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1. Officers of the session
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   R. H. Clark  vice-president

2. Representatives of Members of WMO
   M. Fuschini Mejia  principal delegate  Argentina
   C. Laboranti  delegate
   A. J. Lértora  adviser
   A. J. Hall  principal delegate  Australia
   F. Bultot  principal delegate  Belgium
   G. Dupriez  delegate
   P. P. da Silva Pereira  principal delegate  Brazil
   J. P. Bruce  principal delegate  Canada
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   H. L. Ferguson  delegate
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   I. Helimäki  delegate
   R. Trendel  principal delegate  France
   M. Merlet  delegate
   J. Rodier  delegate
   S. Müller  principal delegate  German Democratic Rep.
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principal delegate  
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S. Benarafa  
principal delegate  
Morocco

J. W. van der Made  
principal delegate  
Netherlands

H. A. R. de Bruin  
delegate

H. J. Colenbrander  
delegate

J. R. Waugh  
principal delegate  
New Zealand

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principal delegate  
Nigeria

E. O. Adubifa  
delegate
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J. Cirugeda Guardiola delegate
R. Berggren principal delegate Sweden
C. Emmenegger principal delegate Switzerland
S. Bhodhprasart (Mrs.) principal delegate Thailand
T. Brikshavana delegate
D. Jaraswathana delegate
S. Çelenk principal delegate Turkey
J. H. M. Katende principal delegate Uganda
P. A. Byarugaba delegate
H. Y. Temu delegate
S. K. Cherkovskij principal delegate Union of Soviet Socialist Republics
E. G. Popov delegate
V. V. Kuprianov delegate
Y. Golubev delegate
R. Murray principal delegate United Kingdom of Great Britain and Northern Ireland
O. Gibb delegate
H. J. Richards delegate
J. Nana-Tchoudja principal delegate United Republic of Cameroon
D. S. Bushajabwe principal delegate United Republic of Tanzania
P. A. Byarugaba delegate
H. Y. Temu delegate
R. A. Clark principal delegate United States of America
H. H. Barnes, Jr. delegate
W. W. Duncan delegate
A. Flanders delegate
O. M. Hackett delegate
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J. Battione Chiarino alternate

3. Observers

(a) Intergovernmental organizations

J. A. da Costa United Nations Educational, Scientific and Cultural Organization (Unesco)
R. A. Halliday International Organization for Standardization (ISO/TC 113)
T. H. Anstey International Commission on Irrigation and Drainage (ICID)

(b) Other organizations

J. Rodier International Union of Geodesy and Geophysics (IUGG)

4. Invited expert

J. Cragwall United States of America

5. WMO Secretariat

J. Nemec Representative of the Secretary-General
T. Palas Chief, Hydrology Division
E. A. Hassan Technical Officer, Hydrology and Water Resources Department
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GENERAL SUMMARY OF THE WORK OF THE SESSION

1. OPENING OF THE SESSION (Agenda item 1)

The president of the Commission, Professor E. G. Popov (U.S.S.R.), opened the fifth session of the Commission for Hydrology at 10 a.m. on 5 July 1976. The opening ceremony took place in the Government Conference Centre in Ottawa, Canada, where the session was held at the kind invitation of the Government of Canada.

The Honourable Romeo Leblanc, Minister of State for Fisheries of the Government of Canada, greeted the participants and extended a warm and personal welcome to them on behalf of the Canadian Government. He stressed the role and work of the World Meteorological Organization and indicated that the programme which the Commission for Hydrology had under way was of great interest to the Canadian Government at both Federal and Provincial level. He drew the attention of the Commission to one of the main concerns of the United Nations Conference on Human Settlements (Habitat), which had been held in Vancouver in June 1976, and indicated that Canada strongly supported the resolutions that conference made with the aim of supplying clean water for all the settlements of the world by 1990. He expressed his confidence that the programmes of the Commission for Hydrology would help in achieving this goal. In conclusion, he welcomed all the participants to Canada and wished the Commission every success in its work.

The Permanent Representative of Canada with WMO, Mr. R. Noble, addressed the Commission and emphasized the excellent co-operation and interrelation which exist between hydrologists and meteorologists in Canada. He was glad to note that, despite certain financial restraints imposed by the last session of the WMO Executive Committee, the implementation of the WMO Operational Hydrology Programme would not be unduly affected. He stressed the need for international and inter-organizational co-operation in the fields of hydrology and meteorology and indicated the role that WMO plays in this respect.

The representative of the Secretary-General of WMO, Professor J. Némec, Director of the Hydrology and Water Resources Department of the WMO Secretariat, on behalf of the Secretary-General of WMO, Dr. D. A. Davies, expressed his great appreciation to the Canadian Government for the invitation and arrangements which resulted in the holding of the fifth session of the Commission in Ottawa. Warmest greetings were extended on behalf of the Secretary-General of WMO to all participants. Professor Némec indicated that the holding of the session of the Commission for Hydrology in Canada in 1976 had a special significance because thirty years ago, the first meeting of the Commission for Hydrology of the International Meteorological Organization (the predecessor of WMO) was held in Canada. Thus it could be said that, as Canada was the cradle of present activities in hydrology, it was only proper to celebrate the thirtieth anniversary of the Commission in Canada. He recalled the decision of Seventh Congress of WMO and in particular the changes in the WMO Convention with respect to operational hydrology and the decision to establish WMO activities in hydrology and water resources as one of the main programmes of the Organization.
He further recalled the agreement reached between the Secretary-General of WMO and the Director General of Unesco on co-ordination and co-operation regarding both organizations' hydrology programmes; he also recalled the importance of the programmes of the Commission in connexion with the forthcoming UN Water Conference, in which WMO was co-operating. In conclusion, he reiterated WMO's gratitude to the Canadian authorities for the invitation to hold the meeting in Canada.

Finally, Professor E. G. Popov gave his presidential address, in which he expressed the appreciation of all the participants for the hospitality of the Canadian Government. He recalled the important events that had occurred since the fourth session of the Commission, in particular the End-of-Decade Conference convened by Unesco and WMO which recommended programmes in hydrology to be carried out by both organizations during the next five years. He also recalled decisions of the Seventh WMO Congress with respect to the activities of the Commission and mentioned the priorities set out by Congress for the Commission's activities during the next inter-sessional period; he thanked the Canadian organizers for their efforts in the preparation of the Commission's session and expressed his confidence that the session would meet with success.

2. ORGANIZATION OF THE SESSION (Agenda item 2)

All the meetings took place in the Canadian Government Conference Centre. Documents were produced in four of the five working languages of WMO, namely English, French, Russian and Spanish, and simultaneous interpretation in these languages was provided for all meetings.

There were 93 participants in the session, which included representatives from 44 countries and 4 international organizations.

In addition to the representative of the Secretary-General, Professor J. Němec, the following WMO Secretariat staff members attended: Mr. T. Palas, Chief of the Hydrology Division, and Mr. E. A. Hassan, technical officer of the Hydrology and Water Resources Department.

2.1 Consideration of the Report on Credentials (Agenda item 2.1)

The representative of the Secretary-General presented a list of participants and the capacities in which they were attending the session. This list was accepted as the report on credentials.

2.2 Adoption of the agenda (Agenda item 2.2)

The provisional agenda was adopted without discussion. The final agenda is given at the beginning of this report, together with a list of relevant documents.

2.3 Establishment of committees (Agenda item 2.3)

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

RA I: W. Stewart (Liberia)
RA II: S.K. Cherkavskij (U.S.S.R)
RA III: P. Poggi Pereira (Brazil)
RA IV: R.A. Clark (U.S.A)
RA V: A. Hall (Australia)
RA VI: S. Mustonen (Finland)

Mr. S. Mustonen was elected chairman of the Nomination Committee.

2.3.2 A committee for nominating rapporteurs and members of working groups was established, consisting of Messrs. J. Otnes (Norway), chairman, V. Kuprianov (U.S.S.R), R.A. Clark (U.S.A), W. Stewart (Liberia), P. Poggi Pereira (Brazil), D. Jarswathana (Thailand) and J. Rodier (France).

2.3.3 Two working committees were set up to examine in detail the various agenda items:

Committee A to examine items 5, 6, 7, 8, 9 and 11;
Committee B to examine items 12, 13, 14, 15, 16 and 17.

Mr. R.A. Clark (Canada) and Dr. E. Bobinski (Poland) were elected chairman of Committee A and Committee B respectively.

Items 3 and 10 were dealt with by both committees. Items 4 and 18 were examined first by a committee of the Commission as a whole.

2.3.4 A Co-ordination Committee was established, consisting of the president and the chairmen of the two committees. Representatives of the local Secretariat were also members of the Co-ordinating Committee.

2.4 Other organizational questions (Agenda item 2.4)

The hours of work adopted were 09.30 to 13.00 and 14.30 to 17.30.

The Commission approved the minutes of the first two plenary meetings. It was noted that the minutes of the other plenary meetings would be circulated to participants.

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

The president, in his report, recalled a steady increase in the participation of WMO Members in the activities of the Commission, as illustrated by the following figures: 1964 - 62 countries; 1968 - 71 countries; 1972 - 78 countries; 1976 - 82 countries. He also noted that more than 70 WMO Members had designated advisers to their permanent representatives with WMO with respect to WMO's activities in operational hydrology. He stressed with satisfaction that all recommendations adopted by CHy-IV had been approved by the Executive Committee, and that those needing consideration by Congress had been approved by Seventh Congress. He also mentioned the action taken on these recommendations.
The president then briefly discussed the work of the working groups and rapporteurs. He stressed some important results of their activities, such as the new chapter of WMO Technical Regulations “Meteorological services for hydrology”, approved by Seventh Congress, the international hydrological codes and certain technical reports. At the same time he noted that not all the tasks assigned by CHy-IV had been implemented as completely or in as much detail as would have been desirable and mentioned some of the reasons for this. In this connexion, the president emphasized the necessity of taking those reasons into consideration in CHy-V, when planning the work, to avoid some of those drawbacks in the future. He then reported on CHy’s co-operation with other technical commissions of WMO, and that of WMO with other international organizations in the field of hydrology.

Speaking of the future activities of CHy, the president brought to the Commission’s attention the priority activities in the WMO Operational Hydrology Programme for the period 1975-1980, as approved by Seventh Congress. He also mentioned a proposal for the possible structure of the Commission for Hydrology for the next inter-sessional period, as suggested by the CHy Advisory Working Group.

In concluding his report the president expressed his gratitude to all members of the working groups and rapporteurs, and in particular to the members of the Advisory Working Group, for their efforts and contributions to the activities of the Commission, to all members of the Commission for their collaboration, and to the Secretary-General and his staff for their most effective assistance in his work.

In the discussion, several members of the Commission commented on the very worthwhile experience acquired in the work of the Commission by the nomination of rapporteurs as members of the Commission’s working groups. This point had also been noted by WMO Congress. Certain shortcomings in the reporting of these rapporteurs to the Commission with respect to the duplication of their reports by those of the chairman of the working groups to the Commission were, however, also mentioned in the general discussion. Several delegates complimented the president on his report and expressed views on the directions in which the Commission should concentrate its efforts within the priorities adopted by Congress for the WMO Operational Hydrology Programme. The Commission noted with appreciation the report by the president and considered that all the items included in it were dealt with under other agenda items. It took action on the reporting of the rapporteurs to the Commission with respect to the reports of the chairman of the working groups under other agenda items also, while adopting resolutions for the establishment of working groups. The Commission noted that the experience of Cg-VII had shown that it was difficult for representatives of Hydrological Services to attend Congress during its entire session. It would, however, be desirable that they attend all discussions on hydrological matters. The Commission therefore suggested that the Secretary-General examine the possibility of proposing that the Co-ordination Committee of Congress concentrate these items so as to allow the representatives of Hydrological Services to attend during their discussion. Some members of the Commission considered that it would be advantageous if the Executive Committee could consider the possibility of inviting its members who are directors of Meteorological Services to arrange, whenever possible and appropriate, to be accompanied at the session of the Executive Committee by their hydrological advisers, if such advisers have been appointed. No further action was taken on the president's report under this agenda item.
4. ACTIVITIES OF THE COMMISSION IN THE LIGHT OF Cg-VII DECISIONS (Agenda item 4)

4.1 Decisions of Congress affecting the Operational Hydrology Programme (Agenda item 4.1)

4.1.1 The Commission was informed by a document of the Secretary-General of a number of important decisions regarding the WMO hydrology and water resources development programmes in general and the work of CHy in particular. The Commission noted particularly Resolution 26 (Cg-VII), "WMO Operational Hydrology Programme", which endorses most of the recommendations of CHy adopted at its fourth session and as approved by the Executive Committee, and furthermore approved the scope of the OHP, together with its priorities for the period 1975-1980. These priorities were basically endorsed by the International Conference on the Results of the IHD and on Future Programmes in Hydrology (Paris, 1974). The Commission was informed of these priorities in the report of its president under agenda item 3. The Commission took all its decisions on its future programmes, bearing in mind these priorities, as well as the views of the Advisory Working Group on their implementation. The Commission also noted that Congress further considered the WMO programme of co-operation in the field of hydrology and water resources with other international organizations and approved several concrete projects within this programme. For this purpose it adopted Resolution 28 (Cg-VII); the Commission took action to implement this resolution under agenda items 18.3, 18.4 and 18.5. The Commission noted that Congress had taken several other decisions connected with its activities, in particular concerning the WWW programme, the technical co-operation and training programmes, weather modification and climate changes, the Tropical Cyclone Project, promotion of special applications of meteorology, climatology and hydrology, activities in the field of environmental pollution and WMO co-operation with the United Nations Environment Programme (UNEP). The Commission considered the necessary action to be taken on these Congress decisions under the relevant agenda items of the session.

4.1.2 In considering the priorities within the OHP, as adopted by Congress in Resolution 26 (Cg-VII), and also bearing in mind Resolution 28 (Cg-VII), the Commission felt that it was most necessary that the WMO activities outlined in the priorities acquire a more significant impact at the national level and in particular that they were of maximum assistance to the developing countries. In this connexion, the Commission noted that the recently held United Nations Conference on Human Settlements (Habitat) stressed the importance of the aim of supplying clean water for all the settlements of the world by 1990. Several delegates pointed out that the Commission should take immediate action directed towards such an aim. The Commission therefore decided that guidance material should be prepared for the rapid assessment of quantity and quality of water resources available for water supply for human settlements on the basis of the material already existing in different WMO publications and documents prepared by the Commission in the past. It requested the president and its Advisory Working Group to arrange for the preparation of such guidance material by inputs from all relevant working groups and rapporteurs of the Commission, with the assistance of the Secretariat of WMO in co-operation with relevant international organizations, in particular the IHP of Unesco.

4.1.3 While the above action taken by the Commission was considered as a first step in the implementation of the Congress decisions on the strengthening of WMO programmes in the field of hydrology and water resources, the Commission felt that it would be appropriate, in order to enhance the Commission's past and future efforts,
to develop a long-term project which would integrate all the elements of basic operational hydrological activities and research, including the development of observational networks, data transmission and processing, and supply of real-time and historical data and hydrological forecasts, necessary for servicing water resources management projects in national and international river basins. For this purpose, it recommended the development of an Integrated Operational Hydrological System (IOHS) (a provisional working title). This system, duly co-ordinated with WMO National and Regional Meteorological Centres, could be installed by any national Service in need of servicing water resources management programmes and projects, particularly in developing countries. The Commission incorporated its views on the design and development of the IOHS in Recommendation 1 (CHy-V). The Commission requested the president and its Advisory Working Group in co-operation with the WMO Secretariat to start the planning of the development of the IOHS within presently available financial support, using in particular the inputs of the relevant CHy working groups and rapporteurs. It further requested the president, when a detailed plan and a sufficiently developed concept of the IOHS will have been prepared, to circulate the implementation plan of the IOHS to the members of CHy for study and support, prior to its submission to the Executive Committee and Cg-VIII for approval, so that a Congress decision can be taken on the actual realization of the IOHS to begin in the next financial period. For this purpose, the Commission recommended that the materials to be circulated to members of CHy and submitted to the Executive Committee and Cg-VIII contain a detailed plan of IOHS realization, including a cost/benefit study of the project. For the purpose of studying the feasibility of the IOHS in various conditions, the Commission requested the Secretary-General to consider the possibility of initiating experimental studies of the system in certain river basins, preferably within the WMO technical co-operation projects, suitable for installation of such a system. The Commission considered that the first preliminary results of these experimental studies should be made available to the president of CHy and its Advisory Working Group in due time so that they may be taken into account in the development of the implementation plan for the IOHS. Noting that proposals for the IOHS project were presented only at the session and delegates had no opportunity to study them in depth, the Commission requested the Secretariat to circulate the adopted Recommendation 1 (CHy-V) and its annexes to CHy members for study.

4.1.4 The Commission was informed, by a document of the Secretary-General, of the request of the Executive Committee, expressed at its twenty-eighth session, that the Commission strengthen its activities in the field of hydrological forecasting for purposes of environmental protection and in this connexion also consider the possibility of preparing a manual on networks for monitoring inland water pollution within the framework of an integrated air-ocean-inland water-monitoring system. The Commission took action on this request of the Executive Committee under agenda items 11 and 13.3 respectively.

