHy-X for publication in the Operational Hydrology Report series had been issued. The Commission regretted that the fifth report, on basin-scale modelling for groundwater management, had not been finalized and hence could not be published. All 11 reports approved by CHy-X to be published in the Technical Reports in Hydrology and Water Resources Series had been issued.

15.1.2 The Commission was informed of the status of the WMO/UNESCO *Water Resources Assessment: Handbook for Review of National Capabilities*. It noted that the English, Russian and Spanish versions had been prepared and published by WMO. UNESCO had published

the French version and had arranged to have the *Handbook* translated into Arabic. In consultation with UNESCO, work was under way to make the *Handbook* available on the Internet.

15.1.3 Technical reports were complex and lengthy documents and, at its tenth session, the Commission had expressed concern that an appropriate review could not be carried out during its session. It had therefore requested its AWG to evaluate alternative review procedures. The recommendation of the AWG might be summarized as followed:

- (a) The chairperson of a working group determined whether a particular report was ready for review;
- (b) If it was not considered ready, the chairperson advised the author as to how it might be amended so as to make it suitable;
- (c) The member of the AWG responsible for CHy publications consulted with the WMO Secretariat and selected two reviewers, if appropriate, drawn from the list of associate experts;
- (d) Those reviewers considered the report from a scientific, technical and editorial point of view and provided their advice using a standard reporting form, including a recommendation as to whether the report should be:
 - (i) Published as an Operational Hydrological Report;
 - (ii) Issued in the series of Technical Reports in Hydrology and Water Resources;
 - (iii) Not published, but retained for further use in the work of the Commission;
- (e) The member of the AWG responsible used the reports of the reviewers to make a final recommendation on how to publish the report;
- (f) That recommendation was submitted to the president of CHy for a final decision on behalf of the Commission.

15.1.4 That review procedure was endorsed by the Commission for application both to the technical reports requested by CHy-X and to those requested by CHy-XI and future sessions of the Commission.

15.2 SYMPOSIA, TECHNICAL CONFERENCES AND SEMINARS (agenda item 15.2)

15.2.1 The Commission examined the list of 38 meetings of working groups, 26 courses and workshops and 49 symposia in the field of hydrology and water resources convened or co-sponsored by WMO during the last inter-sessional period. The Commission expressed its appreciation to all the sponsors and host countries of the meetings.

15.2.2 The Commission reviewed a list of symposia, technical conferences, workshops and seminars related to hydrology and water resources tentatively planned for 2000–2003, as contained in Annex I to this report. It noted that Thirteenth Congress had made budgetary provision for WMO to convene or co-sponsor a number of those meetings and that the Secretary-General had taken action to support others requiring no financial contribution from the Organization.

15.2.3 The Commission recommended that Members advise the Secretariat in the near future of any offers to host or otherwise support the meetings listed in Annex I.

16. LONG-TERM PLANNING AS RELATED TO THE COMMISSION'S ACTIVITIES (agenda item 16)

16.1 FOURTH WMO LONG-TERM PLAN (agenda item 16.1)

The Commission recalled the role it had played in the development of the Fourth WMO Long-term Plan (4LTP) which covered the 10-year period 1996–2005. The first four years of that period, for which the 4LTP was presented in greater detail, had therefore provided the framework within which CHy-X had met and its decisions had been implemented.

16.2 FIFTH WMO LONG-TERM PLAN (agenda item 16.2)

16.2.1 The Commission had also contributed to the development of the Fifth WMO Long-term Plan (5LTP) which had been adopted by Thirteenth Congress to cover the period 2000–2009. The Commission noted that technical commissions were requested both to adhere to the policies and strategies as well as to organize their activities to achieve the main long-term objectives as defined in the Plan. Accordingly, account was taken of the overall structure and priorities contained in the 5LTP when the Commission developed its own plans for future activities under agenda item 17.

16.2.2 The Commission expressed its satisfaction that, in line with the recommendations it had made at its ninth session in 1993, the 5LTP was now presented in an integrated form of a single document that could be widely distributed and understood and that it included new component programmes on sustainable development and capacity building based on the advice of CHy-X.

16.2.3 It noted that an evaluation report covering the early part of the 5LTP would eventually be prepared for consideration by Fourteenth Congress. The Commission requested its president to ensure the provision of the relevant contribution expected from CHy in the pertinent evaluation process.

16.3 SIXTH WMO LONG-TERM PLAN (agenda item 16.3)

16.3.1 The Commission noted that Thirteenth Congress had requested the Executive Council to establish the necessary mechanism for the preparation of the Sixth WMO Long-term Plan (6LTP), with the active participation of the technical commissions.

16.3.2 The Commission further noted the general approach, the period of coverage and the overall structure and contents of the Plan, as approved by the Executive Council following the guidance of Thirteenth Congress.

16.3.3 As CHy had been requested by Congress to lead the formulation of the scientific and technical aspects of the HWRP, the Commission formulated its views on the national, regional and global aspects and recorded them in Annex II to this report.

16.3.4 As at its previous sessions, the Commission requested its president to follow-up on its views and

proposals and to continue to represent the Commission in formulating the part of the 6LTP relating to hydrology and water resources. It requested the AWG to assist the president in that task.

LONG-TERM PLANNING PROCESS

16.3.5 The Commission recognized that a first draft of the 6LTP would be prepared for consideration by the fifty-third session of the Executive Council in May 2001.

16.3.6 The Commission noted that, in the preparation of the 6LTP, the monitoring and evaluation approach, including performance indicators and milestones, should be clearly outlined to facilitate its subsequent monitoring and evaluation.

REVIEW OF THE STRUCTURE OF WMO

16.3.7 The Commission noted that Thirteenth Congress had endorsed a number of measures to encourage and promote overall participation in, and cooperation among, the technical commissions and regional associations, and had requested the presidents of technical commissions, among others, to implement them, as appropriate, within available resources.

16.3.8 The Commission also noted the views of the Executive Council concerning the review of the structure of WMO. The Commission considered that matter and recorded its views in Annex II.

17. FUTURE PROGRAMME OF WORK OF THE COMMISSION (agenda item 17)

17.1 The Commission noted the structure for the future programme of work of CHy, as proposed by the president in his report, and agreed to the establishment of an AWG and two subject-oriented working groups. The Commission identified a set of activities for each expert. In determining the areas on which the Commission would focus over the next four years, the Commission decided that priority should be given to the topics of flood forecasting (short, medium and long term), data management (especially metadata) and risk management. Those topic areas represented close cooperation with the meteorological community and the basic role of NHSs in collecting, processing and disseminating the hydrological (groundwater and surface water) information required by users.

17.2 In coming to that decision, the Commission discussed the advantages of appointing "experts" instead of "rapporteurs" to undertake its work programme. The term "expert" had been introduced at CHy-X. While the majority view supported the retention of "experts", it was noted that the essential point was the ability of the appointee to deliver. Emphasis was placed on the need to set clear goals and objectives and on the fact that the production of a report was only useful if it achieved a particular objective.

17.3 The Commission also discussed the issue of the number of experts to be selected within each working group and the AWG. The Commission decided that there were significant advantages to being able to select associate experts to support the work of the experts in

the subject-oriented working groups. In particular, that allowed the AWG to select associate experts in support of the activities of the Commission once those had been more fully determined by the appointed experts. The Commission decided therefore to select six experts in each subject-oriented working group. That decision would enable increased resources to be available to support the activities of the experts, including the involvement of associate experts.

17.4 In order to focus adequately on the work of the experts in the subject-oriented working groups, the Commission decided to request that experts working on specific topic areas carry out task-oriented activities. The Commission also decided that, within the subject-oriented working groups, activities should also be carried out in the form of specific projects involving a number of experts and, where required, associate experts. Those projects would focus on specific activities and their goal would be to obtain concrete deliverables. To increase their chance of success, the projects should preferably build on ongoing national activities. It was proposed that the projects to be undertaken addressed the following topics:

- (a) Risk management. Development of a set of guidelines and best practice for use by NHSs in applying risk management, particularly in relation to operational hydrology;
- (b) Automated real-time stage-discharge. Development of a software package and associated training manual which would enable the application of the latest stage-discharge calculations to be undertaken in real time;
- (c) Analysis of variability and trend in hydroclimatological data. Development and application of a set of statistical tests for detecting trends and jumps in hydroclimatological time-series in a set of consistent and homogeneous datasets;
- (d) Metadata (in association with the GRDC). Identification of the metadata required in respect to hydrological data collection and development of mechanisms for the provision, display and access to metadata.

17.5 The AWG had proposed a project on a global flood forecasting system. However, the Commission noted that, unless one or two Members of WMO were able to sponsor such a project, it could not proceed. The Commission urged any country that had an interest in contributing to such a project to contact the chairperson of the Working Group on Hydrological Forecasting and Prediction.

17.6 Noting that, at the last GRDC Steering Committee meeting, the representative of UNESCO had indicated that UNESCO would be prepared to support financially an initial meeting of experts for the development of an automated real-time stage-discharge system initiative, the Commission urged the WMO Secretariat to support the proposed meeting of experts.

17.7 The Commission also decided to nominate an Expert on Technology Transfer and Capacity Building. That Expert would be required to work with the Working

Groups on Water Resources and on Hydrological Forecasting and Protection and to assist the other experts in training initiatives associated with their activities. The intent was to place increased emphasis on transferring documented technologies to enhance the capacity and capabilities of NHSs.

17.8 The Commission discussed the issue of resources allocated to training activities within the HWRP. The Commission recommended that the WMO Secretariat ensure that resources allocated to training were provided to training initiatives that were closely aligned with the agreed work plan for the inter-sessional periods. It also urged the WMO Secretariat to work closely with the members of CHy working groups having responsibility in that area.

17.9 The two subject-oriented working groups established were the Working Groups on Water Resources and on Hydrological Forecasting and Prediction. The Working Group on Water Resources would focus on activities in support of water resources assessment and management, while the Working Group on Hydrological Forecasting and Prediction would focus on the application of hydrological techniques in relation to forecasting of disasters including floods and droughts. The Commission identified the areas of low lying coastal lands, urban environments and small islands as areas that might require priority action.

17.10 The Commission noted that a small number of experts had yet to complete all of the tasks which they had been assigned by CHy-X, for example one of the Experts on Hydrological Models for Forecasting (Mr P. Serban) and his associate experts were in the process of compiling a third report to conclude the activities associated with the intercomparison of hydraulic forecast models. Further work in that area should be coordinated through the chairperson of the Working Group on Hydrological Forecasting and Prediction. Also, one of the Experts on Water Quality Data (Mr P. Literathy) was in the process of compiling an Operational Hydrology Report on water quality monitoring.

17.11 As with CHy-X, the Commission decided that the functioning of the individual experts, coordinated within and between the working groups, would be flexible. Outputs, scheduled carefully over the four-year life-time of the working groups would be varied and, through correspondence, meetings, workshops and conferences, would provide recommendations, advice and, above all, tangible action within Member States.

17.12 The Committee agreed that it would expect the working groups to continue to seek cooperation in undertaking activities with other groups, including:

- (a) Other WMO commissions;
- (b) Regional associations;
- (c) Other water-related United Nations agencies, particularly the IHP of UNESCO;
- (d) Non-governmental organizations, particularly the International Association of Hydrological Sciences (IAHS).

17.13 The Commission recorded its decision on the establishment of working groups under agenda item 21,

which identified topics to be addressed by the Commission during the next inter-sessional period and designated experts to work on those topics.

