

WORLD METEOROLOGICAL ORGANIZATION

Weather • Climate • Water

COMMISSION FOR HYDROLOGY

TWELFTH SESSION

GENEVA, 20–29 OCTOBER 2004

ABRIDGED FINAL REPORT WITH RESOLUTIONS AND RECOMMENDATIONS



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REPORTS OF RECENT WMO CONSTITUENT BODY SESSIONS

Congress and Executive Council

- 915 — Executive Council, fifty-second session, Geneva, 16–26 May 2000
- 929 — Executive Council, fifty-third session, Geneva, 5–15 June 2001
- 932 — Thirteenth World Meteorological Congress, Proceedings, Geneva, 4–26 May 1999
- 945 — Executive Council, fifty-fourth session, Geneva, 11–21 June 2002
- 960 — Fourteenth World Meteorological Congress, Geneva, 5–24 May 2003
- 961 — Executive Council, fifty-fifth session, Geneva, 26–28 May 2003
- 972 — Fourteenth World Meteorological Congress, Proceedings, Geneva, 5–24 May 2003
- 977 — Executive Council, fifty-sixth session, Geneva, 8–18 June 2004

Regional associations

- 924 — Regional Association II (Asia), twelfth session, Seoul, 19–27 September 2000
- 927 — Regional Association IV (North and Central America), thirteenth session, Maracay, 28 March–6 April 2001
- 934 — Regional Association III (South America), thirteenth session, Quito, 19–26 September 2001
- 942 — Regional Association VI (Europe), thirteenth session, Geneva, 2–10 May 2002
- 944 — Regional Association V (South–West Pacific), thirteenth session, Manila, 21–28 May 2002
- 954 — Regional Association I (Africa), thirteenth session, Mbabane, 20–28 November 2002

Technical commissions

- 921 — Commission for Hydrology, eleventh session, Abuja, 6–16 November 2000
- 923 — Commission for Basic Systems, twelfth session, Geneva, 29 November–8 December 2000
- 931 — Joint WMO/IOC Technical Commission for Oceanography and Marine Meteorology, first session, Akureyri, 19–29 June 2001
- 938 — Commission for Climatology, thirteenth session, Geneva, 21–30 November 2001
- 941 — Commission for Atmospheric Sciences, thirteenth session, Oslo, 12–20 February 2002
- 947 — Commission for Instruments and Methods of Observation, thirteenth session, Bratislava, 25 September–3 October 2002
- 951 — Commission for Agricultural Meteorology, thirteenth session, Ljubljana, 10–18 October 2002
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2004

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CONTENTS

	<i>Page</i>
GENERAL SUMMARY OF THE WORK OF THE SESSION	
1. OPENING OF THE SESSION (CHy-XII/Doc. 4; 4, ADD. 1; PINK 1)	1
2. ORGANIZATION OF THE SESSION (CHy-XII/Doc. 4; 4, ADD. 1; PINK 2).....	1
2.1 Consideration of the report on credentials.....	1
2.2 Adoption of the agenda (CHy-XII/Doc. 1; 2).....	1
2.3 Establishment of committees	1
2.4 Organizational questions	2
3. REPORT BY THE PRESIDENT OF THE COMMISSION (CHy-XII/Doc. 3; 4; 4, ADD. 1; PINK 3).....	2
4. DECISIONS OF CONGRESS AND THE EXECUTIVE COUNCIL OF RELEVANCE TO THE HYDROLOGY AND WATER RESOURCES PROGRAMME (CHy-XII/Doc. 4; 4, ADD. 1; PINK 4)	3
5. WMO REGIONAL ACTIVITIES IN RELATION TO THE HYDROLOGY AND WATER RESOURCES PROGRAMME (CHy-XII/Doc. 4; 4, ADD. 1; PINK 5)	4
6. BASIC SYSTEMS IN HYDROLOGY (CHy-XII/Doc. 4; 4, ADD. 1; 5; PINK 6)	5
6.0 Report of the Working Group on Water Resources	5
6.1 Water resources assessment	6
6.2 Hydrological Operational Multipurpose System	6
6.3 World Hydrological Cycle Observing System	6
6.4 Standardization and regulatory activities	7
7. FORECASTING AND APPLICATIONS IN HYDROLOGY (CHy-XII/Doc. 4; 4, ADD. 1; 6; PINK 7).....	9
7.0 Report of the Working Group on Hydrological Forecasting and Prediction.....	9
7.1 Hydrological aspects of disasters	10
7.2 Public understanding of hydrological forecasting and risk management strategies	11
7.3 Hydrology in the context of environmental issues	11
8. SUSTAINABLE DEVELOPMENT OF WATER RESOURCES (CHy-XII/Doc. 4; 4, ADD. 1; PINK 8).....	12
9. CAPACITY-BUILDING IN HYDROLOGY AND WATER RESOURCES (CHy-XII/Doc. 4; 4, ADD. 1; PINK 9).....	13
9.1 Organization and development of Hydrological Services	13
9.2 Education and training.....	13
9.3 Product delivery and public awareness.....	14
10. COOPERATION WITH WATER-RELATED PROGRAMMES OF OTHER ORGANIZATIONS (CHy-XII/Doc. 4; 4, ADD. 1; PINK 10).....	14
10.1 Cooperation within the United Nations system and other governmental organizations	14
10.2 Cooperation with international river basin commissions and non-governmental organizations	16
11. COOPERATION WITH OTHER WMO MAJOR PROGRAMMES (CHy-XII/Doc. 4; 4, ADD. 1; PINK 11).....	17
11.1 HWRP's contribution to the Natural Disaster Prevention and Mitigation Programme	17
11.2 Activities of the WMO Space Programme relevant to the HWRP	18
11.3 Collaboration with WCP and other climate-related programmes	18
11.4 Collaboration with other technical commissions and programmes	19
12. EXCHANGE OF HYDROLOGICAL DATA AND PRODUCTS (CHy-XII/Doc. 4; 4, ADD. 1; PINK 12).....	19
13. FUTURE PROGRAMME OF WORK OF THE COMMISSION (CHy-XII/Doc. 4; 4, ADD. 1; PINK 13).....	20
14. TECHNICAL COOPERATION, VOLUNTARY COOPERATION PROGRAMME AND RELATED PROJECTS (CHy-XII/Doc. 4; 4, ADD. 1; PINK 14).....	21
15. PUBLICATIONS AND SYMPOSIA (CHy-XII/Doc. 4; 4, ADD. 1; PINK 15).....	21
15.1 Publications	21
15.2 Symposia, technical conferences and seminars	22

	<i>Page</i>
16. LONG-TERM PLANNING AS RELATED TO THE COMMISSION'S ACTIVITIES (CHy-XII/Doc. 4; 4, ADD. 1; PINK 16).....	22
16.1 Sixth WMO Long-term Plan	22
16.2 Seventh WMO Long-term Plan	22
17. SCIENTIFIC LECTURES (CHy-XII/Doc. 4; 4, ADD. 1; PINK 17)	23
18. NOMINATION OF EXPERTS AND WORKING GROUP MEMBERS (CHy-XII/Doc. 4; 4, ADD. 1; PINK 18).....	23
19. REVIEW OF PREVIOUS RESOLUTIONS AND RECOMMENDATIONS OF THE COMMISSION AND OF RELEVANT EXECUTIVE COUNCIL RESOLUTIONS (CHy-XII/Doc. 4; 4, ADD. 1; PINK 19)	23
20. ELECTION OF OFFICERS (CHy-XII/Doc. 4; 4, ADD. 1; PINK 20(1); (2)).....	24
21. DATE AND PLACE OF THE THIRTEENTH SESSION (CHy-XII/Doc. 4; 4, ADD. 1; PINK 21).....	24
22. CLOSURE OF THE SESSION (CHy-XII/Doc. 4; 4, ADD. 1; PINK 22).....	24

RESOLUTIONS ADOPTED BY THE SESSION

<i>Final No.</i>	<i>Session No.</i>		
1	13/1	Structure and programme of work of the Commission for Hydrology	25
2	19/1	Review of previous resolutions and recommendations of the Commission for Hydrology	32

RECOMMENDATIONS ADOPTED BY THE SESSION

<i>Final No.</i>	<i>Session No.</i>		
1	6/1	Amendments to the WMO <i>Technical Regulations (WMO-No. 49), Volume III – Hydrology</i>	33
2	9/1	WMO Strategy on Education and Training in Hydrology and Water Resources.....	34
3	9/2	Revision of scope of the WMO Regional Meteorological Training Centres (RMTCs)	34
4	19/1	Review of the resolution of the Executive Council based on previous recommendations of the Commission for Hydrology	35

ANNEXES

I	Criteria for the selection of pristine river basins (paragraph 7.3.7 of the general summary)	36
II	WMO Strategy on Education and Training in Hydrology and Water Resources (paragraph 9.2.4 of the general summary).....	38
III	Programme of scientific lectures (paragraph 17 of the general summary).....	42

APPENDICES

A.	List of persons attending the session	43
B.	List of abbreviations	53

GENERAL SUMMARY OF THE WORK OF THE SESSION

1. OPENING OF THE SESSION (agenda item 1)

1.1 The acting president of the Commission for Hydrology (CHy), Mr B.J. Stewart (Australia), opened the twelfth session at 10.00 a.m. on 20 October 2004 at the World Meteorological Organization (WMO) Headquarters, Geneva, Switzerland. He explained that, due to the recent relinquishing of the post by the former president of the Commission, Mr D.G. Rutashobya (United Republic of Tanzania), and in accordance with General Regulation 12, he had been asked by the Secretary-General to act, in his capacity as vice-president, as president for the duration of the twelfth session of CHy. Mr B.J. Stewart welcomed delegates and the representatives of other international organizations. Congratulating Mr M. Jarraud on his appointment as Secretary-General on behalf of the Commission, he noted that CHy-XII was the first session of a WMO technical commission to be held under his mandate.

1.2 The Secretary-General of WMO, Mr M. Jarraud, welcomed participants. In his address, he expressed his appreciation to Mr D.G. Rutashobya for his dedication to the work of CHy and thanked Mr B.J. Stewart for having accepted to preside over the session on such short notice. He extended his gratitude to the chairpersons, experts and members of the working groups for their contributions to the work of the Commission and the work of the Hydrology and Water Resources Programme (HWRP) of WMO. Noting that WMO had always devoted special attention to water issues, he stressed that, in addressing water-related challenges, WMO's expertise could not be bypassed. He informed delegates of the establishment by Fourteenth World Meteorological Congress of the new WMO major Programme on Natural Disaster Prevention and Mitigation, and highlighted that it promoted preventive and proactive strategies for disaster management. He encouraged the Commission to continue its efforts to optimize the use of available resources by reviewing its structure and future programme of work, and recognized its concentrated effort to bring together the meteorological and hydrological communities in exploring ways of improving flood forecasting. He reiterated his faith in CHy in providing the leadership needed to meet the water-related challenges and the expectations of WMO Members.

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 for all meetings of the plenary and working committees in all six working languages.

2.0.2 A total of 161 participants attended the

session, representing 55 Members of WMO and 10 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 acting 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 2.3)

The Commission for Hydrology approved the provisional agenda.

2.3 ESTABLISHMENT OF COMMITTEES (agenda item 2.3)

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

- RA I: P. Munah (Kenya)
- RA II: S. Kim (Republic of Korea)
- RA III: M.A. Freitas (Brazil)
- RA IV: V. Schneider (United States)
- RA V: A. Calver (United Kingdom)
- RA VI: J. Kubát (Czech Republic)

Mr J. Kubát (Czech Republic) was elected chairperson of the Nomination Committee.

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

- RA I: A.B. Chirwa (Malawi)
- RA II: K. Miyake (Japan)
- RA III: M. A. Vázquez (Paraguay)
- RA IV: T. Yuzyk (Canada)
- RA V: V. Schneider (United States)
- RA VI: K. Hofius (Germany)

Mr K. Hofius (Germany) 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, 8, 12, 14 and 15

Committee B: items 7, 9, 10, 11 and 16

Items 3, 4, 5 and 13 were examined in the Committee of the Whole and items 1, 2 and 17 to 22 were taken up only in plenary. The following delegates were elected to co-chair the working committees:

Committee A: Mr H. Lins (United States) and Mr A. Terakawa (Japan)

Committee B: Mrs A. Calver (United Kingdom) and Mr J. Wellens-Mensah (Ghana)

At the request of the acting president, Mr I. Shiklomanov (Russian Federation) agreed to act as vice-chairperson of the Committee of the Whole.

2.3.4 A Coordination Committee was established, consisting of the acting president, the vice-

chairperson of the Committee of the Whole, the co-chairpersons of Committees A and B, and the representative of the Secretary-General.

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

- (a) WHYCOS issues – D.G. Rutashobya (United Republic of Tanzania), chairperson, and G. Wennerberg (Sweden), vice-chairperson;
- (b) WMO Strategy on Education and Training in Hydrology and Water Resources – S. Demuth (Germany), chairperson;
- (c) Long-term Planning and Visibility of the HWRP – M. Gromiec (Poland), chairperson;
- (d) Future Programme of Work of the Commission – P. Pilon (Canada), chairperson.

2.4 ORGANIZATIONAL QUESTIONS (agenda item 2.4)

2.4.1 The working hours adopted were 9.00 a.m. to 12.00 a.m. and 2.00 p.m. to 5.00 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 proposals contained in each part of the document during discussions under the relevant agenda items.

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

3.1 The Commission was informed by its acting president of the activities of CHy since its eleventh session (Abuja, Nigeria, November 2000) and of the outcome of the discussion on the in-depth report on those activities which the former president had submitted to the fifty-sixth session of the Executive Council (Geneva, Switzerland, June 2004). The acting president noted that the membership of the Commission now stood at 294 individual members from 146 Members of WMO, a slight increase of four individual members and one country as compared to the situation four years earlier.

3.2 In his report, the president noted that the activities of CHy had been mainly concerned with the execution of the tasks established by CHy-XI within the HWRP. The acting president also highlighted the activities undertaken by the CHy Advisory Working Group (AWG), both as the coordinating body for CHy affairs and the Steering Committee for the Hydrological Operational Multipurpose System (HOMS). Expressing his concern at the slow rate of replenishment of the components for the *HOMS Reference Manual* (HRM), he invited Member countries to actively contribute to the HOMS, especially those covering the latest technological advances. In that context, the Commission noted the actions by members of the AWG responsible for specific matters such as liaison with regional associations; joint activities of the HWRP of WMO and

the International Hydrological Programme (IHP) of the United Nations Educational, Scientific and Cultural Organization (UNESCO); international data exchange; CHy input to internal WMO activities and sustainable water resources practices.

3.3 He noted that, by adopting the subtitle “weather, climate and water” for the Organization, Fourteenth Congress had placed a significant responsibility on the hydrological community within WMO, and provided CHy with a challenging opportunity. He reiterated his conviction that WMO should raise the profile of its hydrology and water resources activities and thus establish a strong visibility in the international water arena. He also stressed the need to strengthen cooperation between meteorological and hydrological services in the Member countries in line with their role as service providers.

3.4 The acting president pointed out that there had been a number of fundamental changes both in the scope and structure of the HWRP. With the adoption of the subtitle, the first cycle came to a close. It was, therefore, necessary to review the structure of the Programme. The acting president implored the Commission to provide advice and suggestions on how to mobilize further resources for the development of the Programme.

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 Congress Resolution 18 (Cg-XIV) — Panel of Experts on Fresh Water.

3.6 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 13.

3.7 The acting president stressed the need for the Commission to focus its activities in those areas for which it had the expertise and skills and where it could add value to existing efforts. He reminded the Commission that its activities should bring benefits to all of its members, in particular developing countries. He identified the external influences of the need for sustainable water resources management, the development of knowledge-based policies (based on sound science), the application of risk management procedures and globalization as being important to the future directions of the Commission.

3.8 The Commission thanked the acting president for his report. In response to the various matters he raised, the Commission agreed that in developing its future programme of work it should select and prioritize achievable and beneficial activities within the resources available. The Commission expressed its appreciation for the decision by Fourteenth Congress to adopt the subtitle “weather, climate and water” and was pleased to learn that it would now appear on all official documentation, correspondence and publications. The Commission was also pleased to hear that, during the intersessional period, the

activities of the Commission and the Secretariat had been brought into closer alignment, and that that had resulted in significant progress in various initiatives.

3.9 The Commission expressed its appreciation to the former president for his outstanding contribution to the activities of the Commission over the four years of his presidency and also before then, as vice-president. The Commission welcomed the appointment of Mr A. Tyagi as the new Director of the Hydrology and Water Resources Department and expressed its appreciation to Messrs A. Askew and J. Bassier (former members of the Secretariat) for their contribution to the work of the Commission over many years.

3.10 Noting the concern of participants that the list of CHy members needed to be updated, the Commission recommended that all Members should review the membership of their country in CHy and inform the Secretariat accordingly.

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-XI and in particular its continued support to the enhancement of the role of WMO in hydrology and water resources matters, through, among other actions, its advice and assistance towards the adoption of the WMO subtitle, and its approval of the establishment of an International Groundwater Resources Assessment Centre (IGRAC).

4.2 Through the reports of the acting president and the Secretary-General, the Commission was informed of the decisions of the Fourteenth World Meteorological Congress, held in May 2003, 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, to discuss in detail matters pertaining to the HWRP.

4.3 The Commission was pleased to note that Congress, through Resolution 24 (Cg-XIV), had adopted the subtitle "weather, climate and water" for WMO, to be used on all official documentation, correspondence and publications. The Commission agreed with its acting president that that decision had placed significant responsibility on the hydrological community within WMO, and that it had also provided a challenging opportunity for CHy in particular. The Commission reaffirmed its desire, as expressed at CHy-XI, to see a greater representation of hydrologists in higher positions within the WMO decision-making structure, for example, on the Executive Council and in its subsidiary bodies, in line with the high recognition the subtitle evoked.

4.4 As regards the practice of establishing a subcommittee on hydrology during Congresses, the management of the WMO Secretariat, in the

framework of a review of the organization of Congress and Executive Council sessions, had sought the opinion of the CHy AWG. In the opinion of the AWG, the practice of establishing a subcommittee on hydrology as provided in General Regulation 29 (b) "At each session of Congress an open subcommittee on hydrology shall be established [...]" was not conducive to close interaction between the National Hydrological Services (NHSs) and National Meteorological Services (NMSs) and was essentially contrary to the spirit of strategy laid down in the Sixth WMO Long-term Plan (6LTP). After reviewing various alternatives, the AWG had agreed that the best course of action would be to modify the text of General Regulation 29 (b) by replacing "shall" by "may". The recommendation as to whether, in a particular session of Congress, such a subcommittee on hydrology should be established or not and which items it should discuss, would then be made by CHy to the Bureau during its session preceding Congress.

4.5 Recognizing that the change in the General Regulations would have to be approved by next Congress, the AWG suggested that, meanwhile, the subcommittee could be used to discuss only a few issues that required in-depth analysis, on the recommendation of the AWG, with the rest of the HWRP being considered by the appropriate working committee. The Commission endorsed unanimously the course of action proposed by its AWG.

4.6 The Commission was informed of Resolution 18 (Cg-XIV), which urged Members to support the establishment of a Panel of Experts on Fresh Water and requested the Secretary-General to, inter alia, develop the proposal for the Panel that would define its terms of reference; its operation mechanism; the role of WMO, other United Nations organizations and international agencies working on water issues; and the level of resources required, and to invite and engage those United Nations organizations and international agencies in the further development of that initiative.