4.2 Amendments to the Convention and role of the Advisory Committee for Operational Hydrology (Agenda item 4.2)

4.2.1 The Commission noted with satisfaction the decision of Cg-VII concerning the amendments to the WMO Convention and General Regulations needed in connexion with WMO activities in hydrology. The Commission was satisfied that the original concept of these amendments stemmed from the views of CHy-III. The Commission noted that amendments had been made to the preamble and Article 2 of the Convention in particular
by inserting the following new paragraph (e) in the latter, specifying that one of the purposes of WMO is "to promote activities in operational hydrology and to further close co-operation between Meteorological and Hydrological Services". Congress amended Articles 7, 14, 8 and 18 in a sense providing the organization with the necessary flexibility to react and respond to new ideas and developments, and in particular to carry out its responsibilities in the field of operational hydrology. Congress also approved very important amendments to Articles 6 and 13 by which all Directors of Meteorological or Hydrometeorological Services are equally eligible in the Executive Committee and in the position of officers of the Organization. The significance of this amendment is that the definition of the Director of a Meteorological or Hydrometeorological Service in the General Regulations now permits a Member to have the Director of a Service of a Member responsible at national level for meteorology or for meteorology and operational hydrology to be ranked with a Director of a Meteorological or Hydrometeorological Service. While noting the above Congress decisions with great appreciation, the Commission considered that they had already enhanced the effectiveness of the Commission's work by increasing the interest of national Hydrological Services in its activities, as demonstrated by the participation of representatives of these Services in its fifth session, which had by far the largest participation of Members of all the sessions of the Commission since its establishment.

4.2.2 The Commission also noted that Congress had, by Resolution 27 (Cg-VII), re-established the Advisory Committee for Operational Hydrology (ACOH). It noted with satisfaction in the report of its president, who is an ex-officio member of ACOH, that no difficulties had been experienced in co-ordinating the activities of ACOH with those of CHy. ACOH provided several recommendations related to CHy activities in the following areas:

(a) Standardization in hydrology (Technical Regulations) and its practical application by users;
(b) Classification of WMO publications into different levels of standardization;
(c) Use of WWW systems by Hydrological Services.

The Commission endorsed the views of the president that it would be most useful for the future activities of the Commission if ACOH could prepare specific proposals with respect to the participation of Hydrological Services in the implementation of WMO's OHP on the regional level and in particular regarding means of collaboration between national Meteorological and Hydrological Services. The Commission further considered that, if its recommendation concerning the development of the IOHS were approved by the Executive Committee, ACOH would be in a very good position to evaluate the impact of the IOHS on the daily work of Hydrological Services and the ways in which Hydrological Services interested in its development could contribute to its implementation.

4.2.3 The Commission finally noted that EC-XXVIII had agreed that, in view of the responsibilities which WMO had accepted in operational hydrology, it would be appropriate for the Organization to award a prize for outstanding work in this field. While welcoming this view of the Executive Committee with enthusiasm, the Commission agreed with those members of the Executive Committee who felt that it would be better to have a separate WMO prize for operational hydrology. It further considered that the CHy Advisory Working Group would be in the best position to provide the Secretary-
General with advice on the procedures and conditions connected with the institution and award of such a prize, for submission of proposals to the next session of the Executive Committee.

5. GUIDE AND TECHNICAL REGULATIONS (Agenda item 5)

The Commission considered the report of the Working Group on the Guide and Technical Regulations which was presented by its chairman. The Commission expressed its great appreciation for the excellent work accomplished by the working group and in particular by its chairman.

The Commission noted with satisfaction that the third edition of the Guide was published in 1975 in English and in Russian. This was the first edition of any WMO Guide in Russian, which also made this the first WMO Guide available in four (English, French, Russian and Spanish) of the official languages of the Organization.

5.1 Amendments to the Guide to Hydrological Practices (Agenda item 5.1)

5.1.1 The Commission considered proposals by the working group for inclusion in Chapters 2 to 6 inclusive of the Guide of new material prepared by the working groups of the Commission. The Commission examined all the material submitted and approved its inclusion in the Guide with amendments made at the session.

5.1.2 The Commission noted that, for various reasons, some of the contributions for the Guide which CHy-IV asked various working groups and rapporteurs to prepare had not been available in time for appropriate review and consideration by the working group. These contributions are:

(a) Analysis and modelling of hydrological systems;
(b) Applications to water management;
(c) Water quality (including temperature).

The Commission requested the Working Group on the Guide and Technical Regulations, which it re-established by Resolution 1 (CHy-V), to finalize these contributions. With respect to the contribution listed under (a), the Commission recommended that particular attention be given to:

(i) Ensuring the balanced presentation of the general methods of identifying linear and non-linear hydrological systems;
(ii) Considering the possibility of including additional examples of conceptual models;
(iii) Suitably expanding the part of the material on stochastic modelling.

With respect to the section "Relationship between hydrological data, hydrological projects and water quality" of the contribution listed under (b) above, the Commission recommended that particular attention be given to the following aspects:

(i) The draft material should be condensed to focus on essential points;
(ii) Quantitative practical examples should be included;

(iii) Water-quality models should be discussed, as appropriate.

5.1.3 In view of the need to disseminate guidance on these subjects as soon as practicable, the Commission decided to delegate to the president of CHy the authority to approve, on its behalf, the publication of these contributions, revised as appropriate, in time to be included in the Guide, together with the material mentioned in paragraph 5.1.1 so as to make it as complete as possible.

The Commission agreed that the annex on "Applications to water management", as revised, should be included as Chapter 7 of the fourth edition of the Guide.

5.1.4 The Commission further considered proposals for new material to be included in the Guide and decided that appropriate guidance material, in accordance with the list appended in Annex I to this report, should be prepared by appropriate working groups and rapporteurs of the Commission as indicated under the relevant agenda items of this report.

The Commission requested the Working Group on Hydrological Forecasting, which it re-established by Resolution 10 (CHy-V), to revise Chapter 6 of the Guide on hydrological forecasting with a view to updating it and making it compatible with the material mentioned in paragraph 5.1.2 (a).

5.1.5 In discussing the preparation of additional material for the Guide, the Commission considered the philosophy and the concept of the Guide. It was agreed that the Guide should provide, in convenient and concise form, basic information on recommended practices, procedures and instrumentation. In accordance with this concept and philosophy the Commission considered that a detailed description and discussion of methods of application, which would make the Guide unmanageable in size and possibly inhibit its usefulness, should therefore be included in other types of WMO publication, such as manuals. The Commission agreed that the "Manual on stream-gauging procedures", the final version of which had been prepared by the CHy Working Group on Hydrological Instruments and Methods of Observation, was a good example of this approach. As far as practical arrangements are concerned, the Commission recommended that the loose-leaf format of the Guide be maintained and that the Guide should be kept up to date by means of supplements.

A new edition of the Guide should be prepared only when several substantial parts of it have become obsolete. The Commission felt that, in accordance with the above principle, it would be appropriate that a new edition be issued after several inter-sessional periods.

5.2 Amendments to Technical Regulations (Agenda item 5.2)

5.2.1 The Commission noted with satisfaction that all additions and amendments to Volume III of the Technical Regulations, recommended by CHy-IV, had been approved by Seventh Congress. Technical Regulations related to WMO hydrology and water resources programmes now appear under Section D - Hydrology - which forms Volume III of the Technical Regulations as follows:

D.1 - Operational hydrology (formerly C.4);
D.2 - Meteorological services for hydrology (new).

The Commission also noted that the amended version of Volumes I and III of the Technical Regulations had come into force on 1 July 1976 and that the introduction to the Technical Regulations had been amended to reflect the decision of Seventh Congress with regard to hydrology. The Commission further noted that Volume III of the Technical Regulations included appropriate references to the hydrological codes HYDRA and HYFOR which have been published in Annex II to the WMO Technical Regulations (Manual on Codes, WMO Publication No. 306, Volume I).

5.2.2 As requested by Seventh Congress, the Commission considered the need for a definition of "daily run" of wind and the question of "precision" of meteorological measurements required for hydrology and decided to refer these matters to the Working Group on Improvement and Standardization of Instruments and Methods of Observation for Hydrological Purposes, which was established by Resolution 4 (CHy-V), for detailed consideration and submission of specific proposals.

5.2.3 The Commission noted the guiding principles adopted by Seventh Congress for updating the Technical Regulations. It considered the recommendation of the Working Group on the Guide and Technical Regulations concerning an amendment to existing Regulation D.1.1/ 5.1 (h) and approved it for submission to Eighth Congress for its adoption, as indicated in Recommendation 2 (CHy-V).

5.2.4 In considering future action to be taken to strengthen the existing Technical Regulations for Hydrology, the Commission considered the introduction of annexes and appendices to the WMO Technical Regulations for hydrology. "Annexes" are texts which have the status of Technical Regulations but which appear in separate publications. "Appendices" are texts appended to the Technical Regulations and have the same status as the Technical Regulations to which they refer.

5.2.5 The Commission recommended that an Annex to Volume III (Hydrology) of the WMO Technical Regulations should be published, containing all necessary, detailed, recommended practices and procedures to support the appropriate Technical Regulations of Volume III, where they are stated in terms of accuracy of performance of a given instrument or method. ISO standards, exclusive of their general guidance-type material, and other relevant international standards provide a logical source of material for inclusion in this Annex. The Commission recognized that material must, of course, be edited to conform to the WMO terminology and be made compatible with existing WMO Technical Regulations.

The Commission recommended, as a first step in the preparation of this Annex, that pertinent material be abstracted from the following ISO standards to elaborate the relevant Technical Regulations:

ISO/3455 D.1.2 - Calibration of current meters;
ISO/1100 D.1.2 - Number of discharge measurements to define rating curve;
ISO/748 D.1.2 - Accuracy of discharge measurements.

5.2.6 The Commission decided that the draft text of this Annex and the necessary revisions to the corresponding chapters of Volume III of the Technical Regulations
should be circulated to the members of the Commission for comment in sufficient time to be included in the Secretary-General's consolidated report on Technical Regulations to Eighth Congress.

The Commission noted that in several cases Congress had already decided to delegate to the Executive Committee authority to approve amendments to Annexes to the Technical Regulations, thus facilitating keeping the Annexes up to date. The Commission therefore recommended that Congress be requested to delegate to the Executive Committee authority for subsequent future approval of additional material and amendments to this Annex.

5.2.7 The Commission noted that the Universal Decimal Classification (UDC) in hydrology had not yet been included in the Technical Regulations and, in view of the need for such inclusion, recommended its publication as an Appendix to Volume III of the Technical Regulations for hydrology.

5.2.8 The Commission noted that a selective list of recommended symbols and units for hydrological purposes was given in Tables 1.1 - 1.4 of the third edition of the Guide and in Appendix B of the WMO/Unesco Glossary of Hydrology. In view of the extreme importance of standardization of both symbols and units, the Commission recommended the publication of this list also as an Appendix to Volume III of the Technical Regulations for hydrology. Furthermore, the Commission endorsed the recommendation of the Inter-agency Panel on Standardization of Instruments and Techniques in Hydrology that this list also be published in a separate publication by WMO and Unesco and that authors assisting UN agencies in preparing international guidance material be requested to use the symbols and units contained in this list.

5.2.9 By Resolution 1 (CHy-V), the Commission decided to re-establish a Working Group on the Guide and Technical Regulations and urged all working groups and rapporteurs to submit their contributions for the Guide and Technical Regulations in good time to permit their appropriate review and consideration. The Commission included all its recommendations on the Technical Regulations in Recommendation 2 (CHy-V).

5.3 General problems of standardization (Agenda item 5.3)

5.3.1 The report of the CHy Rapporteur on Standardization was considered under this item. The Commission noted that it had considered and taken action on the rapporteur's recommendations concerning the Guide and Technical Regulations under agenda items 5.1 and 5.2. The Commission noted with approval the tabulated classification of WMO publication series as applied to hydrology, which had been prepared by the Secretariat in consultation with the rapporteur, as recommended by the CHy Advisory Working Group. This tabulation is given in Annex II to this report. The Commission also agreed that the guidance material resulting from WMO standardization activities in hydrology might be broadly classified into three levels:

(a) Precisely-defined standards;

(b) Recommended practices;
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(c) Suggested practices, e.g. annexes to the Guide, Technical Notes, Operational Hydrology Reports, Casebooks, Manuals, Glossaries and Proceedings, Training Reports, etc.

The Commission decided to continue its efforts to ensure that the levels of standardization intended for the several WMO publication series were clearly understood and observed. This would include a review to make certain that material for a given standard was not duplicated at a higher standardization level.

5.3.2 The Commission noted with appreciation the information on ISO activities in the field of hydrology provided by the ISO Central Secretariat in Geneva. It noted that the activities of the ISO Technical Committee ISO/TC 113 "Measurement of liquid flow in open channels" and ISO/TC 147 "Water quality" were of direct concern to CHy and that close co-operation between these two committees and the WMO Secretariat had been established during the CHy-IV inter-sessional period. The Commission realized that several of its activities were closely related with the current activities of these committees. In order to obviate any possible duplication of effort and to ensure that ISO standards are also acceptable to it, the Commission requested the Secretariat to develop, in co-operation with the ISO Central Secretariat, mutual procedures which would ensure the above. In this connexion, the Commission noted with satisfaction that specific action had been taken by WMO and other international organizations to co-ordinate standardization activities of common interest through the efforts of the Inter-agency Panel on Standardization of Instruments and Techniques in Hydrology, whose activities, as well as standardization activities pursued by WMO in co-operation with other organizations, are described in WMO/IHD Report No. 18.

5.3.3 The Commission agreed that the Working Group on the Guide and Technical Regulations, appointed by Resolution 1 (CHy-V), was in the best position to monitor and evaluate the entire process of standardization within CHy. In order to facilitate this task for the working group and in accordance with the recommendation of its Advisory Working Group, the Commission appointed a Rapporteur on Standardization with terms of reference as given in Part A of Annex VI to this report and decided to include him in the membership of the Working Group on the Guide and Technical Regulations.

6. HYDROLOGICAL NETWORK DESIGN (Agenda item 6)

6.1 Casebook on Hydrological Network Design Practices and Network Statistics (Agenda item 6.1)

6.1.1 The Commission noted the report of its Rapporteur on the Casebook on Hydrological Network Design Practice. It noted with great satisfaction that the "Casebook on Hydrological Network Design Practice", consisting of a first set of 41 papers from 12 countries, was published in loose-leaf form in 1972 (WMO Publication No. 324). The Casebook was established as a continuing project of WMO because of the transient state of network-design practice. The first publication is to be updated by the release of new or revised papers as the science of network design matures. The Commission noted that a second set of papers was being processed for publication in 1976. It will be issued as an addition to the 1972 publication. The Commission expressed its appreciation to the rapporteur for his work and endorsed his recommendation to continue issuing new or revised papers as additions to the Casebook.
6.1.2 The Commission noted that all too often data collection became an end in itself with insufficient thought being given to the purpose of the data collection. The problem generally stems from a lack of routine periodic evaluation of the data-collection programme to take into account the impact of new technology and changing needs for hydrological information. It is vital to evaluate periodically the efficiency and effectiveness of the established networks. However, the Commission recommended the maintenance of some of the principal hydrometric stations in a network in order to obtain in the future a long series of data and also recommended the establishment of supplementary bench-mark stations.

6.1.3 The Commission noted that each of the WMO publications dealing with hydrological network design had been aimed at fulfilling a different need in the hydrological community and none had presented the full picture of network design. It therefore endorsed the recommendation of the Rapporteur on the Casebook on Hydrological Network Design Practice, as well as that of the Rapporteur on Information Transfer and Network Design, that a technical report attempting to provide a detailed and co-ordinated reference to the current status of network design be prepared as a matter of high priority. To perform these tasks, the Commission appointed a Rapporteur on Network Design and Evaluation whose terms of reference are given in Part A of Annex VII to this report (Resolution 2 (CHy-V)).

6.1.4 The Commission noted with appreciation that in accordance with his terms of reference the rapporteur had prepared a comprehensive and detailed project document on the compilation of global network statistics which was used by the Secretariat in the implementation of this project. In this connexion, the Commission noted that information on the organization of national operational services dealing with hydrological observing networks and stations, on the operation of hydrometric networks and other important material had been collected by several CHy working groups and rapporteurs, by WMO regional associations and by ACOH. The Commission endorsed the recommendation of ACOH that this information be published in a WMO publication to be entitled "Statistical information on activities in operational hydrology" for distribution to all concerned.

6.2 Training seminars and meeting of invited experts on network design and information transfer (Agenda item 6.2)

6.2.1 The Commission noted the report of its Rapporteur on Information Transfer and Network Design. It noted with great satisfaction that this rapporteur and the Rapporteur on the Casebook on Hydrological Network Design Practice had co-operated with the WMO Secretariat and the University of Newcastle upon Tyne (U.K.) in the organization of the International Seminar on Hydrological Network Design and Information Transfer held in the University of Newcastle upon Tyne from 19 to 24 August 1974. The seminar consisted of two separate but related parts: a forum and a training workshop. There were about 70 participants from 27 countries, including participants from 14 developing countries and from four international organizations. The proceedings of the seminar were published by WMO in 1976 ("Hydrological network design and information transfer", WMO No. 433, Operational Hydrology Report No. 8, 1976).