18. TECHNICAL COOPERATION, THE VOLUNTARY COOPERATION PROGRAMME AND RELATED PROJECTS (agenda item 18)

18.1 The Commission noted that most of the technical cooperation activities of WMO in the field of freshwater were focused on the HYCOS projects which were reported under agenda item 13. Those were carried out with the financial support of the World Bank, the European Commission and the Government of France.

18.2 The Commission noted that the WMO Secretariat had invited the Hydrological Services of Members to submit requests for Voluntary Cooperation Programme (VCP) support. Of the 15 requests listed only two, both within the framework of HOMMS, had been supported. The Commission therefore renewed its appeal to Member countries to be more generous in their support for the VCP (Hydrology).

18.3 The Commission noted that the overall funding allocation to the VCP for hydrology and water resources activities was relatively small. It was felt that that inadequate funding level had had a negative impact on cooperative initiatives in hydrology and water resources, an area of extreme importance for strengthening NHSs and for both society and the economies of Members. It was felt that the area of hydrology and water resources should receive a reasonable share of those limited resources and put them to effective use in support of the NHSs. The Commission requested the AWG, notably the president of CHy, to make efforts to raise that issue both within the WMO Secretariat and within the constituent bodies of the Organization, and to report on progress on that issue at the next session of CHy.

18.4 The Commission was informed that WMO had initiated a hydrological data rescue project with a pilot study involving some six African countries. The participating countries were being provided with a computer and data management software, as well as staff training, to transfer data to an electronic format. Chad, Gambia, Ghana, Kenya, Rwanda and Togo were currently participating in that study. On behalf of the African countries which had benefited from the data rescue project, the Ghanaian delegation expressed appreciation for the assistance provided by WMO and proposed a full scale project to assist other countries with similar problems. The Commission was informed that the Russian Federation also sought assistance to transfer a large volume of valuable hydrological data to electronic media and that that would facilitate its accessibility by the international hydrological community.

18.5 The Commission noted that, in addition to WHYCOS activities, technical assistance had been provided to Mexico and Tanzania in the implementation of water resources management projects supported by the World Bank. It was pleased to note that four CHy

Experts, Messrs P. Givone, C. Pearson, P. J. Pilon and B. J. Stewart, had participated in the provision of that assistance.

18.6 The Commission was informed that Brazil had been operating the Data Telemetry Training Centre since 1982. The Centre conducted courses in English which were open to international students.

19. COOPERATION WITH WATER-RELATED PROGRAMMES OF OTHER ORGANIZATIONS (agenda item 19)

19.1 COOPERATION WITHIN THE UNITED NATIONS SYSTEM AND OTHER GOVERNMENTAL ORGANIZATIONS (agenda item 19.1)

19.1.1 The Commission noted that senior officials in many Governments now recognized the critical situation that the world faced with regard to its freshwater resources. One consequence was an increase in international activity in that field but, as the Commission recognized, that was not necessarily reflected in increased support for the established programmes of the United Nations system, such as those of WMO. Bodies such as the World Water Council (WWC) and the GWP now played a role in international activities and many Governments had increased their bilateral, rather than their multilateral, aid programmes. That presented a new and ever changing environment in which the Commission, and WMO as a whole, now worked to fulfil its aims and objectives and serve its Members. With that in mind, the Commission reviewed relevant developments and advised on future plans.

19.1.2 The Commission noted the major effort that WMO had made, together with other agencies within the United Nations system, to produce the report entitled *Comprehensive Assessment of the Freshwater Resources of the World* that had been submitted to the fifth session of the United Nations CSD in 1997. WMO had subsequently published one of the basic background papers for the report, namely that on the assessment of water resources and water availability edited by Mr I. A. Shiklomanov (Russian Federation). The nineteenth special session of the United Nations General Assembly (New York, June 1997) and the sixth session of CSD (New York, April 1998) had paid particular attention to freshwater matters.

19.1.3 The Commission recognized the importance of WMO's involvement in those developments and noted the call made by the fifty-second session of the Executive Council for Members and the WMO Secretariat to take an active part in the Rio+10 process, in particular as regarded the follow-up to the Dublin Conference and Chapter 18 — Protection of the quality and supply of freshwater resources: application of integrated approaches to the development, management and use of water resources, of Agenda 21. The Commission was advised that the principal preparatory meeting for the Rio+10 event would be the tenth session of CSD that would open in May 2001 and continue again in April 2002. In addition, Germany would convene an International Conference on Freshwater in Bonn from 3 to 7 December 2001 to debate

some of the key issues in the field. The Commission recommended that WMO should be involved in those meetings in an appropriate manner.

19.1.4 The Commission was informed of the recent moves to amend the working methods of the United Nations Administrative Committee on Coordination (ACC) Subcommittee on Water Resources in response to the increased recognition being given to it by the CSD. Particular note was taken of the plans of the Subcommittee to issue a World Water Development Report (WWDR) on a biennial basis and of the call by the fifty-second session of the Executive Council for Members and the WMO Secretariat to provide support to that project. The Commission was pleased to learn that an inter-agency secretariat had been established at UNESCO Headquarters to oversee the production of the WWDR as the first and principal product of an inter-agency World Water Assessment Programme (WWAP), and recognized the generosity of Japan in providing the necessary financial support. The Commission also noted the need for the active participation of hydrologists through WMO channels in that important activity.

19.1.5 Information was provided on the celebration of World Water Day on 22 March of each year, noting that the theme for 2001 would be "Water and health" and led by the World Health Organization (WHO), and that the theme for 2002 was provisionally "Water and development" and might be led by the WWAP Secretariat. The Commission was also informed that, in some countries, national non-governmental water-related associations played an important role in the celebration of World Water Day.

19.1.6 The Commission reviewed in particular the cooperation of WMO with UNESCO in matters concerning freshwater. It noted that that was based on an inter-secretariat agreement established in 1972 and focused on activities in water resource assessment, the preparation of the third edition of the *International Glossary of Hydrology*, WCP-Water and education and training in hydrology.

19.1.7 The working agreement allowed for annual meetings of the WMO/UNESCO Liaison Committee for Hydrological Activities and the convening every five or six years of a UNESCO/WMO International Conference on Hydrology. The Commission was informed of the fifth such conference, which had been hosted by WMO in Geneva from 8 to 12 February 1999. The Commission noted the very constructive manner in which the Conference had approached its work, leading to a number of valuable recommendations which had been submitted to Thirteenth Congress and taken into account when reviewing the HWRP and when finalizing the 5LTP.

19.1.8 Three specific recommendations of the Conference were brought to the attention of the Commission. One was for the establishment of a project called HELP, which was being led by UNESCO and supported by WMO with the aim of delivering social, economic and environmental benefits to stakeholders through sustainable and appropriate use of water by

deploying hydrological science in support of improved integrated catchment management. The second was the establishment of IGRAC, as discussed under agenda item 12.5. The third was for closer ties between IAEA, UNESCO and WMO in the use of isotopes in hydrological investigations. In response to the latter, ties between WMO and IAEA were being strengthened through the introduction of isotope techniques in HOMS, the establishment of links with GCOS and the revitalization of the Global Network of Isotopes in Precipitation (GNIP).

19.1.9 The Commission also noted that the Bureau of UNESCO's IHP had met in the new WMO Headquarters building in September 1999 in parallel with a session of the CHy AWG, thus allowing the members of the two bodies to meet together to discuss joint action. They had expressed the wish that such meetings should be organized again whenever practical.

19.1.10 As regarded HELP, the Commission noted the endorsement of that initiative by both the fifth UNESCO/WMO International Conference on Hydrology and the decision of Thirteenth Congress that "the extent and nature of WMO's involvement in the project should fall within WMO's field of interest and serve the objectives of the Organization" (general summary paragraph 3.5.5.8 of the *Abridged Final Report with Resolutions of the Thirteenth World Meteorological Congress* (WMO-No. 902)). In order to ensure that and to strengthen links with UNESCO, a member of the AWG was assigned the task of providing input to, and of reporting on, the HELP initiative.

19.1.11 Reference was made to discussions held some seven years before on the possibility of combining in some way the IHP with the HWRP and of co-convening, or even uniting, the Intergovernmental Council of the IHP with CHy. The Executive Council of WMO had expressed an interest in the matter and the meeting of the IHP Bureau with the CHy AWG, referred to under general summary paragraph 19.1.9, had been one outcome. At the joint Conference referred to under general summary paragraph 19.1.7, the freshwater programmes of the two Organizations had been presented in such a way as to demonstrate their complementarity and lack of duplication. However, no further discussion had been entered into as regarded combining the two programmes, and it had been considered unproductive to pursue the idea of uniting the Commission with the IHP Council. Nevertheless, the recent establishment of the Joint WMO/IOC Technical Commission for Oceanography and Marine Meteorology (JCOMM) did challenge the two Organizations to look again at whether closer links might be forged between their freshwater programmes. The AWG was asked to study the matter with care and to report back to CHy-XII.

19.1.12 As noted under general summary paragraph 5.4, new developments in the regional governance of the IHP offered fresh opportunities for interaction and hopefully joint action between the regional bodies of the two Organizations.

19.1.13 The work on the new edition of the *International Glossary of Hydrology* had reached an advanced stage, the

fifth meeting of the WMO/UNESCO Standing Committee on Terminology, held in Cairo in February 2000. The Commission thanked Mr P. Huber (France) for his work on producing an electronic version of the second edition of the *Glossary* which incorporated several additional languages. The Commission recommended that the third edition be produced in a similar format. That edition would include terms relating to the following main themes: surface water, groundwater, water resources, water quality, subsurface water, hydrological models and hydrometry. As regarded education and training, UNESCO collaborated closely with WMO in support of the WMO Task Force on Education in Hydrology. That Task Force would prepare and update curricula for the education and training of hydrologists. UNESCO and WMO would continue joint support to a number of regular courses in hydrology.

19.1.14 The representative of Germany informed the Commission of the compilation by German specialists of a comprehensive lexicon of the geosciences which was being published in six volumes. Ten per cent of its 25 000 terms concerned hydrology and hydrogeology. The publisher would invite UNESCO and WMO to discuss the possibility of issuing the lexicon in other languages.

19.1.15 The Commission noted with appreciation the results of the first meeting of the new Steering Committee for the World Climate Programme (WCP)-Water, held in Geneva in October 2000. The goal of WCP-Water was to promote hydrological activities in the WCP and related conventions, to provide the water community with current data and information on hydrological and water resources conditions and variations, in a climate context, over a wide range of time- and space-scales. The work plan for the period 2000-2003 included activities relating to regional and global analyses of hydrological change and trends, climate-related natural disasters, climate and health, as well as climate and risk management in agricultural practices. The Commission was informed that the report of the meeting was expected to be published in December 2000 and would be distributed immediately to members of CHy.

19.1.16 The Commission recognized that, in its restructured form, WCP-Water had the potential to serve as an important link between climatological and hydrological programmes and projects.

19.1.17 The Commission was informed of the efforts of WMO and the global observing systems to establish a Global Hydrological Network for Climate in collaboration with the other United Nations agencies such as UNESCO, the Food and Agriculture Organization of the United Nations (FAO), WHO and the United Nations Environment Programme (UNEP). The Expert Meeting on the Establishment of a Global Hydrological Observation Network for Climate had been held to that effect in Geisenheim, Germany in June 2000. The network was seen as being complementary to existing data centres and networks and would serve as a "network of networks". Key functions of the network included the provision of timely access to data and metadata of 10

hydrological variables through the cooperation of existing centres such as GRDC and the Global Precipitation Climatology Centre (GPCC) and networks such as WHY-COS, within the framework of WMO Resolutions 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, and 25 (Cg-XIII) — Exchange of hydrological data and products. Another key function of the network was to facilitate the generation of relevant products and related documentation for the climate and hydrological community. The 10 variables referred to above were discharge, precipitation, snow cover, evapotranspiration, vapour pressure, soil moisture, groundwater fluxes, surface water storage, water use and biogeochemical fluxes.