4.7 The Commission was informed that subsequently, at its fifty-sixth session, the Executive Council had noted that the outcome of consultations, held by the Secretariat with other United Nations agencies working on water issues through the United Nations Interagency Committee on Freshwater (UN-Water), had not been encouraging. The Council had recommended that, given the limited resources, it would be appropriate for WMO to concentrate on delivering concrete outputs which would also be in the spirit of the United Nations General Assembly resolution 58/217 on the International Decade for Action, "Water for Life". Seeing little merit in continuing with the proposal, the Council had recommended that that issue not be pursued any further. The Commission took note of the decision of the fifty-sixth session of the Executive Council with regard to the Panel of Experts on Fresh Water and agreed with the Council to make effective use of the

available limited resources toward action-oriented activities. It was nevertheless observed that the original proposal of an intergovernmental mechanism on freshwater was possibly ahead of its time and therefore should be put aside until such time that the international conditions would be more supportive of its acceptance.

4.8 The Commission noted that Congress had requested the Secretary-General to prepare a comprehensive report on the status of the Hydrological Cycle Observing System (HYCOS) projects under way to assess their state of implementation and sustainability. The draft of that report was considered under agenda item 6.3.

4.9 The attention of the Commission was drawn to the fact that Fourteenth Congress had kept in force resolutions adopted by Twelfth Congress on the World Hydrological Cycle Observing System (WHYCOS) and the Global Runoff Data Centre (GRDC) and on the monitoring and assessment of water resources of Africa, and by Thirteenth Congress on the exchange of hydrological data and products, thereby confirming its continued support for those activities.

4.10 The Commission joined Congress in expressing appreciation to France, Germany and Japan 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.

4.11 The Commission took note of the relevant comments and proposals of the fifty-sixth session of the Executive Council while laying plans for its future activities. The comments of the Council with regard to other HWRP activities 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 (WGHs) of the regional associations (RAs) 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.

5.2 The Commission was informed of the sessions of the regional working groups, all of which had met once during the past intersessional period, namely: WGH of RA I (Cairo, Egypt, 2002), of RA II (Bangkok, Thailand, 2004), of RA III (Santiago, Chile, 2000), of RA IV (Santo Domingo, Dominican Republic, 2003), of RA V (Wellington, New Zealand, 2002) and of RA VI (Berlin, Germany, 2002).

5.3 During their respective thirteenth sessions, all the regional associations had re-established their WGHs which were open to representatives of

Hydrological, Meteorological and Hydrometeorological Services of Members of the Regions and chaired by the respective Regional Hydrological Adviser (RHA). The collective membership of those groups stood at 157, of which 37 had been assigned specific tasks as rapporteurs or sub-regional/sub-group coordinators. Several of those groups had subsequently developed increasingly project-oriented work programmes.

5.4 Those WGHs had identified priorities for action in their respective Regions. Those included topics such as flood forecasting and warning, data standards and accuracy of flow measurements, drought forecasting, *El Niño*-Southern Oscillation Index (SOI), climate variability/change and water, in addition to the standard areas of common interest, such as WHYCOS, HOMS, water resources assessment (WRA) and the *Guide to Hydrological Practices* (WMO-No. 168) and the *Technical Regulations* (WMO-No. 49).

5.5 The Commission expressed its concern with regard to the recent decline in the support provided for the organization of sessions of the regional WGHs, which had forced most groups to reduce their meetings to a core group of a few members. Noting that that practice would not be sustainable in the medium term, it analysed several alternative solutions, such as holding WGH meetings at the same time as other activities of sister organizations, a practice which might attract other resources. In view of the limited time available, the Commission requested the AWG to study the matter further and prepare a proposal on its behalf to be considered by the Secretary-General for the preparation of the proposed Programme and Budget of the fifteenth financial period of WMO (2008-2011).

5.6 Concerns were also expressed at the low visibility of the activities of the WGHs in the annual report of the presidents of the regional associations to the Executive Council. It appealed to the RHAs to adopt a proactive approach and provide inputs to the presidents of the RAs for their annual reports.

5.7 The Commission noted that the AWG had adopted a watching brief approach to the working of the RA WGHs during the last intersessional period. When appropriate, an AWG member had attended meetings of the RA WGHs with the aim of providing linkages between the work of the Commission and the work plans of the RA WGHs. It was noted that the AWG had taken the activities of the RA WGHs into consideration when developing the proposal of the future programme of work of the Commission. Additional regional activities not directly linked with the RA WGHs were considered under the relevant agenda items.

6. BASIC SYSTEMS IN HYDROLOGY (agenda item 6)

6.0 REPORT OF THE WORKING GROUP ON WATER RESOURCES (agenda item 6.0)

6.0.1 Under that agenda item, the Commission

considered the report of the Working Group on Water Resources. The chairperson of the Working Group, Mr I. Shiklomanov (Russian Federation), described the activities of the Working Group as well as the difficulties encountered in its functioning. The achievements in the various topics covered by the experts were reported (see general summary paragraphs 6.0.8 to 6.0.13 below). He made a number of proposals concerning future activities, in particular concerning WRA, rating curves/flow derivation, statistical and spatial analysis, and technology transfer and capacity-building. The Commission commended the chairperson and the experts for the results of their activities. In developing its future programme of work, the Commission took into consideration the proposal made by the chairperson.

6.0.2 The chairperson analysed in detail the difficulties encountered in the implementation of the work plan of the Working Group and recommended a series of measures to overcome them in the future. In particular, he recommended that activities should be focused, without diluting efforts in too many areas of interest and by establishing closer linkage between activity themes of the Commission and those of the regional WGHs. The Commission took note of the proposal of the chairperson on that subject and invited other partners sharing the same area of interest to cooperate with WMO.

6.0.3 The chairperson pointed out that the meetings and workshops that had been organized to support the experts' activities had proved to be extremely useful for achieving the results. The Commission recommended that web-based facilities such as discussion forums and video- or teleconferencing should be used in order to allow frequent contacts among experts working on the same theme.

6.0.4 The Commission also noted that the chairperson of the Working Group had presented several lectures on the theme of water resources at international conferences and symposia and had participated in the preparation of monographs on that theme.

6.0.5 The Commission noted that the first session of the two subject-oriented working groups had been held as joint and parallel meetings during the same period in the WMO Secretariat from 3 to 7 September 2001. It had provided an opportunity for the experts and members of the two groups to meet and discuss many items of common interest and to agree on the collaboration needed to implement the individual programmes of work.

6.0.6 The Commission noted that the AWG, at its second meeting in December 2002, had decided to reorient resources originally foreseen for holding a second meeting of the subject-oriented working groups to support experts in the execution of their tasks. Priority was given to those activities of the subject-oriented working groups where the experts had defined clearly the objectives and outputs of

their activities, and a successful completion of work could be reasonably expected.

6.0.7 The Commission commended the new approach adopted in the activities of the working groups and noted with satisfaction that it had helped in focusing the limited resources available and achieving tangible results. The Commission, nevertheless, was concerned by the low output of some of the experts. It was recognized that that was often due to lack of support for the experts' activities and partly due to their national responsibilities, which prevented them from devoting sufficient time to the task assigned.

6.0.8 The Commission considered the report of Mr M. Kaneki (Japan), expert on data management, which was presented by Mr J. Yoshitani. Mr Kaneki had compiled a draft report on the subject based on the Japanese experience and on the basis of replies to a questionnaire received from 16 countries. The report was distributed to participants during the session.

6.0.9 The Commission noted that the Japanese experience in data management would be very useful for Members and invited the Secretariat to explore the possibility of distributing it widely. It was agreed that the report should be submitted to the CHy publication process.

6.0.10 The Commission noted that the expert on rating curves/flow derivation, Mr N. Crookshank (Canada), had made satisfactory progress in his assignment. It was pleased to note that the Secretariat had assisted the expert in carrying out his activity with the support of associated experts from Bangladesh, Canada, Czech Republic, Colombia, Italy and Zimbabwe. A workshop was held in Geneva in November 2003 to present the software package developed by the expert's team, and to obtain feedback from participants. The software package enabled the establishment of rating curves for conditions with stable control, the estimation of discharge for systems with unstable control and real-time stage/discharge calculations. A CD-ROM containing a copy of the software was distributed to experts in different countries with a view to test its usefulness.

6.0.11 The Commission noted that the software being developed was useful for members. It recommended that the final version of the software should be widely distributed to members for further testing. It also recommended that the possibility of its use in the HYCOS projects be explored.

6.0.12 The Commission noted that the expert on technology transfer and capacity-building, Mr E.D. Udoeka (Nigeria), had carried out a mission to Egypt to visit the Regional Training Centres (RTCs) there and discuss their training programmes with experts. In his report the expert made proposals on training and capacity-building requirements for technicians.

6.0.13 The Commission noted that the expert on statistical and spatial analysis of hydroclimatological

variability and trends, Mr U. Haryoko (Indonesia), had carried out a mission to the Centre for Ecology and Hydrology (CEH) in Wallingford, United Kingdom, for discussions on the ongoing trend analysis projects at CEH and to acquaint himself with the trend analysis software Hydrospect. In his report, the expert documented the testing of the application of software developed by Warsaw University for analysing variability and trends.

6.1 WATER RESOURCES ASSESSMENT (agenda item 6.1)

6.1.1 The Commission was informed that WMO had continued in its efforts to promote the use of the methodology contained in the WMO/UNESCO *Water Resources Assessment – Handbook for the Review of National Capabilities* through regional workshops. It appreciated the efforts made by the vice-president and the Secretariat in producing a CD-ROM version of the *Handbook* and agreed that once it had been tested at the national level, and the feedback from NHSs taken into account, it should become a HOMS component. The Commission also noted that the AWG was preparing a manual for WRA (see general summary paragraph 6.4.11).

6.2 HYDROLOGICAL OPERATIONAL MULTIPURPOSE SYSTEM (agenda item 6.2)

6.2.1 The Commission noted the progress made in the implementation of the Plan for HOMS in the twenty-first century during the past intersessional period. In particular, in June 2001 a CD-ROM containing Version 2000 of the *HRM*, together with promotional material on HOMS in the form of a brochure and a slide presentation with relative script, was distributed to all the HOMS National Reference Centres (HNRCs) and HOMS Regional Focal Points (HRFPs). The online version of the *HRM* was being updated regularly, and it appeared to be consulted and utilized with ever-increasing frequency by hydrologists worldwide, especially since 2003, when most components' descriptions had become available in English, French, Russian and Spanish. A more quantitative method of measuring the frequency with which individual components were requested would be desirable.

6.2.2 The Commission noted with concern that, although there were 180 updated components currently in the *HRM*, the replenishment of the *HRM* with new contributions had advanced rather slowly. Following the recommendation of the AWG, selected HNRCs were requested in May 2002 to contribute new components in those areas where the *HRM* presented gaps. Unfortunately, only a handful of replies had been received, despite the fact that the contribution and transfer mechanisms had been simplified considerably in recent years. The Commission, noting that the HOMS network consisted of 122 HNRCs and eight HRFPs, and that that network still constituted a powerful distribution channel for hydrology and water resources

technology, encouraged its members to contribute new HOMS components.

6.2.3 The Commission, in order to increase the number of available components, saw merit in modifying HOMS selection criteria by adding a new, general section to the *HRM* for components "under testing" (i.e. not operationally proven). The classification under that section would follow the customary HOMS classification. The characteristics of the new section would be clearly explained both on the HOMS home page, under the new section list of components, and in each component's description, and each proposed new component inclusion would be subject to the approval of the AWG member responsible for HOMS. The Commission noted that a number of HNRCs had discontinued support to some of the components they had contributed, mainly because of staffing and funding restrictions. Among them were also some components which had proven very useful and were in high demand by HOMS users. The Commission recommended that those specific components should be retained in the *HRM*, with a warning label indicating that technical support was no longer available. The Commission further recommended that, whenever feasible, the on-line version of the HOMS components' description should include a link for its downloading.

6.2.4 An area where there had been encouraging results was that related to HOMS training activities. The Commission observed that those results seemed to confirm the effectiveness of the combined strategies of "training the trainers" and conducting roving seminars. In particular, the Commission thanked Canada for its support to the training of instructors from RA I on flood and low flows frequency analysis and flood plain delineation procedures, and Germany for its continued support of training courses on the Aquifer Simulation Model in RA II. The Commission encouraged other countries to follow those successful examples.

6.2.5 The Commission noted that in the 2004-2007 Programme and Budget several additional training activities related to HOMS were planned. In view of the relative scarcity of funds available for education and training in HWR, the Commission welcomed the initiative of the AWG and the Secretariat of taking a comprehensive approach in preparing a consolidated WMO strategy on the subject, which included HOMS-related training.

6.3 WORLD HYDROLOGICAL CYCLE OBSERVING SYSTEM (agenda item 6.3)

6.3.1 The Commission was informed of progress in the development and implementation of the different regional components of WHYCOS. It was pleased to note that the HYCOS components that had been implemented had provided a major contribution, at the regional scale, to the development of hydrological products, standardization, capacity-building and, in particular, confidence-building among NHSs.

6.3.2 The WHYCOS programme continued to generate considerable interest in the hydrological community around the world, as reflected by the references made to it in a number of key documents and resolutions on freshwater issues. Those included the ministerial commitments in the Pan African Implementation and Partnership Conference on Water (Addis Ababa, Ethiopia, December 2003) and the summit of the Niger Basin Authority (NBA) (Paris, France, April 2004).

6.3.3 The Commission noted the status of implementation of the different HYCOS projects. It was informed that the South African Development Community-HYCOS (SADC-HYCOS) and the pilot phase of the West and Central Africa-HYCOS (AOC-HYCOS) had come to an end in August and December 2002, respectively. The Commission was pleased to note that phase II of SADC-HYCOS, the Volta River Basin-HYCOS (Volta-HYCOS) and the Niger River Basin-HYCOS (Niger-HYCOS) had started in 2004 with financial support from the European Commission and the Governments of The Netherlands and France.

6.3.4 The Commission expressed its appreciation to the European Commission and the Governments of The Netherlands, France and United States for their valuable contributions to the implementation of HYCOS projects. The Commission also noted with satisfaction the Secretariat's work in the development of those new components and commended it for its efforts to generate extrabudgetary funds for the programme. It encouraged the Secretariat to maintain the momentum and continue its efforts for generating more resources in support of the programme.

6.3.5 The Commission was informed that, at the request of the participating countries and river basin organizations (RBOs), a substantial number of HYCOS projects were being developed and were at various stages of preparation. Those projects were classified into five groups:

- (a) Those which had started implementation;
- (b) Those with project documents already developed;
- (c) Those with a project proposal being developed;
- (d) Those projects where a concept paper was being developed;
- (e) Those where the request for developing a HYCOS component was still under consideration.

6.3.6 The Commission noted with satisfaction that the WHYCOS International Advisory Group (WIAG) and WHYCOS Coordination Group (WCG) had continued to serve as a means for reviewing programme activities, developing future plans and ensuring coordination among different projects and different departments in the Secretariat. It was informed that the meetings of the WIAG and the WCG had taken place regularly, the last ones being in November 2003 and June 2004, respectively.

6.3.7 The Commission reviewed the first draft of the comprehensive report on the status of HYCOS projects requested by Fourteenth Congress and noted that the Secretariat had undertaken considerable work in the preparation of that comprehensive and objective report. It recommended that a table indicating the number of stations planned, installed and still operational under various HYCOS components should be included in the final text.

6.3.8 The Commission recognized that the concept of WHYCOS had considerably evolved over the years. It felt the need to communicate that evolving concept with other partners through appropriate information material. The Commission recommended that focus should be placed on regional and national operational objectives, rather than global data needs, since that had provided impetus for HYCOS project development and implementation. The Commission noted that in several cases the development of new components, particularly in the early stages of formulation, had been slowed down by the long negotiation process.

6.3.9 The Commission supported the view that the issue of sustainability of the projects after the end of external support should be addressed in the initial stages of project development. Emphasis should also be given to the aspects of training and institutional capacity-building.

6.3.10 The Commission was briefed on the development of the preparation of the first draft of the guidelines on WHYCOS and appreciated the work of the authors and the Secretariat undertaken for the preparation of that valuable document. The Commission also felt that the guidelines should not be prescriptive, except for some topics such as data exchange, regional cooperation and ownership.

6.3.11 The Commission further recommended that project development should be geared to focus on issues related to specific basin/regional needs; duties and responsibilities of regional bodies promoting and implementing HYCOS components should be clearly spelled out; the data exchange formats and protocols should be in conformity with other WMO standards; individual countries participating in a project should play a more active role in fund raising; and performance indicators should be developed and used as a scale for evaluating the success of the programme and of the individual components. Standards for instrumentation, data collection and exchange would be referred to, or included as an annex.

6.4 STANDARDIZATION AND REGULATORY ACTIVITIES (agenda item 6.4)

Guide to Hydrological Practices (WMO-No. 168)

6.4.1 The Commission was pleased to note that the fifth edition of the *Guide to Hydrological Practices* was now available on CD-ROM in four languages (English, French, Russian and Spanish). It also noted that several Members had engaged in the translation of the *Guide* in their national language, which was

evidence of the use and value of that publication. The Commission encouraged that process and agreed that copies of the draft chapters of the sixth edition, once through the review process, should be made available for that purpose.

6.4.2 The Commission noted with appreciation the significant progress made in the preparation of the sixth edition of the *Guide*. It was pleased to note that the draft text of many chapters was available and expressed its appreciation to the Review Committee and its chairperson, Mr K. Hofius (Germany), for having led the review process, and to the authors for their valuable contributions. The Commission also invited Members to make their experts available for writing and reviewing parts of the new edition, and included a reference in that regard into the terms of reference of the AWG and other experts (see Resolution 1 (CHy-XII)).

6.4.3 The Commission also urged the Review Committee to consider the inclusion in the new edition of material on environmental issues, in particular hydrological aspects of environmental impact assessment (EIA) and calculation of probable maximum precipitation (PMP) (see agenda item 13: Future programme of work of the Commission).

6.4.4 The Commission requested the Review Committee and the Secretariat to continue their efforts in the preparation of the new edition and to publish it in both hard copies and on CD-ROM, first in English and subsequently in the other three languages. It therefore agreed that that activity should be given high priority during the next intersessional period.

6.4.5 The Commission recognized the value of that publication for NHSs and the hydrological community at large in their daily activities and therefore recommended that its widest distribution and availability should be ensured, including by making it available through the Internet.

Technical Regulations (WMO-No. 49)

6.4.6 The Commission noted that the changes approved by Thirteenth Congress in relation to the terms of reference of the Commission should also be reflected in the *Technical Regulations*. It also noted that in some languages the wording “operational hydrology” was still included in the terms of reference of the Commission and that that should be amended appropriately. The Commission requested the Secretariat to harmonize the terminology in all languages in various relevant publications.

6.4.7 The Commission was informed that Fourteenth Congress had not introduced any changes to the *Technical Regulations* (WMO-No. 49), *Volume II - Hydrology*. The changes approved by Thirteenth Congress were in the process of being incorporated in a new edition of the publication. The Commission considered the proposal of amendments to the *Technical Regulations* prepared by the CHy AWG and recommended that the Executive Council approve the amendments through the adoption of Recommendation 1 (CHy-XII). The proposed

amendments are contained in the annex to the Recommendation.