6.2.2 The Commission commended the rapporteur for preparing a revised version of Chapter 3, "Design of networks" for inclusion in the Guide, taking into consideration
the comments of the Rapporteur on the Casebook on Hydrological Network Design Practice. It noted with approval the views of the rapporteur that regions with different physiographical, climatological and hydrological features would require different analysis techniques. The international character of the Guide requires a pragmatic approach to this problem. Until a consensus is reached among hydrologists, it is not practical to recommend, in Chapter 3 of the Guide, any specific analytical techniques for information transfer, data synthesis and network design.

6.2.3 The Commission considered that misunderstandings among hydrologists on the principles, objectives and techniques of network design have arisen through failure to recognize that the planning and implementation of hydrological networks is an evolutionary process. During the pre-development phase of a region, when the hydrological régime is still in its natural state, hydrological information requirements are mainly for resource inventory and for planning and evaluating future development proposals. As a region enters the development phase, the hydrological networks must take into account additional data requirements for detailed design and construction purposes, and for documenting pre-project environmental conditions. As the level of development progresses, the hydrological régime becomes modified by water-supply regulation, diversion and other human activities such as agriculture, logging, urbanization and industrialization. Consequently, networks evolve into highly complex systems of sub-networks designed to gather data for specific operational, legal, administrative and research purposes related to national, regional and local water-management needs. The level of information requirements for decision-making appropriate to the various purposes can differ greatly and each purpose requires some particular data needs, accuracy standards and density requirements. The Commission therefore appointed a Rapporteur on Network Design under Special Conditions and assigned to him the tasks indicated in Part B of Annex VII to this report.

6.2.4 The Commission noted that the problems associated with providing information for planning, design and operation of hydrological networks have existed for many generations. The present generation is beginning to experience a new type of demand for hydrological data. Monitoring of the environment in the hope of discovering and evaluating the effects of man's activities on the biology and other quality aspects of water has created a growing need for new kinds of water data, and thus for specialized data networks. Network-design procedures for this type of activity are still not clearly defined. The costs entailed in these new activities will increase emphasis on the principles of network design. Considering also the request of the Executive Committee that activities in the field be strengthened, the Commission accordingly appointed a Rapporteur on Environmental Monitoring whose terms of reference are given in Part C of Annex VII to this report. The rapporteur was also entrusted with the task of assisting the Rapporteur on Network Design and Evaluation on problems related to networks for monitoring water quality.

6.2.5 The Commission noted that the design, evaluation and operation of networks for measuring elements of the hydrological cycle as well as the real assessment of hydrological elements, constituted one of the priority activities in the OHP for the period 1975-1980 as approved by Seventh Congress. To permit the above rapporteurs to pool international experience in these fields, it established, by Resolution 2 (Chy-V), a Working Group on Network Design and Areal Assessment of Hydrological Elements. The chairman of this working group was entrusted by the Commission with the editing of the Casebook on Hydrological Network Design Practice and with assisting the Secretariat as regards network statistics.
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6.2.6    As the problem of network design is closely related to problems of assessment of areal values of hydrological elements, the Commission included in the membership of the Working Group on Network Design and Areal Assessment of Hydrological Elements the Rapporteur on Areal Assessment of Precipitation and the Rapporteur on Areal Assessment of Evaporation and Soil Moisture, both appointed under agenda item 14.2.

7.    METEOROLOGICAL OBSERVATIONS FOR HYDROLOGICAL PURPOSES (Agenda item 7)

7.0.1    Under this item of the agenda the Commission considered the report of its Working Group on Meteorological Instruments and Methods of Observation for Hydrological Purposes. It thanked the chairman of the working group for effectively co-ordinating the work of the six rapporteurs who were members of his group, despite the fact that the working group had been unable to hold a formal session. In particular, the Commission noted that, in accomplishing its assignment, the working group and its rapporteurs had collaborated closely with CIMO on the subject of comparison tests for an international evaporimeter and on the precipitation studies being conducted by the CIMO Working Group on Measurements of Precipitation, Evaporation and Soil Moisture.

7.0.2    The Commission noted that, with the approval of the president of CHy, the material prepared by three rapporteurs (on snow cover, areal precipitation and areal assessment of soil moisture) and the chairman, in accordance with their respective terms of reference, had been combined into a single draft Technical Note, "Snow-cover measurements and areal assessment of precipitation and soil moisture for hydrological purposes". Noting the usefulness of the contents of the draft Technical Note, the Commission recommended that it be finalized and published as soon as possible.

7.0.3    The Commission then considered the recommendations of the working group (and the rapporteurs) and agreed that those of the proposed technical studies which mainly concerned meteorological instrumentation and methods of observation fell within the responsibility of CIMO, and that therefore CHy should not undertake such studies. It therefore recommended that the attention of CIMO should be drawn to the importance of an objective assessment of exposure of precipitation gauges for the needs of hydrology. In addition, the following items of the priority activities in the WMO Operational Hydrology Programme for the period 1975-1980 should be drawn to the attention of CIMO:

(a) Ascertainment and improvement of accuracy of precipitation (liquid and solid) measurement at a point;

(b) Means of measuring and recording rainfall intensity;

(c) Standardization of evaporation measurement, and estimation of evaporation.

It was agreed that, in carrying out the above studies, CHy should fully co-operate with CIMO, mainly through CHy representatives on the CIMO Working Group on Measurement of Precipitation, Evaporation and Soil Moisture. Although the problem of accuracy of point precipitation falls mainly within the competence of CIMO, the Commission considered that, in view of its importance for hydrology, and also bearing in mind that it was CHy which was at the origin of the intercomparison project on standard national gauges with the pit gauge, it appointed, by Resolution 3 (CHy-V), a Rapporteur on
Accuracy of Point Precipitation Measurement mainly to co-operate with the relevant CIMO working group.

7.0.4 The consideration of the following subjects in the priorities set out by Cg-VII should be undertaken by CHy itself through its rapporteurs:

(a) Computation of areal precipitation values (see item 14.2);

(b) Derivation of areal values of evapotranspiration and soil moisture in connexion with water-balance computations (see item 14.2).

7.0.5 The Commission further considered the remaining subjects which CHy had recommended for further study by the Working Group on Meteorological Instruments and Methods of Observation for Hydrological Purposes and decided that:

(a) The subject of instruments and systems for the automatic collection and transmission of data would best be dealt with by the Working Group on Hydrological Data Transmission, Processing and Retrieval, established under agenda item 9;

(b) The subject of exchange of information on methods of relating orographic precipitation patterns to meteorological parameters should be considered by the Rapporteur on Areal Assessment of Precipitation, appointed under agenda item 14.2 and included in the Working Group on Network Design and Areal Assessment of Hydrological Elements, established under agenda item 6. The rapporteur should keep abreast of the work of CAS on quantitative precipitation;

(c) The subject of collecting information on the detector and recording systems and techniques used in aerial nuclear devices for measuring the water equivalent of snow cover and soil moisture would best be dealt with by the CHy Rapporteur on Remote Sensing of Hydrological Elements, appointed under agenda item 9.1 and included in the Working Group on Improvement and Standardization of Instruments and Methods of Observation for Hydrological Purposes, established under agenda item 8.

7.0.6 The Commission finally considered the proposal for WMO to organize a workshop on aerial nuclear measuring devices for water equivalent of snow cover and areal soil moisture, as well as for a symposium on methods for the use of meteorological measurements to improve hydrological forecasting, and included them in the list of symposia and technical meetings proposed for the next inter-sessional period, established under agenda item 15.3.

7.1 Precipitation and snow-cover measurements (Agenda item 7.1)

7.1.1 The Commission considered the activities of the Rapporteur on Precipitation Measurement, who was also the CHy representative on the CIMO Working Group on Measurements of Precipitation, Evaporation and Soil Moisture and who had worked directly on the studies pertaining to the hydrological aspects of the international intercomparison of national precipitation gauges and pit gauges for measurement of rainfall. The Commission was of the opinion that these intercomparisons were of great significance for hydrologists and it agreed that the final results of the intercomparison studies should be brought to the attention of all Hydrological Services and requested the Secretary-General to make the necessary arrangements in this connexion.
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7.1.2 The Commission then considered the report of the Rapporteur on Snow Cover and noted with appreciation his contribution to the Technical Note mentioned in paragraph 7.0.2 above, and to the Guide to Hydrological Practices.

7.1.3 The Commission considered the reports on areal precipitation under agenda item 14.2.

7.2 Evaporation measurements (Agenda item 7.2)

7.2.1 The Commission considered the report by the Rapporteur on Evaporation in conjunction with that by the Secretary-General and noted that the rapporteur had effectively co-operated with the relevant CIMO working groups concerned with evaporation studies, although a CHy expert was specifically responsible for evaporimeter comparisons and development of a new type of evaporation pan for network purposes. The Commission noted with appreciation the rapporteur's contribution to the Guide to Hydrological Practices.

7.2.2 Noting that the final report on CIMO International Evaporation Comparisons would be published shortly, the Commission requested the Secretary-General to distribute the report to all Hydrological Services to enable them to adjust their evaporation data as appropriate. In accordance with Recommendation 4 (CHy-IV), a 20 m² evaporimeter was used as reference for intercomparisons. The Commission noted with appreciation the efforts concerning the development of new, more accurate evaporation-measuring instruments for network purposes and, in particular, endorsed the testing programme for the new insulated evaporimeter as a possible reference and network instrument. Some delegates cautioned the Commission against over-optimism with respect to the development of a new evaporation pan for network purposes. It agreed that CHy should continue to co-operate with CIMO on this project, through a CHy expert, and that the testing should be completed as soon as possible.

7.2.3 Although the Commission agreed with the CIMO working group's conclusion that the use of indirect means, in particular the energy-budget technique (Bowen ratio), for determining evaporation should be encouraged, it expressed the view that all relevant meteorological data are not normally available for areas where evaporation data are needed in designing development projects. In such cases, the evaporation pan still served an invaluable purpose. The Commission therefore recommended that both the direct and the indirect methods of obtaining evaporation data should be continued until a more satisfactory and practical solution could be found. The Commission included its views in Recommendation 3 (CHy-V).

7.2.4 The Commission considered that, in view of the important role played by evaporation and evapotranspiration in almost all aspects of operational hydrology, it should continue to keep abreast of developments in the measurement of these elements by all means available to it and agreed that this effort should be continued in co-operation with CIMO.

7.2.5 The question of operational assessment of areal evaporation was discussed under agenda item 14.2

7.3 Soil-moisture measurements (Agenda item 7.3)

The Commission noted with appreciation the contribution of the Rapporteur on Areal Assessment of Soil Moisture to the Technical Note mentioned in paragraph 7.0.2
above, and also the soil-moisture measurement comparisons being conducted in Canada, using neutron meters from five different countries and a large weighing lysimeter. The CIMO working group had also examined the remote sensing techniques for soil-moisture observation. This topic was also discussed under agenda item 14.2.

8. HYDROLOGICAL INSTRUMENTS AND METHODS OF OBSERVATION (Agenda item 8)

8.0.1 Under this item of the agenda, the Commission examined the report of the Working Group on Hydrological Instruments and Methods of Observation. The Commission noted that the working group had completed all the tasks given in its terms of reference and expressed its appreciation to the members of the working group and to the chairman in particular. The Commission considered the report of the working group as follows:

8.0.2 CHy-IV had given first priority to the preparation of guidance material on stream-gauging procedures. The Commission noted that the working group had finalized the first draft of a "Manual on stream gauging" which includes material prepared by the Rapporteurs on New Methods of Measuring River Discharge, on Levels and Discharge Measurements under Difficult Conditions and on Operation of Hydrometric Networks. The Commission noted that since the Manual provides detailed and extensive coverage of modern stream-gauging procedures there is no appreciable duplication with relevant parts of the Guide to Hydrological Practices. The Commission agreed that this Manual would be a major contribution of WMO in meeting the needs of Hydrological Services and recommended its publication in the WMO Operational Hydrology Reports series.

8.0.3 The Commission noted that, as recommended at CHy-IV, a Seminar on Modern Developments in Hydrometry had been convened by WMO in co-operation with Unesco and IAHS and organized by the International Centre of Hydrology of the University of Padua in September 1975. The working group had made a substantial contribution to the organization of the seminar. The Commission recommended that another seminar on similar lines should be held in or about 1980 and that it should include an exhibition of hydrometric instruments. The Commission noted with appreciation the invitation of the Delegation of the United Kingdom to host this seminar in the United Kingdom.

8.0.4 The Commission considered and endorsed the recommendations of its working group for future activities and accordingly established, by Resolution 4 (CHy-V), a Working Group on Improvement and Standardization of Instruments and Methods of Observation for Hydrological Purposes. In addition to the chairman, who is also the Rapporteur on Sediment Transport, the members of the working group are the Rapporteurs on New Methods of Discharge Measurements, Levels and Discharge Measurements under Difficult Conditions, Intercomparison of Principal Hydrometric Instruments, Groundwater, and Remote Sensing of Hydrological Elements. The terms of reference of these rapporteurs are indicated in Parts A to F of Annex VIII to this report.

8.1 Accuracy of hydrometric measurements (Agenda item 8.1)

8.1.1 The Commission was informed by the Secretariat about the activities carried out by the Rapporteur on Accuracy of Hydrometric Measurements. It noted that the Rapporteur had prepared a draft report reviewing contemporary methods of evaluation of accuracy of discharge measurements by the velocity-area method submitted to the Working Group on Hydrological Instruments and Methods of Observation. It noted also that this working group had prepared other contributions to be used by the rapporteur
to expand his report: these contributions included the latest ISO work on accuracy of stream gauging and the evaluation of accuracy for discharge measurements using hydraulic structures. The Commission noted that due to successive changes of rapporteurs it had not been possible to finalize the report nor to prepare relevant material for the Guide to Hydrological Practices. The Commission noted that the rapporteur had represented CHy in sessions of the former CIMO Working Group on Accuracy of Measurements and that CIMO-VI had entrusted the study of the accuracy of measurements for atmospheric parameters to a sub-group of the CIMO Advisory Working Group.

8.1.2 The Commission noted that ACOH had requested CHy to review the levels of accuracy of hydrological observations, as specified at present in the WMO Technical Regulations for Hydrology, in the light of the state of the art and also to assign levels of accuracy requirements for various needs of data users. It further noted that, acting on this recommendation of ACOH, the CHy Advisory Working Group recommended that these matters be studied by the Rapporteur on Accuracy of Hydrometric Measurements who should report on them to the Working Group on the Guide and Technical Regulations. The Commission noted that, for the same reasons expressed in paragraph 8.1.1 above, this task had not been finalized.

8.1.3 The Commission considered that its activities during the next period would consist mainly in completing the above-mentioned unfinished work, and included these tasks in the terms of reference of the Rapporteur on Accuracy of Hydrometric Measurements as indicated in Part B of Annex VI. In this connexion, the Commission considered that there was a need for an internationally agreed definition of terms relating to the accuracy of hydrometric measurements as well as to the mathematical and statistical aspects of these definitions. It agreed that suitable texts concerning terms such as "accuracy", "uncertainty", "error", "precision", "resolution" should be prepared for inclusion in the WMO guidance material (Glossary, Guide, Technical Regulations). It included this among the tasks of the rapporteur, requesting him to take fully into account the CIMO work in this field. The Commission finally decided to include the Rapporteur on Accuracy of Hydrometric Measurements in the membership of its Working Group on the Guide and Technical Regulations appointed by Resolution 1 (CHy-V).

8.2 New methods and measurement under difficult conditions (Agenda item 8.2)

8.2.1 Under this item of the agenda, CHy considered the report of the Rapporteur on New Methods of Measuring River Discharge, which summarized the replies from 26 countries to a questionnaire on new methods being used for measuring river discharges. The findings of the rapporteur primarily concern three new methods: the moving-boat, ultrasonic and electro-magnetic methods. The Commission noted that the moving-boat method was operational and was reported as being used by ten countries, almost entirely on large rivers. The ultrasonic system, which measures the average velocity, is used mainly with unstable stage-discharge relation. The electro-magnetic technique is still in the research stage and probably will find its main use in rivers affected by weed growth or moving-bed conditions. The Commission noted that material on these questions had been included in the "Manual on stream gauging" mentioned in paragraph 8.0.2 above and that a technical summary of the methods had been prepared for inclusion in the Guide to Hydrological Practices.

8.2.2 The Commission also examined under this item of the agenda the report of its Rapporteur on Levels and Discharge Measurements under Difficult Conditions. It noted that the Rapporteur had submitted a technical report to the Working Group on
Hydrological Instruments and Methods of Observation, including information on methods for measuring discharges under special conditions such as unstable channels, mountain streams, irregular unsteady motion (spillover and floods) and weed growth. This information had been prepared taking into account the answers from 31 countries to a questionnaire prepared by the rapporteur. The Commission noted that parts of this material had been incorporated in the "Manual on stream gauging" and in the "Guide to hydrological practices".

8.2.3 The Commission considered that future developments concerning new techniques for measuring levels and discharges as well as special cases of conducting these measurements under difficult conditions, particularly those encountered in developing countries, should be closely followed. Particular attention should be given to continuous discharge measurements by dilution, optical current meters and flow measurements using aircraft, and to the operation of streamflow stations under special conditions such as in floods and low flows, in semi-arid and arid zones and densely forested tropical areas. To carry out these tasks the Commission appointed a Rapporteur on New Methods of Discharge Measurement and a Rapporteur on Levels and Discharge Measurements under Difficult Conditions whose terms of reference are given in Parts B and C respectively of Annex VIII to this report.