19.1.18 The Commission noted with appreciation the establishment of that network as a means to enhance the exchange of data and information for the timely production of products for applications in climate and hydrology and water resources management.

19.1.19 The Commission further noted that duplication of effort should be avoided under all circumstances and the development of that network should not impose any unnecessary burden on NHSS. In addition, the origin and ownership of data and information should be transparent at all levels within the network and for the users of information generated by the network. In that respect, the Commission also noted the importance of feedback between providers and users of data.

19.1.20 The representative of UNESCO informed the Commission of the extensive and long standing cooperation that existed between the IHP of UNESCO and the HWRP of WMO. The close links meant that the two Organizations frequently shared responsibility for all of the major high-level international activities held recently. The IHP greatly valued that cooperation and wished to continue it in the future. He outlined the progress made in the implementation of the various themes of IHP-V (1996–2001). He informed the Commission that, after exhaustive worldwide consultation and in recognition of the shift in thinking about water from fragmented compartments of scientific inquiry to a more holistic, integrated approach, the general theme for IHP-VI (2002–2007) had been defined as “Water interactions: systems at risk and social challenges”. The five themes of the IHP-VI were elaborated on and the two cross-cutting programme components — Flow Regimes from International Experimental and Network Data (FRIEND) and HELP were mentioned. The IHP-VI Strategic Plan was approved by the fourteenth session of the Intergovernmental Council of the IHP held in Paris in June 2000.

19.1.21 He informed the Commission that the IHP had taken the lead and was very actively implementing several new initiatives, in close collaboration with WMO, and other organizations of the United Nations system. Those included:

(a) HELP, which was designed to establish a global network of catchments to improve the links between

hydrology and the needs of society. HELP was expected to create a new approach to integrated catchment management by using real catchments with real water-related problems as the environment within which hydrological scientists, water resources managers and water law and policy experts could be brought together;

(b) The Joint International Isotope Hydrology Programme (JIIHP), the main objective of which was to enhance the utilization of isotope techniques in various water resources assessment and management operations. The programme would be convened in close cooperation with the International Atomic Energy Agency (IAEA);

(c) International Shared Aquifer Resources Management (ISARM). The IHP, in cooperation with IAH, FAO and the United Nations Economic Commission for Europe (UN/ECE), had launched that programme in recognition that there were many large regional aquifers shared by more than one country and were critical for national and regional water security;

(d) The UNESCO International Institute for Infrastructural, Hydraulics and Environmental Engineering (IHE) Institute for Water Education and Training, the aim of which was to strengthen freshwater resources education. UNESCO was pursuing with the Government of The Netherlands the designation of the IHE in Delft as a UNESCO Centre of Excellence in Water Resources Education.

19.1.22 He referred also to the establishment of the Secretariat of the WWAP within the UNESCO Headquarters (see also general summary paragraph 19.1.4) and the joint sponsorship of IGRAC by WMO and UNESCO (see general summary paragraphs 12.5.3 to 12.5.5). In closing, he emphasized that, for the IHP, the HWRP was the most important and natural partner within the intergovernmental community.

19.1.23 The Commission noted that WMO had continued its collaboration with other agencies of the United Nations system, including WHO on water quality, FAO on land and water management, and the United Nations Economic Commissions within their respective regions. The Commission recalled the many contributions made by WMO during the 1990s to the International Decade for Natural Disaster Reduction (IDNDR), including the publication in 1999 of the WMO report *Comprehensive Risk Assessment for National Hazards* (WMO/TD-No. 955). Now that the Decade had finished, the Commission saw it as important that WMO play an active role in the newly established inter-agency initiative entitled International Strategy for Disaster Reduction, in particular as regarded efforts to reduce losses from water-related disasters.

19.1.24 The Commission recognized the importance of WMO maintaining contact with the United Nations Development Programme (UNDP), the World Bank and the various regional development banks, in particular because of the valuable work they undertook in areas that were of importance to NHSS and to projects in which WMO itself was involved.

19.2 COOPERATION WITH INTERNATIONAL RIVER BASIN COMMISSIONS AND NON-GOVERNMENTAL ORGANIZATIONS (agenda item 19.2)

19.2.1 The Commission noted that WMO maintained contact with a number of international river basin commissions, such as those of the Rhine, the Elbe, the Niger, the Nile, the Danube and the Lake Chad Basin, leading to very fruitful collaboration on a number of joint projects.

19.2.2 The representative of the International Commission for the Hydrology of the Rhine Basin (CHR) informed the Commission about its activities since its foundation in 1970. He drew attention in particular to the IHP and HWRP framework within which the CHR was working. Recent projects were concerned with the impacts of climate variability and change on the runoff regime, sedimentation, use of GIS information, development of an alarm model and assessment of flood forecasting models.

19.2.3 The representative of Germany briefly informed the Commission about cooperation between the 13 countries sharing the Danube Basin. That cooperation was similar to that on the River Rhine in that it was implemented within the framework of UNESCO's IHP and WMO's HWRP. That cooperation had two pillars: one was that every second year a conference on hydrological forecasting was organized and the other involved cooperation between experts. That cooperation had become a very useful vehicle for bringing together many different interests in the Danube Region and had been maintained since the beginning of the International Hydrological Decade in 1965. The first result of that cooperation was the elaboration of a comprehensive monograph, which was published in 1986 in German and Russian. It was later published also in English and French. After the publication of the monograph, the cooperation continued on specific issues, which were of common interest to all Danube countries. Those issues related to water balance, sedimentation and the runoff regime. In the light of the implementation of the European Water Directive, the overlapping of programmes and activities on the River Danube was under careful study.

19.2.4 The representative of Germany informed the session of the network of hydrological and ecological institutes of the European Union called Euraqua. One institute from each State was a member of the network and it was intended to expand it to the eastern neighbours in the future. Every year a technical conference was held on a specific hydrological or ecological problem of common concern. The main goal of that network was to exchange knowledge and to have influence on the water-oriented research agenda in the European Union.

19.2.5 The representative of the Niger Basin Authority (NBA) referred to its cooperation with WMO in a number of fields, including the HydroNiger project, which played a major role in the subregion in terms of hydrological forecasting on a scale as large as the River Niger Basin. He recalled that that cooperation had concerned equipment, training, personnel and technical advice. In recognition of that exemplary cooperation, the Council

of Ministers of the Authority had expressed its deep appreciation to WMO at their meetings in 1998, 1999 and 2000. The NBA hoped that such cooperation would be further strengthened in the future, particularly within the context of WHYCOS and various NBA projects.

19.2.6 The Commission was informed of the International Commission for the Protection of the Elbe which had been established 10 years earlier and comprised three members: the Czech Republic, Germany and the European Union. It dealt mainly with problems of water quality protection, but also with the water quality and sediment transport regime of the Elbe River. In the field of hydrology, there were two working groups currently active, the Working Group on Hydrology and the Working Group on Flood Protection. After several big floods in Europe during recent years, attention was now focusing on regional flood problems and the influence on those floods of human activities in the Basin. The main outputs already achieved in that regard were reports on "Hydrological aspects of floods in the Elbe Basin" and "Strategy for flood protection in the Elbe Basin".

19.2.7 The Secretariat advised the Commission of developments since its last session as regarded the GWP and the WWC, it being represented on the Board of Governors of the latter. The Commission noted the new dimension that those bodies brought to international activities in the field of freshwater and that, although WMO's involvement had not as yet led to any funding for activities supportive of NHSs, the potential remained and the partnership did offer a valuable point of contact between representatives of countries, international organizations and donors. There was the hope that funding might be obtained through those channels for a global flood initiative proposed by WMO.

19.2.8 The Commission noted the outcome of the Second World Water Forum and of the Ministerial Conference which had been held in The Hague, The Netherlands in March 2000, in particular the call in its Ministerial Declaration for the Secretary-General of the United Nations to strengthen further the coordination and coherence of activities on water issues within the United Nations system, and also the Ministers' commitment to work within the United Nations system and to adopt consistent positions in the respective governing bodies to enhance coherence in those activities.

19.2.9 The representative of Japan briefed the session on preparations for the Third World Water Forum, to be held in that country in March 2003. The secretariat preparing the conference was established in July 2000 with the support of several Japanese governmental organizations, including the Ministry of Construction. The organizers sought the cooperation of relevant United Nations organizations, including WMO, and also non-governmental organizations in order to ensure the success of the Forum. The aim was to share experiences among countries in coping with various water-related problems, including floods, water shortage and deteriorating water quality. The plans for the Forum were open to public on the Internet, the Web site being <http://www.water-forum3.com>.

19.2.10 The Commission noted that the Fourth World Water Forum was expected to be held in Montreal in 2006.

19.2.11 The Commission also noted that, while those new developments had been followed and, as appropriate, supported by WMO, the Organization had maintained its long standing cooperation with other non-governmental bodies, in particular the IAHS and the International Organization for Standardization (ISO), and had recently strengthened its link with the IAHR.

19.2.12 The representative of the IAHS brought the greetings of its president, Mr J. Rodda, and the president-elect Mr K. Takeuchi. He expressed the satisfaction of IAHS with the close collaboration that existed between the Association and WMO in a number of fields. He took the opportunity of expressing thanks to WMO for its support to the Fifth IAHS Scientific Assembly, held in Rabat in 1997, and to the General Assembly of the International Union of Geodesy and Geophysics (IUGG), held in Birmingham in 1999, which gave scientists from developing countries the opportunity to participate in those events.

19.2.13 IAHS shared the concern expressed by Professor Obasi in his opening address at the proliferation of initiatives and agencies concerned with water problems. In that regard, the Association sought further collaboration with both WMO and UNESCO and was willing to lend its utmost support to such collaboration, as it had in the past.

19.2.14 The work of IAHS focused on the long-term future of hydrology and on a better understanding of its relationship with water management. The Sixth IAHS Scientific Assembly would be held from 18 to 27 July 2001 in Maastricht, The Netherlands on the theme "Water for a thirsty planet".

19.2.15 The representative of the International Geographical Union (IGU) spoke of its strong interest in hydrology and water-related issues. The General Assembly in Seoul in August 2000 had established a new Study Group on Water Sustainability. That succeeded the recent Group on Regional Hydrological Response to Climate Change, which had published a book with that title with Kluwer, and the Group on Environmental Change and Extreme Hydrological Events, which had a number of special issues in international scientific journals currently in press. The new group aimed to foster research into the interactions and feedback between water resources and the environment, and had put forward a proposal for a new *Atlas of World Water Resources* to cover environmental, socio-economic and political aspects as well as the dynamics of water fluxes. Discussions had been under way on possible links with the WWDR, but substantial funding was still being sought for that project.

20. SCIENTIFIC LECTURES (agenda item 20)

The Commission devoted the afternoon of 14 November and the morning of 15 November to a series of scientific lectures on the subjects "Hydrology:

an African perspective" and "Global issues in hydrology". Annex III to this report contains the programme of the scientific lectures.

21. NOMINATION OF EXPERTS AND WORKING GROUP MEMBERS (agenda item 21)

21.1 In order to carry out its programme of work between the eleventh and twelfth sessions, the Commission established an AWG and two other working groups composed of a total of 20 members. The composition of those working groups, the names of their members and their terms of reference are given in Resolution 1 (CHy-XI).

21.2 In so far as possible, the chairpersons and members of the working groups were designated during the session. The president was authorized to designate substitutes should any of those selected be unable to serve, taking into consideration, in those cases, the candidates that had already been submitted to the Commission by Members before CHy-XI.