6.4.8 The Commission also decided to assign responsibility to the AWG to make recommendations for amendments to the *Technical Regulations* if the AWG considered them to be of an urgent nature.

Hydrological Information Referral Service

6.4.9 The Commission recalled that, in discussing the future of the Hydrological Information Referral Service (INFOHYDRO), CHy-XI had concluded that INFOHYDRO should continue to operate, but in a modified and reduced format, and had initiated a process to review the system. As a consequence, the AWG had prepared a proposal for the revised INFOHYDRO, based on metadata standards and recommended structures, which was presented to the Commission.

6.4.10 The Commission considered the revised set of tables for completion with regard to the provision of information for INFOHYDRO. In view of the difficulties encountered in collecting and updating data in the framework of the previous release of INFOHYDRO, the Commission recommended that the new version of INFOHYDRO should be further significantly simplified and requested the AWG to finalize the new version at its first meeting. Furthermore, the Commission:

- (a) Requested that the RA WGHs coordinate the completion of the revised INFOHYDRO in each region and that the vice-president, with the assistance of the WMO Secretariat, compile a global version;
- (b) Noted that the material would be compiled as Excel tables and made available on the Internet with hyperlinks, where available;
- (c) Noted that email would be used to send the Excel tables to member countries for completion;
- (d) Noted that that approach should make INFOHYDRO a more usable and valued information source.

Manuals and Guidelines

6.4.11 The Commission was informed that Fourteenth Congress had supported the idea of preparing a user-friendly manual to assist countries in assessing their water resources. The Commission was pleased to learn that the first draft had been prepared and requested the AWG and the Secretariat to finalize the manual. Water-use assessment should also be included in the manual for WRA since it was an activity carried out by a number of NHSs and in view of its relevance for calculating water balances (see general summary paragraph 6.1.1).

6.4.12 The Commission noted the need to update the WMO *Manual on Stream Gauging* (WMO-No. 519). It requested the AWG and the Secretariat to prepare the revised version and ensure the inclusion of the new technologies introduced and used in this field, including acoustic

Doppler current profilers (ADCP). The Commission also endorsed the proposal for a manual on flood forecasting.

6.4.13 The Commission noted the need expressed by many Members for reliable, updated and readily available guidance and regulatory material, particularly on the themes of data observation procedures, database management, and data dissemination protocols and formats, and considered those issues in the establishment of its future programme of work.

7. FORECASTING AND APPLICATIONS IN HYDROLOGY (agenda item 7)

7.0 REPORT OF THE WORKING GROUP ON HYDROLOGICAL FORECASTING AND PREDICTION (agenda item 7.0)

7.0.1 Under that agenda item, the Commission considered the report of its Working Group on Hydrological Forecasting and Prediction. Mr P. Pilon (Canada), chairperson of the Working Group, briefly described the work of the Group (the achievements on various topics are reported in the following general summary paragraphs) and its activities, along with the difficulties in its functioning and proposals for future activities. Those proposals included the establishment of the programme of work for the Commission as a whole instead of allocating specific tasks to individual experts. He pointed out the need for harmonizing the expertise and professional experience of the experts and the activities to be undertaken by the Commission for the intersessional period. Another recommendation was for the establishment of an "associate" expert category that would allow for capacity-building among experts from developing countries. Establishing a better mechanism for improving communication among experts and with CHy was also proposed as being important. The Commission was pleased to learn of the advances made in the different topics allocated to the Group, and congratulated the chairperson and the experts, who provided their inputs to CHy, in particular in relation to the future programme of work of the Commission. The Commission noted with concern that there were many constraints on the work of the members of the Group and took note of the proposals made by the chairperson to overcome those difficulties.

Short-term hydrological forecasting

7.0.2 CHy-XI had appointed Mr S.V. Borsch (Russian Federation) as the expert on short-term hydrological forecasting. At its session, the Working Group had proposed a work plan, which had been considered and approved in the first session of the AWG. The expert had represented CHy at the first meeting organized in the framework of the Flood Forecasting Initiative (see general summary paragraphs 7.1.3 and 7.1.4 below). The Commission noted that the expert had been assisted by a number of associate experts and, in relation to the

Global/Regional Short-term Hydrological Forecasting System, also by the vice-president of CHy. The Commission considered with appreciation the report of the expert.

Medium- to long-term forecasting

7.0.3 The Commission had assigned Mr F. Vidal Jara (Chile), the expert on medium- to long-term forecasting, to prepare a report on the advantages and disadvantages of employing those techniques. The expert had represented the Commission at a meeting of the Commission for Basic Systems (CBS) on precipitation measurements (Bratislava, Slovakia, April 2001).

Remote sensing

7.0.4 The Commission had appointed Ms A.S. Suh (Republic of Korea) as the expert on remote sensing and had assigned her to report on advances in remote sensing for hydrological applications. The Commission noted that the expert had submitted an administrative report to the session.

Risk management

7.0.5 The Commission had assigned the expert on risk management, Mr J.A. Shamonda (Nigeria), the responsibility of leading the Project on Risk Management. The president of CHy had been cooperating with him in the leadership of the Project. A WMO consultant had prepared an Internet-based report on risk management in support of the Project. The Commission noted that the expert had prepared two reports, and requested that he send them to the Secretariat for evaluation.

Probable maximum precipitation and flood

7.0.6 The Commission had assigned the expert on probable maximum precipitation and flood, Mr Wang Guoan (China), to revise and update the manual on best practices for probable maximum precipitation (PMP)/probable maximum flood (PMF). The expert, with the assistance of some associate experts, had prepared a draft of the third edition of Operational Hydrology Report No. 1, *Manual for Estimation of Probable Maximum Precipitation* (WMO-No. 332). The Commission considered with appreciation the report prepared by the expert and recommended necessary follow-up steps for its finalization and publication. The Commission appreciated the support provided by the Government of China in facilitating the work of the expert. The Commission agreed that, since the *Manual* was an update of an Operational Hydrology Report (OHR), the normal process for approving the report was not applicable in that case. Instead, it requested the AWG member responsible for publications to assure that the report fulfilled the requirements of an OHR. The Commission also noted with appreciation the offer of the expert for the development of a design flood manual.

Streamflow routing techniques

7.0.7 The Commission was informed that, following the recommendation of the second session of the AWG, a meeting between Mr P. Serban (Romania), who had been appointed by CHy-X as an expert on hydrological models for forecasting, and two of his associate experts had taken place in Geneva in October 2003. As a result of that meeting, the draft report of the expert and the draft report of the associate experts had been combined into a single draft report on flood routing techniques. The Commission decided to publish that report as a technical document in hydrology and water resources.

7.1 HYDROLOGICAL ASPECTS OF DISASTERS (agenda item 7.1)

7.1.1 The Commission noted with appreciation that a number of workshops had been carried out such as the Workshop on Flood Forecasting and Hydrological Warning Systems (Bogotá, Colombia, December 2001), with participation from RAs III and IV, and the Expert Meeting on Flood Plain Management (Kathmandu, Nepal, November 2001), with participation from 12 countries of RA II.

7.1.2 The Commission was informed that an expert meeting on the development of the CHy project Global/Regional Short-term Hydrological Forecasting System had been held in Pretoria, South Africa, from 13 to 15 November 2003. The Commission also noted the progress made in the development of the Flash Flood Threshold Pilot Project (FFTP), which was promoted by a CHy associate expert. The Commission requested the Secretariat to present the results of the expert meeting in the proposed regional workshops to be organized within the framework of the Flood Forecasting Initiative.

7.1.3 The Commission welcomed the launching of the WMO Flood Forecasting Initiative. The principal objective of the initiative was to improve flood forecasting by making use of advanced weather forecasting products through the enhanced cooperation between NMSs and NHSs. That initiative was seen as being closely related to the CHy project on the Global/Regional Short-term Hydrological Forecasting System.

7.1.4 The Commission noted that three regional meetings had already been organized as part of that initiative and similar meetings were planned in all the other Regions in 2005 in accordance with the recommendations of the expert meeting held on the subject in April 2003 at the Secretariat. The three regional meetings held to date had gathered together approximately 90 meteorologists and 70 hydrologists and had produced important recommendations to enhance flood forecasting activities in their respective Regions. It also noted that, based on inputs from the regional workshops, a worldwide synthesis conference, supported through extrabudgetary resources, was proposed for 2006.

7.1.5 The Commission was informed on the activities of the Executive Council Advisory Group on Natural Disaster Prevention and Mitigation and, in particular, on the proposed project on Marine Impacts on Lowland Agricultural and Coastal Resources (MILAC). The Commission appreciated efforts to promote the project and noted that its eventual implementation would significantly contribute to the Commission's activities in risk management.

7.1.6 In the context of medium- and long-term hydrological forecasting, the Commission recognized the need to extend its activities in the areas of low-flows and prediction of droughts (hydrological aspects). It also recognized the need for improved seasonal and inter-annual weather prediction to establish best practice guidelines for drought monitoring warning and mitigation.

7.1.7 The Commission noted the information provided by the president of the Commission for Climatology (CCI) on the development of climate and climate-change related indices and the development of seasonal and intra-annual climate predictions, as well as the establishment of a climate watch-alert system that could be of use to enhance forecasting capabilities of NHSs on national and regional levels. The Commission also noted the call given by the president of CCI for closer collaboration with CCI in the future.

7.1.8 The Commission, after discussing in detail the Global/Regional Short-term Hydrological Forecasting System and the WMO Flood Forecasting Initiative, recommended that those activities should be taken up in the future programme of work of the Commission. It noted the suggestion of including snow- and ice-induced floods in its activities and coastal surges in their interaction with river flooding. The Commission appealed to Members to contribute the resources required to hold the global technical conference as planned in 2006. The Commission noted with appreciation the proposal made by the United States during the fifty-sixth session of the Executive Council of organizing jointly with WMO an international technical conference on flash flood forecasting in Costa Rica during the second half of 2005. The Commission further suggested that the activities undertaken in the WMO Flood Forecasting Initiative and the CHy project on the Global/Regional Short-term Hydrological Forecasting System should be interlinked.

7.1.9 The Commission was informed that, as part of the activities in the field of flood forecasting, active collaboration was sought with the Hydrological Ensemble Prediction Experiment (HEPEX) initiative under the auspices of the European Centre for Medium-Range Weather Forecasts (ECMWF) and the National Oceanic and Atmospheric Administration (NOAA). It noted the objective of HEPEX to bring the international hydrological community together with the meteorological community to demonstrate how to produce reliable "engineering quality" hydrological

ensemble forecasts that could be used with confidence to assist the water resources sector to make decisions that had important consequences for the economy and for public health and safety.

7.1.10 The Commission, noting the close relationship between HEPEX and the WMO Flood Forecasting Initiative as well as the Commission's projects, such as those on risk management and the Global/Regional Short-term Hydrological Forecasting System, recommended that close collaboration should be sought with the Global Energy and Water Cycle Experiment (GEWEX) Water Resources Applications project, and in particular with HEPEX, to benefit from synergies resulting from those activities to improve medium-range flood forecasting services.

7.2 PUBLIC UNDERSTANDING OF HYDROLOGICAL FORECASTING AND RISK MANAGEMENT STRATEGIES (agenda item 7.2)

7.2.1 The Commission noted the increasing demand for high-accuracy and timely hydrological forecasting information and recognized the need to inform the user community of the potential and current limitations of hydrological forecasting. The AWG had considered the WMO Statement on the scientific basis for, and limitations of, weather and climate forecasting and had decided to prepare some preliminary information on a similar statement in relation to the scientific basis for, and limitations of, hydrological modelling. The Commission recommended that the draft WMO Statement on the scientific basis for, and limitations of, hydrological modelling introduced during the session should be further reviewed. The Commission recommended that NHSs, in consultation with other appropriate agencies in their respective countries, should provide their views and comments to the Secretariat. The AWG should subsequently take a final view on the adoption of the Statement.

7.2.2 The Commission noted the progress made in the project on Risk Management and took note of the development of a web-based study with the principal objective to obtain a first survey on approaches, methodologies and techniques currently used in risk management related to flooding and climate variability. The Commission recalled that the principal objective of that project was to assist NHSs in implementing risk management practices to mitigate social, economic and environmental impacts resulting from flooding, in particular in response to the impacts of climate variability.

7.2.3 The Commission was informed of the publication of the United Nations *Guidelines for Reducing Flood Losses* that had been prepared by the United Nations Department of Economic and Social Affairs (UN/DESA) and the NOAA, and appreciated the support provided by the chairperson of the CHy Working Group on Hydrological Forecasting and Prediction and the Secretariat. The Commission noted that WMO had organized the thematic session on Managing Risks – Water and

Climate at the Pan African Implementation and Partnership Conference on Water (Addis Ababa, Ethiopia, December 2003). It also noted that a Workshop on the Management of Water-related Risks and Food Security had been organized at the World Water Week (Stockholm, Sweden, 16-20 August 2004).

7.2.4 The Commission, realizing the value of a risk-based approach to disaster mitigation and water resource management, recommended that risk management principles should be included in the flood and drought management activities of CHy which might also contribute to the new WMO Programme on Natural Disaster Prevention and Mitigation.

7.3 HYDROLOGY IN THE CONTEXT OF ENVIRONMENTAL ISSUES (agenda item 7.3)

7.3.1 The Commission was informed of the results of the fifth Steering Committee of the GRDC held in June 2003, as well as the present status of the activities of the Centre, and noted with appreciation its continued provision of data and services to the water management and research communities. It noted its initiative, the Global Terrestrial Network for River Discharge (GTN-R), an effort to collect and provide near real-time runoff information from online gauging stations worldwide, as a complement of the Global Terrestrial Network – Hydrology (GTN-H) mostly for climate and applications-oriented studies.

7.3.2 The Commission noted progress made in the development of GTN-H as a "network of networks" of global data centres and information providers for hydrological and relevant meteorological data and information. The Commission was informed of the implementation plan developed for GTN-H which outlined common practices among the participating programmes and centres, the procedures for harmonizing the products among the participants and the processes to be used for data dissemination.

7.3.3 The Commission was informed of the Global Climate Observing System (GCOS) Implementation Plan and the call by GCOS for assistance from the Commission to obtain access to hydrological data and information needed for achieving the objectives of GCOS in response to the United Nations Framework Convention on Climate Change (UNFCCC) and the Conference of Parties to the Convention. After discussing the objectives and activities of GTN-H, the Commission showed its appreciation of the outcomes achieved so far, which it hoped would be successfully built upon in the future, in collaboration with GCOS.

7.3.4 The Commission was informed of progress made in the implementation of WCP-Water in a collaborative effort between the HWRP and the World Climate Programme (WCP) of WMO and UNESCO. The Commission welcomed the series of recent publications in the context of that programme and noted the close link between WCP-Water

activities and the Project on Analysis of Hydroclimatological Variability and Trends. The Commission welcomed plans to prepare a global statistical analysis on the sensitivity of runoff to precipitation.

7.3.5 The Commission further noted with interest the links between WCP-Water and the Intergovernmental Panel on Climate Change (IPCC) with the aim to promote the importance of water in the overall development of the Fourth IPCC Assessment. In that regard, the Commission was informed that WMO, together with WCP-Water, had taken the lead in proposing the preparation of a Special Report on Water and Climate for the nineteenth session of the IPCC in April 2002. A special IPCC technical meeting had been convened at the WMO Secretariat to consider the issue and advise the Panel on the action. The Commission took note that Fourteenth Congress had encouraged WCP-Water to continue its fruitful relationship with the IPCC and to maintain a high profile in the water- and climate-related programmes and projects of other international organizations.

7.3.6 The Commission appreciated progress made in the implementation of the Project on Analysis of Hydroclimatological Variability and Trends that had been carried out in collaboration with WCP-Water, and welcomed the development of a data analysis system for the detection of changes in hydrological time series. The Commission was informed that there was no peer review process in place for the reports prepared by WCP-Water. The Commission recommended that all reports prepared in the framework of WCP-Water should have a peer review system harmonized with that adopted by CHy.

7.3.7 The Commission noted that, during the past intersessional period, the AWG had reiterated its view that hydrological time series from pristine/stable basins were required in order to assess the variability and trends in hydrological data associated with climate variability and change. That information was required for the Commission's Project on Hydroclimatological Variability and Trends in support of the planned activities of WCP-Water, GCOS and the Global Terrestrial Observing System (GTOS). The selection criteria for the selection of pristine river basins as a Reference Climate Variability and Change Hydrological Station Network are contained in Annex I to this report. The Commission was pleased to learn that GTN-H would be undertaking activities to help Members identify stations within their countries which met those criteria.

7.3.8 The Commission expressed its appreciation to the Government of The Netherlands for its support to IGRAC, which had been launched in 2003. The Commission noted with appreciation that IGRAC was currently operating under the auspices of WMO and was also expected to be recognized shortly by UNESCO. The Commission

also noted an invitation to Members to make pertinent data, information and resources available to the Centre.

7.3.9 The Commission noted that WMO was collaborating with the Cooperative Programme on Water and Climate (CPWC) and was also a member of its International Steering Group established to jointly promote water- and climate-related issues. It further noted collaborative activities to develop a training programme on water and climate in the Nile Basin. The Commission encouraged the Secretariat to support capacity-building, joint research programmes and the specialized training needs of the Nile Basin countries through the Nile Basin Capacity Building Network (NBCBN).

8. SUSTAINABLE DEVELOPMENT OF WATER RESOURCES (agenda item 8)

8.1 The Commission was informed of WMO's participation at the International Conference on Freshwater (Bonn, Germany, December 2001) as a preparatory step for freshwater issues at the World Summit on Sustainable Development (WSSD) (Johannesburg, South Africa, August-September 2002). It noted also with appreciation the active participation of WMO in water-related activities at WSSD. It was pleased to note that WMO's participation in the Water Dome had offered an excellent opportunity to enhance WMO's visibility in the fields of hydrology and water resources.

8.2 The Commission noted that budgetary provisions to implement activities under the Programme on Sustainable Development of Water Resources had been very limited in the thirteenth financial period (2000-2003). Accordingly, while appreciating the advances made with such limited resources, it was pleased to note that, in the fourteenth financial period (2004-2007), the budget to implement that important Programme had been augmented.

8.3 The Commission noted that WMO had co-sponsored the International Conference on Urban Hydrology for the 21st century, (Kuala Lumpur, Malaysia, 14-16 October 2002).

8.4 The Commission noted the Secretariat's plans to organize workshops on groundwater resources management for small islands States and countries under arid and semi-arid zones, under the framework of the activities foreseen by the 6LTP for the Programme. The Commission agreed to consider those proposals in developing its future programme of work.

8.5 The Commission noted with satisfaction the joint activity between WMO and the Third World Network of Scientific Organizations (TWNSO) in organizing two workshops on safe drinking water and integrated water resources management (IWRM). The Commission was pleased to note that the membership of the Advisory Committee of the Associated Programme on Flood Management (APFM) included two members appointed by CHy. It was also pleased to note that WMO had co-

sponsored the World Bank Institute course on IWRM (August 2004). The Commission recommended that such joint activities should be encouraged.

8.6 The Commission noted that, in conjunction with the Global Water Partnership (GWP), the APFM had been launched in August 2001 with the support of Japan and the Netherlands. It noted with appreciation that a concept paper on integrated flood management had been produced and widely disseminated, and four regional pilot projects were being implemented. It recommended that an integrated flood management approach, in conjunction with IWRM for the sustainable development of water resources, should be promoted.