8.3 Intercomparison of hydrometric instruments (Agenda item 8.3)

8.3.1 Under this item of the agenda, the Commission considered the report of the Rapporteur on Intercomparison of the Principal Hydrometric Instruments as well as complementary information given by the Secretariat on the implementation of Recommendation 5 (CHy-IV) for the initiation of an international project for comparative tests of principal hydrometric instruments. The Commission noted that, following the advice of the Advisory Working Group and ACOH, the project was being implemented in two phases, the first being limited to testing the current meters and water-level recorders owned by the participating countries. The second phase (to be started after CHy-V) should include testing of selected instruments on loan (or exchanged) among those countries. The first phase included the collection of technical, operational and economic characteristics of instruments as well as laboratory and field tests specified to characterize the accuracy, sensitivity, reliability and durability of the instrument under different conditions. The Commission noted that comprehensive guidelines and specifications for the tests had been dispatched to all participating countries to ensure the compatibility of the results.

8.3.2 The Commission noted that eight participating countries had tested 29 types of water-level recorder and 18 types of current meter and that the results of these tests had been analysed by the rapporteur. It noted that the most frequently used types of water-level recorder had been tested but the number of current meters was not sufficient for generalization. In this connexion, the Commission was informed that further results of tests were still expected from national institutes which had indicated willingness to participate in the project.

8.3.3 The Commission endorsed the principles of implementation of this project and commended the rapporteur on his work. It agreed that the Intercomparison Project of Principal Hydrometric Instruments should be continued in a second phase, involving international exchange of instruments. In this connexion CHy agreed with the views of ACOH that the testing of selected instruments lent by (or exchanged among) participating countries should be carried out at a limited number of places representing
as many commonly encountered field conditions as possible, ensuring that these sites will be as judiciously selected as possible by bilateral and/or multilateral agreement under the auspices and co-ordination of WMO. In the continuation of the project, consideration should be given to the comparative testing not only of water-level recorders and current meters but also of other hydrometric instruments such as ultrasonic flow meters and sediment samplers. It was suggested that snow-density gauges also be included in the project.

The Commission recommended that the WMO Secretariat arrange for the continuation of the Project on Intercomparison of Hydrometric Instruments along the lines expressed above and adopted Recommendation 4 (CHy-V) to this effect. It also stressed the importance of ACOH advice on implementing the project. To assist the WMO Secretariat in the implementation of the project, the Commission appointed a Rapporteur on Intercomparison of Principal Hydrometric Instruments with terms of reference as given in Part D of Annex VIII to this report.

8.4 Measurement of sediment transport (Agenda item 8.4)

8.4.1 Under this item the Commission considered the report of its Rapporteur on Measurement of Sediment Transport and noted that information on instrumentation and methods for the observation, analysis and processing of suspended sediment discharge and bed load had been collected from Member countries of WMO by means of a questionnaire. It noted that the rapporteur had prepared a first draft of a Technical Note on "Measurement of river sediment" including material on all the above questions as well as on methodologies for studying sediment-producing areas with inadequate observation networks. The Commission noted that this first draft of the Technical Note reflected mainly the national experience of the rapporteur. It agreed that the Technical Note should be finalized during the next inter-sessional period to include appropriate information from other countries.

8.4.2 The Commission considered that, in many developing countries, optimum methods for collecting sediment data were not being used because of physical and/or economic limitations and decided that one chapter of the Technical Note should be dedicated to the study of methods for estimating sediment transport under difficult conditions and for establishing the respective levels of accuracy. It also agreed that the Technical Note should include a description of the volumetric measurements of sediments in reservoirs and traps and measurements of bed-load transport based on geometry and migration velocity of sand banks and dunes. In order to finalize the Technical Note and extract material from it for the Guide to Hydrological Practices, the Commission appointed a Rapporteur on Sediment Transport whose terms of reference are given in Part A of Annex VIII to this report. In carrying out his tasks, the rapporteur should take into account the relevant standards of ISO TC 113, and the work of the Rapporteur on Streamflow/Water-quality Relationship.

8.5 Measurement of water quality (Agenda item 8.5)

8.5.1 Under this agenda item, the Commission considered the report of its Rapporteur on Measurement of Water Quality (including Temperature). The Commission noted that a restricted inquiry on networks for the measurement of water quality had been circulated by the Secretariat and information on national experiences had been submitted by nine WMO Members. The Commission noted that the rapporteur had prepared a
first draft of a Technical Note on "Water-quality measurement", including the questions of observation networks for different purposes, parameters to be measured, instrumentation (including sensors and associated equipment) and related aspects of network operation. The Commission noted that the rapporteur had closely followed and taken into account both the work of Unesco/WHO on Water Quality Surveys and other work of WHO so as to avoid unnecessary duplication. The Commission noted that the rapporteur had prepared contributions for Chapters 2 and 3 of the Guide to Hydrological Practices on instruments and methods of observation of physical and chemical parameters and on network design as requested by his terms of reference. It further noted that, because his material did not arrive on time, it could not be considered by the Working Group on the Guide and Technical Regulations. The Commission considered that both the Technical Note and the material for the Guide should be finalized as a matter of urgency and by Resolution 5 (CHy-V) appointed a Rapporteur on Water-quality Monitoring to carry out these tasks. It also considered that the Technical Note should briefly cover aspects concerning groundwater quality as related to surface water and included this task in the rapporteur's terms of reference.

8.6 Measurement of groundwater levels (Agenda item 8.6)

8.6.1 Under this item the Commission considered the report of its Rapporteur on Groundwater. It noted that he had collected information from WMO Members on instruments used for water-level observations and their expected accuracy. Twenty-nine replies had been received on sample networks pertaining to different types of aquifer and to the purposes for which the networks were constructed, such as alluvial valleys, sand/sandstone, carbonate rock and for sea-/freshwater interface monitoring. The Commission noted that the returns showed that only a few countries are using national standards for groundwater measurements. The Commission noted that the rapporteur had prepared material on the installation and testing of observation wells and on the planning and design of groundwater observation networks for the Guide to Hydrological Practices. These activities had been co-ordinated with those conducted in the IHD of Unesco and the rapporteur had attended the sessions of the IHD Working Group on Groundwater on behalf of WMO.

8.6.2 The Commission considered the future work to be done regarding problems of operational hydrology in the field of groundwater. It agreed that this work should be directed towards the following main objectives:

(a) Promotion of national standards in groundwater observation programmes;

(b) Improvement of methodology for assessing national water balances;

(c) Promotion of training of field and office intermediate personnel.

With regard to (a) above, the Commission decided to prepare an operational manual on a groundwater observing programme; with respect to (b) it decided that its future activities would include the preparation of guidance material on the interrelation of ground and surface water (infiltration and recharge, springs, base flow and interflow). The Commission discussed point (c) above under agenda item 16.1. The Commission also considered, under agenda item 8.5, matters concerning quality of groundwater; under agenda item 10, aspects of groundwater implications for surface-water design data, and, under agenda item 11, matters concerning the forecasting and model-
ling of the quality and quantity of groundwater. The Commission appointed a Rap­porter on Groundwater and assigned him the tasks indicated in Part E of Annex VIII to this report.

8.7 Operation of hydrometric networks (Agenda item 8.7)

8.7.1 Under this item of the agenda, the Commission considered the report of the Rapporteur on Operation of Hydrometric Networks. It noted that a questionnaire had been distributed to Members requesting information on their experience on operation of hydrometric networks for specific regions in their countries. The material collected from 41 cases (17 countries) included the characteristics of the sample regions and the networks, capital and operation costs and manpower. The Commission noted a technical report prepared by the rapporteur on the basis of this information, establishing some general characteristics of the actual range of sophistication for different techniques and some administrative aspects of hydrometric network operation. The Commission considered that this technical report contained very useful material; it was however of the opinion that, in order to have more meaningful conclusions, the analysis of the available information should be made for groups of cases in regions with the same geographical and social characteristics. Further information should be collected to enlarge the sampling for some specific types of region, as appropriate.

8.7.2 The Commission felt that work should be continued in the field of operation of hydrological networks with emphasis on the cost of stream gauging, operations under difficult conditions and operation of water-quality networks. To carry out these tasks, the Commission appointed, by Resolution 6 (CHy-V), a Rapporteur on Operation of Hydrometric Networks. Finally, the Commission recommended that the rapporteur prepare the material for publication in the WMO Operational Hydrology Report series.

9. DATA COLLECTION, TRANSMISSION, PROCESSING, STORAGE AND RETRIEVAL (Agenda item 9)

9.0.1 The Commission noted with appreciation the report of the Working Group on Data Treatment. Noting that the development of a data-processing system is a function of a wide variety of conditions, such as extent of networks, format of data produced by network instrumentation, real-time data requirements, needs of users and staff, etc., the Commission agreed that the possibilities for standardization in data-treatment procedures were limited, except in the case of codes for transmission of hydrological data. The exchange of data and the increasing application of water-resources data for planning purposes also had implications for standardization. A great deal of expertise and experience in the development of operational data-treatment procedures resided in a number of agencies throughout the world, but little of the detail of their construction had been published. The Commission believed that the experience gained in the development of such procedures would be very valuable to agencies embarking upon the automation of their data-treatment processes.

9.0.2 The Commission also noted that the Working Group on Data Treatment had considered the question related to the development of procedures for the transfer of large volumes of non-real-time data, using computer media. It noted that, although there were a number of different computer types, it was possible for data sets produced by one machine to be successfully read by another, provided certain conventions
were observed. In this connexion, the Commission examined the proposed specifications prepared by the working group and referred them to the Working Group on the Guide and Technical Regulations for finalization and inclusion in the Guide. It also recommended that future transfers of large volumes of non-real-time data should try to comply with these specifications.

9.0.3 The Commission noted that the outline of the OHP gave special attention to data-transmission and processing facilities, so that the best use could be made of the great increase in data which the efforts in network expansion were bringing about. It also considered it important that the opportunities available through the development of the WWW be properly assessed from the viewpoint of hydrological data transmission and storage — an aspect which had been given added emphasis by Resolution 33 (Cg-VII), in which VAP was made available for the hydrological applications of the WWW.

Noting that the activities proposed by the working group were closely interrelated and could be handled conveniently by rapporteurs formed into a single working group of CHy, the Commission established a Working Group on Hydrological Data Transmission, Processing and Retrieval in Resolution 7 (CHy-V). It further designated its chairman as the Rapporteur on Application of WWW to Operational Hydrology, with terms of reference included in Part A of Annex IX to this report (see also paragraph 12.1.5).

9.1 COLLECTION AND PROCESSING SYSTEMS, INCLUDING REMOTE SENSING
(Agenda item 9.1)

9.1.1 The Commission noted with appreciation the report of the Rapporteur on Hydrological Data Collection and Processing Systems who, with the approval of the president of CHy, had concentrated his work on the use of the WMO Global Data-processing System (GDPS) for collection and processing of data for international exchange only. The rapporteur represented the Commission on the CBS Working Group on the GDPS, and had prepared a technical report which included the basic principles of future activity of the Commission in this field.

With respect to the GDPS, it was noted that, for the time being, only that part of the non-real-time data which could be transmitted in a coded form through the GTS was being archived. Accordingly the list of hydrological data proposed for inclusion in the GDPS storage and retrieval service was not included in the Guide on the GDPS, as originally planned. The Commission noted that the list might, however, be considered for inclusion in the Guide on the GDPS, reflecting the requirements at the national level.

9.1.2 The Commission endorsed the recommendation of the rapporteur concerning the continuation of studies on hydrological data-processing, archiving and retrieval systems, especially in connexion with the GDPS and the preparation of specifications for the different elements of these systems based on the technical report prepared by the rapporteur. With respect to the inclusion of hydrological data in the GDPS, the Commission recommended the preparation of appropriate recommendations on standards for quality control and real-time and other hydrological data-processing procedures for forecasting and river-regulation purposes and included these tasks in the terms of reference of the Rapporteur on Standardization of Primary Data-processing indicated in Part C of Annex IX to this report.
9.1.3 The Commission noted the report of its Rapporteur on Survey of National Hydrological Data Banks and expressed its appreciation to the rapporteur for the very useful survey he had conducted. The Commission was gratified to note from the survey that 63 countries used, and 14 countries would soon be using, computers for processing and archiving data.

9.1.4 The Commission approved the inclusion of the tables showing the status of national hydrological data banks in the proposed WMO publication "Statistical Information on activities in operational hydrology". It further decided to keep these tables on file and submit them for updating to Members every four years. This would ensure that the latest information was available to Members concerning developments of hydrological data banks in other countries. The Commission recommended to Members to make a special effort to inform potential users systematically, through the WMO Secretariat, of the type of information available and the format in which it could be supplied. If standard analyses of the basic data were available, this fact too should be publicized. As proposed by its Working Group on Data Treatment, the Commission finally recommended the preparation of guidance material on the planning, development and organization of national hydrological data banks, possibly through a number of case studies of well-developed national banks. These case studies should include information on developing specific data archives for specific elements and on the broader concept of co-ordinated data banks. The Commission included the above tasks in the terms of reference of the rapporteur indicated in Part C of Annex IX to this report.

9.1.5 The Commission noted with appreciation the report of the Rapporteur on Remote Sensing of Hydrological Elements who had conducted a survey among a selected number of countries on the use of remote sensing techniques for hydrological purposes. The Commission noted that the number of countries utilizing remote sensing methods in hydrology had risen to 13. The Commission was informed that the rapporteur had prepared a draft Technical Note on "Remote sensing applications to hydrology", which included the results of this survey.

9.1.6 The Commission expressed its gratitude to the rapporteur for his assistance in the WMO Project on Snow Studies by Satellites. Thirty-one countries had expressed their interest in taking part in the second phase of this project; the first phase had been concluded with the publication of WMO/IHD Report No. 19. During the test periods (July 1974 - August 1976) the participating countries had carried out intercomparisons of data obtained by conventional methods with those obtained by using satellite techniques; the results would be discussed at the International Working Seminar on Snow Studies by Satellite to be held in Geneva from 18 to 22 October 1976.

9.1.7 The Commission endorsed the recommendation of the rapporteur concerning the encouragement of further inter-communication and closer collaboration among Members so that data, materials and advice could be shared for the benefit of all, and so that the desired intercomparison of the various satellite techniques with traditional methods would be effected in a satisfactory and timely manner.

9.2 Requirements and codes for data transmission (Agenda item 9.2)

9.2.1 The Commission considered the report of its Rapporteur on Requirements for Transmission of Data for Hydrological Purposes, and noted with appreciation that he
had prepared a technical report based on the information received from 63 Members in response to a questionnaire. The report provided a preliminary assessment only and much additional work was needed, particularly at the regional level, to assess more fully the present status of hydrological facilities and to ascertain to a greater depth data requirements of Members' plans regarding hydrological data-transmission systems and the WWW. The Commission agreed that further studies should be conducted rather at the regional level, in accordance with the recommendations outlined in the above-mentioned technical report. It therefore recommended that regional associations, through their respective working groups (rapporteur) on hydrology, should undertake this task in close co-operation with the regional working groups on the Global Telecommunication System (GTS). The Commission felt that there was an urgent need for regional planning to identify the extent to which participating countries would need to relay data and the level of automation, if any, of their planned networks. In this connexion, the Commission adopted Recommendation 5 (CHy-V).

9.2.2 The Commission considered it necessary to co-ordinate its activities with those of the Commission for Basic Systems (CBS) for the purpose of ensuring appropriate inclusion of hydrological data-transmission material in the Manual on the GTS. The Commission therefore decided that the CHy Rapporteur on Design of Automatic Telemetering and Satellite Data Transmission Systems should follow the activities and, if appropriate, prepare proposals for the consideration of the CBS Working Group on the GTS. The terms of reference of this rapporteur are indicated in Part B of Annex IX to this report.

9.2.3 The Commission noted with appreciation the report of the Rapporteur on Hydrological Codes and expressed its satisfaction at the adoption of two hydrological code forms:

FM67-VI HYDRA - Report of hydrological observations from a hydrological station;

FM68-VI HYFOR - Hydrological forecast.

An international system of hydrological observing station identification numbers was also adopted. The hydrological codes came into effect on 1 January 1975. The code forms were circulated to all Members and appropriate international river basin bodies. The Commission was pleased to note that the Danube Commission and a number of other countries were considering use of WMO codes.

The Commission noted that RA IV and RAVI had already adopted the lists allocating the international indicator for basin or group of basins (BB) in their Regions (A) and the indicator of the country (Ci) for each basin (BB). A number of countries in these Regions had also submitted identification numbers of their hydrological observing stations (iHiHiH). The allocation of indicators in other Regions is expected to be completed in due course. The Commission also noted that lists of BB and Ci will be published in Volume II of the Manual on Codes (WMO-No. 306) and those of iHiHiHi in a separate publication.

9.2.4 The Commission also endorsed the president's decision that the hydrological codes and all the lists of indicators, which were included in the complete Manual on Codes, be published in a separate self-contained form together with the Technical Regulations in hydrology (Volume III) for the benefit of users, thus facilitating distribution of the hydrological codes and Technical Regulations to the Hydrological Services.
9.2.5 The Commission did not expect immediate widespread use of hydrological codes, and realized that they would be used as the need arose, especially with the growing use of computers for data processing and for international exchange of data on international river basins in connexion with hydrological forecasting and water-resources management.

The Commission agreed with the recommendation of the Working Group on Data Treatment that other code forms, such as for river-system operation (RISOP), should be developed on the basis of experience gained in the implementation of the HYDRA and HYFOR.