21.3 The Commission recommended that, if possible, the two working groups hold their first meeting at the same time and place to enable the plans for their future activities to be coordinated. The Commission also recommended that, once the working groups had established their work plans, the AWG would decide how best to provide the support of associate experts and, through the president, appoint such experts to assist the working groups in undertaking their tasks. The procedure for the identification and selection of associate experts should be the same as that applied in the last inter-sessional period.

21.4 As regarded the participation in their work by experts nominated by other governmental or non-governmental organizations, the Commission noted that the existing working arrangements between WMO and those organizations provided for such participation and recommended that the president and Secretary-General take every opportunity to invite the organizations concerned to contribute to the work of the Commission.

22. REVIEW OF PREVIOUS RESOLUTIONS AND RECOMMENDATIONS OF THE COMMISSION AND OF RELEVANT EXECUTIVE COUNCIL RESOLUTIONS (agenda item 22)

22.1 The Commission examined the resolutions and recommendations adopted at its tenth session, as well as the Executive Council resolution relating to CHy activities which was still in force, namely Resolution 9 (EC-XLIX) — Report of the tenth session of the Commission for Hydrology. The decisions of the Commission in that regard were incorporated in Resolution 2 (CHy-XI) and Recommendation 2 (CHy-XI).

22.2 It was recognized that much of the substance of Recommendation 2 (CHy-IX) — Support to global data centres, had been incorporated by Congress in its Resolution 21 (Cg-XII) — Global Runoff Data Centre, which had subsequently been kept in force by Thirteenth Congress. Nevertheless, the Commission decided to keep its original recommendation in force in order to demonstrate its continuing support for the

important work of the global data centers operating under the auspices of WMO and recorded its thanks to the Members that bore the major financial responsibility for their operation. It was expected that plans for IGRAC (see general summary paragraph 12.5.3 and Recommendation 1 (CHy-XI)) and other data and information centers would come to fruition by the time of CHy-XII when an updated recommendation could be adopted to replace Recommendation 2 (CHy-IX).

22.3 Recommendation 1 (CHy-X) — Hydrological networks, was kept in force because of the continuing concern of the Commission for the maintenance of such networks and the need of data for global studies.

22.4 As requested in Recommendation 2 (CHy-X) — Participation of women in the work of the Commission, the president of CHy reported on the participation of women during inter-sessional meetings and at CHy-XI. He regretted that usually one, and at most three, women had attended subsidiary bodies of CHy over the past four years and, while the participation of women in CHy-XI was significantly better than in CHy-IX, it was well below that of CHy-X. While the Commission was pleased to note that its recommendation had led the way for other technical commissions to adopt similar positions, and that the gender issue was now being considered more widely within WMO, it regarded the current situation within CHy as unsatisfactory. Accordingly, the Secretariat was encouraged to involve more women in CHy activities as and when it was in a position of making a choice.

22.5 The Commission recognized, however, that its room for choice, and that of the Secretariat, depended on their being sufficient qualified candidates. That in turn, depended on the extent to which women participate in the work of NHSS. A number of delegations reported on their efforts and aspirations in that regard.

22.6 In view of the above, the Commission decided to keep in force Recommendation 2 (CHy-X).

23. ELECTION OF OFFICERS (agenda item 23)

Messrs D. G. Rutashobya (United Republic of Tanzania) and B. J. Stewart (Australia) were elected president and vice-president, respectively, of the Commission for Hydrology for the next inter-sessional period.

24. DATE AND PLACE OF THE TWELFTH SESSION (agenda item 24)

The Commission agreed that its twelfth session should be held in the second half of 2004.

25. CLOSURE OF THE SESSION (agenda item 25)

25.1 At the close of the session, Mr K. Hofius expressed his satisfaction with the work that had been accomplished, much of the credit going to those who had chaired the various committees and working parties. Members of the Commission thanked the president for his competent and dynamic leadership over the previous eight years.

25.2 The principal delegate of Australia expressed appreciation on behalf of Mr J. Zillman, Permanent Representative of Australia and President of WMO, for the dedicated, constructive and promotional role that Mr K. Hofius had played as president of the Commission.

25.3 Nigeria was warmly thanked for hosting the session and for extending such generous hospitality, reference being made in particular to the staff of the Permanent Representative and that of his Hydrological Adviser.

25.4 The WMO Secretariat was thanked for its support to the work of the Commission, not only during the session, but also during the inter-sessional period. Mr A. Askew responded on behalf of the Secretary-General of WMO by expressing pleasure at the successful outcome of the meeting.

25.5 The eleventh session of the Commission for Hydrology closed at 12.25 p.m. on 16 November 2000.

RESOLUTIONS ADOPTED BY THE SESSION

RESOLUTION 1 (CHy-XI)

WORKING GROUPS AND EXPERTS OF THE COMMISSION FOR HYDROLOGY

THE COMMISSION FOR HYDROLOGY,

NOTING:

- (1) Resolution 16 (Cg-XIII) — Hydrology and Water Resources Programme,
- (2) The report of the president of the Commission for Hydrology (CHy),
- (3) The reports of the working groups which the Commission established at its tenth session,
- (4) The report of the Secretary-General regarding the activities of the Commission during its previous inter-sessional period,
- (5) That it is standard practice for the work plans of all CHy working groups to be approved by the president of the Commission before being implemented,

CONSIDERING the valuable role that can be played by the experts of national agencies, as members of working groups, in implementing the activities of the Commission,

DECIDES:

- (1) To re-establish the Advisory Working Group (AWG) of the Commission for Hydrology, acting also as the Steering Committee for the Hydrological Operational Multipurpose System (HOMS), with the terms of reference given in the annex to this resolution;
- (2) To establish:
 - (a) A Working Group on Water Resources;
 - (b) A Working Group on Hydrological Forecasting and Prediction;each composed of a chairperson and member experts whose terms of reference are given in the annex to this resolution;
- (3) To establish the following general terms of reference applicable to all working groups and experts:
 - (a) Members of working groups are each to review the sections of the *Guide to Hydrological Practices* (WMO-No. 168) and *Technical Regulations* (WMO-No. 49) relevant to their particular areas of responsibility and

to prepare specific proposals for revisions and/or additions to be included in future editions of these two publications;

- (b) Members of working groups are each to advise and assist the president of CHy and the WMO Secretariat, as appropriate, in the development of HOMS components and sequences within the general subject area related to their terms of reference;
 - (c) Members of working groups are to take account of relevant international agreements and conventions and of the activities of other international organizations working in fields related to theirs when fulfilling the tasks specified in their individual terms of reference;
 - (d) Members of working groups are to submit a work plan through the chairperson of their working group to the president of the Commission for his approval and are to report to their chairperson and the WMO Secretariat on a continuing basis, at no less than six monthly intervals, including in relation to monitoring of new developments;
 - (e) Members of subject-oriented working groups are each to submit a final report to the Commission, through the chairperson of their respective working groups, at least seven months before the twelfth session of the Commission;
 - (f) Subject-oriented working groups of the Commission are each to submit a final report to the president of the Commission not later than six months before the twelfth session of the Commission;
- (4) To invite those whose names are given in the annex to this resolution to serve in the capacities indicated therein.

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ANNEX TO RESOLUTION 1 (CHy-XI)

COMPOSITION AND TERMS OF REFERENCE OF THE WORKING GROUPS AND EXPERTS OF THE COMMISSION FOR HYDROLOGY AS ESTABLISHED AT ITS ELEVENTH SESSION

PART A

ADVISORY WORKING GROUP OF THE COMMISSION FOR HYDROLOGY
(ALSO THE STEERING COMMITTEE FOR HOMS)

1. President of CHy

D. G. Rutashobya (United Republic of Tanzania)

- (a) To undertake the duties required of a president of a WMO technical commission;
- (b) To chair meetings, as required, within the above duties, including for example, the CHy Advisory Working Group and the World Hydrological Cycle Observing System (WHYCOS) International Advisory Group;
- (c) To represent CHy both within WMO and at a range of other meetings, workshops and conferences;
- (d) To promote recognition and increase awareness of the role of water resources assessment in hydrology and water resources.

2. Vice-president of CHy

B. J. Stewart (Australia)

- (a) To assist the president of the Commission as and when required;
- (b) To ensure that the activities of the regional associations, and in particular the regional Working Groups on Hydrology (WGH), are coordinated within the overall Commission activities and that there is effective communication between the Commission and the WGH (in particular, to seek information and case studies from the WGH on methodologies for the reconstruction of time-series of natural streamflow data and the social and economic value of hydrological forecasts);
- (c) To promote World Resources Assessment (WRA) activities within the WGH;
- (d) To provide a liaison function between CHy and non-governmental organizations and the United Nations Educational, Scientific and Cultural Organization (UNESCO) regional activities;
- (e) To monitor and report on changes in the role of National Hydrological Services (NHSs).

- 3. Member responsible for the WMO Hydrology and Water Resources Programme (HWRP) and the UNESCO International Hydrological Programme (IHP) joint initiatives

M. Garcia de Mejia (Ms) (Colombia)

- (a) To monitor, provide input to, and report on, joint activities undertaken between the HWRP of WMO and the IHP of UNESCO, including those relating to:
 - (i) WRA;
 - (ii) The World Water Development Report (WWDR);
 - (iii) The Hydrology for the Environment, Life and Policy (HELP) initiative;
 - (iv) The *International Glossary of Hydrology*;
 - (v) The International Groundwater Resources Assessment Centre (IGRAC);
- (b) To assist the vice-president of CHy regarding the UNESCO regional activities.

- 4. Member responsible for international data exchange

J. Wellens-Mensah (Ghana)

- (a) To monitor and report on the application of Resolution 25 (Cg-XIII) — Exchange of hydrological data and products, by Members;
- (b) To provide or update promotional and guidance material relative to Resolution 25 (Cg-XIII), as required;
- (c) To promote the application of Resolution 25 (Cg-XIII) within the Hydrological Cycle Observing System (HYCOS) projects as, and when, necessary;
- (d) To monitor and report on the activities of the international data centres, including the Global Runoff Data Centre (GRDC), the Global Precipitation Climatology Centre (GPCC), and IGRAC, if established;
- (e) To coordinate, review, modify and submit to CHy aspects related to Hydrological Information Referral Service (INFOHYDRO).