8.7 The Commission noted the efforts made to obtain extrabudgetary resources for implementing a proposal on drought management which had been prepared by the vice-president, the chairperson of the Working Group on Hydrological Forecasting and Prediction and the Secretariat. The Commission was informed of several other initiatives on the theme of drought, notably the document on a European drought policy produced by the European Network of Fresh Water Research Organizations (EURAQUA); the European Drought Centre launched by the Northern European Flow Regimes from International Experimental and Network Data (NE FRIEND) Low Flow Group; the initiative of the European Union Water Directors to prepare a document on water scarcity; and courses on low flow and drought organized in Bhutan by the International Centre for Integrated Mountain Development (ICIMOD) and the Hindu Kush-Himalayan FRIEND (HKH FRIEND), and in Malaysia by the Humid Tropics Centre in Kuala Lumpur together with the German IHP/HWRP Secretariat and UNESCO.

8.8 The Commission recognized the importance of drought management as a necessary component of sustainable water resources development.

8.9 The Commission, realizing the limited resources available for supporting the activities in the framework of this programme, recommended focusing on clearly identified actions. It therefore invited Member countries to provide additional resources to support the implementation of the programme and urged the Secretariat to continue its fund raising efforts.

9. CAPACITY-BUILDING IN HYDROLOGY AND WATER RESOURCES (agenda item 9)

9.1 ORGANIZATION AND DEVELOPMENT OF HYDROLOGICAL SERVICES (agenda item 9.1)

9.1.1 The Commission recalled that, based on a recommendation by the fifty-second session of the Executive Council, the preparation of a set of guidelines on the role and operation of NHSs had been undertaken, using as an initial basis the

elements identified in the corresponding work for NMSs.

9.1.2 The Commission noted the recommendation of the AWG that, in view of its relevance, the document should be published as an OHR under the title *Guidelines on the role, operation and management of National Hydrological Services*. It noted also that, formally, the final draft should be presented to the Executive Council Advisory Group on the Role and Operation of National Meteorological and Hydrological Services (NMHSs) prior to publication. As that Group would be meeting in March 2005, CHy members were given additional time to provide their comments for the final draft.

9.2 EDUCATION AND TRAINING (agenda item 9.2)

9.2.1 The Commission noted that that programme activity, implemented in close cooperation with the Education and Training Programme (ETRP) of WMO, encouraged the systematic review of staff and training needs of NHSs and supported various training events.

9.2.2 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 intersessional period. Those courses included regular training courses in Venezuela (every two years), Kenya (every year) and the United States (every two years), which had been approved by Thirteenth and Fourteenth Congress and others that had been proposed by Member countries. It noted also that, owing to financial constraints, the course in Kenya would be financially supported by WMO in the future once every two years.

9.2.3 The Commission was informed that the Editorial Task Force – Hydrology established at the end of the previous CHy intersessional period had prepared the *Guidelines for the Education and Training of Personnel in Meteorology and Operational Hydrology* (WMO-No. 258), *Volume II – Hydrology*, which also covered the field of IWRM. The Commission noted that the English version of that volume had been sent to all Members during the first half of 2004. Furthermore, noting that the *Guidelines* were an important conceptual tool for training activities, the Commission strongly encouraged the Secretariat to provide for their translation into additional languages, in order to widen their dissemination.

9.2.4 The Commission was informed of the work undertaken by the AWG on education and training, in particular through a task force that had developed the basis for the development of a strategy on the subject. Based on that work, the AWG member responsible for CHy input to internal WMO activities and the Secretariat had prepared the WMO Strategy on Education and Training in Hydrology and Water Resources. The Commission, after considering that document in detail and suggesting several slight changes, approved it as recorded in Annex II to this report. Furthermore, the Commission adopted Recommendation 2 (CHy-XII) – WMO Strategy on

Education and Training in Hydrology and Water Resources and Recommendation 3 (CHy-XII) – Revision of scope of the WMO Regional Meteorological Training Centres (RMTCs).

9.3 PRODUCT DELIVERY AND PUBLIC AWARENESS (agenda item 9.3)

9.3.1 The Commission was pleased to note the importance being accorded by WMO at the international and national level to the celebrations of the World Water Day (WWD) held on 22 March each year. It noted with interest that WMO, jointly with the International Strategy for Disaster Reduction (ISDR), had taken the lead in planning the celebrations for 2004 on the theme "water and disasters" and expressed its appreciation for the successful conduct of that event. The emphasis in the awareness campaign was 'be informed and be prepared'. WMO had prepared an information kit that included a booklet, a poster and fact sheets on the activities of various United Nations agencies in the field of water-related disasters. A web site, www.waterday2004.org had been established which had attracted more than half a million hits to date.

9.3.2 The Commission noted with satisfaction that the WWD had proven to be an excellent meeting point for governmental and non-governmental bodies and for the public. In the celebrations and preparations of WWD, the role of Non-Governmental Organizations (NGOs) had appeared to be important in many member countries.

9.3.3 The Commission noted with interest that the United Nations General Assembly, with its resolution A/RES/58/217 adopted on 23 December 2003, had proclaimed the period from 2005 to 2015 as the International Decade for Action, "Water for Life", commencing on WWD on 22 March 2005. The resolution called upon the relevant United Nations bodies, specialized agencies, regional commissions and other organizations of the United Nations system to deliver a coordinated response, to make "Water for Life" a decade for action. The Commission was informed of the recommendation by UN-Water that, in the first implementation phase of the International Decade for Action, WMO, jointly with the United Nations ISDR, would contribute with the theme of disaster risk reduction.

9.3.4 Addressing its inputs to the International Decade for Action, the Commission was of the opinion that the main focus should include helping NHTs with regard to the development of services and products and delivery of timely and accurate data and information to all stakeholders. The Commission requested its AWG to consider activities associated with the International Decade for Action when developing input to the Seventh WMO Long-term Plan (7LTP).

10. COOPERATION WITH WATER-RELATED PROGRAMMES OF OTHER ORGANIZATIONS (agenda item 10)

10.1 COOPERATION WITHIN THE UNITED NATIONS SYSTEM AND OTHER GOVERNMENTAL ORGANIZATIONS (agenda item 10.1)

10.1.1 The Commission noted with appreciation the long-standing cooperation between WMO and UNESCO in the field of hydrology and water resources and, in particular, related to the joint planning and implementation of programmes and activities such as WRA, WCP-Water, GTN-H, the *International Glossary of Hydrology* and IGRAC.

10.1.2 The Commission recognized that much of the success of that cooperation was due to the close inter-Secretariat links, in particular through the Joint UNESCO/WMO Liaison Committee for Hydrological Activities, which convened annually, and the Joint UNESCO/WMO International Conference on Hydrology organized every six years.

10.1.3 The Commission was informed that UNESCO had now proposed that in place of the sixth UNESCO/WMO International Conference, a joint meeting of the CHy AWG and the IHP Bureau should be held with the objective to strengthen the relationship between CHy and the IHP Bureau, which would contribute to the improved planning and implementation of joint activities between the HWRP of WMO and the IHP of UNESCO. The Commission welcomed the proposal and recommended that the joint meeting should be organized as soon as possible.

10.1.4 The Commission, noting the need for more effective cooperation between WMO and UNESCO, discussed how that cooperation could be improved in the future. The aim would be to ensure closer collaboration by undertaking joint activities and, possibly, joint programmes, thus improving the linkage between the research, management and operational aspects of hydrology and water resources and more effective use of available resources. The Commission requested that that topic be included on the agenda of the joint meeting of the AWG and IHP Bureau. The Commission further requested the AWG to investigate cooperative mechanisms, such as the Joint WMO/IOC Technical Commission for Oceanography and Marine Meteorology (JCOMM) approach, amongst others, including their financial implications, to promote collaboration between WMO and UNESCO and report back to the next session. The AWG should take into account the relevant reports and investigations on the topic.

10.1.5 The Commission noted with satisfaction the ongoing efforts in promoting the use of the *Water Resources Assessment – Handbook for Review of National Capabilities*.

10.1.6 The Commission was informed on the planned establishment of the Joint UNESCO/WMO Committee on Floods and noted with satisfaction that that joint UNESCO/WMO Task Team consisting of

three members each of the UNESCO IHP and CHY had been formed and that the Task Team had formulated a concept paper on the Joint UNESCO/WMO Flood Initiative (JUWFI). The Commission was informed that the sixteenth session of the IHP Intergovernmental Council of UNESCO had approved it and had recommended that, in order to encourage a broader participation, the paper should be entitled The International Flood Initiative (IFI).

10.1.7 The Commission, while being in support of the concept of JUWFI and its mission, recommended that the Joint Task Team should review the concept paper with the aim of improving on its consistency and content and to add specific details on responsibilities, actions to be undertaken and timelines.

10.1.8 The Commission noted with appreciation the proposal of the Government of Japan to offer services in support of JUWFI at the Public Works Research Institute and its International Centre for Water Hazard and Risk Management to be established under the auspices of UNESCO, and recommended that the Centre could provide support services to JUWFI with the consensus of UNESCO and WMO.

10.1.9 The Commission was informed that JUWFI was planned to be launched during the forthcoming World Conference on Disaster Reduction in January 2005, with the objective to gain wider recognition and support. In that regard, the Commission noted with interest the proposal of the United Nations University (UNU) and the International Association of Hydrological Sciences (IAHS) to actively participate in JUWFI and suggested that the Joint Task Team should establish a framework for the broader participation of partners in JUWFI.

10.1.10 The Commission, while having expressed its support for the establishment of JUWFI and also noting that the fifty-fourth session of the Executive Council had called for the establishment of a joint committee on WRA, suggested that a similar cooperative approach should be adopted for collaboration between the two organizations in the field of WRA. The Commission requested the AWG to develop a concept for such an initiative, providing detailed objectives, expected deliverables and activities.

10.1.11 The Commission was informed of the seventh session of the Standing Committee on Terminology for the preparation of the third edition of the UNESCO/WMO *International Glossary on Hydrology* which took place at the UNESCO Headquarters from 13 to 17 January 2003. The Commission was informed that the first draft of the third edition of the *Glossary* was going to be circulated to the members of the Standing Committee on Terminology before the end of 2004.

10.1.12 The Commission was informed about the approval of the International Sediment Initiative by the sixteenth session of the Intergovernmental

Council for the IHP of UNESCO. The Commission expressed its interest in the initiative.

10.1.13 The Commission was informed about developments in the Hydrology for the Environment, Life and Policy (HELP) programme which was led by UNESCO in collaboration with WMO.

10.1.14 The Commission recognized the potential value of the HELP programme and noted that its concept and added value need to be communicated clearly to NHSs, and that WMO's participation should reflect added value to the HWRP while at the same time contributing to the objectives of HELP. The Commission encouraged NHSs to contribute towards HELP in areas such as flood forecasting, flood plain management and water- and climate-related issues. The Commission further suggested that the AWG should provide a more detailed analysis of the benefits of collaboration in HELP.

10.1.15 The Commission noted that some basins identified within the HELP initiative might meet the criteria for the selection of pristine river basins and would thus prove valuable for the analysis of hydroclimatological data for variability and trends. It was hoped that such metadata and the hydrological data would be provided to the GRDC for further redistribution. The Commission urged the AWG to develop a strategy with UNESCO regarding that matter.

10.1.16 The Commission was informed of the cooperation between WMO and other international organizations and programmes in the fields of hydrology and water resources. That cooperation was seen as fundamental to further enhance the role and visibility of the Organization in that area. The Commission noted with satisfaction that the direct involvement of WMO resulted in bringing back in place the coordinating mechanism among United Nations agencies dealing with water issues under the title of UN-Water. The Commission commended those efforts in the light of the need for an enhanced visibility of the HWRP and in recognition of the value for the Organization as a whole to be represented at various international forums. It noted, however, that, in view of scarce resources, the participation in those activities needed to be balanced with regard to the benefit of the Programme and, in particular, in view of the priority to develop improved services and products in support of NHSs.

10.1.17 The Commission further noted that, in general, there needed to be a careful examination of the value of cooperative efforts and a review of joint initiatives in view of the development of its work programme during the next intersessional period.

10.1.18 The Commission was informed about collaborative activities between WMO and other United Nations agencies working in water-related issues under UN-Water, and its participation in the preparation of the first World Water Development Report (WWDR) and in the ongoing activities for the preparation of the second WWDR to be published in 2006.

10.1.19 The Commission noted with satisfaction that WMO had participated actively in the activities of the Water Cluster of the United Nations System-wide Special Initiative on Africa (UNSA) and recently had become a member of the African Water Task Force (AWTF). It also noted that the Interagency Group for Water in Africa (IGWA) was now named UN Water - Africa. It was pleased to learn that WMO had provided support for the establishment of the African Ministerial Council on Water (AMCOW) and facilitated its working.

10.1.20 The Commission was informed of WMO's participation at the Pan-African Implementation and Partnership Conference on Water and the associated exhibition (Addis Ababa, Ethiopia, December 2003). It was pleased to learn that WMO had provided substantial support to the Conference, which had offered a good opportunity for WMO to expose its activities to African leaders, and that WMO's policy and activities had been very well reflected in the Ministerial Commitments.

10.1.21 The Commission recommended that WMO should continue its active role in the field of water in Africa and maintain the momentum gained through further cooperation with other members of UN Water-Africa to ensure successful implementation of the conference's outcomes to achieve the Millennium Development Goals (MDG) in Africa.

10.1.22 The Commission was informed of WMO's participation at the third World Water Forum (WWF3) and the Ministerial Conference on the occasion of WWF3 held from 16 to 23 March 2003 in Kyoto, Japan. It was pleased to learn that WMO had convened a joint session on integrated flood management (IFM) along with the session on people, floods and vulnerability reduction. WMO had also convened sessions on climate change and variability impact on water resources in Africa during the Regional Day for Africa, and on water and information in Osaka, Japan.

10.1.23 The Commission was informed of the preparation of WWF4 to be held in Mexico City in 2006 on the theme "Local Actions for a Global Challenge". The Commission took note of the invitation from the Government of Mexico and the World Water Council (WWC) to participate in the forum.

10.1.24 The Commission was informed of activities similar to APFM with regard to the recent Foresight 'Future Flooding' initiative for long-term flood risk, including socio-economic impacts.

10.1.25 The Commission was informed by the representative of UNESCO of some of the main developments concerning freshwater at UNESCO since the last session of CHy, including the designation of "water and associated ecosystems" as a principal priority at UNESCO and the establishment of the UNESCO/International Institute for Infrastructural, Hydraulics and

Environmental Engineering (IHE) Institute for Water Education in Delft, the Netherlands. The Commission was also informed of the major outcomes of the recent sixteenth session of the Intergovernmental Council of the IHP Hydrological Programme (Paris, France, 20-24 September 2004), where specific mention had been made of the joint activities with WMO. The Commission noted the endorsement by the IHP Bureau of the creation of a joint committee on WRA and its proposal that the series of Joint UNESCO/WMO International Conferences be phased out. It welcomed the concept of holding a joint planning meeting between the IHP Bureau and the CHy AWG in 2005. The Commission noted the cooperation between the two organizations with regard to the WWDR chapters on the state of the resource and on ensuring the knowledge base. With respect to the joint UNESCO/WMO IGRAC, the Commission was further informed that the formal granting of the auspices of UNESCO was pending since the Dutch Government had still to propose that item to the governing bodies of UNESCO.

10.2 COOPERATION WITH INTERNATIONAL RIVER BASIN COMMISSIONS AND NON-GOVERNMENTAL ORGANIZATIONS (agenda item 10.2)

10.2.1 The Commission noted that WMO maintained contact with a number of international river basin commissions, such as those of the River Niger, Lake Chad, River Senegal, La Plata River Basin and Mekong River Commission (MRC), leading to very fruitful collaboration on certain joint projects. It was pleased to note the agreements between WMO and NBA for the implementation of the Niger-HYCOS.

10.2.2 The Commission was informed of a Memorandum of Understanding (MoU) signed between WMO and the Intergovernmental Coordinating Committee of the La Plata River Basin Countries (CIC) in December 2000 to facilitate the cooperation between WMO and CIC. The main areas of cooperation were hydrological warnings and water quality. In December 2003, a workshop on hydrological warnings was organized. Another workshop on hydrological warnings and water quality was held in June 2004, in which WMO supported participants from NMSs and NHSs from the five countries sharing the basin. With the support of WMO, it was expected that NMHSs in the La Plata Basin would be able to actively participate in CIC activities in future. It was also expected that WMO would contribute to the joint activities of countries sharing the basin through the active participation in a Global Environment Facility (GEF) project on water resources management in cooperation with the Organization of American States (OAS).

10.2.3 The Commission was advised of the MoU between WMO and the MRC signed in 2002 with the aim of assisting the MRC in the implementation of its flood management strategy through the establishment of a flood information system and

improving flood forecasting capacity of NHMSs in the Mekong river basin in the framework of a Mekong-HYCOS project.

10.2.4 The Commission was further advised of the MoU between WMO and ICIMOD signed in 2002 with the principal aim to establish a flood information system and to improve flood forecasting capacity of NHMSs in the Ganges-Brahmaputra-Meghna basin in the HKH in the framework of a HKH-HYCOS project.

10.2.5 The Commission appreciated increased collaboration with RBOs and other well-known regional organizations as effective means to foster regional cooperation and to promote improved flood forecasting and water resources management in river basins. The Commission requested the Secretariat to develop further collaborative agreements on regional and sub-regional levels, preferably with existing river/lake basin authorities. The Commission proposed that priority should be given to collaboration with international RBOs and suggested that HELP basins might be included in such cooperative arrangements.

10.2.6 The Commission was informed that WMO had been elected for a third term to the Board of Governors of the WWC and that WMO was one of the sponsoring partners of the GWP. Concerning collaboration with bodies such as GWP and WWC, the Commission noted that those activities enhancing the visibility of WMO in the water resources community were valuable to keep the Organization in the mainstream of water activities and could provide the contacts that led donors to fund WMO's own activities.

10.2.7 The Commission was informed of the IAHS initiative entitled Prediction in Ungauged Basins (PUB). The Commission recalled that Congress had encouraged WMO's support to that programme which complemented WMO's activities to improve hydrological information in many data-sparse parts of the world. The Commission, after the discussion of aspects relating to the practical implementation of PUB, and noting that Fourteenth Congress had encouraged CHy to cooperate in that initiative, saw value in cooperation with PUB in support of its efforts to reduce uncertainties in predictions from ungauged basins.

10.2.8 The Commission noted the activities of the IAHS/WMO Working Group on GEWEX, which continued to serve as an important linkage between those two major science communities by providing an efficient transfer mechanism of science in hydrology into the GEWEX community. The Commission was informed that, in close cooperation with the Working Group, the Water Resources Application Project (WRAP) had been established within GEWEX.

10.2.9 The Commission was informed on the long and fruitful history of collaboration between WMO and IAHS and the value IAHS offered in providing scientific support to the activities of the

Commission. The Commission, being aware of the added value of organizing joint meetings and conferences between IAHS and WMO allowing hydrologists and water resources managers from developing countries to attend during such occasions, expressed its intent to further continue and foster its collaboration with IAHS. In that respect, the Commission was informed of the upcoming seventh IAHS Scientific Assembly that would be held in Foz de Iguaçu, Brazil, from 3 to 9 April 2005, and of the call from IAHS to participate and possibly support that meeting.