9.2.6 The Commission noted that with the explicit mentioning of HYDRA and HYFOR in Volume III of Technical Regulations, they had become of a mandatory nature, leading to the standardization of coding procedures and practices. It also considered the structure of codes flexible enough to accommodate necessary future requirements. It therefore agreed that work relating to coding problems should be continued by a rapporteur as indicated in his terms of reference in Part D of Annex IX to this report. The Commission recommended that at the level of each regional association, the regional Working Groups (Rapporteur) on Hydrology should define the requirements as regards the programme for the dissemination of coded information for international basins.

10. DESIGN DATA FOR WATER RESOURCES PROJECTS (Agenda item 10)

10.0.1 The Commission considered the report of the Working Group on Hydrological Design Data for Water Resources Projects. It noted that, in accordance with its recommendation, the first session of this working group had been held in conjunction with the Symposium on Design of Water Resources Projects with Inadequate Data (Madrid, 4 – 8 June 1973) and that relevant symposium papers had been used by the working group in revising basically the annex to the Guide "Applications to water management" which was published in 1975 in the third edition of the Guide. It had also prepared detailed proposals for amendments to several sections of the Guide as discussed by the Commission under agenda item 5.1.

10.0.2 The Commission noted with appreciation that the working group had reviewed the manuscripts of Operational Hydrology Reports No. 4 and No. 5 which had been subsequently published in 1973 and 1975 respectively. The French version of the former report was published in 1975. As recommended by the Commission, the "Manual for estimation of probable maximum precipitation" was published in 1975 as the first report in the Operational Hydrology Report series. The Commission agreed on the need to examine the possibility of preparing guidance material on estimation of PMP in tropical zones and included this task in the terms of reference of its Rapporteur on Extremes of Precipitation (see paragraph 10.1.2). The Commission considered the proposals of the working group concerning hydrological maps under agenda item 14.1.

10.0.3 The Commission noted with satisfaction that Seventh Congress had included design data for projects, including cases with inadequate data, in the priority activities in the OHP for the period 1975-1980. The Commission considered the recommendations of the working group for future work as indicated below.

10.1 Design values of water yield (Agenda item 10.1)

10.1.1 Under this agenda item, the Commission considered the report by its Rapporteur on Water Yield. It noted with appreciation that the rapporteur had not only
carried out all the tasks included in his terms of reference but had also prepared
draft material on design floods, sediment transport and the application of stochastic
methods in the analysis of hydrological data for inclusion in the Guide.

10.1.2 The Commission considered that several WMO publications (Guide, Technical
Notes, Operational Hydrology Reports, etc.) contain examples of probabilistic ap-
proaches or statistical procedures for the computation of extremes of precipitation.
However, there is a need for integrated and comprehensive information on the advan-
tages and disadvantages of each method. The Commission accordingly endorsed the
recommendation of the working group and that of the rapporteur that a report should
be prepared on extremes of precipitation. For this purpose it appointed a Rapporteur
on Extremes of Precipitation, with the terms of reference as indicated in Part A
of Annex X to this report (Resolution 9 (CHy-V)).

10.1.3 The Commission agreed with the views of the working group and the rappor-
teur that an explicit description of the accuracy of the available data would contri-
bute both to the design process and to the methods of obtaining the hydrological data.
The Commission therefore recommended that a report be prepared to determine the accu-
racy levels of design data. For this purpose and also to carry out the task described
in paragraph 10.2.2 below, it appointed a Rapporteur on Standardization of Requirements
for and Accuracy Levels of Hydrological Design Data, with the terms of reference as
indicated in Part B of Annex X to this report.

10.2 Design values of flood flow (Agenda item 10.2)

10.2.1 Under this agenda item, the Commission considered the report by its Rappor-
teur on Design Floods. It noted with appreciation that the rapporteur had completed
his assignment and, in addition, had participated in the meetings and work of the
IHD Working Group on Floods and Low Water. The rapporteur had commented on and con-
tributed to the Unesco publications "Catalogue of very large floods" and "Catalogue of
low waters".

10.2.2 The Commission considered that standardization of requirements for the col-
lection and availability of all data needed in the planning and design of projects
would be beneficial to agencies which collect data and others which make use of these
data. It endorsed the recommendation of the working group for the preparation of
a report on standardization of input data for floods (including estuaries) and low-
flow computations.

10.2.3 The Commission noted the recommendation of the working group and that of
the rapporteur concerning the preparation of an annotated bibliography on methods of
computation of design floods. It noted that the guidance material on this subject,
being prepared within the framework of the IHP, contained an extensive bibliography,
and agreed that no further action should be taken by the Commission at this stage.

10.3 Water quality and other specialized aspects of design (Agenda item 10.3)

10.3.1 Under this agenda item, the Commission considered the report of its Rappor-
teur on Streamflow/Water-quality Relationship. It noted that, in addition to his
contribution to the Guide, the rapporteur had prepared:
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(a) A report on relationships between hydrological data, hydrological projects and water quality;

(b) A list of references in the field of thermal pollution;

(c) A bibliography on the subject of salt-water intrusion.

The Commission also noted with appreciation that the rapporteur had participated in the meetings and work of both the WMO Executive Committee Panel of Experts on Meteorological Aspects of Air Pollution and the WMO Executive Committee Panel of Experts on Environmental Pollution (see paragraph 13.3).

The Commission endorsed the working group's recommendation that the report listed under (a) above should be suitably expanded by including more case studies and examples, as well as a chapter on the interrelationship between sediments and water quality, and that the whole report, as revised, be published.

10.3.2 The Commission considered that the studies of streamflow/water-quality relationship (including aspects of the impact of heat release to water and questions related to the sea/freshwater interface in tidal streams) should be continued and appointed a Rapporteur on Streamflow/Water-quality Relationship (Resolution 8 (CHy-V)). The Commission also considered this subject under agenda item 13.3.

10.3.3 The Commission noted that, in accordance with its recommendation, the Secretary-General had arranged for the U.S. Coastal Engineering Research Center of the U.S. Army Corps of Engineers to prepare a report on "Estimation of maximum reservoir levels". The Commission commended this Center for its valuable report, parts of which will be included in the annex to the Guide. The Commission noted that the Working Group had included additional material on the subjects of sediment transport and evapotranspiration in the revised annex proposed for publication as Chapter 7 in the fourth edition of the Guide.

10.3.4 The Commission recognized the increasing role of groundwater in water-resources activities and considered that the importance of groundwater for surface-water hydrology and design consists mainly in the natural and induced variations of springflow discharge (and quality). The requirements for artificial groundwater recharge from surface-water resources are another important problem. In accordance with the recommendation of the working group and the rapporteur, the Commission decided that a report should be prepared on groundwater implications for surface-water design data. It decided to include this task in the terms of reference of the Rapporteur on Groundwater appointed under agenda item 8.6.

10.4 Secondary data treatment (Agenda item 10.4)

10.4.1 The Commission agreed with the views of the Working Group on Data Treatment and with those of the Rapporteur on Secondary Data Treatment that secondary data treatment was the analysis and computation of processed data from one single observational series or a combination of series of one hydrological or meteorological element. Tertiary data treatment was considered to be the analysis of a combination of time series from two or more hydrological and/or meteorological elements (e.g. rainfall-runoff modelling).
10.4.2 The Commission noted that the rapporteur had prepared a preliminary report containing analysed material included in the replies to the questionnaire on secondary data treatment distributed in 1973 to all WMO Members. The Commission recommended the finalization of this report during its next inter-sessional period. For this purpose it appointed a Rapporteur on Secondary Data-treatment Procedures with terms of reference as indicated in Part C of Annex X to this report (Resolution 9 CHy-V).

10.4.3 The Commission agreed with the views of the Working Group on Data Treatment and those of the rapporteur that there were generally too many variations in the conditions pertaining to data-treatment situations to enable any realistic and useful steps to be taken towards standardization.

10.4.4 The Commission considered the possibility of establishing an information bank at the WMO Secretariat where Members interested might obtain details on where to acquire advice to solve specific data-treatment problems. It recommended that the Secretary-General study this possibility with the assistance of the Rapporteur on Secondary Data-treatment Procedures.

10.5 Priorities in the field of hydrological data for design (Agenda item 10.5)

10.5.1 The Commission agreed with the working group that the common techniques for the extrapolation of design data are of limited scope and thus the resultant data are not of optimum quality. It considered that a more integrated approach, including several techniques, should contribute to solving this problem and appointed a Rapporteur on Extrapolation of Design Data, with terms of reference indicated in Part D of Annex X to this report.

10.5.2 Several delegations, noting the interest of countries, particularly the developing ones, in preparation of material on assessment of operational use of hydrological data in connexion with IOHS, proposed the establishment of a rapporteur on this question.

10.5.3 The Commission recommended that the implementation of the tasks indicated under agenda item 10 should all be closely co-ordinated with the related activities planned by Unesco and approved by the IHP Intergovernmental Council. In this connexion, the Commission considered the recommendation of its working group that WMO and Unesco should jointly undertake the preparation of an international directory of recommended procedures concerning hydrological studies needed for water-development projects. The Commission also noted that the terms of reference of the Unesco/IHP Working Group on Methods of Computation of Hydrological Parameters for Water Projects included, inter alia, the preparation of a "Guidebook on methods of hydrological computations for water projects". The Commission agreed with the views of this working group that the Guidebook should reflect the experience of hydrological computations existing in various countries and located in different physiographical areas. The Unesco working group indicated that, during the preparation of the Guidebook, it was necessary to take into account the results of work carried out by Unesco, WMO, IAHS, and other international organizations during the IHD as well as the ongoing studies conducted within the framework of the IHP, in order not to duplicate existing or planned publications. In the view of the Unesco working group, the text of the Guidebook should be kept as concise as possible (200-250 pages) and make reference to relevant publications containing a detailed description of recommended methods. The contents of the Guidebook should be problem-oriented, i.e. the Guidebook should start from
the practical requirements of water management and mention the hydrological procedures involved, taking into consideration the various climatic and physiographical conditions.

10.5.4 The Commission considered that the "Directory" proposed by the CHy working group had many common features with the proposed IHP "Guidebook" and endorsed the recommendation of the CHy working group that WMO and Unesco jointly undertake the finalization of this publication. The Commission preferred that the title of this publication be "Directory", which gives a better indication of its content, but considered that it might be decided by a Joint WMO/Unesco panel of experts which, it recommended, should compile and prepare this publication by 1979. It agreed that WMO be represented on this joint panel by two members of the Working Group on Design Data for Projects. It entrusted the president of CHy and the Advisory Working Group with the selection of these two rapporteurs.

10.5.5 The Commission stressed the need to complete all the tasks listed above and to continue the updating and revision of the annex to the Guide and, if necessary, some parts of other relevant chapters of the Guide during the next inter-sessional period. In view of this, it established in Resolution 9 (CHy-V) a Working Group on Design Data for Projects. In addition to the chairman, the members of the working group are the Rapporteur on Extremes of Precipitation, the Rapporteur on Standardization of Requirements for and Accuracy Levels of Hydrological Design Data, the Rapporteur on Secondary Data-treatment Procedures, and the Rapporteur on Extrapolation of Design Data. In view of the discussion indicated in paragraph 13.4.4 of this report, it also included in the working group a Rapporteur on Cost/benefit Assessment of the Application of Hydrological Data in Water Resource Management Projects with the terms of reference as indicated in Part E of Annex X to this report.

11. HYDROLOGICAL FORECASTING (Agenda item 11)

11.0.1 Under this agenda item, the Commission considered the report of its Working Group on Hydrological Forecasting. It noted with satisfaction that the working group had completed a draft of a Technical Note on "New methods of hydrological forecasting" and had submitted considerable material for inclusion in the Guide to Hydrological Practices. Finally, the Commission noted that the working group had prepared a list of maps used for hydrological forecasting and discussed this subject under Agenda item 14.1.

11.0.2 The Commission noted that the End-of-the-Decade Conference had assigned top priority to the subject of hydrological forecasting and that Seventh Congress had included it in the priority activities of the Operational Hydrology Programme for the period 1975-1980. The Commission examined and endorsed the recommendations of the working group on the subjects on which additional guidance should be prepared during the next inter-sessional period and accordingly established in Resolution 10 (CHy-V) a Working Group on Hydrological Forecasting. The members of this working group are: the Rapporteur on Multi-purpose Basin simulation Sub-system; the Rapporteur on Models for Snowmelt Runoff; the Rapporteur on On-the-Line Forecasting Systems; the Rapporteur on Forecasting of Low Flows and Related Aspects of Droughts; the Rapporteur on Long-range Water-supply Forecasting; and the Rapporteur on Flash Floods. The terms of reference of these rapporteurs are included in Parts A to F of Annex XI to this report.

11.0.3 The Commission was informed that the Executive Committee, at its twenty-eighth session (June 1976), had requested it to strengthen its activities in the field of hydrological forecasting for purposes of environmental protection. The Commission considered that the present and future problems of pollution in rivers had
resulted in new requirements for an expanded river-forecasting service to predict reliably low flows for the control of pollution. During low-water periods, forecasting the volume of water available in a reach of a river where pollution-causing agents might be diluted is important for the effective monitoring and control of pollution. In the foreseeable future, the value of low-flow forecasts could well equal that of flood forecasts. The Commission therefore fully agreed with the Executive Committee and took action on its request in Resolution 8 (CHy-V).

11.1 Forecasts of discharge, water level and flow volume (Agenda item 11.1)

11.1.1 The Commission noted the report of its Rapporteur on Use of Conceptual Models and of WWW Systems for Hydrological Forecasting and commended him for his cooperation with the Secretariat in the implementation of the WMO project on the intercomparison of conceptual models used in operational hydrological forecasting. It also noted with appreciation that the rapporteur had contributed to the Technical Note on "New methods of hydrological forecasting" and to the Guide and that he had prepared comments for the Technical Regulations.

11.1.2 The Commission then examined a document by the Secretary-General and noted with satisfaction that the WMO intercomparison project indicated above had been successfully completed with the publication of a final report as Operational Hydrology Report No. 7 (WMO-No. 429). The Commission considered the recommendations included in this report concerning future WMO activities in the field of hydrological forecasting, particularly with respect to extending the results of this project to practical applications. In this connexion, the Commission noted that the End-of-the-Decade Conference had recommended to WMO that, within the OHP, efforts to promote the development and operational application of hydrological models be strengthened and broadened to include snowmelt runoff. It also noted that the intercomparison project mentioned above did not include models for snowmelt runoff. The Commission therefore recommended, in Recommendation 6 (CHy-V), the initiation of a project on the intercomparison of conceptual models for snowmelt runoff. The Commission also asked its Rapporteur on Models for Snowmelt Runoff to co-operate with the Secretariat in the execution of this project. The Commission considered the other recommendations under agenda items 4 and 16.

11.1.3 The Commission noted the report of its Rapporteur on Forecasting of Floods Resulting from Tropical Cyclone Rainfall. It commended him on his technical report on forecasting floods from rainfall associated with tropical cyclones, an abridged version of which was published in the WMO Bulletin of April 1976.

The Commission noted with satisfaction, from the rapporteur's report and a document submitted by the Secretary-General, that the WMO Tropical Cyclone Project was proceeding satisfactorily, due consideration being given to strengthening flood-forecasting capabilities through close co-operation with such regional bodies as WMO/ESCAP Typhoon Committee, WMO/ESCAP Panel on Tropical Cyclones and RA I Tropical Cyclone Committee for the south-west Indian Ocean. The Commission noted that the UNDP had provided considerable support to the Tropical Cyclone Project and that 22 WMO/UNDP projects related to tropical cyclones had been or were being implemented throughout the world.

11.1.4 The Commission noted that WMO had collaborated with ESCAP and the League of Red Cross Societies (LRCS) in the preparation of the report "Guidelines for community
preparedness and disaster prevention" and with UNDRO in the preparation of the report "A study of the state-of-the-art in disaster prevention and mitigation" and with UNEP in the preparation of the report "Quantitative evaluation of disaster risk (Tropical cyclones)."

11.1.5 The Commission endorsed the recommendation of its rapporteur concerning the preparation of a state-of-the-art report on the combined effect of storm surges and floods and included this task in the terms of reference of the working group which it had established in Resolution 10 (CHy-V). The Commission also recommended that WMO continue to expand its efforts to develop hydrological forecasting capabilities of Member countries, especially developing countries, in areas affected by tropical cyclones.

11.1.6 The Commission noted that the International Conference on the Results of the IHD and on Future Programmes in Hydrology (1974) had made a strong plea to the WMO Executive Committee to promote research on quantitative precipitation forecasting. It noted with satisfaction that a plan had been prepared for initiating a project for intercomparison of quantitative precipitation forecasting models in 1977.

11.1.7 The Commission noted with appreciation in the report of its Rapporteur on Influence of Infiltration on Forecasts of Runoff that he had prepared guidance material on infiltration for inclusion in the Guide to Hydrological Practices. The Commission considered the proposals of the rapporteur concerning future activities in this field. It recommended that the WMO Commission for Agricultural Meteorology arrange, as appropriate, for the collection of information on maximum water available for plants and report back on its findings. It also recommended that the WMO Secretariat co-operate with Unesco in collecting information on infiltration losses in various types of soil, vegetation and sand dune.