- 5. Member responsible for CHy input to internal WMO activities

K. Hofius (Germany)

- (a) To coordinate the collection, review and submission to CHy of material for the *Technical Regulations* (WMO-No. 49) and the *Guide to*

<p><i>Hydrological Practices</i> (WMO-No. 168), with an emphasis on groundwater and health and safety issues;</p> <p>(b) To assist the AWG in fulfilling its duties as outlined in the Implementation Plan for HOMS;</p> <p>(c) To coordinate the editing and publication of reports prepared on behalf of CHy;</p> <p>(d) To advise the president of CHy with respect to activities undertaken in cooperation with other Commissions (e.g. the Commission for Basic Systems (CBS), the Commission for Climatology (CCI) and the Commission for Instruments and Methods of Observation (CIMO) (instrument calibration));</p> <p>(e) To monitor the education and training requirements of the Commission's programmes;</p> <p>(f) To advise the president of CHy on activities undertaken in association with WHYCOS.</p> <p>6. Member responsible for sustainable water resources practices</p> <p style="text-align: center;">Liu Heng (China)</p> <p>(a) To provide CHy input, monitor and report on activities associated with promoting the role of CHy in the sustainable management of water resources, including participation in:</p> <p>(i) Large-scale hydrological studies such as Global Energy and Water Cycle Experiment (GEWEX), the GEWEX Continental-scale International Project (GCIP), etc.;</p> <p>(ii) The Global Climate Observing System (GCOS), the Global Terrestrial Observing System (GTOS) and the Global Terrestrial Network - Hydrology (GTN-H);</p> <p>(b) To monitor and report on indicators of sustainable development of water resources, including indicators of aquatic ecosystem health and the impact of human activities on water resources;</p> <p>(c) To work closely with CHy Experts contributing to sustainable water resources practices;</p> <p>(d) To promote the application of the concept of sustainable water use in operational practices and legislative mechanisms, e.g. environmental impact assessment.</p> <p>7. Chairperson of the Working Group on Water Resources</p> <p style="text-align: center;">I. A. Shiklomanov (Russian Federation)</p> <p>(a) To manage, coordinate and report on the activities of the Working Group on Water Resources, including, in particular, the projects on:</p>	<p>(i) Automated real-time stage-discharge systems;</p> <p>(ii) Analysis of variability and trends in hydroclimatological data;</p> <p>(b) To coordinate activities and advise the president of CHy with respect to activities undertaken within the World Climate Programme (WCP)-Water.</p> <p>8. Chairperson of the Working Group on Hydrological Forecasting and Prediction</p> <p style="text-align: center;">P. J. Pilon (Canada)</p> <p>(a) To manage, coordinate and report on the activities of the Working Group on Hydrological Forecasting and Prediction, including, in particular, the project on risk management;</p> <p>(b) Should a project on global forecasts and warning be established, to manage, coordinate and report on this project.</p> <p>Tasks of the Advisory Working Group:</p> <p>(a) To serve as an active inter-sessional management and coordination body for the Commission's affairs and, in particular:</p> <p>(i) To assist the president in proposing or taking action on urgent matters referred to the Commission in accordance with General Regulation 146(b);</p> <p>(ii) To assist the president in reviewing the progress of the work of the Commission, in particular its working groups and experts, and in coordinating their work, as appropriate, with that of the Regional Associations' Working Group on Hydrology;</p> <p>(iii) To contribute, on behalf of the Commission, to the preparation of the Sixth WMO Long-term Plan with respect to hydrology and water resources and, in general, to assist the president and the WMO Secretariat in this task;</p> <p>(iv) To assist the president in the review of the activities of the Commission relevant to programmes of other international organizations;</p> <p>(v) To assist the president and the WMO Secretariat in addressing the issue of resource mobilization strategies for the HWRP, including the means of encouraging contributions to the WMO Trust Fund for Hydrology and water resources activities;</p> <p>(vi) Assisted by the WMO Secretariat, to coordinate the preparation of</p>
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<p><i>Technical Regulations</i> and the sixth edition of the <i>Guide to Hydrological Practices</i>, taking into account the decisions of the Commission on these matters;</p> <p>(vii) To contribute, as appropriate, to the implementation of the HWRP, individual members of the working group taking responsibility and contributing in relation to the topics listed under their names;</p> <p>(viii) To undertake any other activities requested by the president of the Commission;</p> <p>(b) To act as the Steering Committee for HOMS and thus:</p> <p>(i) To advise the president on the organization and strengthening of the network of HOMS National Reference Centres, on the coordination of inputs by the experts and working groups of CHy and the Regional Associations' Working Group on Hydrology to HOMS and on the implementation of HOMS in accordance with the Implementation Plan for HOMS in the Twenty-first Century;</p> <p>(ii) To monitor components and sequences for conformity with the <i>Technical Regulations</i> and appropriate standards;</p> <p>(iii) To assess the continued adequacy of the <i>HOMS Reference Manual</i> to satisfy the requirements of users and to propose improvements in substance and form;</p> <p>(iv) To assist in the approval of components and sequences and in the updating of the annexes to the <i>Manual</i>, as and when required;</p> <p>(v) To assist in the assessment of users' requirements for hydrological information as they pertain to HOMS.</p> <p style="text-align: center;">PART B WORKING GROUP ON WATER RESOURCES</p> <p>1. Chairperson I. A. Shiklomanov (Russian Federation)</p> <p>2. Expert on Data Management M. Kaneki (Japan)</p> <p>(a) To review and report on current data quality control procedures and update the <i>Guide to Hydrological Practices</i> accordingly;</p>	<p>(b) To identify the metadata standards and requirements for hydrological data collection systems and provide advice on how these might be implemented by NHSs and other data centres (e.g. HYCOS, the Global Runoff Data Centre (GRDC), etc.);</p> <p>(c) To review and provide guidance on methods of data and metadata presentation and requirements for water resources information systems;</p> <p>(d) To examine and identify the metadata requirements for the exchange of hydrological data and assist the AWG member responsible for international data exchange, as appropriate;</p> <p>(e) To determine the requirements for data rescue and provide advice to NHSs through CHy;</p> <p>(f) To assist the Project on an Automated Real-time Stage-discharge System;</p> <p>(g) To assist the Project on Analysis of Variability and Trends in Hydroclimato-logical Data;</p> <p>(h) To assist the Pilot Project on Metadata which is being lead by the GRDC.</p> <p>3. Expert on Network Design M. Morell (France)</p> <p>(a) To continue the work associated with the integration of specialized hydrological, including groundwater and surface water, networks to address high priority environmental and social issues, with a focus on urban areas and small islands;</p> <p>(b) To investigate the use of modern modelling technologies to increase network effectiveness;</p> <p>(c) To develop a methodology for a review of trends in national hydrological, including surface water and groundwater, networks in association with developments in the Hydrological Information Referral Service (INFOHYDRO);</p> <p>(d) To assist the development of a specialized network for the Project on Analysis of Variability and Trends in Hydroclimato-logical Data;</p> <p>(e) To provide guidance on approaches to ensure the economic sustainability of networks.</p> <p>4. Expert on Rating Curves/Flow Derivation N. Crookshank (Canada)</p> <p>(a) To develop a decision-support system which:</p> <p>(i) Provides a methodology for establishing rating curves based on hydraulic modelling;</p>
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<p>(ii) Provides an estimate of discharge and/or velocity for systems with an unstable control that has no unique rating curve;</p> <p>(b) To lead the Project on an Automated Real-time Stage-discharge system.</p> <p>5. Expert on Water Use and Conservation</p> <p style="text-align: center;">M. Malakani (Syria)</p> <p>(a) To provide advice on methods for collecting data and information on water use and demand and for assessing their impact with respect to future resource availability;</p> <p>(b) To review and develop methods for forecasting water availability, demand and use for both groundwater and surface water;</p> <p>(c) To report on water use reduction strategies and their successes and failures in relation to their impacts on the amount of water left for use;</p> <p>(d) To undertake some of these activities in association with the vice-president of the Commission;</p> <p>(e) To evaluate and prepare guidelines for assessing artificial groundwater recharge and its role within optimal water resources management.</p> <p>6. Expert on Statistical and Spatial Analysis of Hydroclimatological Variability and Trend</p> <p style="text-align: center;">U. Haryoko (Indonesia)</p> <p>(a) To review statistical procedures for variability and trend analysis;</p> <p>(b) To establish the criteria for station selection for a specialized reference network for variability and trend analysis;</p> <p>(c) To acquire the data, develop the necessary software and undertake the analysis of the data;</p> <p>(d) To provide input to WCP-Water including assisting in the Project on Analysis of Variability and Trends in Hydroclimatological Data;</p> <p>(e) To produce a report on the above activities;</p> <p>(f) To assess the impact of detected trends on groundwater and surface water availability.</p> <p>7. Expert on Technology Transfer and Capacity Building</p> <p style="text-align: center;">E. D. Udoeka (Nigeria)</p> <p>(a) To organize, with the assistance of CHy experts and associate experts, roving training workshops on priority topic areas such as flood forecasting, risk management and basic data acquisition systems;</p> <p>(b) To provide technology transfer and capacity building input to the WHYCOS project in close collaboration with the AWG member responsible for WHYCOS.</p>	<p>The task of the Working Group on Water Resources is to contribute, as appropriate, to the implementation of the HWRP, individual members of the working group taking responsibility and contributing in relation to the topics listed under their names.</p> <p style="text-align: center;">PART C WORKING GROUP ON HYDROLOGICAL FORECASTING AND PREDICTION</p> <p>1. Chairperson</p> <p style="text-align: center;">P. J. Pilon (Canada)</p> <p>2. Expert on Short-term Hydrological Forecasting</p> <p style="text-align: center;">S. V. Borsch (Russian Federation)</p> <p>(a) To document operational experience using quantitative precipitation forecasting (QPF);</p> <p>(b) To assess and report on emerging technologies/capabilities with respect to QPF;</p> <p>(c) To establish methods of validating ensemble forecasts;</p> <p>(d) To provide guidelines for NHSs on the use of uncertainty estimation techniques;</p> <p>(e) To establish the effect of scale of discretization for distributed models in view of parametric and input uncertainty;</p> <p>(f) To establish and report on the advantages/disadvantages of lumped versus distributed models;</p> <p>(g) To assist in the Project on Risk Management.</p> <p>3. Expert on Medium- to Long-term Forecasting</p> <p style="text-align: center;">F. Vidal Jara (Chile)</p> <p>(a) To review current progress in medium- to long-term hydrological forecasting/climate forecasting;</p> <p>(b) To establish and report on the advantages and disadvantages if employing these techniques;</p> <p>(c) To examine the benefits and capabilities of long-term climate prediction in association with hydrological prediction;</p> <p>(d) To assess approaches and provide guidance material for use in operational forecasting;</p> <p>(e) To examine the social benefits of these techniques.</p> <p>4. Expert on Remote Sensing</p> <p style="text-align: center;">A. S. Suh (Ms) (Republic of Korea)</p> <p>(a) To monitor and report on advances in remote sensing for hydrological applications with particular emphasis on identifying and reporting on its advantages and disadvantages in forecasting;</p>
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<p>(b) To assist in the implementation of the proposal for a training course on remote sensing;</p> <p>(c) To identify technology that is potentially suitable for HOMS components;</p> <p>(d) To assist in the Project on Risk Management.</p> <p>5. Expert on Risk Management</p> <p style="text-align: center;">J. A. Shamonda (Nigeria)</p> <p>(a) To develop a comprehensive risk evaluation and management strategy;</p> <p>(b) To promote and assist in the application of the strategy to a HYCOS initiative, including the development of a forecasting application for HYCOS aimed at risk reduction, in close collaboration with the AWG member responsible for CHy input to internal WMO activities;</p> <p>(c) To develop promotional material for flood plain management policies or strategies suitable for use by NHSs;</p> <p>(d) To develop public relations material and strategies for risk management suitable for use by NHSs;</p> <p>(e) To lead the Project on Risk Management;</p> <p>(f) To consider and compile best practices on the role of risk management for social and economic sustainability.</p> <p>6. Expert on Probable Maximum Precipitation and Flood</p> <p style="text-align: center;">Wang Guoan (China)</p> <p>(a) To review international developments and practices on probable maximum precipitation/probable maximum flood (PMP/PMF);</p>	<p>(b) To revise and update the manual on best practices for PMP/PMF;</p> <p>(c) To prepare a series of case studies on the subject from various major geographical and climatological areas, possibly aligned with the regional associations.</p> <p>7. Expert on Water Quality Alarm Systems</p> <p style="text-align: center;">A. Coudrain-Ribstein (Ms) (France)</p> <p>(a) To identify and collect case studies on water quality incidents, accidents and the use of water quality models in warning systems;</p> <p>(b) To identify the hydrological aspects of these case studies and ascertain the utility of hydrologically-based forecasting and prediction methodologies for various types of water bodies;</p> <p>(c) To provide advice on the development of water quality models for warning systems;</p> <p>(d) To monitor scientific and technical advances in detecting pollution transported by sediment processes and provide advice to NHSs through CHy;</p> <p>(e) To review material on this topic within the <i>Guide to Hydrological Practices</i> and to prepare additional materials, as necessary, for inclusion in the <i>Guide</i>.</p> <p>The task of the Working Group on Hydrological Forecasting and Prediction is to contribute, as appropriate, to the implementation of the HWRP, individual members of the working group taking responsibility and contributing in relation to the topics listed under their names.</p>
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RESOLUTION 2 (CHy-XI)

REVIEW OF PREVIOUS RESOLUTIONS AND RECOMMENDATIONS OF THE COMMISSION FOR HYDROLOGY

THE COMMISSION FOR HYDROLOGY,

CONSIDERING that all resolutions adopted prior to its eleventh session are now obsolete,

NOTING the action taken on the recommendations adopted prior to its eleventh session,

DECIDES:

(1) Not to keep in force any of the resolutions of its prior sessions;

(2) To note with satisfaction the action taken by the competent bodies on the recommendations of its prior sessions and to keep in force Recommendation 2 (CHy-IX) — Support to global data centres, and Recommendations 1 (CHy-X) — Hydrological networks, and 2 (CHy-X) — Participation of women in the work of the Commission, all other recommendations now being redundant.