10.2.10 The Commission noted the joint activities carried out by WMO and the International Association of Hydraulic Engineering and Research (IAHR), namely the cooperation for the preparation of the *Guidelines for the Education and Training of Personnel in Meteorology and Operational Hydrology* (WMO-No. 258) *Volume II – Hydrology* (referred to in general summary paragraph 9.2.3) and in the preparation of the report on intercomparison of flow routing techniques. The Commission was pleased to receive the offer of the IAHR to continue joint activities at global and regional levels.

10.2.11 The Commission, discussing a broader scope of cooperation with partners, noted the importance of the participation of the private sector and proposed further collaboration at the level of NMHSs.

11. COOPERATION WITH OTHER WMO MAJOR PROGRAMMES (agenda item 11)

11.1 HWRP'S CONTRIBUTION TO THE NATURAL DISASTER PREVENTION AND MITIGATION PROGRAMME (agenda item 11.1)

11.1.1 The Commission was informed that Fourteenth Congress had decided, through Resolution 29 (Cg-XIV), to initiate a new WMO major Programme on Natural Disaster Prevention and Mitigation as a cross-cutting programme to enhance international cooperation and collaboration in the field of natural disaster activities.

11.1.2 The Commission noted that the fifty-six session of the Executive Council had adopted the implementation plan of the National Disaster and Mitigation Programme, which set out the vision, the overall objective and the strategy. The overall objectives of the Programme included the development of a mechanism to provide, in an integrated fashion, the WMO response to the requirements and needs of Members and the international community concerning disaster reduction and to assist Members in developing/enhancing the contribution of NMHSs to national disaster preparedness programmes. The Programme's activities should place emphasis on pre-disaster preparedness and be based on the activities of WMO's scientific and technical programmes, including the World Weather Watch (WWW), the Tropical Cyclone Programme (TCP), WCP, the World Climate Research Programme (WCRP) and the HWRP. The

Commission also noted that the Executive Council had set up an Executive Council Advisory Group on Natural Disaster Prevention and Mitigation to provide appropriate guidance and provide an overview. The Commission also observed that the Advisory Group would promote and strengthen cooperation between WMO technical commissions.

11.1.3 The Commission, after an in-depth discussion of the objectives of the new Programme, recommended that the Programme be supported with the expectation that shared benefits could be achieved through such cooperation. The Commission agreed that the experience of HOMS could be used as an example for the establishment of a similar system for the exchange of technology and know-how in the field of national disaster prevention and mitigation.

11.2 ACTIVITIES OF THE WMO SPACE PROGRAMME RELEVANT TO THE HWRP (agenda item 11.2)

11.2.1 The Commission was informed that Fourteenth Congress had adopted Resolution 5 (Cg-XIV), which established a new major cross-cutting Programme, the WMO Space Programme.

11.2.2 The Commission also noted that Congress had adopted Resolution 6 (Cg-XIV) to institutionalize the WMO Consultative Meetings on High-level Policy on Satellite Matters. The Commission also noted that the Executive Council at its fifty-sixth session had adopted Resolution 9 (EC-LVI) endorsing the Global Earth Observation System of Systems (GEOSS) and requesting the technical commissions to advise as to how existing WMO observation systems could play their role effectively in support of that concept. GEOSS was expected to cover a full spectrum of in situ and remotely-sensed observations, providing an opportunity for all nations and international organizations to work together in that important area. The Commission further noted that Fourteenth Congress had agreed to build a new and closer partnership under the auspices of WMO between NMSs and environmental satellite communities.

11.2.3 The Commission noted that the 2004-2007 implementation plan of the WMO Space Programme as contained in the report of the fourth session of the WMO Consultative Meeting on High-level Policy on Satellite Matters (CM-4) had been approved by the fifty-six session of the Executive Council and that the implementation plan provided further details to the WMO Space Programme Long-term Strategy as approved in the 6LTP by Fourteenth Congress. The Commission noted the overall objective of the WMO Space Programme and the call by CM-4 for support with regard to WHYCOS and the HWRP as articulated through CHY.

11.2.4 The Commission saw value in cooperating in the Programme, recognizing the importance of space-based observations in hydrology and water resources, and recommended cooperation with the Programme. The Commission noted, however, that, in view of the limited resources available, only those

activities where a shared benefit was expected and extrabudgetary resources could be identified could be undertaken. The Commission felt that more information was required to decide on specific activities to be undertaken jointly by the two Programmes.

11.3 COLLABORATION WITH WCP AND OTHER CLIMATE-RELATED PROGRAMMES (agenda item 11.3)

11.3.1 The Commission noted with interest the continuing close links between the activities of the HWRP and those of other WMO programmes related to climate and weather, in particular the WCP, WWW, TCP, WCRP and GCOS. It noted the very special role played by water as an element within the weather and climate system and the fact that any variability and change in weather and climate had a major impact on the hydrological cycle and the manner in which water resources were managed, including disaster preparedness and prevention.

11.3.2 In particular, the Commission noted that as regards WCP the main fields of collaboration had been joint activities in the planning and implementation of WCP-Water and the production of the 1996–2001 Global Climate System Review. Joint activities had been undertaken with WWW on standardization of data management, including metadatabases and the development of integrated hydrometeorological information systems in the overall context of the Future WMO Information System (FWIS). In RA II that had led to the compilation of a strategy for the development and use of telecommunication infrastructure in a hydrological information system including the Global Telecommunication System (GTS). As regards WCRP, collaboration was centred on the activities of GEWEX and, in particular, the development of the Water Resources Applications Project, with an overall objective of improved forecasting capacity based on a better understanding of the hydrological cycle. Another important activity had been the joint development of the Global Water Cycle Theme for the Integrated Global Observing Strategy (IGOS) Partnership with the objective of providing a framework for guiding decisions for the maintenance and enhancement of water cycle observations. With regard to GCOS, emphasis had been put on the joint development and implementation GTN-H.

11.3.3 The Commission was informed about the GCOS implementation plan in support of the UNFCCC and was requested by GCOS to respond to those activities that related to CHY's responsibilities, especially with respect to the GTN-H.

11.3.4 The Commission, considering the various collaborative activities with different WMO programmes related to weather and climate, recommended that active participation be continued in those activities that covered the role of water in global environmental issues in support of the HWRP.

11.4 COLLABORATION WITH OTHER TECHNICAL COMMISSIONS AND PROGRAMMES (agenda item 11.4)

11.4.1 The Commission was informed on the issues discussed at the yearly Meetings of Presidents of Technical Commissions during the last intersessional period. Particular reference was made to those issues that were of relevance to CHy, such as the activities related to the new WMO Natural Disaster Prevention and Mitigation Programme, the WMO quality management framework (QMF), and FWIS. On the last topic, it was noted that the fifty-six session of the Executive Council had established an Intercommission Coordination Group on the FWIS.

11.4.2 The Commission was pleased to note that some of its members had been involved in activities in conjunction with other Commissions - in particular on FWIS, Regional Climate Centres (RCCs), the WMO QMF, natural disasters, and instruments and methods of observation.

11.4.3 The Commission noted the call made by the president of CCI for closer intercommission cooperation and noted the invitation to participate in an intercommission expert team on data collection related to phenology.

11.4.4 In view of the welcome increase in intercommission activities, the Commission requested its AWG to identify areas in intercommission activities with the potential to add value to the HWRP and in particular activities related to the future work programme and thematic areas of the Commission.

12. EXCHANGE OF HYDROLOGICAL DATA AND PRODUCTS (agenda item 12)

12.1 The Commission noted with satisfaction that a brochure on Resolution 25 (Cg-XIII) – Exchange of hydrological data and products – and a technical report on the types of data to be exchanged had been prepared by the AWG, published in four languages and widely circulated to Members, other organizations and international conferences. The Commission reaffirmed that the exchange of hydrological data and products was a vital requirement to reduce flood losses, maximize successful river management and support hydrological studies, particularly those on global change. It encouraged the Secretariat to continue its efforts to promote the policy established through Resolution 25 (Cg-XIII) and requested the Member countries to implement Resolution 25 (Cg-XIII) as required when dealing with data exchange activities with other countries, the research community and International Data Centres (IDCs).

12.2 The Commission was informed that, in response to the request made by Congress to keep the implementation of Resolution 25 (Cg-XIII) under review, a questionnaire on the exchange of hydrological data and products had been circulated to all WMO Members. The Commission noted the report prepared by the AWG member responsible for

data exchange on the outcome of the survey. The Commission noted that 61 per cent of the responding countries had been aware of Resolution 25 (Cg-XIII) prior to receiving the questionnaire. The survey showed that 47 per cent of the respondents had restrictions on the international exchange of data. The restrictions included denial of access for commercial use, for security reasons and owing to political conflicts. Data most commonly exchanged were water levels of rivers and reservoirs, flows and precipitation in non-real time or as historical data. Only 20 per cent provided data on flood forecasts, ice jams and water pollution alerts in near-real time. Fifty-seven per cent of the respondents had been emphatic about their willingness to exchange data, with 69 per cent believing that Resolution 25 (Cg-XIII) could help in achieving a wider exchange of hydrological data and products.

12.3 Following a request by Fourteenth Congress, the questionnaire, after being adapted, had been further circulated to RBOs and IDCs to obtain their comments and views on the status of the international exchange of data. The Commission made a request to the Secretariat that, after having received the replies from RBOs and IDCs, the results of the survey should be finalized as soon as possible and forwarded to Members. The Commission also reiterated the need for periodical assessment of the impacts of Resolution 25 (Cg-XIII).

12.4 The Commission noted with satisfaction the efforts made by WMO during the WSSD (Johannesburg, South Africa, August-September 2002), the 3WWF (Kyoto, Shiga and Osaka, Japan, March 2003) and the Pan African Implementation and Partnership Conference on Water (Addis Ababa, Ethiopia, December 2003) to address data exchange issues. The Commission supported the AWG recommendation that the issue of international data exchange be included on the agenda of international forums, wherever possible, to promote and encourage countries to implement Resolution 25 (Cg-XIII).

12.5 The Commission noted that one of the major obstacles in the practice of data exchange was the lack of a standard format. It noted that some Members had in recent years developed such standards, like America's SHEF, which could be used as a reference. The Commission noted the progress made in the metadata project that was being undertaken in close collaboration with the GRDC. It was informed about developments in the WWW Group on Data Management, in particular with regard to the refinement and implementation of a proposed WMO metadata standard that conformed to relevant International Organization for Standardization (ISO) standards, which were of relevance to the Project. The Commission, noting the difficulties encountered by NHSs in the development of standards for hydrological data and information exchange, invited the Secretariat to deploy further efforts in that direction, in cooperation with NHSs,

NMSs and global data centres. The Commission recommended that such standards should be used in the implementation of the HYCOS projects, which, in turn, could act as a vehicle for promoting the WMO policy on data and information exchange as depicted in Resolution 40 (Cg-XII) and Resolution 25 (Cg-XIII).

13. FUTURE PROGRAMME OF WORK OF THE COMMISSION (agenda item 13)

13.1 The Commission noted the structure of the future programme of work of CHy, as proposed by the president in his report. While considering the future programme of work, eight principles were considered to guide decision-making. Those principles included meeting the demands/needs of NHSs, in particular those of developing countries; building upon the role of CHy and the expertise of members; identifying activities with realistic expectations and measurable outcomes; utilizing linkages within WMO; establishing clear mutual goals with external groups (UNESCO, IAHS, HEPEX, etc.) so as not to duplicate activities and to take advantage of the skills of other groups; building on flexibility to make it possible to redirect activities, as appropriate; the need for a flexible implementation structure; and an ability to take advantage of extrabudgetary resources.

13.2 The Commission agreed, through the adoption of Resolution 1 (CHy-XII), to establish an AWG and five Open Panels of CHy Experts (OPACHE) to be organized by the following thematic areas:

- (a) Basic systems (hydrometry and hydraulics);
- (b) Water resources assessment and water use;
- (c) Hydrological forecasting and prediction;
- (d) Disaster mitigation – floods and droughts (hydrological aspects);
- (e) Analysis of hydroclimatological data for variability and trends.

13.3 Apart from identifying the five thematic areas with responsibility assigned to the AWG members, the Commission also decided to identify two additional AWG members. One was to focus on activities associated with WHYCOS and international data access and exchange, and the other on capacity-building and technology transfer activities. The Commission identified a set of activities and outputs for each member of the AWG. The Commission noted that with nine members on the AWG, there had been an increase of one member compared to the previous intersessional period. However, it observed that the added costs had been balanced by the decision not to create two subject-orientated technical working groups. The Commission urged the AWG to ensure that the funds available for the activities of the Commission were directed at achieving the measurable outcomes identified for those activities.

13.4 The Commission also discussed the mechanism to conduct its work during the following intersessional period, making use of the large number of experts who had expressed their desire to work for the Commission. In addition to the tradition of establishing experts and associate experts (by creating the five OPACHE), the Commission decided to create task teams to assist the AWG in its activities. Task teams could have a number of experts, each having associated experts. In that context, the Commission decided to continue the task of developing the sixth edition of the *Guide to Hydrological Practices* (WMO-No. 168), maintaining the Review Committee and assigning its chairperson as leader. The president might establish similar small working groups or teams to address specific subjects or topics. The task teams would report to the AWG. As appropriate, the task team leaders might be invited to attend an AWG meeting to report on the progress, recommendations and conclusions resulting from their activities. The creation of such teams would allow increased flexibility to deal with issues as they arose. It was expected that the term of the task teams would be limited.

13.5 The Commission noted that the AWG members responsible for the thematic areas might chose to take advantage of task teams should the sub-theme topic be sufficiently complex to warrant it. Any such proposals would be approved by the president of the Commission, with advice from the AWG.

13.6 The Commission considered the concept that had been adopted by CHy-XI regarding the establishment of a limited number of projects to focus attention on priority issues. It urged the AWG to follow a similar approach during the next intersessional period.

13.7 The Commission noted that pools of experts had been identified through the selection process from which task team leaders, experts and associate experts could be drawn. Those pools would be supplemented with additional names during the intersessional period.

13.8 The Commission also supported the identification of individuals who wished to increase their expertise by working closely with experts on specific topic areas. That would be a capacity-building or mentoring activity and would be undertaken through the appointment of associate experts who had expressed a desire to be considered for training or mentoring.

13.9 The Commission noted that some experts appointed by CHy-XI had still to finalize their technical reports and requested those experts to continue their work and forward their completed documents to the Secretariat so that the publication process of the Commission could be initiated as soon as possible. Those included the reports by the expert on short-term hydrological forecasting (S.V. Borsch), remote sensing (A.S. Suh), risk management (J.A. Shamonda), probable maximum

precipitation and flood (Wang Guoan), rating curves/flow derivation (N. Crookshank), statistical and spatial analysis of hydroclimatological variability and trends (U. Haryoko), and technology transfer and capacity-building (E.D. Udoeka).

13.10 The Commission requested the AWG to meet as soon as practicable and to further develop the individual work plans of AWG members and the structure to support the activities agreed to within the thematic areas. The Commission expressed the desire that work commence as soon as possible on the engagement of leaders, experts and associate experts and thus on the implementation of the future programme of work.

13.11 The Commission recalled the issues raised by the chairpersons of the subject-orientated working groups from the previous intersessional period regarding factors affecting the productivity of the experts. The Commission urged the AWG to address those issues in implementing the future programme of work, especially the establishment of an adequate communication mechanism between the AWG, leaders, experts and associate experts, and a procedure whereby the performance of AWG members, leaders, experts and associate experts was monitored and evaluated. The Commission urged the president of the Commission to take corrective action to address any issues that might arise.

13.12 Noting that the role and function of NHSs varied from country to country, the Commission requested the AWG to compile a discussion paper on the advantages and disadvantages of changing the name of the Commission for Hydrology to the Commission for Hydrology and Water Resources, in line with programme and department titles and with the inclusion of "water" in the subtitle of WMO. The discussion paper should be referred to members of CHy for comment and, if agreed, a proposal would be developed for submission to the Executive Council prior to the next session of Congress.

14. TECHNICAL COOPERATION, VOLUNTARY COOPERATION PROGRAMME AND RELATED PROJECTS (agenda item 14)

14.1 The Commission was informed that requests for technical assistance from Members under the Voluntary Cooperation Programme (VCP) in hydrology and water resources had received little support. It was recognized that support to developing countries in their efforts to improve the capacity and work of their NHSs was an important part of the Secretariat's activities. In that regard, the Commission noted with satisfaction the implementation of pilot projects on hydrological data rescue which had involved several countries from RA I, RA III and RA VI using VCP funds. It was pleased to note that the pilot project in Africa had been implemented successfully and had contributed to strengthening the human and institutional capacity

of the NHSs in many African countries; strengthening the capacity of trainers in Africa; and modernizing data archiving systems in the Region. Through the project, a valuable set of historical data had been eventually made available to the international hydrological community. The Commission was pleased to note that further phases of the project were planned. The Commission recommended that data rescue projects be implemented in other regions, in particular South-East Asia and the Pacific. Such projects could also be used as a vehicle for promoting harmonization and standardization of data formats.

14.2 The Commission noted the benefits derived from VCP projects for the participating NHSs and called on all Members to increase their contribution to the programme, and requested the Secretariat to ensure that hydrological projects continue to receive due support in the framework of the VCP.

14.3 The Commission noted that technical assistance continued to be provided to Mexico under the Programme for the Modernization of Water Resources Management (PROMMA) supported by the World Bank. It was pleased to note that several CHy experts and Secretariat staff had participated in the provision of that assistance.

14.4 The Commission also noted that the riparian countries of the Sava River (Albania, Bosnia and Herzegovina, Croatia, Serbia and Montenegro, and Slovenia) had requested WMO assistance in developing a cooperation project for the development and upgrading of a hydrometeorological information and forecasting system. Through improved data collection and management, and updated forecasting models, the project would support the implementation of the Framework Agreement on the Sava River Basin and the activities of the Interim Commission for the Sava River Basin.

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. It noted that, during the period under consideration, three publications had been issued in the OHR series, and five under the Technical Reports in Hydrology and Water Resources series. It also noted that several publicity materials had been printed and distributed.

15.1.2 The Commission also noted that TWNSO, in collaboration with WMO, had published case studies from developing countries in the Sharing Innovative Experiences series on water resources management. It was also pleased to note WMO's contribution to the first edition of the WWDR, published in 2003, and its involvement in the preparation of the second edition, to be published in 2006.

15.1.3 The Commission noted that the concept paper on Integrated Flood Management had been prepared and published in English, French and Spanish under the APFM. The paper had also been translated into Japanese by the Government of Japan.

15.1.4 The Commission was also informed of the publication of the booklet entitled *Water and disasters: Be informed and be prepared* (WMO-No. 971) as part of the public awareness effort of WWD 2004. In that same context, the January 2004 issue of the *WMO Bulletin* had been dedicated to the theme "Water and disasters". WMO had also participated, together with UN-DESA, ISDR, the United Nations Economic and Social Commission for Asia and the Pacific (ESCAP) and NOAA, in the preparation of the United Nations publication *Guidelines for Reducing Flood Losses*.

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

15.2.1 The Commission examined the list of meetings of working groups, courses and workshops and symposia in the field of hydrology and water resources convened or co-sponsored by WMO during the last intersessional period. The Commission expressed its appreciation to all sponsors and host countries of meetings. It also noted that, through WMO co-sponsorship, representatives from developing countries had been able to participate in some major international scientific symposia.