11.2 Specialized forecasts - ice conditions, water temperature and chemical quality (Agenda item 11.2)

11.2.1 The Commission noted the report of its Rapporteur on Forecasting of Ice Formation and Ice Break-up. It noted with appreciation that he had prepared material for inclusion in the Technical Note "New methods of hydrological forecasting", the Guide and a short survey on methods of forecasting ice conditions. The Commission endorsed the recommendation of the rapporteur concerning the preparation of material on new methods of long-term forecasting of ice conditions. It decided by Resolution 11 (CHy-V) to appoint a Rapporteur on Forecasting of Ice Conditions who should closely co-operate with the Working Group on Hydrological Forecasting and the Rapporteur on Water-quality Monitoring.

The Commission considered, under agenda item 10.3, other specialized forecasts, namely, modelling techniques as applied to water quality and the possibilities of forecasting water-quality changes on the basis of hydrological forecasts.

11.3 Cost/benefit relationship of hydrological forecasts (Agenda item 11.3)

11.3.1 The Commission noted the report of its Rapporteur on Cost/benefit Relationship of Hydrological Forecasts and commended him on the material he had prepared for inclusion in the Technical Note on new methods of hydrological forecasting and in the Guide to Hydrological Practices. The Commission also noted that a proposal for a
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cost/benefit study associated with hydrological forecasting along the Rhine River was being considered by RA VI. The Commission agreed with the views of its rapporteur that flash floods are a critical problem throughout the world and that the problems associated with them are unique. The Commission accordingly appointed a Rapporteur on Flash Floods with the terms of reference as indicated in Part F of Annex XI to this report. It requested him to prepare a report on flash floods as indicated in his terms of reference. In preparing this report he should take into consideration the material submitted to the IAHS Symposium on Flash Floods (Paris, 1974).

12. HYDROLOGICAL ASPECTS OF WWW (Agenda item 12)

12.1 Requirements of Hydrological Services and planned applications of WWW to hydrology (Agenda item 12.1)

12.1.1 Under this item of the agenda, the Commission considered the report of its Rapporteur on Application of WWW to Hydrology. It noted with satisfaction that a comprehensive report on the implementation of WWW applications to hydrology had been prepared by the rapporteur and submitted to the president of CHy in May 1973. It noted that, using this report as a basis, the rapporteur and the Secretariat produced a document entitled "Use of WWW facilities for hydrology" which had been approved by the presidents of CHy and CBS and was being published in the WMO WWW Report series. The Commission commended the rapporteur for his work in the preparation of this report which will be equally useful for both Hydrological and Meteorological Services. At the recommendation of ACOH, this publication will be distributed to all Hydrological Services and the response of these Services should provide further basic information for WWW planning and provide services for operational hydrology.

12.1.2 The Commission considered the recommendations included in the report of the rapporteur and the action already taken on them. Action on some of these recommendations (concerning standard terms for use in hydrological forecasting and the processing of hydrometeorological data by WWW centres for large-scale water balances and modelling studies) was dealt with under other agenda items of the session. Under this agenda item, CHy considered and recorded decisions on the remaining recommendations of the rapporteur.

12.1.3 The Commission noted that, at the recommendation of the rapporteur, the CHy Advisory Working Group had taken action to initiate case studies on systems development projects through WMO regional associations. As a result, WWW basin studies are now in progress in the Saint John river basin in WMO Region IV (North and Central America) and on the Danube and Rhine basins in WMO Region VI (Europe) while similar studies are being considered for the Niger and other basins (see paragraph 18.1 of this report). In this connexion, the Commission noted that a report on the application of WWW to the Rhine river basin had been prepared and submitted to WMO by a group of experts of the countries of the basin. It agreed that the way to implement these studies consisted in establishing the requirements of WWW products and facilities for Hydrological Services in the pilot basins and assessing such existing and/or planned facilities. This could be done by implementation meetings at the basin level in which experts from Meteorological and Hydrological Services of the countries concerned should participate. Existing international (basin-wide) bodies concerned should also be invited to participate in these studies.

12.1.4 The Commission was presented with a document submitted by Canada and the United States giving information on the progress of a pilot study in the Saint John river basin, aiming at evaluating the application of WWW systems and facilities to
hydrological forecasting. The Commission noted that a steering committee representing all Canadian and US. Agencies involved had been set up. It noted that the activities of the pilot study, which was carried on within the framework of Regional Association IV, were co-ordinated with those of the WMO Snow Studies by Satellite project. The Commission considered that the programme and way of implementation of the pilot study were a good example for similar studies on basins in other WMO Regions. It recommended that these types of activity should be developed by the countries concerned, using the advice and expertise of CHy bodies and regional association Working Groups on Hydrology as appropriate.

12.1.5 The Commission noted that the target date for the completion of the Saint John Basin Study was December 1977. It recommended that consideration be given to holding a workshop of experts in 1978 to discuss the results of the pilot study, with the participation of the CHy rapporteurs concerned with these activities.

The Commission considered that activities in this field should continue during its next inter-sessional period with emphasis on the implementation of pilot projects within the framework of WMO regional associations. To assist in this work and to follow WWW developments as they may be related to hydrology, it appointed a Rapporteur on Application of WWW to Operational Hydrology with terms of reference as indicated in Part A of Annex IX to this report and included him in the membership of the Working Group on Hydrological Data Transmission, Processing and Retrieval.

12.2 Atmospheric vapour flux (Agenda item 12.2)

12.2.1 Under this item of the agenda, the Commission considered the report of its Rapporteur on Atmospheric Vapour Flux. It noted with appreciation a technical report prepared by the rapporteur summarizing the basic formulation of the problem of application in the use of a rawinsonde network for obtaining vapour-flux data and the potential application of satellite data. The report also includes a review of the important elements of a programme of vapour-flux computations within the framework of the WWW. Within WWW/GOS, rawinsonde remains the main tool for obtaining humidity and wind data for vapour-flux computation. On the other hand, satellite products of today may be of value for estimation of total vapour content on region of poor rawinsonde coverage but are of marginal value for vapour-flux computation because of inadequate vertical resolution of humidity profile and derived wind data.

12.2.2 The Commission noted that the operational existing rawinsonde network is designed on a scale to resolve synoptic meteorological features; thus this type of network is of value for regional water-balance computations over areas of $10^6$ - $10^7$ km$^2$. The Commission considered that the results from these regional water-balance computations, even though not performed on the scales of primary interest to hydrologists, could be used in the development and testing of general relationship which once calculated could be applied to smaller basins.

12.2.3 The Commission considered a proposal by its rapporteur that WMO promote the implementation of studies on vapour-flux computations within the framework of the activities of the regional associations. The Commission was of the opinion that the density and programme of observations of existing rawinsonde networks were not adequate for the computation of terms of the balance equation to the degree of accuracy required. It then recommended that, for the time being, regional associations might wish to conduct preliminary investigations to assess the feasibility of carrying out such studies in specific areas in the Region.
12.2.4 With regard to inter-agency activities concerned with this subject, the Commission noted that WMO had prepared a technical paper on atmospheric vapour-flux computation for presentation at the Unesco/WMO Workshop on Continental Water Balance of Europe (Varna, Bulgaria, September 1976). It also noted that WMO was co-operating in the implementation of the IHP Project 1.4 on "Methods of computation of large-scale water balances based on air-moisture flux and distributed system modelling".

12.2.5 The Commission recommended that the report by its rapporteur on "Hydrological application of atmospheric vapour-flux analysis" be published in an appropriate WMO Publication series (see paragraph 15.2). It decided that there was no need to appoint a Chy rapporteur on this subject for the next inter-sessional period.

13. SPECIAL ENVIRONMENTAL PROBLEMS OF INTEREST TO THE COMMISSION (Agenda item 13)

The Commission noted that in addition to the specific environmental projects discussed under the sub-items of this agenda item, WMO was co-operating with several other international organizations in carrying out activities within a plan for the protection of the environment as a part of the United Nations Environment Programme (UNEP). The Commission considered the general aspects of WMO co-operation with UNEP under agenda item 18.5.

13.1 Artificial inducement of precipitation (Agenda item 13.1)

13.1.1 The Commission noted, from a document submitted by the Secretary-General, that Seventh Congress had established a Weather Modification Programme which included a plan for a Precipitation Enhancement Project (PEP). The Commission was informed of the specific objectives of PEP, as approved by the twenty-eighth session of the Executive Committee (May-June 1976). The Commission noted that an interim PEP Board had been established by the Executive Committee to act as the central international body for the planning and preparation for PEP, including the selection of the site for conducting the PEP experiment from among the sixteen sites already proposed by Members. The Commission also noted that technical support for the Board would be provided by a Scientific Planning Group (SPG) working in the WMO Secretariat, and that the study of the scientific and technical aspects of weather modification, as well as the co-ordination of the WMO activities in this field, were the responsibilities of the EC Panel of Experts on Weather Modification. The Commission finally noted with approval that a document on precipitation enhancement had been prepared by WMO for the United Nations Water Conference to be held in 1977.

13.1.2 The Commission noted that in its Recommendation 3, the End-of-Decade Conference had recommended that appropriate WMO bodies take steps to evaluate the economic significance of artificially augmented precipitation on water-resources management. It also noted that Seventh Congress had requested the Secretary-General to consider fully this recommendation when planning or taking decisions concerning WMO's Weather Modification Programme. The Commission noted with satisfaction that Seventh Congress had included hydrological aspects of weather modification in the priority activities in the OHP for the period 1975-1980. The Commission considered that it was most important to study the hydrological consequences of the PEP experiments on the water resources. It fully concurred with the views expressed by the EC Panel of Experts on Weather Modification at its fifth session (Geneva, May 1976) that the appropriate hydrological factors would need to be taken fully into account during the
detailed designing of the PEP experiment and that there was a need for hydrological expertise within the PEP to advise on these questions. In this connexion, the Commission suggested in Recommendation 7 (CHy-V) that the Executive Committee might wish to consider including an expert hydrologist in its Panel of Experts on Weather Modification. In addition, the Commission appointed in Resolution 12 (CHy-V) a Rapporteur on Hydrological Aspects of Weather Modification.

13.2 Assessment of droughts (Agenda item 13.2)

13.2.1 The Commission noted with appreciation that WMO had initiated in 1973 a drought project aimed at mitigating the devastating effects of the Sahel drought and any future disasters of this nature. It noted that a comprehensive programme for the development of applications of meteorology and hydrology in the rehabilitation of the Sahel zone had been prepared and that two WMO studies were being finalized, namely, the establishment of crop/weather correlations and the establishment of weather/runoff correlations as well as compilation of maps of agricultural and water-resources potentials. The Commission also noted that, within a WMO/UNDP programme for assistance to the countries in the Sahel zone, a regional centre for training and for application of agrometeorology and operational hydrology was being established in Niamey (Niger) and that the Hydrological Services of the seven Sahel countries were being strengthened and developed.

13.2.2 The Commission further noted the WMO/IAHS report on "Drought conditions in tropical and subtropical regions, with special reference to the drought of 1972 in Africa" which had been considered by the End-of-Decade Conference. It noted that this report was limited to an analysis of streamflow and precipitation data collected from Africa and from some parts of Central and South America, and that it gave only preliminary results of the analysis. In this connexion, the Commission fully endorsed the views of the Conference that the first problem to be solved for conducting drought studies was to ensure the availability of sound meteorological and hydrological data and stressed the need for the strengthening of the national Services responsible for the collection and processing of such data. The Commission considered that further studies should be carried out on a more extensive scale so as to include the analyses of drought on a global scale for a better understanding of global fluctuations of water conditions. The Commission recommended the completion and expansion of this report and included this task in the terms of reference of its Rapporteur on Forecasting of Low Flows and Related Aspects of Droughts (Part D of Annex XI to this report). It requested the rapporteur to co-ordinate his work with that being carried out by the IHP working groups on this subject. The Commission invited all its members from countries concerned with this problem to provide this rapporteur with the national data available.

13.2.3 The Commission considered the recommendations contained in the report on "Forecasting of low flows and related aspects of droughts" which had been reviewed by the CHy-IV Working Group on Hydrological Forecasting. It agreed that an outline of the basic errors commonly committed in correlation of series of precipitation and other elements should be prepared for inclusion in the Guide, in order to safeguard against faulty premises. With respect to the proposal for initiating a project for intercomparison of models used in low-flow forecasting, the Commission considered that the completed WMO project on the intercomparison of conceptual models used in operational hydrological forecasting included models which produced low-flow forecasts and hence there was no need to start a new project. The Commission, however, noted that,
to the best of its knowledge, there did not exist, at the present time, reliable methods for long-term drought forecasting and that low-flow forecasting was possible in some specific cases. The Commission considered the proposal to organize a symposium specifically to cover aspects of hydrological and meteorological droughts and noted that a two-week Seminar on Application of Meteorology and Hydrology to Drought Problems in the Sahelian Zone and Other Parts of Africa was proposed to be held in Niamey, and that a Symposium on Hydrological Aspects of Droughts was planned to be held in India in 1978 or 1979. The symposium is to be organized by the Indian National Committee for the IHP and convened by Unesco in co-operation with IAHS and possibly WMO, if the WMO Executive Committee approves such a proposal. The Commission recommended that the subject of climatic change be included in its programme. It also recommended to the Executive Committee that WMO be a joint convener with Unesco of this symposium.

13.2.4 The Commission noted that Seventh Congress had decided that WMO should undertake the necessary co-ordination leading to the planning and execution of an integrated international effort on investigation of climate changes with their implications on man's natural environment and on world food production. It noted that EC-XXVIII (May-June 1976) approved the proposals of its Panel of Experts on Climatic Change regarding the integrated international effort in research on climatic changes. This panel considered the problem of climate to encompass not only those aspects concerned with the atmosphere and the oceans but also those related to hydrology (snow and ice masses, ice and water balance of glacier basins). The Commission consequently decided to continue its work on those projects relevant to various aspects of climatic change, such as hydrological aspects of weather modification and low-flow forecasting, and accordingly took action in Resolution 12 (CHy-V) and in Part D of Annex XI to this report (Resolution (10 CHy-V)).

13.3 Hydrological aspects of environmental pollution (Agenda item 13.3)

13.3.1 The Commission noted the report by the Secretary-General providing background information on WMO activities, at both global and regional level, in hydrological aspects of inland water pollution. The Commission noted that some projects pertaining to the OHP were also discussed under item 8.5 (water-quality monitoring systems), item 9.2 (transmission of warnings on international rivers) and item 10.3 (streamflow/water-quality relationship).

13.3.2 The Commission noted that, in accordance with its recommendation, the Secretary-General had collected information from ten Member countries on methods used in determining and forecasting salt-water intrusion into estuaries and lower reaches of streams. The Commission considered the report on "Methods for calculating forecasting and monitoring salt-water intrusion into estuaries" which had been prepared by the State Oceanographic Institute of the U.S.S.R. on the basis of the information collected from Members by the Secretary-General and commended the Institute on the preparation of this valuable report.

13.3.3 The Commission noted that the RA VI Working Group on Hydrology had prepared a report on the meteorological and hydrological aspects of thermal water pollution and was also preparing technical reports on the influence of reservoirs on water quality. It also noted that the following other problem areas had been identified by the Executive Committee on the recommendation of its Panel of Experts on Environmental Pollution:
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(a) Increase of acidity in lakes and rivers due to pollutants from the atmosphere;

(b) Assessment of the amount of inland water pollutants emanating from the atmosphere;

(c) Planning and establishment of co-ordinated streamflow-quality (pollution) networks and of the observational procedures involved;

(d) Monitoring of transport of pollutants through rivers to the oceans.

With regard to (a) and (b) above, the Commission noted that these questions were being dealt with at regional level, particularly in Regions IV and VI. With respect to (c) above it entrusted the preparation of the relevant guidance material to its Rapporteur on Environmental Monitoring. The Commission finally considered that the studies related to (d) above should be carried out by the Rapporteur on Streamflow/Water-quality Relationship appointed by Resolution 8 (CHy-V).

13.3.4 The Commission considered the Executive Committee's request for preparation of a Manual on Methods of Monitoring Inland Water Pollution within the framework of an integrated air-ocean inland water monitoring system. The Commission considered that this Manual represented a major endeavour which could be undertaken only by a concerted action of several international agencies involved. The Commission noted in particular that, at the present time, arrangements were being made between Unesco, WHO and WMO to collaborate with UNEP on a project dealing with the design of water-quality monitoring programmes for national and international waters. This project foresaw the preparation of a joint UNEP/WHO/Unesco/WMO publication on the recommended procedures for the establishment and operation of water-quality monitoring services. The Commission considered that this and other inter-agency projects on the matter ensured a good coverage of the question. It requested the rapporteur appointed under agenda item 8.5 to assist the Secretariat in the implementation of these inter-agency projects.

13.3.5 The Commission noted that several OHP activities might represent an effective contribution to the following projects, implemented by multi-agency co-operation and approved by the Executive Committee, to be carried out in co-operation with Unesco, UNEP, WHO, and FAO:

(a) Multi-purpose environmental monitoring network design;

(b) Mathematical modelling of water-quality forecasting in rivers, lakes and reservoirs;

(c) Environmental impact of man's activity on pollution of water (surface and groundwater), including thermal pollution;

(d) Estimation of the changes in the salt-/freshwater balances in deltas, estuaries and coastal zones.