RECOMMENDATIONS ADOPTED BY THE SESSION

RECOMMENDATION 1 (CHy-XI)

ESTABLISHMENT OF AN INTERNATIONAL GROUNDWATER RESOURCES ASSESSMENT CENTRE (IGRAC)

THE COMMISSION FOR HYDROLOGY,

NOTING:

- (1) The recommendation addressed to WMO and the United Nations Educational, Scientific and Cultural Organization (UNESCO) by the Fifth UNESCO/WMO International Conference on Hydrology (Geneva, February 1999) to consider setting up a global groundwater information centre,
- (2) The need for such a centre expressed at a number of technical meetings, including the fourth session of the Global Runoff Data Centre (GRDC) Steering Committee (Koblenz, June 1999),
- (3) The recommendation of the second session of the CHy Working Group on Applications (Geneva, December 1999) on the creation of an international groundwater resources assessment centre,
- (4) The subsequent proposal by the CHy Advisory Working Group that this matter be considered by CHy-XI,

RECOGNIZING the role of WMO in supporting the collection, processing and distribution of hydrological and related data, particularly at the regional and international levels,

NOTING, with appreciation, that the Netherlands is considering establishing an International Groundwater Resources Assessment Centre (IGRAC) functioning under the auspices of WMO and UNESCO, for which the Netherlands Institute of Applied Geoscience TNO has been proposed as the focal point, collaborating with, and drawing on, the expertise of other Members,

NOTING ALSO that Resolution 25 (Cg-XIII) — Exchange of hydrological data and products, which adopts a stand

of committing to broadening and enhancing, whenever possible, the free and unrestricted international exchange of hydrological data and products would be applicable in particular to the operation of IGRAC,

CONSIDERING that this Centre will contribute greatly to the WMO HWRP and the International Hydrological Programme of UNESCO and to the work of a number of other United Nations agencies, and should fulfill an important role in the preparation of the biennial United Nations World Water Development Reports,

CONSIDERING also that this Centre will contribute to the support of hydrogeological services at the national level through standardization of procedures, training and development of applications,

REQUESTS the Secretary-General of WMO to collaborate with the Director-General of UNESCO in facilitating the establishment of such a Centre, in particular by:

- (a) Mobilizing financial support from different sources, including international financial institutions, regional banks and foundations, for the successful implementation of the proposed Centre;
- (b) Setting up an International Steering Committee for guiding the work of the proposed Centre;
- (c) Taking care that the proposed Centre will closely coordinate its activities with those of other relevant United Nations bodies, in particular the United Nations Environment Programme (UNEP) and the International Atomic Energy Agency (IAEA), and other current global or regional activities;

ENCOURAGES Members and appropriate United Nations agencies to support and collaborate in the establishment and the functioning of the Centre.

RECOMMENDATION 2 (CHy-XI)

REVIEW OF THE RESOLUTION OF THE EXECUTIVE COUNCIL BASED ON PREVIOUS RECOMMENDATIONS OF THE COMMISSION FOR HYDROLOGY

THE COMMISSION FOR HYDROLOGY,

NOTING with satisfaction the action taken by the Executive Council on the previous recommendations of the Commission for Hydrology addressed to it,

CONSIDERING that these recommendations have become redundant in the meantime,

RECOMMENDS that the following Executive Council resolution be no longer considered necessary: Resolution 9 (EC-XLIX) — Report of the tenth session of the Commission for Hydrology.

ANNEXES

ANNEX I

Annex to paragraph 15.2.2 of the general summary

MEETINGS IN HYDROLOGY AND WATER RESOURCES TENTATIVELY PLANNED FOR 2001–2004

2001

Session of CHy Advisory Working Group
Session of CHy Working Group on Water Resources
Symposium on the Management of Hydrological Services
Meeting of representatives of HNRCs
Meeting of the WHYCOS International Advisory Group
Regional Technical Conference on Flood Disaster Prevention
RA V Working Group on Hydrology
RA VI Working Group on Hydrology
Expert Meeting on Studies of Environmental Change
Session of the WMO/UNESCO Liaison Committee on Hydrology
Regional Workshop on Marketing of Hydrological Products

2002

Session of CHy Advisory Working Group
Meeting of the WHYCOS International Advisory Group
Session of CHy subject-oriented working group
Expert Meeting on Technology Transfer in Disaster Reduction
RA I Working Group on Hydrology

2003

Session of CHy Advisory Working Group
Meeting of the WHYCOS International Advisory Group
Session of CHy subject-oriented working group
Expert Meeting on Technology Transfer in Disaster Reduction
Expert Meeting on Urban Hydrology

2004

Technical Conference on International River Basins
Workshop on Rainfall: Runoff Simulation Models

ANNEX II

Annex to paragraph 16.3.3 of the general summary

LONG-TERM PLANNING AND THE STRUCTURE OF WMO AS REGARDS HYDROLOGY AND WATER RESOURCES

Views formulated by the WMO Commission for Hydrology at its eleventh session (Abuja, November 2000)

Introduction

1. In recent years, the governments of the world have come to realize the serious problems faced by many countries in managing their limited resources of fresh-water, in protecting their peoples and the environment from the extremes of flood and drought and in adapting to variability and change of hydrological regimes and availability of water resources both in quantity and quality. If these problems are to be solved, there will be a need to improve greatly our knowledge of these resources at the national and global levels and of their

likely future variability in space and time. This, in turn, demands that WMO plays a significant role in assisting countries to meet this challenge.

2. The 5LTP in its present form provides a good basis for the implementation of the activities of the Organization in the field of hydrology and water resources. In addition to activities already included within the 5LTP, there are other aspects of relevance that might be considered for inclusion as future activities in the 6LTP. In particular, some of the aspects that are presently not well covered are:

- (a) Aspects of drought;
- (b) Intercomparison of methods of hydrological observations;

- (c) Networking and interaction of NHSs in the regions;
- (d) Integrated activities of Meteorological and Hydrological Services on the national, regional and global levels; and
- (e) The socio-economic and environmental dimension of activities.

Future activities of the HWRP need to consider more output-oriented objectives. All future activities and programmes need to be prioritized. The Commission requested its Advisory Working Group to establish and monitor these priorities.

3. With a view to the development of the 6LTP, various issues are presented below on the basis of national, regional and global interests and from a programmatic and organizational view with regard to recommended changes in the priorities, structure and working mechanisms of WMO.

National issues

4. The devolution of hydrological activities and services from the national to the local level in many member countries calls for an improved coordination of projects and activities at the national level, in particular with regard to the water-related activities of international organizations such as WMO.

5. Institutionalized linkages should be established between NHSs so as to ensure, *inter alia*, the timely communication of information between these organizations and between them and regional and global activities. This improved communication is important for enhanced forecasting and prediction, including ensemble forecasts which, together with targeted capacity building, can reduce the economic impacts of floods, droughts and changes of hydrological regimes and improve among other things the planning of agricultural and navigational activities. This will permit greater account to be taken of improved climate predictions in providing advice to agriculture, industry inland navigation and those responsible for urban development, particularly in low-lying coastal areas where the competition for land and water resources is becoming acute. The linkage of Meteorological and Hydrological Services should be seen in the context of sustainable development and protection of the environment.

6. In order to enhance the visibility of NHSs, and therefore to promote adequate funding of these services, benchmarking methods should be introduced in the monitoring of the services they provide. Cost-benefit studies should be undertaken to evaluate the value-added capacities of NHSs.

7. To give NHSs greater visibility, they might explore the possibility of including some form of hydrological outlook/advisory in weather presentations on television, radio, the Internet and other appropriate media.

Regional and global issues

8. WMO should be the authoritative voice on weather, climate and the coordinated monitoring of freshwater, including in providing science-based advice for Governments and in briefing the media. WMO should be

recognized as a unique platform for the exchange of data and all relevant information related to forecasting, early warning, state-of-the-art information on instruments and methods of observation and integrated operational modelling of the hydrological and water resources systems, considering the close linkages between climate, weather and water as well as sector-specific requirements at the national, regional and global levels.

9. It is important to take account of the peculiar nature of the integration of hydrology from the basin level up to the global level and to ensure that data from basins feeding into global programmes meet the requirements. A strategy should be developed to assist Members to meet WMO minimum standards for stations and network densities, based in part on the further implementation of WHYCOS.

10. Timely and accurate provision of improved forecasts are vital for the public, Governments and interested parties throughout the world. In particular, attention should focus on the social dimension of improved and accurate forecasting of extreme events and the detection of change in the pattern and distribution of rainfall and runoff. This is of critical importance in vulnerable regions and for societies with inadequate capacity to respond to, adapt or mitigate the impact of extreme events and environmental change.

11. With a view to increasing the visibility and value of the work of NHSs, periodic outlooks of water resource availability should be produced on the country, regional and global scales in close interaction with the relevant climate-related programmes of WMO and its Members.

12. The widely different state of development of NHSs and their capacity to produce relevant outputs must be taken into account. The networking of NHSs on a regional basis could provide a sound basis for the development of those NHSs which are lagging behind in their operational capacity.

Programme areas

13. The present programme areas of the HWRP are well positioned with regard to the evolving user needs; they need amendment as specified in paragraph 2 above. An important role of WMO in these aspects is also the development and promotion of standardized methods for instrumentation, observation and data transfer.

Organizational matters and the structure of WMO

14. The structure and organization of WMO has an important impact on how it is viewed by its various constituent communities, of which the hydrological community is one. Also important is the corresponding organizational structure at the national level, which can aid or hinder contacts and cooperation with WMO.

15. WMO Regional and Subregional Offices, as presently constituted, do not include the hydrological expertise needed to serve the hydrology and water resources communities in the regions, something which has been noted by the Executive Council in the past.

16. The organization of WMO and its structure need to be viewed from the perspective of overall evolving

technological trends, globalization and changes in the United Nations system. These changes should be closely monitored to ensure compatibility and optimize the effects of such changes with respect to the implementation of the programmes or projects of WMO. This relates in particular to WMO's activities in the HWRP and its relations with other governmental and non-governmental organizations.

17. Overlaps in programme activities of various organizations can be beneficial, whereas duplication should be avoided under all circumstances. Even closer cooperation between WMO and water-related programmes of other organizations, notably UNESCO, will therefore be indispensable in the future. This cooperation will be more effective, if the position of hydrology in WMO is further strengthened.