15.2.2 The Commission reviewed a list of symposia, technical conferences, workshops and seminars related to hydrology and water resources tentatively planned for 2005-2007. It noted that Fourteenth Congress had made budgetary provisions for WMO to convene or co-sponsor a number of those meetings, and that the Secretary-General had taken action to support other meetings not requiring a financial contribution from the Organization. The Commission further invited Members to provide support to, and offer to host, such events. The Commission appreciated the offer from the delegation of the United Kingdom of Great Britain and Northern Ireland to host some of the planned events and encouraged them to formalize the offer.

15.2.3 The Commission recommended that the outcomes of such workshops and symposia should be reflected in its future activities. In future, workshops and symposia to be sponsored by WMO should be closely linked to the Commission's work plan.

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

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

The Commission recalled its contribution to the development of the 6LTP, which had been adopted by Fourteenth Congress to cover the 2004-2011 period. Account had been taken of the overall structure and priorities contained in the 6LTP when the Commission had developed its own plans for future activities.

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

16.2.1 The Commission noted that Fourteenth Congress had requested the Executive Council to establish the necessary coordination mechanism for the preparation of the 7LTP, with the active participation of the technical commissions and deep involvement of the regional associations.

16.2.2 The Commission noted that the 6LTP covered the years 2004 to 2011, inclusive. The 7LTP, which would be adopted by Fifteenth Congress in 2007, would be an updated, revised and extended version of the 6LTP and intended to cover the years 2008 to 2015, inclusive.

16.2.3 The Commission was informed that Fourteenth Congress had stated that "consideration should also be given as to how best to incorporate WMO support programmes, address cross-cutting issues such as the role and operation of NMHSs, further develop cross-cutting programmes like the Regional Programme and Natural Disaster Prevention and Mitigation Programme and move forward strategic initiatives, particularly on integrated global observation and data management strategies."

16.2.4 Noting that Congress had requested the Commission to lead the formulation of all scientific and technical aspects of HWRP, including providing relevant analysis, assessment and indication of priorities, the Commission drew on the current strategic directions of the 6LTP, namely the six desired outcomes and nine strategies. The Commission also considered the importance of the long-term goals of major international meetings, including the WSSD (Johannesburg, South Africa, August-September 2002) and the 3WWF (Kyoto, Siga and Osaka, Japan, March 2003).

16.2.5 The Commission recommended that the AWG, in developing the input for the 7LTP, should ensure that the focus be on how it could contribute to both the internal goals and strategies and the external objectives.

16.2.6 The Commission recommended that, in reviewing the content of the 6LTP when making decisions for the 7LTP, the AWG should include programme activities related to water scarcity, disaster prevention and data management with

regard to the future development of the FWIS and the development of GEOSS.

16.2.7 The Commission noted that many of the activities identified in the 6LTP lacked specific details and suggested that, when compiling the 7LTP, greater attention be given to identify activities of substance and prioritize them. The Commission therefore proposed that, in developing new material for the 7LTP, the AWG should, in particular, take into consideration the following: to promote the leadership role of the Commission with regard to its areas of specific competence in hydrology and water resources by enhancing, amongst others, the visibility of the programme and seeking collaborative partnerships. The 7LTP should also address the need for institutional development in the water and environment sector. Furthermore, the Commission proposed that the following issues be addressed in the compilation of the 7LTP:

- (a) Outputs of recent key international meetings, such as the WSSD and the associated MDG, should be taken into account;
- (b) Responses to the increasing impacts of natural disasters on sustainable development;
- (c) Identification of opportunities for the integration of data management, making use of technological developments in monitoring capabilities and integrated observing systems, including those provided by remote sensing, to enhance science and modelling capabilities with a view to improve accuracy and timeliness of hydrological forecasting;
- (d) The need for adequate quality control processes and procedures, such as ISO standards;
- (e) Incorporation of those priority areas identified in the GCOS Implementation Plan which related to CHy's mandate;
- (f) The results from the IPCC Fourth Assessment Report with regard to hydrology and water resources;
- (g) The potential role of the private sector in assisting the work of the Commission.

16.2.8 The Commission recommended that both its future programme of work and the 7LTP should include, where feasible, measurable and meaningful performance indicators that could be used to evaluate the success of the activities proposed. It was noted that the activities would need to be achievable and have adequate resources.

16.2.9 The Commission requested the AWG to review the five-component programme structure of the HWRP in the light of the development of the 7LTP. The Commission requested the president to seek comments on any proposed revisions prior to the next session of the Commission.

16.2.10 The Commission noted that there should

be greater opportunity for members to contribute to the development of the Long-term Plan, and that members should also be requested to identify specific inputs to the work of the Commission to meet the objectives of its work plan. The Commission therefore requested that a draft of the Long-term Plan be circulated all members for comment prior to its finalization and final submission to Congress.

16.2.11 The Commission, noting that the 7LTP would be adopted a year before the next session of CHy, requested its president to follow up on its views and proposals and to continue to represent the Commission in formulating the part of the 7LTP relating to hydrology and water resources. It requested the AWG to assist the president in that task.

17. SCIENTIFIC LECTURES (agenda item 17)

The Commission devoted the afternoons of 21 and 27 October, and part of the afternoon of 22 October, to a series of lectures on the subjects "Progress on CHy projects" and "International data needs". Annex III to this report contains the programme of the scientific lectures. The Commission expressed its appreciation to those who had delivered the lectures. The Commission noted that the technical lectures had been a valuable contribution to the meeting and that the presentations had been made available in the CD provided to all participants and would also be uploaded on the CHy web site.

18. NOMINATION OF EXPERTS AND WORKING GROUP MEMBERS (agenda item 18)

18.1 To carry out its programme of work between the twelfth and thirteenth sessions, the Commission established an AWG composed of nine members and OPACHE on the five thematic areas. The composition of the AWG, and its terms of reference, is given in Part A of the annex to Resolution 1 (CHy-XII). The activities and expected outcomes from the five thematic areas are given in Part B of the annex to Resolution 1 (CHy-XII).

18.2 Members of the AWG were designated during the session. The names of the members of the AWG are listed in the annex to Resolution 1 (CHy-XII). The president was authorized to designate substitutes should any of those selected be unable to serve, taking into consideration, in those cases, the candidatures that had already been submitted to the Commission by Members before the end of the session.

19. REVIEW OF PREVIOUS RESOLUTIONS AND RECOMMENDATIONS OF THE COMMISSION AND OF RELEVANT EXECUTIVE COUNCIL RESOLUTIONS (agenda item 19)

The Commission examined the resolutions and recommendations adopted at its eleventh

session, as well as the Executive Council resolution relating to CHy activities which was still in force, namely Resolution 9 (EC-LIII). The decisions of the Commission in that regard are incorporated in Resolution 2 (CHy-XII) and Recommendation 4 (CHy-XII).

20. ELECTION OF OFFICERS
(agenda item 20)

Mr B.J. Stewart (Australia) was unanimously elected president of the Commission for Hydrology for the next intersessional period, and Mr J. Wellens-Mensah (Ghana) was elected vice-president.

21. DATE AND PLACE OF THE THIRTEENTH SESSION (agenda item 21)

21.1 The Commission agreed that its thirteenth session should be held in 2008. The Commission was pleased to learn that the Water Resources Ministry of China had expressed an interest in hosting the session, and noted that the invitation would need to be approved by the appropriate authorities of the Government of China.

21.2 The Commission was also pleased that the Ministry of Water Resources and Irrigation of Egypt and the Egyptian Meteorological Authority had

expressed the intention to host CHy-XIII in their country.

22. CLOSURE OF THE SESSION (agenda item 22)

22.1 At the close of the session, Mr B.J. Stewart 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. He thanked all participants for their contributions and the WMO Secretariat for its support, not only during the session, but also during the intersessional period. He went on to express his appreciation to all those who had contributed to making the session a success, including the interpreters, translators, conference officers and document clerks.

22.2 On behalf of the Secretary-General, Mr A. Tyagi added his thanks to all delegates for their active participation in the deliberations and assured them that their advice would guide the WMO Secretariat in implementing the HWRP during the next intersessional period.

22.3 The twelfth session of the Commission for Hydrology closed at 11.20 a.m. on 29 October 2004.

RESOLUTIONS ADOPTED BY THE SESSION

RESOLUTION 1 (CHy-XII)

STRUCTURE AND PROGRAMME OF WORK OF THE COMMISSION FOR HYDROLOGY

THE COMMISSION FOR HYDROLOGY,

NOTING:

- (1) Resolution 17 (Cg-XIV) — 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 eleventh session,
- (4) The report of the Secretary-General regarding the activities of the Commission during its previous intersessional 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 in implementing the activities of the Commission,

DECIDES:

- (1) To re-establish the Advisory Working Group (AWG) of CHy, acting also as the Steering Committee for the Hydrological Operational Multipurpose System (HOMS), with the terms of reference given in Part A of the annex to this resolution;
- (2) To adopt the five thematic areas contained in Part B of the annex to this resolution as a priority for the work of the Commission in the next intersessional period, together with the corresponding sets of activities and expected outputs/outcomes contained therein;
- (3) To establish five Open Panels of CHy Experts (OPACHE), one for each of the thematic areas

mentioned in (2) above and listed in Part B of the annex to this resolution, which can be further divided into sub-themes;

- (4) To establish the following general terms of reference applicable to the AWG and other experts:

- (a) Members of the AWG and experts 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 prepare specific proposals for revisions and/or additions to be included in future editions of these two publications;

- (b) Members of the AWG and experts 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 the AWG and experts 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;

- (5) To invite those whose names are given in the annex to this resolution to serve in the capacities indicated therein.

ANNEX TO RESOLUTION 1 (CHy-XII)

COMPOSITION AND TERMS OF REFERENCE OF THE ADVISORY WORKING GROUP AND THEMATIC AREAS OF THE COMMISSION FOR HYDROLOGY AS ESTABLISHED AT ITS TWELFTH SESSION**PART A****ADVISORY WORKING GROUP OF THE COMMISSION FOR HYDROLOGY (ALSO THE STEERING COMMITTEE FOR HOMs)****1. B.J. Stewart (Australia), president of CHy****Terms of reference**

- (a) To undertake the duties required of a president of a WMO technical commission in accordance with General Regulation 185;
- (b) To chair meetings, as required, within the above duties, including, for example, the CHy AWG, the WHYCOS International Advisory Group, etc.;
- (c) To represent CHy in the WMO system, in cooperation with other United Nations agencies, especially UNESCO, and at a range of other meetings, workshops and conferences;
- (d) To promote the recognition of, and increase awareness about, the role of WMO in hydrology and water resources;
- (e) To monitor progress made in the revision of the *Guide to Hydrological Practices* (WMO-No. 168).

Expected outputs/outcomes

- (a) Assistance to NMHSs in fulfilling their role and responsibilities through the observance of the general terms of reference for all WMO technical commissions and the terms of reference of the Commission for Hydrology as provided in Annex III to the General Regulations;
- (b) An up-to-date sixth edition of the *Guide to Hydrological Practices*.

2. J. Wellens-Mensah (Ghana), vice-president of CHy**Terms of reference**

- (a) To assist the president of the Commission, as and when required;
- (b) To ensure that the activities of regional associations, and, in particular, the Regional Association Working Groups on Hydrology (RA WGHs) are coordinated within overall Commission activities and that there is effective communication between the Commission and the RA WGHs;
- (c) To monitor, report and provide advice on changes in the role and responsibilities of NMHSs, in particular in relation to water-related matters at national level;
- (d) To monitor product delivery and public awareness in hydrology and water resources;
- (e) To organize the update of INFOHYDRO.

Expected outputs/outcomes

- (a) Assistance to NMHSs in fulfilling their role and responsibilities through the observance of the terms of reference of the Commission for Hydrology as provided in Annex III to the General Regulations;
- (b) Increased efficiency and effectiveness of WMO's contribution to hydrology and water resources through coordination of the activities of the RA WGHs and CHy (to be reported on at each AWG meeting);
- (c) Provision of advice (through papers, technical documents, etc.) to NMHSs on key issues/topics as they arise;
- (d) A new version of INFOHYDRO.

3. M. de Freitas (Brazil), member leading activities associated with WHYCOS and international data access and exchange

Terms of reference

- (a) To promote, monitor and provide advice with regard to the development and implementation of the WHYCOS project;
- (b) To assist in the development of material in support of the WHYCOS project (including information on data standards and metadata in liaison with the relevant member of AWG);
- (c) To promote, monitor, report and provide advice on the application of Resolution 25 (Cg-XIII) by Members and in HYCOS projects, as and when necessary;
- (d) To monitor, report and provide advice on the activities of the international data centres and international data requirements, including, among others, GRDC, the Global Precipitation Climatology Centre (GPCC) and IGRAC and hydrological components of large-scale initiatives such as GEWEX and GTN-H, GCOS, GTOS, IGOSS (Water Cycle) and GEOSS;
- (e) To report on activities at each AWG meeting and as requested by the president of CHy.

Expected outputs/outcomes

- (a) The application of internationally agreed, common standards for hydrological data collection, storage, analysis and presentation in the WHYCOS project and the individual HYCOS activities;
- (b) Wide application of Resolution 25 (Cg-XIII) and the improvements to global and regional initiatives that this will enable;
- (c) Effective CHy contribution to relevant global and regional initiatives that enable the required information to be available for sustainable water resources management and disaster mitigation.

4. E. Udoeka (Nigeria), member leading activities associated with capacity-building and technology transfer

Terms of reference

- (a) To coordinate the collection, review and submission to CHy AWG of material for the *Technical Regulations* (WMO-No. 49);
- (b) To assist the AWG in fulfilling its duties as outlined in the Implementation Plan for HOMS;
- (c) To coordinate the editing and publication of reports prepared on behalf of CHy;
- (d) To identify and lead actions with regard to the education and training requirements of the Commission's activities under the adopted Capacity-Building Strategy;
- (e) To report on activities at each AWG meeting and as requested by the president of CHy.

Expected outputs/outcomes

- (a) CHy *Technical Regulations* that are up to date and relevant to the roles and responsibilities of NMHSs;
- (b) Capacity-building of NMHSs through the provision of relevant technology and training to meet their identified needs;
- (c) Timely and effective publications of the outputs of the activities of the CHy programme of work;
- (d) Effective implementation of the CHy Capacity-Building Strategy in support of the role and responsibilities of NMHSs.

5. P. Pilon (Canada), member leading activities associated with the basic systems (hydrometry and hydraulics) theme of CHy

Terms of reference

To lead, monitor, report and provide advice on the activities of the relevant OPACHE, as indicated in Part B of this annex, and to undertake the following activities:

- (a) To liaise, as necessary, with relevant areas of WMO (e.g. CIMO) and other United Nations agencies with regard to basic systems (hydrometry and hydraulics) activities;
- (b) To report on activities at each AWG meeting and as requested by the president of CHy.

Expected outputs/outcomes

- (a) Provision of support, through holding meetings and workshops and preparing documents as appropriate, to NMHSs through the fulfilment of the programme of work being undertaken under the hydrometry and hydraulics theme of CHy;
- (b) Improved knowledge, understanding, information and technology in relation to the identified hydrometric and hydraulic information requirements of NMHSs;
- (c) Increased effectiveness of CHy activities through strategic alliances with other relevant groups and agencies.

6. A. Calver (Ms) (United Kingdom), member leading activities associated with the water resources assessment and water use theme of CHy

Terms of reference

To lead, monitor, report and provide advice on the activities of the relevant OPACHE, as indicated in Part B of this annex, and to undertake the following activities:

- (a) To liaise, as necessary, with relevant areas of WMO and other United Nations agencies (e.g. UNESCO) and relevant groups with regard to water resources assessment and water use activities;
- (b) To report on activities at each AWG meeting and as requested by the president of CHy.

Expected outputs/outcomes

- (a) Provision of support, through holding meetings and workshops and preparing documents as appropriate, to NMHSs through the fulfilment of the programme of work being undertaken under the water resources assessment and water use theme of CHy;
- (b) Improved knowledge, understanding, information and technology in relation to the identified water resources assessment and water use information requirements of NMHSs;
- (c) Increased effectiveness of CHy activities through appropriate cooperation and coordination of activities with other relevant groups and agencies;
- (d) Avoidance/decrease of duplication of effort between WMO and other United Nations agencies dealing in hydrology and water resources.

7. J. Zhang (China), member leading activities associated with the hydrological forecasting and prediction theme of CHy

Terms of reference

To lead, monitor, report and provide advice on the activities of the relevant OPACHE, as indicated in Part B of this annex, and to undertake the following activities:

- (a) To liaise, as necessary, with relevant areas of WMO and other United Nations agencies (e.g. UNESCO IHP, Joint WMO/UNESCO Flood Initiative) with regard to hydrological forecasting and prediction activities;
- (b) To report on activities at each AWG meeting and as requested by the president of CHy.

Expected outputs/outcomes

- (a) Provision of support, through holding meetings and workshops and preparing documents as appropriate, to NMHSs through the fulfilment of the programme of work being undertaken under the hydrological forecasting and prediction theme of CHy;

- (b) Improved knowledge, understanding, information and technology in, relation to the identified hydrological forecasting and prediction information requirements of NMHSs;
- (c) Increased effectiveness of CHy activities through strategic alliances with other relevant groups and agencies;
- (d) Avoidance/decrease of duplication of effort between WMO and other United Nations agencies dealing in hydrology and water resources.

8. S. Demuth (Germany), member leading activities associated with the disaster mitigation – floods and droughts (hydrological aspects) theme of CHy

Terms of reference

To lead, monitor, report and provide advice on the activities of the relevant OPACHE, as indicated in Part B of this annex, and to undertake the following activities:

- (a) To liaise, as necessary, with relevant areas of WMO (with special regard to the WMO Programme on Natural Disaster Prevention and Mitigation) and assist in WMO's contribution to the WWDR through the provision of inputs on risk assessment and with regard to disaster mitigation – floods and droughts (hydrological aspects) activities;
- (b) To report on activities at each AWG meeting and as requested by the president of CHy.

Expected outputs/outcomes

- (a) Provision of support, through holding meetings, workshops and preparing documents as appropriate, to NMHSs through the fulfilment of the programme of work being undertaken under the disaster mitigation – floods and droughts (hydrological aspects) theme of CHy;
- (b) Improved knowledge, understanding, information and technology in relation to the identified disaster mitigation – floods and droughts (hydrological aspects) information requirements of NMHSs;
- (c) Increased effectiveness of CHy activities through strategic alliances with other relevant groups and agencies.

9. H. Lins (United States), member leading activities associated with the analysis of hydroclimatological data for variability and trends theme of CHy

Terms of reference

To lead, monitor, report and provide advice on the activities of the relevant OPACHE, as indicated in Part B of this annex, and to undertake the following activities:

- (a) To liaise, as necessary, with relevant areas of WMO and other United Nations agencies (UNESCO IHP, IAHS) with regard to the analysis of hydroclimatological data for variability and trends activities;
- (b) To report on activities at each AWG meeting and as requested by the president of CHy.

Expected outputs/outcomes

- (a) Provision of support, through holding meetings and workshops and preparing documents as appropriate, to NMHSs through the fulfilment of the programme of work being undertaken under the analysis of hydroclimatological data for variability and trends theme of CHy;
- (b) Improved knowledge, understanding, information and technology in relation to the identified analysis of hydroclimatological data for variability and trends information requirements of NMHSs;
- (c) Increased effectiveness of CHy activities through strategic alliances with other relevant groups and agencies.