The Commission discussed the possible WMO contributions to these multi-agency projects. It considered that the guidance material to be prepared on co-ordinated streamflow-quality networks (see paragraph 13.3.3 (c)) would constitute an excellent input to the project under (a) above. It further considered that the
question of water-quality forecasting modelling (see (b) above) could benefit from the activities of its working group appointed under agenda item 11. With regard to (c) and (d) the Commission decided that the WMO contribution to these two projects would be enhanced by the activities of its Rapporteur on Streamflow/Water-quality Relationship appointed under agenda item 10.3 and Rapporteur on Water-quality Monitoring appointed under agenda item 8.5 and reflected this decision in the terms of reference of both rapporteurs.

13.4 Promotion of special applications of hydrology (Agenda item 13.4)

13.4.1 Under this item of the agenda, the Commission was informed by a document presented by the Secretary-General on decisions of the Seventh Congress and the Executive Committee concerning an increased effort by WMO on the applications of hydrology to problems of energy production, human settlement and land-use planning. With regard to energy production, the Commission noted that the WMO plan of action defined by EC-XXVIII included the following activities concerning CHy:

- The promotion of studies at the local and regional scale on the impact of the anthropogenic heat and water-vapour sources on the atmosphere as well as of heat release to water (to be implemented by CoSAMC in consultation with CHy);
- The study of the undeveloped potential for energy from water resources in the world and the feasibility of tapping them (to be considered by the president of CHy in co-operation with the president of CoSAMC);
- The arrangement of inter-agency discussions on energy problems in various parts of the world (action by the Secretary-General in consultation with the presidents of CAS, CoSAMC and CHy).

13.4.2 The Commission noted that several OHP projects currently being carried out were directly related to these applications of hydrology to energy problems. In particular, the Commission took action on follow-up activities concerning (a) above under agenda item 10.3. With regard to (b) above the Commission considered that the estimation of undeveloped hydropower potential in the world was a question to be dealt with at the regional level or under technical co-operation programmes. The Commission agreed that it could help by preparing guidance material on the hydrological component of the methodology required to carry out such estimation. It included this task in the terms of reference of the Working Group on Design Data for Projects established under Resolution 9 (CHy-V). With respect to (c) above, the Commission requested its president and the Advisory Working Group to take any other action, as appropriate, in the pursuance of the tasks entrusted to it by the WMO Executive Committee.

The Commission also considered that one important aspect for energy production was the issuing of specialized hydrological forecasts for the operation of hydro- and thermal power systems, and took action under agenda item 11.

13.4.3 The Commission noted that in the light of Resolution 21 (Cg-VII) and at the recommendation of the EC Panel of Experts on Meteorology and Economic and Social Development, the Executive Committee had invited the president of CHy to consider initiating or pursuing studies on applications of hydrological information or forecasts to various sectors of the economy. In this connexion the Commission noted that studies had been carried out by its Rapporteur on Cost/benefit Relationship of Hydrological Forecasts and that a document on evaluation of economic benefits of Hydro-
logical Services had been prepared at the recommendation of its Advisory Working Group for presentation to the UN Water Conference.

13.4.4 The Commission considered that several of its projects carried out in the framework of the OHP were specifically concerned with questions of economic and social development as also discussed under agenda item 4.1. It decided to conduct studies on the economic and social aspects of the following activities:

(a) Use of hydrological data for water resources projects;
(b) Use of short-, medium- and long-term hydrological forecasts for water resources management including flood protection purposes.

It entrusted the task under (a) to its Working Group on Design Data for Projects established under agenda item 10.5 and the one under (b) to its Working Group on Hydrological Forecasting, established under agenda item 11.1.

With regard to applications of hydrology to human settlements and land-use planning, the Commission considered that there was a need for developing guidelines in the methodology required to permit a preliminary assessment of available water resources for human settlements, particularly for those developing areas with sparse hydrological data. It requested its Working Group on Design Data for Projects to carry out this work in co-operation with the Secretariat, along the lines discussed by the Commission under agenda item 4.1.

14. HYDROLOGICAL MAPPING AND INVENTORIES (Agenda item 14)

14.1 Maps and mapping procedures (Agenda item 14.1)

14.1.1 Under this item the Commission examined a document submitted by the Secretary-General on mapping activities within WMO. The Commission noted that, acting on a CHy-IV recommendation, action had been taken for the co-ordinating of mapping activities among the WMO technical commissions concerned. The Commission noted that in accordance with the decision of the Executive Committee the World Climatic Atlas project had been divided into several sub-projects to be dealt with by the various commissions under overall co-ordination of CoSAMC. The Executive Committee also decided that hydrological mapping activities should be carried out under the supervision of CHy, in consultation as appropriate with CoSAMC. The Commission considered that although CHy was not directly involved in the Climatic Atlas project as such, co-operation might be necessary at a later stage in the preparation of the third, fourth and lower priority regional maps such as mean annual maximum 24-hour precipitation over a 30-year period and mean annual evaporation from a free water surface.

14.1.2 The Commission noted the proposals and priorities for the preparation of maps expressed by the regional associations and agreed that in the case of small-scale maps, priority should be given to mean annual precipitation maps (water-balance method) and annual runoff maps. Second priority should be given to maps of annual precipitation variability; rainfall intensity/frequency; global annual radiation; drought duration/frequency; precipitable atmospheric water; and maximum water equivalent of snow cover.

14.1.3 The Commission then considered the need for providing suitable guidelines for the preparation of large-scale project-oriented hydrological maps. Such guide-
lines would help the regional association Working Groups on Hydrology to investigate the feasibility of preparing maps at the national and regional (basin) level. The Commission noted that its Working Group on Hydrological Design data for Water Resources Projects and Working Group on Hydrological Forecasting had prepared comprehensive lists of these large-scale hydrological maps which could be used in the design of water resources projects and in hydrological forecasting practices. The Commission considered that these lists contained valuable information and included them in Annex III to this report. It agreed that CHy should assist in the preparation of guidelines only for those maps that would be of interest for the regional activities of WMO. To carry out the above tasks and to maintain liaison with other WMO bodies, the Commission appointed a Rapporteur on Hydrological Maps and Mapping Activities in Resolution 13 (CHy-V).

14.1.4 The Commission also considered under this item the report of the Rapporteur on Maps and Mapping Techniques for Hydrological Purposes. The Commission noted with great appreciation the large contribution by the rapporteur to the Unesco/WMO publication "Hydrological maps", to be published in 1976. The Commission agreed that this publication would provide an impetus to mapping activities, particularly in developing countries. However, as data were not yet everywhere of sufficient abundance or quality to allow meaningful mapping, the Commission agreed that a future requirement would be the continued investigation of data interpolation by computer, if necessary from remote-sensing sources. The Commission also noted that hydrological maps were also a subject of major interest for Unesco and that within Unesco's IHP a project had been established on "Development of hydrological maps and improvement of methodology for hydrological mapping" and that Unesco was sponsoring the publication in several languages of an Atlas on World Water Balance, prepared by U.S.S.R. specialists. The Commission agreed that it would remain essential for WMO to co-ordinate its hydrological mapping activities with those of Unesco, as had been done during the IHD. It requested its Rapporteur on Hydrological Maps and Mapping Activities to contribute as appropriate to the IHP project on hydrological mapping.

14.2 Computation of water-balance elements (Agenda item 14.2)

14.2.1 Under this item the Commission considered the report of its Rapporteur on Operational Assessment of Areal Evaporation. It appreciated the work carried out by the rapporteur towards the preparation of a casebook on this subject. It noted that in response to inquiries to Members on their possible contributions of material for inclusion in the casebook, 63 case-study outlines had been received from six Member countries. However, as not many of these corresponded to the purpose of the Casebook, additional information had to be requested. Due to delays caused by the change of rapporteur and necessity of obtaining supplementary material, the rapporteur was unable to complete the work on the casebook prior to CHy-V. Using the material available from Members, the rapporteur prepared and presented to the Commission a preliminary outline of the casebook with suggestions for future work. The Commission noted the rapporteur's proposal to include in the casebook a chapter on results of intercomparisons of formulae used in different countries for the computation of evaporation from a water surface and evapotranspiration from a catchment. The Commission felt that the organization and implementation of such intercomparisons would present a most complicated task and agreed to keep to the original objective of the casebook, namely to provide information about methods used in operational practice in different countries for the assessment of evaporation, and not a comparative evaluation of those methods under different conditions.
With the exception of the inclusion of the above chapter, the Commission agreed with the outline of the casebook as presented by the rapporteur. The Commission considered that the available case studies reflected the experience of only six countries and agreed on the need for further consultations with WMO Members in order to ensure a more representative coverage of the international experience on the subject. It recommended that the casebook be completed and published as a matter of urgency. It entrusted the task of finalizing the casebook to the Rapporteur on Areal Assessment of Evaporation and Soil Moisture, with terms of reference as indicated in Part E of Annex VII to this report, and included him in the membership of the Working Group on Network Design and Areal Assessment of Hydrological Elements.

14.2.2 The Commission was informed of the activities of the Working Committee on Evapotranspiration of the International Commission for Irrigation and Drainage (ICID). It noted that this Committee was scheduled to meet in Budapest (May 1977) and that the Executive Committee had considered holding a WMO Conference on Assessment of Areal Evaporation in connexion with this meeting. However, due to financial stringency, EC-XXVIII had decided that this Conference should be postponed unless it were possible to finance it from economies made from other WMO meetings.

The Commission considered that its Rapporteur on Areal Assessment of Evaporation and Soil Moisture should keep close contact with the ICID Committee, and included this task in his terms of reference.

14.2.3 The Commission noted with appreciation the report of the Rapporteur on Areal Precipitation who, on the basis of the material he had collected, had prepared a contribution for the Technical Note on "Snow cover measurements and areal assessment of precipitation and soil moisture for hydrological purposes". The Commission agreed with the views expressed by the rapporteur that, with the growth in capabilities of small computers, it was feasible to have sufficient data-processing capabilities available at each operational radar site to control the radar and to process all incoming radar data. This will result in a large increase in the application of radar data to hydrological problems. Much effort is needed, however, in the development of methods for utilizing the radar data on integrated hydrological forecasting systems, but this effort can take place in individual countries. The Commission felt that there was a need to study the question of the most effective combination of radars, raingauges and streamflow gauges to produce hydrological forecasts. To deal with this and other questions regarding assessment of areal precipitation, the Commission appointed a Rapporteur on Areal Assessment of Precipitation with terms of reference as indicated in Part E of Annex VII to this report and included the rapporteur in the membership of the Working Group on Network Design and Areal Assessment of Hydrological Elements.

14.2.4 Under this agenda item the Commission also considered the report of the Secretary-General on WMO's contributions to the IHD project on World Water Balance and possible continuing activities within the relevant Unesco IHP projects. The Commission noted with satisfaction that all WMO/IHD planned activities related to the computation of water-balance elements had been completed and their results had been published mainly in the series of reports on WMO/IHD projects and in the new Operational Hydrology Report series.

14.2.5 The Commission noted that the Unesco International Hydrological Programme had included in its work plan for 1975-1980 two major projects related to water balan-
ces: one concerning development and improvement of computation of water balances and 
their elements, including groundwater, for short periods; the other related to compi­ 
lation of longer-term regional, continental and global comprehensive water balances, 
including study of multinational river basins. In this connexion the Commission agreed 
on the need for WMO Members to carry out national water-balance studies as a contribu­
tion to the solution of those regional and global water balances.

14.2.6 The Commission endorsed the view expressed by the joint Unesco/WMO Liaison 
Committee for Hydrological Activities that WMO could assist the Intergovernmental 
Council for IHP by co-operating in these projects. It agreed that WMO should con­
tinue its support to the IHP activities in these projects, and entrusted its Rappor­
teurs on Areal Assessment of Precipitation and Areal Assessment of Evaporation and 
Soil Moisture with the task of assisting WMO in its participation in these projects.

14.3 Representative and experimental basins (Agenda item 14.3)

14.3.1 The Commission noted with appreciation the report of the Rapporteur on 
Representative and Experimental Basins. It expressed its thanks to the rapporteur for 
the preparation of the report on "Choice of an index representing soil moisture at 
the beginning of each storm" and the guidelines for the definition of typical storms, 
as assigned to him by CHy-IV. The Commission also appreciated that during the inter­
essional period the rapporteur had provided excellent liaison between CHy and the 
IHD Working Group on Representative and Experimental Basins. The Commission also 
noted the "State-of-art report on research on experimental and representative basins" 
prepared by the rapporteur. The Commission agreed that this report included much­
needed information on the latest trends in the general planning of representative 
and experimental basins. The Commission agreed with the conclusion in the report that 
precipitation and discharge measurements constitute an important basis for studies 
in experimental basins. The hydrologists studying experimental and representative 
basins could benefit from the progress made in operational hydrology, particularly 
in such fields as digitalization of measurements and remote sensing.

14.3.2 The Commission recommended that the joint WMO/Unesco Liaison Committee for 
Hydrological Activities ensure that:

(a) The various IHP bodies concerned with research in experimental basins 
be fully informed of the progress made by the different WMO bodies in 
the fields of instrumentation and processing, and that WMO be fully 
formed on the needs of the agencies responsible for experimental 
basins;

(b) The studies carried out by WMO in the fields of precipitation and eva­
poration give attention to the special problems of representative and 
experimental basins.

14.3.3 The Commission finally recommended that the WMO Secretariat promote, when­
ever necessary, liaison at the national level between Meteorological Services and 
institutions and Services responsible for representative and experimental and bench­
mark basins, particularly in countries which are in an initial stage of establish­
ment of benchmark basins.

15. TERMINOLOGY, PUBLICATIONS AND SYMPOSIA (Agenda item 15)
15.1 WMO/Unesco glossary and UDC activities in hydrology (Agenda item 15.1)

15.1.1 The Commission considered the report by the Rapporteur on Terminology in Hydrology and was pleased to note that the International Glossary of Hydrology had been published as a joint WMO/Unesco publication (WMO-No. 385) in September 1974.

The Commission expressed its great appreciation to the rapporteur for the time and effort he had spent on the preparation of this most valuable publication. The glossary, which was printed by computer, consists of 1588 terms for the different areas of hydrology concerned with surface water, groundwater, hydrometeorology, soil moisture and related fields. For each entry in the glossary, the equivalent terms and their definitions are listed in four of the official WMO languages, English, French, Russian and Spanish. Each term is followed by its corresponding UDC number(s).

15.1.2 The Commission considered that whatever effort is made to prepare a comprehensive and accurate glossary, it is unavoidable that mistakes and other shortcomings will be discovered. In this connexion, the Commission requested its members to submit, during the coming inter-sessional period, their comments and proposals on new terms and definitions to the WMO Secretariat. The material received should be assembled by the Secretariats of WMO and Unesco if necessary, and at CHy-VI a recommendation should be made if there is a need for renewed intensified activity by WMO and Unesco for the preparation of a second edition of the Glossary. The Commission agreed that there was no need to nominate a special rapporteur on terminology.

15.1.3 The Commission then considered the report of the Rapporteur on the Universal Decimal Classification in Hydrology. It noted with appreciation that the rapporteur had provided not only the UDC numbers contained in the International Glossary of Hydrology, but also the new UDC scheme for hydrology (UDC 556) approved by the "Fédération internationale de Documentation" (FID) and the explanation of the principle and description of the general system of the UDC, as contained in Appendix A to the Glossary.

The Commission further noted that from the returns to the Library Questionnaire it was ascertained that most of the major Meteorological and Hydrometeorological Services used the UDC in one form or another in their special libraries and publications and in the development of automated information and data-retrieval systems.

15.1.4 The Commission agreed to consider the need for renewed activity in the field of terminology only at CHy-VI. In view of this and since the elaboration of a "UDC Guide to hydrology and meteorology" has been referred to the CAS Working Group on Bibliographic Problems, it decided that there was no need for appointing a special rapporteur on UDC questions for the next inter-sessional period.

15.2 Publications and their distribution (Agenda item 15.2)

15.2.1 The Commission noted the report of the Secretary-General on the publication of guidance and other material in the field of hydrology and expressed its satisfaction at the number and standard of these publications. It noted that the series of WMO publications "Reports on WMO/IHD projects" had been terminated at the end of the International Hydrological Decade in 1974 with a total number of twenty publications, and that a similar series of publications entitled "Operational Hydrology Reports" had started in 1973. The Commission appreciated that, at the recommendation of its previous session, the Executive Committee had authorized the Secretary-General to arrange for free distribution of WMO publications in operational hydrology to Hydrological Services of Members, following the same principles as those adopted for
distribution of all WMO publications for permanent representatives of Members. In compliance with this decision of the Executive Committee, more than 40 hydrological publications had already been sent free of charge to heads of Hydrological Services or hydrological advisors to permanent representatives of Members.

15.2.2 The Commission also noted that, at the recommendation of its previous session, the Executive Committee had requested the Secretary-General to look into the possibility of increasing the number of publications translated into several official languages, and that in accordance with this authorization some publications had been translated at the request of Members. In this connexion the Commission noted with appreciation that the "Instituto de Hidrologia" and "Instituto Nacional de Meteorología" of Spain had offered to collaborate in the translation of WMO publications into Spanish.

15.2.3 The Commission noted that, in view of the financial resources available, only a limited number of publications could be issued during the next inter-sessional period. The Commission noted that several technical reports entrusted by CHy-IV to its working groups and rapporteurs were in different stages of preparation and that other subjects in which guidance material should be prepared had been identified at the session. The Commission prepared a list of the above technical reports and guidance material and their respective order of priority for publication as indicated in Annex IV to this report. The Commission finally recommended that all material to be published be carefully selected and examined in detail before its publication by the CHy body responsible for its preparation, so as to ensure a high quality up to WMO standards.