18. While cooperation with non-governmental bodies can add flexibility to the implementation of activities of WMO, it is important to ensure adequate backing of agreed programmes and activities by Members.

19. Water-related activities contribute significantly to the programmes and projects of WMO. The increasing importance of the water problems referred to in paragraph 1 above gives these activities high public visibility which will surely grow more in the future. WMO could therefore benefit from this development, provided its activities are strengthened accordingly and provided it is seen by the wider community as being a major actor in this field.

20. One means of improving WMO's visibility in this regard would be for hydrology to be mentioned, if not in the title, then in a subtitle of the Organization in an appropriate manner.

21. It is important to maintain a specific body within the WMO structure which can advise on, and oversee, the Organization's work in hydrology and water resources. This role is currently fulfilled by the Commission for Hydrology, which should therefore be maintained, even if amended in a form to suit any new overall structure of the Organization.

22. Corresponding changes at the national level might include the establishment of national committees to provide a platform for hydrological data collecting agencies (surface water, groundwater, climate data) to coordinate their activities. This could eventually be followed by the formation of joint committees with those of UNESCO's IHP to coordinate water-related activities of WMO and UNESCO and other organizations and global programmes. It may be noted that France, Germany and the Netherlands, among other things, already have joint national focal points, even joint national committees, for the IHP of UNESCO and the HWRP of WMO.

23. The activities of WMO, and the Commission in particular, are not always as well known in the hydrological community as they should be. This restricts the contributions provided to WMO and limits the use of the results achieved by the Organization. WMO's channels of communication with NHSs and the broader hydrological community should be reviewed and, as necessary, revised so as to encourage a feeling of joint responsibility and commitment for the Organization on the part of the NHSs.

24. This leads again to the wish that NHSs should be represented, not only on the Commission, but also in the Executive Council and Congress with full voting rights and with the possibility of their representatives being elected to all positions, even if this would mean an increase in the membership of the Council. While recognizing that this might call for some countries to provide greater financial contributions to the regular budget of WMO, it would greatly facilitate the cooperative agreements between NHSs and National Meteorological Services (NMSs) at the regional and global levels which are essential to improving the effective operation of both Services.

25. As regards to the functions of the Commission, its activities should be both service- and technical oriented. In this regard, the experts nominated by the Commission should closely interact with the experts in the Working Groups on Hydrology of the respective regional associations so as to enable the transfer of expertise in matters of interest to the association and to ensure the global implementation of its activities in a consistent and well coordinated manner.

26. More efforts should be made to mobilize additional resources for the activities of the Commission on all levels in the context of projects. WMO funds should be handled in a centralized manner so as to ensure the most efficient use of limited resources.

Activities of the Commission for Hydrology

27. Within the context of organizational and structural changes of WMO, changes are also necessary in the activities of the Commission in order to contribute to a more efficient implementation of its programmes and projects.

28. The Commission, together with the regional Working Groups on Hydrology, should play a proactive role in facilitating the establishment of cooperative networks between the activities of various international organization.

29. Many activities of the Commission could be built in the form of modules that complement WHYCOS and HOMS, especially in the areas of capacity building, methods of observations, forecasting and product development for hydrological services.

ANNEX III

Annex to paragraph 20 of the general summary

PROGRAMME OF SCIENTIFIC LECTURES

Abuja (Nigeria) 14 and 15 November 2000

HYDROLOGY: AN AFRICAN PERSPECTIVE

Tuesday, 14 November 2000, 3–5.30 p.m.

OpeningRiver Niger: Actual situation and prospects
I. A. Olomoda (Niger Basin Authority)Challenges facing hydrological services in Africa
J. Wellens-Mensah (Ghana)Characteristics of the February 2000 floods on the upper
Limpopo River basin and effects of dam management
S. Van Biljon (South Africa)A review and prospects of regional cooperation for water
resources development in west and central Africa
J. A. Hanidu (Nigeria)**GLOBAL ISSUES IN HYDROLOGY**

Wednesday, 15 November 2000, 9.30 a.m.–12.30 p.m.

Scale issues and multifractals in hydrology
P. Hubert (International Association of
Hydrological Sciences)Hydrology for the environment, life and policy (HELP)
J. Wallace (United Kingdom)Development of a global hydrologic network for under-
standing the impacts of climate change on our water
resources and aquatic ecosystems
T. R. Yuzyk (Canada) and P. J. Pilon (Canada)

APPENDIX A

LIST OF PERSONS ATTENDING THE SESSION

A. REPRESENTATIVES OF WMO MEMBERS

<i>Member</i>	<i>Name</i>	<i>Capacity</i>	<i>Member</i>	<i>Name</i>	<i>Capacity</i>
Australia	B. J. Stewart Bureau of Meteorology G.P.O. Box 1289K Melbourne Victoria 3001 Tel: (61 3) 966 945 22 Fax: (61 3) 966 947 25 E-mail: b.stewart@bom.gov.au	Principal delegate	China	Chen Dekun Bureau of Hydrology Ministry of Water Resources Baiguang Road Beijing 100053 Tel: (86 10) 632 024 88 Fax: (86 10) 632 025 13 E-mail: dkchen@mwr.gov.cn	Principal delegate
Austria	I. Auer Central Institute for Meteorology and Geodynamics Hohe Warte 38 1190 Vienna Tel: (43) 136 026 2206 Fax: (43) 136 026 72 E-mail: ingeborg.auer@zamg.ac.at	Principal delegate		Liang Jiazhi Bureau of Hydrology Ministry of Water Resources Baiguang Road Beijing 100053 Tel: (86 10) 632 025 20 Fax: (86 10) 635 435 40 E-mail: ljz@mwr.gov.cn	Alternate
Belgium	R. Jilderda (14–16 XI) (see address under The Netherlands)	Principal delegate		Liu Heng Nanjing Institute of Hydrology Water Resources, MWR 1 Xikang Rd., Nanjing 210024 Tel: (86 25) 371 69 25 Fax: (86 25) 373 78 61 E-mail: hliu@china.com	Delegate
Benin	F. J. B. Hounton Service météorologique du Bénin BP 379, Cotonou Tel: (229) 306 627 Fax: (229) 300 839 E-mail: meteo@leland.bj	Principal delegate		Wang Guoan Reconnaissance, Planning, Design and Research Institute Yellow River Conservancy Commission, MWR 109 Jinghui Rd. Zhengzhou Tel: (86-371) 630 36 18 Fax: (86-371) 595 92 36 E-mail: ghc@yrec-design.com.cn	Delegate
Burkina Faso	F. N. Ouattara Direction de la météorologie nationale 01 BP 576, Ouagadougou Burkina Faso Tel: (226) 356 032 Fax: (226) 356 039 E-mail: dirmet@cenatrin.bf	Principal delegate		Yao Yong Xi 95 Tie Xin Giao Street Nanjing Tel: (86-25) 289 07 71 Fax: (86-25) 289 12 20 E-mail: naiwk@jionline.com	Delegate
Cameroon	E. Fotso Direction de la météorologie BP 186, Douala Tel: (237) 42 16 35 Fax: (237) 42 16 35	Principal delegate		Ying Alwen Bureau of Hydrology Ministry of Water Resources Baiguang Road Beijing 100053 Tel: (86 10) 632 024 26 Fax: (86 10) 632 025 13 E-mail: awying@mwr.gov.cn	Delegate
Canada	T. R. Yuzyk Atmospheric Monitoring and Water Survey Directorate Meteorological Service of Canada 373 Sussex Drive LaSalle Academy Room E123 Ottawa, Ontario Canada K1A 0H3 Tel: (613) 992 68 68 Fax: (613) 992 42 88 E-mail: ted.yuzyk@ec.gc.ca	Principal delegate			
	P. J. Pilon Monitoring Services Division Environment Canada 75 Farquhar St. Guelph, Ontario N1H 3N4 Tel: (519) 823 42 02 Fax: (519) 826 20 83 E-mail: Paul.pilon@ec.gc.ca	Alternate	Czech Republic	J. Kubát Czech Hydrometeorological Institute Na Sabatce 17, 14306 Prague 4 Tel: (4202) 401 66 17 Fax: (4202) 401 08 00 E-mail: kubat@chmi.cz	Principal delegate

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	E. Zihindula Kagayo METTELSAT BP 14754 Kinshasa Tel: (243) 880 36 56 Fax: (243) 128 22 13 E-mail: mettelsat@ic.cd	Alternate		K. Hofius IHP/OHP Sekretariat c/o Federal Institute of Hydrology Bundesanstalt für Gewässerkunde Postfach 309 56003 Koblenz Tel: (49 261) 1306 5313 Fax: (49 261) 1306 5422 E-mail: hofius@bafg.de	Alternate
Djibouti	Osman Saad Said Service météorologique de Djibouti BP 204 Aéroport de Djibouti Fax: (253) 340 723 E-mail: mtodji@intnet.dj	Principal delegate		H. J. Liebscher Bundesanstalt für Gewässerkunde Kaiserin-Augusta-Anlagen 18-17 56068 Koblenz Tel: (49 261) 1306 5307 Fax: (49 261) 1306 5363 E-mail: liebscher@bafg.de	Delegate
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Eritrea	G. H. Debesai Water Resources Department Ministry of Land, Water and Environment P.O. Box 1488 Asmara Tel: (291 1) 120 404 Fax: (291 1) 124 625 E-mail: wrd@gcmel.com.er	Principal delegate		J. Wellens-Mensah Hydrological Services Dept. P.O. Box MB 501 Accra Tel: (233 21) 685 526 Fax: (233 21) 663 268 E-mail: hsd@ghana.com	Alternate
Finland	P. O. Seuna Finnish Environment Institute P.O. Box 140 Fin-00250 Helsinki Fax: (358 9) 403 005 90 E-mail: pertti.seuna@vyh.fi	Principal delegate		E. O. Martin Meteorological Services Dept. P.O. Box 87, Legon Tel: (233 21) 778 383	Delegate
France	P. Givone Cemagref-Direction scientifique Parc de Tourvoie 92160 Antony Cedex Tel: (33) 1 40 96 62 57 Fax: (33) 1 40 96 62 00 E-mail: pierrick.givone@cemagref.fr	Principal delegate	Guinea	I. Bokoum Directeur national adjoint de la Direction Nationale de l'hydraulique Conakry Tel: (224) 42 16 70 and (224) 22 83 81 Fax: (224) 45 25 53	Principal delegate
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French Polynesia	J. P. Goutorbe (14–16 XI) (see address under France)	Principal delegate	Iran, Islamic Republic of	J. Mesbahi Water Resources Research Center, Ministry of Energy 235 North Bahar Avenue Tehran Tel: (98 21) 753 76 07	Principal delegate

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Togo	T. Lokmenda Direction de la météorologie nationale BP 1505 Lomé Tel: (228) 224 838 Fax: (228) 224 838	Principal delegate		B. Lecturers	
Tunisia	L. Laatiri Institut national de la météorologie BP 156 2035 Tunis Carthage Tel: (216 1) 773 400	Principal delegate		J. A. Hanidu (see address under Nigeria)	
	M. A. Smaoui Embassy of Tunisia Lagos Nigeria Tel: (234 1) 261 81 50	Alternate		P. Hubert (see address under International Organizations — IAHS)	
United Kingdom of Great Britain and Northern Ireland	J. S. Wallace Centre for Ecology and Hydrology Wallingford Oxon X10 8BB E-mail: JSW@CEH.AC.UK	Principal delegate		I. A. Olomoda (see address under International Organizations — NBA)	
				P. J. Pilon (see address under Canada)	
				S. Van Biljon (see address under South Africa)	
				J. S. Wallace (see address under United Kingdom)	
				J. Wellens-Mensah (see address under Ghana)	
				T. R. Yuzyk (see address under Canada)	