PART B

THEME AREAS

Basic systems (hydrometry and hydraulics)

List of activities

- (a) To continue the development of automated hydrometric data-production procedures, including a decision-support system that:
 - (i) Incorporates a framework for applying quality assurance/quality control procedures in automated systems;
 - (ii) Provides a methodology for establishing rating curves based on hydraulic modelling;
 - (iii) Provides an estimate of discharge and/or velocity for systems with an unstable control that has no unique rating curve;
- (b) To review and revise the *Manual on Stream Gauging* (WMO-No. 519);
- (c) To develop a proposal and implement a project to assess the performance of flow measurement instruments and techniques against WMO standards;
- (d) To assist in the development of standards, formats and protocols for data transfer.

Expected outputs/outcomes

- (a) Identification and documentation of agreed international standards for the hydrometric and hydraulic activities of NMHSs;
- (b) A revised version of the *Manual on Stream Gauging* in support of the role of NMHSs in discharge measurement;
- (c) Identification (hardware) and development (software) of technology to support the required needs of NMHSs in discharge measurement and estimation;
- (d) Standards, formats and protocols for the transfer of hydrological data and information.

Water resources assessment and water use

List of activities

- (a) To investigate the use of modern modelling technologies to increase network effectiveness and assist in the rationalization of hydrological networks (e.g. IAHS PUB);
- (b) To complete the preparation and publication of the manual on methodologies for determining water resources (surface and groundwater) availability and use (state and condition), including for transboundary river basins/aquifers;
- (c) To promote the use of this manual through workshops;
- (d) To identify and document methods of assessing the water losses from reservoirs and large lakes;
- (e) To assist in the WMO contribution to the WWDR through the provision of information on water resources (surface and groundwater) availability and use, including the development of indicators;
- (f) To promote data rescue activities when they are of value/benefit to the activities of NMHSs in water resources assessment;
- (g) To review and revise the draft material provided for the manual for water resources assessment.

Expected outputs/outcomes

- (a) Provision of NMHSs with tools and techniques for the assessment of their water resources (both surface and groundwater) in support of sustainable management of the resource;
- (b) Promotion of the role of NMHSs through involvement in, and contributions to, the WWDR and identification of indicators of water resources (surface and groundwater) availability and use which are measurable by, and relevant to, the activities of NMHSs;
- (c) Increased effectiveness of CHy activities through appropriate cooperation and coordination of activities with other relevant groups and agencies;
- (d) A manual for water resources assessment.

Hydrological forecasting and prediction

List of activities

Flood forecasting, including flash-flood (0-12 hours) and short-term flood forecasting (0-5 days):

- (a) To continue the CHy Project on Global/Regional Short-term Flood Forecasting (in particular with regard to the incorporation of quantitative precipitation estimation (QPE) and quantitative precipitation forecasting (QPF) in flood forecasting models);
- (b) To develop improved QPE techniques at the basin scale, involving multi-sensor approaches, open architecture systems and providing point, gridded or sub-basin scale estimates for data sparse to data rich areas;
- (c) To support development of a manual on flood forecasting;
- (d) To review approaches for forecasting combined storm surge and river flooding;
- (e) To review approaches for forecasting ice formation/break-up and glacier outburst.

Flood forecasting—medium to long-term (>5 days):

- (a) To review current progress in, benefits from and capabilities of medium- to long-term hydrological forecasting/seasonal forecasting (including precipitation);
- (b) To liaise with CCI on related matters.

Cross-cutting activities:

- (a) To enhance product delivery through closer cooperation with NMSs;
- (b) To provide guidance and hold workshops on flood forecasting, including probabilistic approaches;
- (c) To participate, as necessary, in HEPEX and other flood-related international activities.

Expected outputs/outcomes

- (a) Improved flood forecasting capabilities for NMHSs through new techniques and better assimilation of available data into hydrological models for flood forecasting purposes;
- (b) A coordinated and cooperative effort amongst modellers (in NMSs and NHSs) to work together in the interests of developing an effective and technologically sound and robust flood forecasting methodology (incorporating QPE and QPF);
- (c) Development of new multi-sensor methodologies for QPE for operational use that considers gauged data, satellite, ground-based radar and model-derived estimates;
- (d) Approaches to forecasting ice formation/break-up, glacial outburst, and combined storm surge and river flooding will be documented;
- (e) Documentation to assist NMHSs in fulfilling their roles and responsibilities in the provision of flood warning services;
- (f) Guidance on the potential use and benefits of medium- to long-term flood and flow forecasting capabilities;
- (g) Increased effectiveness of CHy activities through appropriate cooperation and coordination of activities with other relevant groups and agencies.

Disaster mitigation – floods and droughts (hydrological aspects)

List of activities

- (a) To promote the use of the United Nations *Guidelines on Reducing Flood Losses* and the role of NHSs in flood disaster mitigation;
- (b) To provide advice and guidance on hydrological risk management issues of relevance to the Commission;
- (c) To prepare a design flood estimation manual which addresses issues such as the scarcity of data, including ungauged basins, and the potential implications of climate change;
- (d) To prepare a design low flow estimation handbook;
- (e) To provide guidance on the legal and governmental frameworks as well as information and public participation for dealing with disaster management, including the role of NHSs;
- (f) To liaise and lead CHy involvement with the associated work on flood forecasting and the MILAC proposal.

Expected outputs/outcomes

- (a) Assistance to, and guidance in, disaster mitigation and risk management in support of the role and responsibilities of NMHSs;
- (b) Design flood and low flow estimation manuals prepared to meet the identified requirements of NMHSs;
- (c) Increased effectiveness of CHy activities through appropriate cooperation and coordination of activities with other relevant groups and agencies.

Analysis of hydroclimatological data for variability and trends**List of activities**

- (a) To continue involvement in the WCP-Water project on the analysis of variability and trends in hydroclimatological data;
- (b) To promote the use of the pristine river basin criteria and the identification of river basins that meet these criteria;
- (c) To liaise, as necessary, with relevant global data activities, such as GTN-H, GCOS and GEOSS;
- (d) To liaise with the IPCC working groups.

Expected outputs/outcomes

- (a) Statistically sound and relevant studies of trends in hydroclimatological data for input to decision-making activities associated with sustainable water resources management and disaster mitigation;
- (b) An agreed international network of pristine river basins;
- (c) Increased effectiveness of CHy activities through appropriate cooperation and coordination of activities with other relevant groups and agencies.

RESOLUTION 2 (CHy-XII)

REVIEW OF PREVIOUS RESOLUTIONS AND RECOMMENDATIONS OF THE COMMISSION FOR HYDROLOGY

THE COMMISSION FOR HYDROLOGY,
CONSIDERING that all resolutions adopted prior to its twelfth session are now obsolete,
NOTING the action taken on the recommendations adopted prior to its twelfth 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, and Recommendation 1 (CHy-XI) — Establishment of an International Groundwater Resources Assessment Centre (IGRAC), all other recommendations now being redundant.

RECOMMENDATIONS ADOPTED BY THE SESSION

RECOMMENDATION 1 (CHy-XII)

AMENDMENTS TO THE WMO *TECHNICAL REGULATIONS* (WMO-No. 49), *VOLUME III — HYDROLOGY*

THE COMMISSION FOR HYDROLOGY,
NOTING the report of the president of the Commission and that of the chairperson of the Working Group on Water Resources,
CONSIDERING that the *Technical Regulations, Volume III – Hydrology*, need to be continuously reviewed and made more comprehensive,

RECOMMENDS to the Executive Council that the *Technical Regulations, Volume III – Hydrology*, be amended to reflect the changes described in the annex.

ANNEX TO RECOMMENDATION 1

PROPOSED AMENDMENTS TO THE WMO *TECHNICAL REGULATIONS* (WMO-No. 49), *VOLUME III — HYDROLOGY*

(proposed text appears in bold)

1. Annex 1: Hydrological Instruments and methods of observation

1.1 Replace the definition on page III-An.1 – 1 of critical flow by: **“Flow in which Froude number equals unity. Under this condition the celerity of small disturbances equals the mean flow velocity.”** Include on this page the following definition: **“Celerity: Speed of propagation of a wave.”**

1.2 Delete from the first and second page of I — CALIBRATION OF CURRENT METERS IN STRAIGHT OPEN TANKS all references to the concept of the Epper effect.

1.3 In the first Note of II — WATER-LEVEL MEASURING DEVICES, item (a), replace the figure in brackets to read **“1995”** instead of 1979.

1.4 Replace the title of III — SOUNDING AND SUSPENSION EQUIPMENT by **“III — DIRECT DEPTH SOUNDING AND SUSPENSION EQUIPMENT”**. Introduce this same change to item (a) of the first note.

1.5 In the first Note of V — PRECALIBRATED WEIRS FOR THE DETERMINATION OF DISCHARGE, item (a), replace 14381/1 (1980) by **“14381/1 (1998)”**, 3846 (1977) by **“3846 (1989)”**, 4360 (1979) by **“4360 (1984)”**, 4374 (1982) by **“4374 (1990)”** and 4377 (1982) by **“4377 (2002)”**.

1.6 In the first Note of VI — ESTABLISHMENT AND OPERATION OF A HYDROMETRIC STATION, item (a), replace (1981) by **“(1996)”** and (1979) by **“(1997)”**.

1.7 In the first Note of VII — DETERMINATION OF THE STAGE-DISCHARGE RELATION, item (a), replace (1982) by **“(1998, 2000)”**.

1.8 Change item (a) of the first Note of section VIII — ESTIMATION OF UNCERTAINTY OF DISCHARGE MEASUREMENTS to read: **‘The material in this section of the annex is based on ISO 1088 (1998) “Liquid flow measurements in open channels – Velocity area methods – Collection and processing of data – for determination of errors in measurement.” Additional information can be found in ISO Technical Report 7178 (1983)’**.

1.9 In the first Note of IX — FLOW MEASUREMENT USING FLUMES, item (a), replace (1983) by **“(1999)”**.

1.10 Change item (a) of the first Note of section X — DILUTION METHODS FOR MEASUREMENT OF FLOW to read: **“The material in this section of the annex is based on: ISO 9555-1 (1994): Measurement of liquid flow in open channels – Tracer dilution methods for the measurement of steady flow – Part 1: General; ISO 9555-2 (1992): Measurement of liquid flow in open channels – Tracer dilution methods for the measurement of steady flow – Part 2: Radioactive tracers; ISO 9555-3 (1992): Measurement of liquid flow in open channels – Tracer dilution methods for the measurement of steady flow – Part 3: Chemical tracers; and ISO 9555-4 (1992): Measurement of liquid flow in open channels – Tracer dilution methods for the measurement of steady flow – Part 4: Fluorescent tracers.”**

2. Other parts of the *Technical Regulations, Volume III — Hydrology*

2.1 Paragraph 18 of the introduction. Remove the footnote and the word “operational”.

2.2 Remove all references to Annex 2 — Hydrological codes.

2.3 Change the title of section D.1 to read **“Hydrological information and warnings”**.

RECOMMENDATION 2 (CHy-XII)

WMO STRATEGY ON EDUCATION AND TRAINING IN HYDROLOGY AND WATER RESOURCES

THE COMMISSION FOR HYDROLOGY,

NOTING:

- (1) That suitably trained staff in hydrology and water resources is the key to the effectiveness of Hydrological and Hydrometeorological Services and is therefore fundamental to the successful implementation of the Hydrology and Water Resources Programme (HWRP) of WMO,
- (2) The recognition by several WMO constituent bodies that there is a need for greater involvement of the technical commissions in the implementation of the scientific and technical programmes of the Organization,
- (3) The need to optimize the use of available resources for education and training in hydrology and water resources, by focusing the efforts of WMO on those areas indicated as a priority by its Members,
- (4) That in order to meet adequately the challenges, any mechanism should be

flexible and include the possibility of being updated easily,

RECOGNIZING the leading role of the Education and Training Programme (ETRP) of WMO in supporting education and training activities in the areas of interest to WMO,

RECOMMENDS to the Executive Council of WMO:

- (1) To endorse the WMO Strategy on Education and Training in Hydrology and Water Resources included in Annex II;
- (2) To request the Secretary-General to take the necessary measures to ensure that WMO activities in this field will, in the future, be conducted in accordance with the principles contained in the Strategy;
- (3) To further request the Secretary-General to disseminate the Strategy to Members, related academic institutions and appropriate United Nations agencies.

RECOMMENDATION 3 (CHy-XII)

REVISION OF SCOPE OF THE WMO REGIONAL METEOROLOGICAL TRAINING CENTRES (RMTCS)

THE COMMISSION FOR HYDROLOGY,

NOTING:

- (1) The call of the Johannesburg Plan of Implementation to enhance and accelerate human, institutional and infrastructure capacity-building initiatives and promote partnerships in that regard which respond to the specific needs of developing countries in the context of sustainable development,
- (2) The additional recommendation of the Johannesburg Plan of Implementation to support local, national, subregional and regional initiatives with actions to develop, use and adapt knowledge and techniques and to enhance local, national, subregional and regional centres of excellence for education, research and training in order to strengthen the knowledge capacity of developing countries and countries with economies in transition through, amongst others, the mobilization from all sources of adequate financial and other resources, including new and additional resources,
- (3) That the ten-year period beginning on 1 January 2005 has been proclaimed the United Nations Decade of Education for Sustainable Development (UNGA/RES/57/254),

- (4) That the twelfth session of the Commission for Hydrology has agreed that well-organized and coherent education and training activities are fundamental to the successful implementation of the Hydrology and Water Resources Programme (HWRP) and has consequently approved the WMO Strategy on Education and Training in Hydrology and Water Resources, consisting of two parts, the first containing guiding general principles, and the second concentrating on the next intersessional period of CHy, to be reviewed by each session of CHy,
- (5) The positive results of the concept of Regional Meteorological Training Centres (RMTCs) in the WMO community,
- (6) The recommendation of the third session of the CHy Advisory Working Group (Geneva, February 2004) to develop a recommendation to submit to the twelfth session of the Commission for Hydrology promoting the establishment of Regional Hydrological Training Centres,
- (7) The growing global consensus that the interrelationships of the various elements of the environment call for an interdisciplinary approach as the only sensible alternative

with any chance of success in their management,

- (8) That the WMO community has an important role to play in weather, climate, water and environmental issues,
- (9) That the recently adopted subtitle of the Organization implies a new, more encompassing approach to its endeavours than in the past,

RECOGNIZING the leading role of the Education and Training Programme (ETRP) of WMO in organizing education and training activities in the areas of interest to WMO,

RECOGNIZING FURTHER that there is a need for WMO to make a meaningful contribution to the United Nations Decade of Education for Sustainable Development,

TAKING INTO ACCOUNT the need to coordinate actions in education and training in hydrology and water resources with other organizations and United Nations agencies, in particular UNESCO, in order to avoid duplication of efforts in an area that has limited resources,

CONSIDERING that the concept of regional training centres will contribute greatly to the streamlining and optimization of education and training activities of the HWRP of WMO,

RECOMMENDS to the Executive Council:

- (1) To consider widening the scope of WMO RMTCs, in order to accommodate the other scientific and technical disciplines under the areas of interest to WMO. This could be achieved, among other actions, by:
 - (i) Modifying the title of the Centres to WMO Regional Training Centres (RTCs);
 - (ii) Adapting the existing Executive Council Criteria for the Recognition of WMO Regional Meteorological Training Centres accordingly;
- (2) To encourage more WMO RTCs to organize training courses in hydrology and water resources;
- (3) To encourage Members and appropriate United Nations agencies to support and collaborate in the establishment and functioning of the RTCs.

RECOMMENDATION 4 (CHy-XII)

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-LIII) — Report of the eleventh session of the Commission for Hydrology.

ANNEXES

ANNEX I

Annex to paragraph 7.3.7 of the general summary

CRITERIA FOR THE SELECTION OF PRISTINE RIVER BASINS

1. Introduction

The IPCC publication *Climate Change 2001: The Scientific Basis*, in its Summary for Policymakers and the Technical Summary of the Working Group I Report, concludes that an increasing body of observations gives a collective picture of a warming world accompanied with other changes in the climate system owing to emissions of greenhouse gases and aerosols generated by human activities, and evidence shows that most of the warming observed over the last 50 years is attributable to human activities. However, the report has called for further action to address remaining gaps in information and understanding of the process.

2. Objective

Climate change has the potential to have significant impacts on the availability of water resources and on extreme events and thereby have socio-economic consequences. Monitoring the implications of climate change on the land phase of the hydrological cycle is crucial for assessing future water availability and managing water-related extreme events and is made even more complex by the interaction between land use and hydrology. In many instances, the changes to variability which result from climate change may be masked by the impact changes to land use have on water resources. The objective of the selection of pristine river basins is to identify those basins where the anthropogenic changes have been minimal, so that the trends attributable to climate change can be identified clearly. The data from these pristine basins would help the scientific community to provide a clearer picture of the hydrological impacts of climate change and provide the water resources planners and managers with indicators for use in the design of sustainable and reliable systems. The analysis of stream-flow records should be complemented, where possible, with precipitation and temperature data. These together can be used to perform long-term water balance analyses.

3. Criteria

Based on the evaluation of the available literature, the AWG has developed a set of selection criteria for the identification of pristine river basins as a Reference Climate Variability and Change Hydrological Station Network, namely:

- (a) Breadth of coverage (seasonal, continuous, streamflow and lake level):
Records should be (wherever possible) continuous streamflow and lake level information. A minimum requirement is daily streamflow and lake level data;
- (b) Degree of basin development:
There should preferably be minimal river basin development. However, if river basin development has occurred, it should now be stable (i.e. not decreasing or increasing) and planning regulations should be in place to restrict substantial development. Pristine sites are considered as those having less than 10 per cent of the surface area modified in some fashion. Examples may include protected water supply catchments, nature reserves, etc.;
- (c) No significant regulation or diversions:
Total extractions or diversions should not exceed five per cent of the mean annual flow;
- (d) Length of suitable record:
At least 20 years of record;
- (e) Longevity:
The stations should be identified as being required for monitoring the impacts of climate change and should be maintained into the future. The conditions outlined above should be maintained as part of that commitment;

- (f) Accuracy of data:
The accuracy of the data should be good to high;
- (g) The data should be available in electronic format.

There was no specific criterion established regarding the density of the network. In essence, judgement should be used in including sites that failed to meet to some extent the established criteria, in under-represented geographic or ecological areas. In addition, where several sites exist in close geographic proximity, judgement should be used to select the best of those available, based mostly on the selection criteria of breadth of coverage, length of record, longevity, and accuracy of records.

Lake levels are also considered as being potentially useful for analysis of the impacts of climate on surface waters and were included in the screening process. Two designations could be allowed for lakes. The first is for lakes representing closed drainage systems. The second represents the more typical lake within an open channel system.

4. Explanation

The *breadth of coverage* criterion refers to the types of hydrometric stations to be considered in the analysis. For example, all seasonal, continuous and lake level stations should be considered for further screening. Seasonal stations can be included in the analysis, as they are operated on a seasonal basis owing to local climatological and physiographic conditions. Such sites are usually operated from just prior to spring break-up to late autumn. It is felt that these sites could prove useful for the analysis of change related to this period of the year, thereby greatly increasing the spatial coverage of the network.

In addition, under this criterion, only observed discharge values and values estimated, through the, application of national standard procedures should be included. This infers that no sites with 'constructed' records should be considered for inclusion in the network.

The second criterion reflected the *degree of basin development*. Stations within the pristine basin network should represent pristine or, as a minimum, stable land-use conditions. If no systematic recording of changes in landscape is made by the NHS, a subjective assessment should be made of the percentage of basin development for each candidate site. Pristine sites are considered as those having less than 10 per cent of the surface area modified in some fashion.

The third criterion is *no significant regulation or diversions* within the river system. For regulated systems, the question arises as to whether the degree of regulation is significant. Basins with structures controlling less than five per cent of the area of a basin should be included in the analysis.

The fourth criterion is *length of record*. A minimum of 20 years is set, with the provision that stations in under-represented geographic, climatic, or ecological zones could be considered.

The fifth criterion is *longevity*. This criterion was established to reflect the judgement of regional staff that the basin would remain in a pristine or stable state in the foreseeable future. In other words, the station must be currently active and no future activities within the basin would impair the data from its inclusion within the pristine basin network. This criterion is also aimed to reflect the relative potential – although difficult in periods of fiscal restraint and budgetary decreases – of future funding. Hence, in some cases, when choosing between potential sites within close proximity, preference may be given to those sites with funding secured for specific purposes, such as flood forecasting.

The sixth criterion is *accuracy of the records*. In most cases in hydrometry, there is no quantitative estimate of the accuracy of a particular published streamflow value. The accuracy of the data should be qualitatively assessed by local experts based on their knowledge of the hydraulic conditions at each site, such as the stability of the control and the accuracy of the rating curve. They may wish to assign a nominal score from one to five, representing excellent to poor quality data. Attention should also be given to assessing impacts of changing instrumentation and measurement methodologies that might influence the homogeneity of data.

Availability in electronic format is the final criterion. While this is not essential, it is strongly advised that data be readily accessible in an easily retrievable electronic format to enable transmission and analysis of the data using modern statistical and other computer-based software. While the criterion is highly desirable, stations which meet all other criteria should not be discounted because they fail to meet this criterion; indeed every effort should be made to have the data for such stations made available in electronic format through a data rescue initiative.

ANNEX II

Annex to paragraph 9.2.4 of the general summary

WMO STRATEGY ON EDUCATION AND TRAINING IN HYDROLOGY AND WATER RESOURCES

PART 1 – General concepts and principles

1. Introduction

The purpose of this document is to lay down the guiding principles on which the education and training activities of WMO in the field of hydrology and water resources (HWR) should be based in the future (after 2004).

The document has been prepared by the AWG and the Secretariat, taking into account:

- (a) The experience accumulated during several years of conducting business, mainly in what could be defined as a 'reactive way', namely considering requests for support to education and training activities on a case-by-case basis, without defining an overall conceptual framework;
- (b) The fact that, during recent WMO financial periods, the financial resources available for HWR in general (and for education and training activities in HWR in particular) in WMO have remained practically constant, while the demand from Members has increased proportionally to the rise of the 'water issue' to the top of the international political agenda;
- (c) The recognition that there is a need to optimize the available resources, by concentrating WMO's support, be it directly to the organizers of education and training activities or through fellowships, to those courses which address areas identified by the WMO hydrological community as requiring priority attention, in which WMO has the possibility of influencing the development of curricula, which represent an adequate geographical balance, and which are proven to be cost-effective;
- (d) The need for a greater involvement of CHy in the design, implementation, monitoring and update of the strategy;
- (e) The fact that, within the WMO Secretariat, the Education and Training Department is the key department for the coordination of education and training activities and that the assignment of fellowships is under the responsibility of the Fellowship Committee;
- (f) The relative success of the concept of Regional Meteorological Training Centres in the WMO community;
- (g) The wish expressed by the AWG to move to a more integrated, focused and proactive approach in education and training in HWR;
- (h) The principles contained in the *Guidelines for the Education and Training of Personnel in Meteorology and Operational Hydrology* (WMO-No. 258), *Volume II — Hydrology*;
- (i) The education and training activities in HWR promoted by other agencies within the United Nations system, in particular UNESCO, and other intergovernmental and non-governmental organizations, and the fact that the 10-year period beginning on 1 January 2005 has been proclaimed the United Nations Decade of Education for Sustainable Development (UNGA/RES/57/254).

On the basis of the above, the following mission, vision, main objectives, identification of target groups, and mechanisms to establish priority areas and implementation means of the HWRP activities relating to education and training in hydrology were defined.

2. Mission

To support Members in assessing their education and training needs in HWR and play a catalytic role in satisfying those needs, by providing both financial and technical assistance.

3. Vision

NHSs contributing effectively to integrated water resources management in their countries, by generating, organizing and disseminating adequate information on the state of water resources.

4. Objectives

The objectives are as follows:

- (a) To assist Members in assessing their own education and training needs in HWR;
- (b) To provide adequate education and training to NHS staff;
- (c) To assist Members in developing/updating national curricula in HWR;
- (d) To optimize the use of available resources and mobilize extrabudgetary resources.

5. Identification of target groups

The primary target group is that of technical staff of the Hydrological and Hydrometeorological Services of WMO Members, including technicians, professionals and managers. The secondary group is that of academic and government agencies involved in hydrology and water resources. While it is fashionable to give local communities, and civil society in general a high level of priority, it has to be recognized that they will generally be outside the scope of this strategy, given the specialized nature of WMO. Particular attention will be given to the needs of NMHSs from developing countries, as they are likely to benefit the most from WMO's assistance.

6. Prioritization of subjects

Education and training activities supported by WMO should in principle be demand driven. The requirements will be determined on the basis of inputs from Members, RA WGHs, CHy and its subsidiary bodies, and surveys undertaken by the WMO Secretariat. The results will be analysed and prioritized by CHy at its regular sessions and presented to the following Executive Council for its endorsement. Prioritization will thus be valid for a four-year period. Permanent Representatives with WMO, their hydrological advisers, members of CHy and training centres which have maintained relationships with WMO will be informed of the priority areas selected for each period.

This means that support given to course organizers as well as the approval of fellowships will be focused on those areas determined as indicated above. There would still be room to support requests on a case-to-case basis, but this should be limited.

Types of education and training activities

In order to maximize the extent of the HWRP activities relating to education and training in hydrology, emphasis will be put on activities of a short duration, with low costs and great potential impact with regard to the number of beneficiaries, without compromising on quality. Given their proven value, activities such as training the trainers and roving seminars will be pursued principally, with regional courses being used only when it is proven to be the most practical solution. Certificates will be issued which recognize the results, the level of the course and hours of attendance at lectures.

Conferences/seminars/workshops on specific issues which are not covered by existing training centres will be organized, preferably through co-sponsorship arrangements.

Particular attention will be paid to distance learning techniques and the application of the latest information technologies available, such as Internet-based presentation software and knowledge management systems, in view of the evident advantages of their successful application. To this end, existing, pioneering experiences already supported by WMO will be evaluated in order to decide if, when and where they are the preferred alternative.

When there is widespread interest in a particular technical topic, the drawing-up of new manuals and guidelines, and the updating of existing ones, will be considered, following the examples of those issued in the past, such as those on stream gauging, PMP, and water quality monitoring.

Another important field of action will be encouraging Members to use the *Guidelines for the Education and Training of Personnel in Meteorology and Operational Hydrology* (WMO-No. 258) *Volume II — Hydrology*, since these *Guidelines* will contribute to the development of national curricula and syllabuses under an international framework, both at the professional and technician level.

Although public awareness and community training activities are recognized as being very important, they are not considered in this Strategy since it is more convenient to separate these areas from those dedicated to the education and training of NMHS staff.

Means of supporting the activities

The support provided by WMO to education and training activities in HWR can take one of the following forms:

Education and Training Programme

- (a) *Support to training events under HWRP*: In view of the available resources, only a handful of international courses will receive support under this modality. Important criteria to determine whether a course qualifies for direct support are: (i) WMO should have the possibility of influencing the development of curricula; (ii) adequate geographical balance, even if only at the regional level, should be ensured; and (iii) cost-effectiveness.
- (b) *Fellowships*: These have to be requested through the Permanent Representative of the candidate's country with WMO. Preference should be given to courses on priority subject areas.

Hydrology and Water Resources Programme

- (a) *Enabling support (partial)*: Under this modality, course organizers request support from WMO in a range of ways, from the simple use of WMO's logo to a limited (normally less than US\$5 000) financial contribution. Decisions, to be made on a case-by-case basis, should be based on the priority of the subject areas treated, the tradition of cooperation between the organizers and WMO, the reputation of the organizing institution, the number and geographical representation of international participants, and the number of participants from developing countries.
- (b) *Support as part of regular activities of the HWRP*: Various components of the regular HWRP of WMO, such as WHYCOS, HOMS and WCP-Water, regularly organize training activities on subjects related to their work. These training activities are funded by the regular budget assigned to each programme, but will in future be organized according to the guiding principles contained in this Strategy.

In the first two cases above, from a budgetary aspect, the financial resources are under the Education and Training Programme (ETRP). The difference between the two is that, while the support to training events under HWRP is earmarked as such, the support to fellowships is part of the total budget of WMO for fellowships. As an indication, in the decade 1990-1999, approximately 11 per cent of all WMO fellowships were awarded in the field of HWR. The third modality is usually financed through a budget assigned to the HWRP, and the requests normally exceed by far the resources available.

7. Promoting partnerships

In addition to the above, particular emphasis will be placed on developing partnerships with academic institutions active in the areas of interest to WMO in HWR, for instance, promoting exchanges of professoriate staff, co-sponsorship by institutions of the developed world of specific international courses organized by developing countries' institutions, and technical assistance in the preparation of syllabuses and course programmes.

Particular attention will be given to cooperation with UNESCO in general and with the UNESCO-IHE Institute for Water Education in particular, in order to take advantage of its high academic level and excellent facilities, and of the fact that it is under the umbrella of WMO's traditional partner of in education and training activities in HWR.

8. Mechanism of implementation

Given that ETRP has the leading role in coordinating education and training activities in the areas of interest to WMO, and that this Programme has well-established mechanisms and procedures, it would seem to be convenient to design and work through similar mechanisms and procedures. It is therefore recommended that the twelfth session of the Commission for Hydrology adopt a recommendation that the Executive Council approve the concept of Regional Training Centres, with criteria based on those approved for RMTCs, and designation procedures similar to those customary for RMTCs. (see Recommendation 3 (CHy-XII).

Evaluation procedures for all courses in HWR supported by WMO will continue, using the customary mechanisms designed for this purpose by the ETRP, and implementing additional ones, if needed.

While Part 1 of this Strategy contains general principles and will barely be reviewed in the future, Part 2 will concentrate on the next intersessional period, detailing the international courses and priority areas to be supported, and will be reviewed by each session of CHy. In view of the fact that the fourteenth financial period of WMO (2004-2007) has already begun, that the programme and budget for direct support to courses have already been approved by Fourteenth Congress, and that the process of identification of requirements has not yet been formally initiated, it is proposed that the twelfth session of the Commission for Hydrology adopt the outline for Part 2 and delegate to the AWG the preparation of the definitive Part 2 that will, in this case, cover the 2006-2007 biennium.

WMO STRATEGY ON EDUCATION AND TRAINING IN HYDROLOGY AND WATER RESOURCES**PART 2 – Priorities for the 2005-2008 period****Outline*****Background material***

1. List of priority areas by WMO Region, as identified by the Working Groups on Hydrology of the regional associations.
2. List of priority areas identified by CHy and its subsidiary bodies.
3. List of priority areas identified by ad hoc studies and questionnaires.

Summary of prioritized demands

4. Final list of priority areas, resulting from the analysis by CHy of the background material, with an indication of relative priority, using three-tier categorization (high, medium, low).

Available offer

5. For each of the priority areas in 4 above, identify existing education and training activities, indicating whether they have been sponsored or co-sponsored by WMO in the past.

Proposals to fill the main gaps

6. At least for each of the high priority areas, but preferably for all those without a corresponding education and training offer, prepare a two-page proposal indicating:
 - (a) Justification of the activity proposed;
 - (b) Intended audience;
 - (c) Programme of studies;
 - (d) Proposed geographical location, if any;
 - (e) Estimation of organizing costs.

These proposals could be prepared by experts designated by the Commission for this purpose, by the Secretariat, or by consultants. They should be prepared in such a format as to be marketable to financing institutions.

Performance-measuring mechanism

7. Based on the objectives detailed in Part 1, some quantitative goals and performance indicators for the relevant four-year period will be established and monitored.

ANNEX III

Annex to paragraph 17 of the general summary

PROGRAMME OF SCIENTIFIC LECTURES

Geneva, 21, 22 and 27 October 2004

21 October 2004, 2.00 to 5.00 p.m. — Progress on CHy projects

- Automated Real-time Stage-discharge: A Decision Support System by S. Hamilton (Canada)
- Global/Regional Short-term Hydrological Forecasting System by K. Georgakakos (United States)
- Analysis of Hydro-climatologic Variability and Trends by H. Lins (United States)
- Global Flood Alert System by A. Terakawa (Japan)
- Probable Maximum Precipitation: Approaches and Methodology by G. Wang (China).

22 October 2004, 2.00 to 2.30 p.m.

- Hydrology for the Environment, Life and Policy (HELP) and the Role of NHSs by M. Bonell (UNESCO).

27 October 2004, 2.00 to 5.00 p.m. — International data needs

- Numerical Weather Predictions and Hydrological Forecasting by E. Poolman (South Africa)
- Global Climate Studies and Hydrological Data Requirements by R. Lawford (United States)
- Climate Change: How to Discern the Hydrological Impacts at Basin Level by V. Van Nguyen (Canada)
- The PUB Initiative: A Challenge or an Opportunity? by A. Askew (IAHS)
- International Data Centers: Their Role and Responsibilities by T. Maurer (GRDC)
- Transfer of Hydrological Information across Temporal and Spatial Scales by E. Varas (Chile).

APPENDIX A

LIST OF PERSONS ATTENDING THE SESSION

A. Representatives of WMO Members

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APPENDIX B

LIST OF ABBREVIATIONS

ADCP	Acoustic Doppler Current Profilers
AMCOW	African Ministerial Council on Water
AOC-HYCOS	West and Central Africa-HYCOS
APFM	Associated Programme on Flood Management
AWG	Advisory Working Group
AWTF	African Water Task Force
CBS	Commission for Basic Systems
CCI	Commission for Climatology
CEH	Centre for Ecology and Hydrology
CHy	Commission for Hydrology
CIC	Intergovernmental Coordinating Committee of the La Plata River Basin Countries
CIMO	Commission for Instruments and Methods of Observation
CM-4	WMO Consultative Meeting on High-level Policy on Satellite Matters – Fourth Session
CPWC	Cooperative Programme on Water and Climate
ECMWF	European Centre for Medium-Range Weather Forecasts
EIA	Environmental Impact Assessment
ESCAP	United Nations Economic and Social Commission for Asia and the Pacific
ETRP	Education and Training Programme
EURAQUA	European Network of Fresh Water Research Organizations
FFTPP	Flash Flood Threshold Pilot Project
FRIEND	Flow Regimes from International Experimental and Network Data
FWIS	Future WMO Information System
GCOS	Global Climate Observing System
GEF	Global Environment Facility
GEOSS	Global Earth Observation System of Systems
GEWEX	Global Energy and Water Cycle Experiment
GPCC	Global Precipitation Climatology Centre
GRDC	Global Runoff Data Centre
GTN-H	Global Terrestrial Network – Hydrology
GTN-R	Global Terrestrial Network for River Discharge
GTOS	Global Terrestrial Observing System
GTS	Global Telecommunication System
GWP	Global Water Partnership
HELP	Hydrology for the Environment, Life and Policy
HEPEX	Hydrological Ensemble Prediction Experiment
HKH FRIEND	Hindu Kush-Himalayan FRIEND
HNRC	HOMS National Reference Centre
HOMS	Hydrological Operational Multipurpose System
HRFPs	HOMS Regional Focal Points
<i>HRM</i>	<i>HOMS Reference Manual</i>
HWRP	Hydrology and Water Resources Programme
HYCOS	Hydrological Cycle Observing System
IAHR	International Association of Hydraulic Engineering and Research
IAHS	International Association of Hydrological Sciences
ICIMOD	International Centre for Integrated Mountain Development
IDCs	International Data Centres
IFM	Integrated Flood Management

IGOS	Integrated Global Observing Strategy
IGRAC	International Groundwater Resources Assessment Centre
IGWA	Interagency Group for Water in Africa
IHE	International Institute for Infrastructural, Hydraulics and Environmental Engineering
IHP	International Hydrological Programme
INFOHYDRO	Hydrological Information Referral Service
IPCC	Intergovernmental Panel on Climate Change
ISDR	International Strategy for Disaster Reduction
ISO	International Organization for Standardization
IWRM	Integrated Water Resources Management
JCOMM	Joint WMO/IOC Technical Commission for Oceanography and Marine Meteorology
JUWFI	Joint UNESCO/WMO Flood Initiative
MDG	Millennium Development Goals
MILAC	Marine Impacts on Lowland Agricultural and Coastal Resources
MoU	Memorandum of Understanding
MRC	Mekong River Commission
NBA	Niger Basin Authority
NBCBN	Nile Basin Capacity Building Network
NE FRIEND	Northern European FRIEND
NGOs	Non-Governmental Organizations
NHS	National Hydrological Service
NIGER-HYCOS	Niger River Basin-HYCOS
NMHSs	National Meteorological and Hydrological Services
NMSs	National Meteorological or Hydrometeorological Services
NOAA	National Oceanic and Atmospheric Administration
OAS	Organization of American States
OHR	Operational Hydrology Report
OPACHE	Open Panel of CHy Experts
PMF	Probable Maximum Flood
PMP	Probable Maximum Precipitation
PROMMA	Programme for the Modernization of Water Resources Management
PUB	Prediction in Ungauged Basins
QMF	Quality Management Framework
QPE	Quantitative Precipitation Estimation
QPF	Quantitative Precipitation Forecasting
RA	Regional Association
RBOs	River Basin Organizations
RCCs	Regional Climate Centres
RHA	Regional Hydrological Adviser
RMTCs	Regional Meteorological Training Centres
RTCs	Regional Training Centres
7LTP	Seventh WMO Long-term Plan
6LTP	Sixth WMO Long-term Plan
SADC-HYCOS	South African Development Community-HYCOS
SOI	Southern Oscillation Index
TCP	Tropical Cyclone Programme
TWNSO	Third World Network of Scientific Organizations
UN/DESA	United Nations Department of Economic and Social Affairs
UNESCO	United Nations Educational, Scientific and Cultural Organization
UNFCCC	United Nations Framework Convention on Climate Change
UNSI	United Nations System-wide Special Initiative on Africa

UNU	United Nations University
UN-WATER	United Nations Interagency Committee on Freshwater
VCP	Voluntary Cooperation Programme
VOLTA-HYCOS	Volta River Basin-HYCOS
WCG	WHYCOS Coordination Group
WCP	World Climate Programme
WCP-Water	WCP-Water
WCRP	World Climate Research Programme
WGHs	Working Groups on Hydrology
WHYCOS	World Hydrological Cycle Observing System
WIAG	WHYCOS International Advisory Group
WMO	World Meteorological Organization
WRA	Water Resources Assessment
WRAP	Water Resources Application Programme
WSSD	World Summit on Sustainable Development
WWAP	World Water Assessment Programme
WWC	World Water Council
WWD	World Water Day
WWDR	World Water Development Report
WWF	World Water Forum
WWW	World Weather Watch