C. Representatives of international organizations

<i>Organization</i>	<i>Name</i>
Food and Agriculture Organization of the United Nations (FAO)	A. D. Ezzo Priso 17 Ontario Crescent Maitama District, Abuja, Nigeria Fax: (234 9) 4137544 E-mail: FAO-NGA@FieldFAO.org
United Nations Educational, Scientific and Cultural Organization (UNESCO)	L. Mandalia Division of Water Sciences 75732 Paris 07SP France Tel: (33 1) 45684054 Fax: (33 1) 45685811 E-mail: l.mandalia@unesco.org ihp@unesco.org
Global Runoff Data Centre (GRDC)	T. Maurer Federal Institute of Hydrology, BfG P.O. Box 200253 56002 Koblenz, Germany Tel: (49 261) 1306 52 24 Fax: (49 261) 1306 52 80 E-mail: thomas.maurer@bafg.de
International Association of Hydrological Sciences (IAHS)	P. Hubert Ecole des mines de Paris 35, rue Saint Honoré 77305 Fontainebleau, France Tel: (33 1) 646 947 40 Fax: (33 1) 646 947 03 E-mail: iahs@ensmp.fr
International Commission for the Hydrology of the Rhine Basin (CHR)	K. Hofius IHP/OHP Sekretariat c/o Federal Institute of Hydrology Bundesanstalt für Gewässerkunde Postfach 309 56003 Koblenz Tel: (49 261) 1306 5313 Fax: (49 261) 1306 5422 E-mail: hofius@bafg.de
International Commission for the Protection of the Elbe	J. Kubát Czech Hydrometeorological Institute Na Sabatce 17 14306 Prague 4, Czech Republic Tel: (4202) 401 66 17 Fax: (4202) 440 323 342 E-mail: kubat@chmi.cz
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<i>Organization</i>	<i>Name</i>
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	D. WMO Secretariat
G. O. P. Obasi	Secretary-General
M. Jarraud	Deputy Secretary-General
A. J. Askew	Director, Hydrology and Water Resources Department
J. L. Bassier	Chief, Hydrology Division
C. Caponi	Officer-in-charge of HOMs
W. Grabs	Chief, Water Resources Division
E. Dar-Ziv (Ms)	Chief, Conferences Unit
J. Housni	Transmission Specialist
F. Fol (Ms)	Administrative Assistant
Y. Burnet (Ms)	Senior Secretary
	E. Local Secretariat
	J. A. Hanidu
	J. O. Basse
	O. A. C. Orji (Ms)
	J. A. Shamonda
	S. A. Ettu
	E. Udoeka
	O. Odomoso

APPENDIX B

AGENDA

<i>Agenda item</i>	<i>Document Nos.</i>	<i>PINK Nos. and person submitting</i>	<i>Resolutions and Recommendations adopted</i>
1. OPENING OF THE SESSION		1, president of CHy	
2. ORGANIZATION OF THE SESSION	4	1, president of CHy	
2.1 Consideration of the report on credentials			
2.2 Adoption of the agenda	1; 2		
2.3 Establishment of committees			
2.4 Organizational questions			
3. REPORT BY THE PRESIDENT OF THE COMMISSION	3; 3, ADD. 1; 4	2, Chairperson, Committee of the Whole	
4. DECISIONS OF CONGRESS AND THE EXECUTIVE COUNCIL OF RELEVANCE TO THE HYDROLOGY AND WATER RESOURCES PROGRAMME	4	2, Chairperson, Committee of the Whole	
5. WMO REGIONAL ACTIVITIES IN RELATION TO THE HYDROLOGY AND WATER RESOURCES PROGRAMME	4	2, Chairperson, Committee of the Whole; 14, president of CHy	
6. STANDARDIZATION AND REGULATORY ACTIVITIES	4	16, Chairperson, Committee A	
6.1 <i>Guide to Hydrological Practices</i> (WMO-No. 168)			
6.2 <i>Technical Regulations</i> (WMO-No. 49)			
6.3 Hydrological Information Referral Service			
7. HYDROLOGICAL OPERATIONAL MULTIPURPOSE SYSTEM	4	10, Chairperson, Committee A	
8. WATER RESOURCE ASSESSMENT	4	13, Chairperson, Committee A	
9. SUSTAINABLE DEVELOPMENT	4	13, Chairperson, Committee A	
10. CAPACITY BUILDING	4	4, Chairperson, Committee B	
10.1 Hydrological Services			
10.2 Education and training			
10.3 Product delivery and public awareness			
11. BASIC SYSTEMS	4; 5	6, Chairperson, Committee A	
11.1 Water use and demand			
11.2 Water quantity data			
11.3 Water quality data			
11.4 Sediment			
11.5 Water quality assessment			
11.6 Remote sensing			
11.7 Network design			
11.8 Data management			
12. APPLICATIONS OF HYDROLOGY	4; 6	5, Chairperson, Committee B	
12.1 Hydrological models for forecasting			
12.2 Flood estimation and forecasting			

<i>Agenda item</i>	<i>Document Nos.</i>	<i>PINK Nos. and person submitting</i>	<i>Resolutions and Recommendations adopted</i>
12.3 Medium- to long-term forecasting			
12.4 Operational forecasting			
12.5 Groundwater modelling			Rec. 1
12.6 Sustainable development			
12.7 Large-scale hydrological studies			
12.8 Climate variability and water resources			
13. WORLD HYDROLOGICAL CYCLE OBSERVING SYSTEM	4	17, Chairperson, Committee A	
14. EXCHANGE OF HYDROLOGICAL DATA AND PRODUCTS	4	11, Chairperson, Committee B	
15. PUBLICATIONS AND SYMPOSIA	4	8, Chairperson, Committee B	
15.1 Publications			
15.2 Symposia, technical conferences and seminars			
16. LONG-TERM PLANNING AS RELATED TO THE COMMISSION'S ACTIVITIES	4; 4, ADD. 1	21, Chairperson, Committee B	
16.1 Fourth WMO Long-term Plan			
16.2 Fifth WMO Long-term Plan			
16.3 Sixth WMO Long-term Plan			
17. FUTURE PROGRAMME OF WORK OF THE COMMISSION	4	18, Chairperson, Committee of the Whole	
18. TECHNICAL COOPERATION, THE VOLUNTARY COOPERATION PROGRAMME AND RELATED PROJECTS	4	9, Chairperson, Committee A	
19. COOPERATION WITH WATER-RELATED PROGRAMMES OF OTHER ORGANIZATIONS	4	7, Chairperson, Committee B	
19.1 Cooperation within the United Nations system and other governmental organizations			
19.2 Cooperation with international river basin commissions and non-governmental organizations			
20. SCIENTIFIC LECTURES	4	20, vice-president of CHy	
21. NOMINATION OF EXPERTS AND WORKING GROUP MEMBERS	4	12, Chairperson, Selection Committee for Experts and Members of Working Groups; 19, Chairperson, Committee of the Whole	Res. 1
22. REVIEW OF PREVIOUS RESOLUTIONS AND RECOMMENDATIONS OF THE COMMISSION AND OF RELEVANT EXECUTIVE COUNCIL RESOLUTIONS	4	15, Chairperson, Committee of the Whole	Res. 2; Rec. 2
23. ELECTION OF OFFICERS	4	3, Chairperson, Nomination Committee; 22, president of CHy	
24. DATE AND PLACE OF THE TWELFTH SESSION	4	22, president of CHy	
25. CLOSURE OF THE SESSION	4	22, president of CHy	

APPENDIX C

LIST OF ABBREVIATIONS

ACC	United Nations Administrative Committee on Coordination
AOC-HYCOS	West and Central Africa Hydrological Cycle Observing System
AWG	Advisory Working Group
CagM	Commission for Agricultural Meteorology
CBS	Commission for Basic Systems
CCI	Commission for Climatology
CHy	Commission for Hydrology
CHR	International Commission for the Hydrology of the Rhine Basin
CIMO	Commission for Instruments and Methods of Observation
CSD	United Nations Commission on Sustainable Development
DCP	Data Collection Platform
EUMETSAT	European Organization for the Exploitation of Meteorological Satellites
5LTP	Fifth WMO Long-term Plan
4LTP	Fourth WMO Long-term Plan
FAO	Food and Agriculture Organization of the United Nations
FFTPP	Flash Flood Threshold Pilot Project
FRIEND	Flow Regimes from International Experimental and Network Data
GCIP	GEWEX Continental-scale International Project
GCOS	Global Climate Observing System
GEWEX	Global Energy and Water Cycle Experiment
GIS	Geographical Information System
GNIP	Global Network of Isotopes in Precipitation
GPCC	Global Precipitation Climatology Centre
GRDC	Global Runoff Data Centre
GTN-H	Global Terrestrial Network – Hydrology
GTOS	Global Terrestrial Observing System
GTS	Global Telecommunication System
GWP	Global Water Partnership
HELP	Hydrology for the Environment, Life and Policy
HNRC	HOMS National Reference Centre
HOMS	Hydrological Operational Multipurpose System
<i>HRM</i>	<i>HOMS Reference Manual</i>
HWRP	Hydrology and Water Resources Programme
HYCAST	Hydrological Forecasting
HYCOS	Hydrological Cycle Observing System
IAEA	International Atomic Energy Agency
IAHR	International Association of Hydraulic Engineering and Research
IAHS	International Association of Hydrological Sciences
IDNDR	International Decade for Natural Disaster Reduction
IGAD-HYCOS	Eastern Africa Hydrological Cycle Observing System
IGRAC	International Groundwater Resources Assessment Centre
IGU	International Geographical Union
IHE	International Institute for Infrastructural, Hydraulics and Environmental Engineering
IHP	International Hydrological Programme
INFOHYDRO	Hydrological Information Referral Service
IOC	Intergovernmental Oceanographic Commission
ISARM	International Shared Aquifer Resources Management

ISO	International Organization for Standardization
IUGG	International Union of Geodesy and Geophysics
JCOMM	Joint WMO/IOC Technical Commission for Oceanography and Marine Meteorology
JIIHP	Joint International Isotope Hydrology Programme
MED-HYCOS	Mediterranean Hydrological Cycle Observing System
MOPEX	Model Parameter Estimation Experiment
NBA	Niger Basin Authority
NHS	National Hydrological Service
NMS	National Meteorological or Hydrometeorological Service
OHRAOC	Regional Hydrological Observing System for Western and Central Africa
PMF	Probable Maximum Flood
PMP	Probable Maximum Precipitation
QPF	Quantitative Precipitation Forecast
RA	Regional Association
RHA	Regional Hydrological Adviser
RMTC	Regional Meteorological Training Centre
6LTP	Sixth WMO Long-term Plan
SADC-HYCOS	South African Development Community-HYCOS
TNO	Netherlands Organization for Applied Scientific Research
UNDP	United Nations Development Programme
UN/ECE	United Nations Economic Commission for Europe
UNEP	United Nations Environment Programme
UNESCO	United Nations Educational, Scientific and Cultural Organization
VCP	Voluntary Cooperation Programme
WCP	World Climate Programme
WCP-Water	WCP-Water
WGH	Working Group on Hydrology
WHO	World Health Organization
WHYCOS	World Hydrological Cycle Observing System
WMO	World Meteorological Organization
WRA	Water Resources Assessment
WWAP	World Water Assessment Programme
WWC	World Water Council
WWDR	World Water Development Report
WWW	World Weather Watch