15.3 Symposia, technical conferences and seminars (Agenda item 15.3)

15.3.1 The Commission examined the report by the Secretary-General containing a list of hydrological symposia, technical conferences, workshops and seminars organized or co-sponsored by WMO since CHy-IV. The Commission noted that of the seventeen meetings listed, the Organization had convened six of the symposia and technical conferences and six seminars. The Commission also noted that, at the recommendation of the president of CHy, WMO had participated in another seventeen such meetings organized by other international organizations. The Commission expressed its appreciation to all the sponsors of the meetings and also to the Secretary-General of WMO for the efforts made by the Secretariat to ensure the successful outcome of the meetings convened by the Organization.

15.3.2 The Commission took note of the list of hydrological symposia, technical conferences, workshops and seminars planned for 1976 to 1980 (see Annex V to this report). It expressed the hope that more efforts would be exerted to ensure a higher degree of implementation of this programme as it was of utmost importance, especially in developing countries. In addition to those already approved by the WMO Executive Committee, the Commission recommended that consideration be given to the possibility of convening the following additional workshop or symposia:

1. Workshop on Use of Mathematical Models and Systems Analysis in Investigations on Representative and Experimental Basins (planned for 1978, jointly with Unesco);

2. Symposium on Specific Aspects of Hydrological Computation for Water Planning (scheduled to be held in Leningrad, 1979);
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3. Symposium on Hydrological Aspects of Droughts (1978 or 1979 - India);
4. Symposium on Modern Developments in Hydrometry (provisional title) (U.K., 1980);
5. Workshop on Aerial Nuclear Measuring Devices for Water Equivalent of Snow Cover and Areal Soil Moisture;
6. Symposium on Methods for the Use of Meteorological Measurements to Improve Hydrological Forecasting.

(See also paragraphs 7.0.6 and 13.2.3.)

16. EDUCATION AND TRAINING (Agenda item 16)

16.1 WMO activities in education and training relevant to operational hydrology (Agenda item 16.1)

16.1.1 The Commission noted the report of its Rapporteur on Training in Hydrology and expressed its appreciation for his active participation in the WMO/IAMAP Symposium on Education and Training in Meteorology and Meteorological Aspects of Environmental Problems (Venezuela, 1975) and in the work of the IHD Working Group on Education in Hydrology. The Commission stressed the importance of training in the development of activities in operational hydrology in Member countries, and in particular in the developing ones, and the need for further activities of WMO in this field, particularly in relation to some specialized subjects of operational hydrology. The Commission therefore decided to re-appoint, in its Resolution 14 (CHy-V), a Rapporteur on Training in Hydrology. Due regard was paid by the Commission, in the terms of reference of this rapporteur, to the IHP programme and to activities of Unesco in the promotion of training and education in hydrology.

16.1.2 The Commission also examined the report of the Secretary-General on this agenda item and noted with appreciation that Seventh Congress had decided that the WMO Voluntary Assistance Programme should be available to provide assistance in the granting of long-term fellowships in hydrology as well as short-term fellowships in the applications of WMO in the field of hydrology. It also noted that the WMO Executive Committee (May, 1975) had agreed that the chairman of ACOH or his representative should participate, as appropriate, in the sessions of the Executive Committee Panel of Experts on Education and Training.

16.1.3 The Commission noted with satisfaction that the Executive Committee Panel of Experts on Education and Training, and subsequently the Executive Committee, had both accepted the revised version of the syllabus in general hydrology proposed by CHy for inclusion in the fundamental education and training of Class I personnel in the revised version of the "Guidelines for the education and training of meteorological personnel" (WMO-No. 258.TP.144).

16.1.4 The Commission noted that, until Cg-VI, which had taken decisions concerning WMO's activities in operational hydrology, the term "hydrometeorology" had been used in WMO to denote all WMO activities in hydrology. Since Cg-VI, and in particular since Cg-VII, a clear definition of the term "operational hydrology" had been adopted and the Commission recommended that the term "hydrometeorology", particularly with respect to training activities, should be used to denote that part of meteorology concerned with the processes in the atmospheric phase of the hydrological cycle and in the boundary between the atmospheric and land phase of the hydrological cycle.
16.1.5 The Commission noted that the curricula and syllabi at present included in the Guidelines under the heading "specialization in hydrometeorology" were those prepared by a former CHy working group for general training of hydrological personnel, and thus did not correspond to the new connotation of the term "hydrometeorology" as recommended by the Commission in paragraph 16.1.4 above. In view of this, the Commission recommended that the Guidelines be amended to include curricula and syllabi for specialized training of meteorological personnel in hydrometeorology, in its new connotation. The Commission noted that a revised version of curricula and syllabi for training in hydrometeorology (in its new connotation) had already been submitted to and studied by the EC Panel of Experts on Education and Training, but that the panel was unable to accept the material mainly because it felt that it was not suitable for training in operational hydrology. The Commission examined this revised version, which covers specialization in hydrometeorology for meteorological personnel of Classes I, II and III, and recommended, in view of the new definition of the term "hydrometeorology" and its implications with respect to training activities, its reconsideration by the EC Panel of Experts on Education and Training for inclusion in the revised version of the Guidelines.

16.1.6 With respect to the specialized training of Class IV meteorological personnel (meteorological observers) in hydrometeorology, the Commission agreed that the curricula and syllabi included in Chapter 9 of the Guidelines were intended for the training of hydrological observers and accordingly recommended that they be replaced by new curricula and syllabi for the specialized training of Class IV meteorological personnel in hydrometeorology. It requested the Rapporteur on Training in Hydrology, whom it appointed in its Resolution 14 (CHy-V), to prepare such new curricula and syllabi in co-operation with the Secretariat.

16.1.7 The Commission noted that the Executive Committee (May 1975) had requested it to prepare suitable syllabi for training in operational hydrology for inclusion in the revised version of the Guidelines. It considered a proposal for a new Chapter 5, "Curricula for education and training of professional personnel in operational hydrology", containing new curricula for the education and training of professional personnel in operational hydrology (corresponding to Class I meteorological personnel). It noted that the Guidelines and the syllabi and curricula included in them were not standard, as training programmes throughout the world must take into account local circumstances and, consequently, variations in the syllabi adopted in the various countries are inevitable. The Commission considered in this connexion that the new curricula for training in operational hydrology should be considered rather as subjects with which a specialist working in the field of operational hydrology should be familiar. The Commission also considered, and several delegates stressed, that similar conclusions had been reached by the Unesco Working Group on Education in Hydrology, namely that education in hydrology may be acquired by several methods: postgraduate courses for university graduates with degrees in basic disciplines such as civil engineering or agriculture, geophysics, geography, geology, etc., or a full university education in the field of hydrology, which is, however, offered in only very few countries of the world. The Commission stressed that, while practical field work in operational hydrology is most important for training in this field, for hydrological technicians such field work is the basis of their training.

16.1.8 While approving the above-mentioned curricula and syllabi in principle, the Commission invited its members to submit possible amendments to them to the WMO Secre-
16.1.9 The Commission noted that, according to the Guidelines for the Education and Training of Meteorological Personnel, meteorological personnel are divided into four classes. However, according to the material prepared by its former Working Group on Training in Hydrometeorology, the personnel of Hydrological Services are divided into three classes, namely professional hydrologists, hydrological technicians and hydrological observers. The Commission realized the differences between the training of meteorological and hydrological personnel and the substantive differences between the approaches to the training of these personnel. It agreed that the three classes of hydrological personnel mentioned above correspond to the situation in most of the Hydrological Services and should be maintained in the future. The Commission therefore endorsed the recommendation of ACOH (June 1974) and that of the IHP Working Group on Technician Training in Hydrology and Water Sciences (May 1976) that the personnel of Hydrological Services be classified into the three classes indicated above.

16.1.10 The Commission considered and endorsed the recommendation of the Technical Conference on the WMO Project on Intercomparison of Conceptual Models Used in Operational Hydrological Forecasting (July 1974) that capable agencies in WMO Member countries should be encouraged to provide opportunities for the training of specialists in hydrological forecasting models, in particular within the framework of WMO training programmes.

16.2 WMO participation in IHD and other projects on education and training in hydrology (Agenda item 16.2)

16.2.1 The Commission was informed, by a document by the Secretary-General, of WMO co-operation with Unesco in its IHD and IHP programmes in education and training in the field of hydrology and other WMO co-operation with Members in this field. The Commission agreed with the Executive Committee (May 1975) that WMO activities in this field should be closely co-ordinated with those of Unesco.

16.2.2 The Commission noted that the International Conference on the Results of the IHD and on Future Programmes in Hydrology (Paris, September 1974) had invited WMO to consider increasing educational activities in operational hydrology, in particular in the training of hydrological technicians in WMO Regional Training Centres, and that the International Seminar on Water-resources Education (Paris and Strasbourg, March 1975) had appealed to both national and international bodies for a major increase in the training of hydrological technicians. The Commission endorsed this invitation and recommended that the Secretary-General study ways of including this training in the WMO Regional Training Centres. In this connexion the Commission endorsed the recommendation of the IHP Working Group on Technician Training in Hydrology and Water Sciences (May 1976) that education and training of technicians should be conducted at the regional level and that theoretical courses should be held in national or regional centres, followed by in-service training at specially equipped national stations or institutes. The Commission agreed to co-operate in the preparation of teaching material and instruction manuals for technician training and requested its Rapporteur on Training in Hydrology to co-operate with the IHP Working Group on...
Technician Training in Hydrology and Water Sciences in the preparation of draft programmes and curricula for training hydrological technicians.

16.2.3 The Commission also noted with appreciation the WMO/UNDP technical assistance projects in education and training. Through the efforts of WMO, a Regional Centre for Training and for Application of Agrometeorology and Hydrology was being established by WMO in Niamey (Niger) through UNDP assistance. The centre would provide training for personnel of both Meteorological and Hydrological Services of the Sahel countries and would subsequently have personnel and equipment for data processing on a regional basis. Within the framework of the WMO/UNDP project "Hydrological forecasting system for the middle and lower basins of the Niger River" a six-month (January-July 1976) training course on hydrology was started in the Federal Polytechnic School in Lausanne (Switzerland) to train experts from Benin, Cameroon, Niger and Upper Volta. Also, within the framework of the WMO/UNDP project "Hydrometeorological Survey of the Catchments of Lakes Victoria, Kyoga and Mobutu Sese Seko", a ten-week course in computer applications in hydrology was held in December 1975 in Nairobi with the participation of 17 counterpart hydrologists and meteorologists from the countries of the project (Burundi, Egypt, Kenya, Rwanda, Sudan, Tanzania and Uganda). The Commission also noted that an International Training Centre in Water Resources including some aspects of operational hydrology was planned to be established at Valbonne, France.

16.2.4 The Commission included all its recommendations in the field of education and training in hydrology in Recommendation 8 (CHy-V).

17. TECHNICAL CO-OPERATION AND RELATED PROJECTS (Agenda item 17)

17.1 The Commission noted with satisfaction the report by the Secretary-General on the technical assistance which WMO provided to its Members in the field of hydrology and water resources. It noted in particular that WMO was executing 43 country projects and 11 inter-country projects, either directly in the field of operational hydrology or including a substantial hydrological component. The main source of funds for this purpose continues to be the United Nations Development Programme, but the importance of projects under funds-in-trust arrangements is increasing, and Seventh Congress (1975) decided that the Voluntary Assistance Programme should be made available to provide assistance in, inter alia, the application of the World Weather Watch in the field of hydrology and that high priority should be given to the provision of assistance to developing countries to ensure the efficiency of Meteorological and Hydrological Services.

17.2 The Commission noted with interest that an increasing number of projects was being implemented for improvement of hydrological forecasting and warning systems, and that, following the disastrous droughts in the Sahel region of Africa during 1972 and 1973, WMO was leading a major programme for the development of Hydrological and Meteorological Services in the Sahel countries.

17.3 The Commission also expressed concern about the large number of Members, including the least developed countries that still do not have an adequate Hydrological Service and networks and therefore are deprived of data much needed for the rational development of their water resources, particularly for increasing food and energy production and for the protection of human lives from flood and drought disasters. It suggested that the Secretary-General consider the establishment of a
monitoring programme for the assessment of needs of Members requiring assistance and Members willing to provide assistance, in all fields of operational hydrology, particularly in education, training and equipment, and to provide assistance and advice to Members in identifying and defining specific requests under this programme, and its subsequent implementation. The Commission also requested the Secretariat to prepare periodically an assessment of increase of hydrological networks as a result of WMO technical co-operation projects and to publish such information in the WMO Bulletin. The Commission finally adopted Recommendation 9 (CHy-V).

18. REGIONAL ACTIVITIES AND CO-OPERATION WITH OTHER INTERNATIONAL ORGANIZATIONS (Agenda item 18)

18.1 WMO regional association Working Groups on Hydrology (Agenda item 18.1)

18.1.1 The Commission was informed by a document of the Secretary-General of the progress of work of the regional association Working Groups on Hydrology. The Commission noted that all regional associations with the exception of RA V had established Working Groups on Hydrology open to experts of all Members of their Regions; Regional Association V, with its special geographical configuration, had appointed a Rapporteur on Hydrology. The Commission noted that the president of CHy and the Secretary-General kept these regional bodies informed of the views of CHy and ACOH concerning their activities and mutual co-operation. In this connexion, the Commission noted with satisfaction the co-operation of these working groups and the rapporteur in the implementation of the OHP at the regional level, particularly in the projects on network statistics, data transmission, hydrological codes and application of WWW to hydrology. Other problems of relevant interest to particular Regions are also being dealt with by these working groups and the Commission noted with appreciation that several technical reports from regional working groups have constituted an excellent input to the activities of CHy rapporteurs (e.g. thermal pollution of rivers, snow-cover measurements, etc.) and recommended the continuation of these activities by the regional working groups.

18.1.2 The Commission agreed with ACOH that representation of the Hydrological Services of Members in the regional working groups was a necessity for the success of their work. It noted that Cg-VII had urged Members to ensure this representation but that adequate representation of Hydrological Services had not yet been achieved in some working groups. The Commission also noted that, on the recommendation of ACOH, the Members from the respective regions were participating in sessions of regional working groups. It considered that this participation was of utmost importance (particularly in those working groups with inadequate representation of Hydrological Services) and recommended that ACOH prepare specific proposals regarding the participation of Hydrological Services of Members in the implementation of WMO's OHP at the regional level.

18.1.3 The Commission noted that all regional working groups had met or were scheduled to meet and that some of these meetings were arranged in connexion with other hydrological events. It noted in particular that the session of the Working Groups on Hydrology of Regional Associations I and III had been or would be held in connexion with preparatory meetings for the UN Water Conference and that the RA IV Working Group on Hydrology would meet immediately following CHy-V, in Ottawa. The Commission considered that such arrangements were not only beneficial to the financial
economy in the meetings of these relatively large bodies but were also very helpful for the work of the working groups and recommended that such practice be continued whenever possible in the future. The Commission further felt that, although some regional working groups had already adopted the practice of CHy in appointing rapporteurs for specific tasks, it would be most useful if this practice could be generalized in all the working groups. The Commission adopted Recommendation 10 (CHy-V).

18.2 Co-operation with UN Regional Economic Commissions (Agenda item 18.2)

18.2.1 The Commission noted with satisfaction the report of the Secretary-General on co-operation with the UN Regional Economic Commissions (ECA, ECE, ECLA and ESCAP). It noted that this co-operation had yielded several projects in hydrology and water resources development and management within the framework of WMO regular and technical co-operation programmes. The Commission considered in detail the co-operation with ESCAP in the implementation of the WMO Tropical Cyclone Project under agenda item 11.1 and aspects of co-operation with ECA and ECLA under the UNDP component of technical co-operation and assistance under agenda item 17. Regarding the ECE area, the Commission noted that regional co-ordination in Europe concerning water pollution and related water questions had been ensured, as in the past, through the inter-secretariat meetings convened by ECE and UNEP (see also paragraph 13.3). The co-operation of WMO with the UN Regional Economic Commissions in the organization of preparatory meetings for the UN Water Conference was discussed under agenda item 18.5. The Commission considered all the above activities most beneficial, particularly for developing countries, and recommended to the Secretary-General and to the Executive Committee that WMO co-operation with UN Regional Economic Commissions be continued in the future.

18.3 Interrelationship of the Commission and the IHP of Unesco (Agenda item 18.3)

18.3.1 The Commission was informed by a document of the Secretary-General of WMO co-operation with Unesco in the last years of the IHD and of WMO participation in the Unesco International Hydrological Programme. The Commission noted with satisfaction that, in accordance with its recommendations and those of the EC Panel of Experts on the IHD, a total of 60 IHD projects had been undertaken and successfully completed by WMO. In order to make the results of these projects readily accessible WMO had published 21 special IHD reports in addition to some 30 hydrological publications within the general framework of the IHD. As also indicated under agenda item 15.3, WMO had organized, or co-sponsored together with Unesco and other organizations, ten international symposia in hydrology. The Commission noted with great satisfaction that another important feature of IHD activities was the development of a spirit of friendly and fruitful co-operation between all the agencies of the United Nations concerned with hydrology and particularly between WMO and Unesco. This development had been greatly facilitated by the signing of a working agreement at the Secretariat level between the two organizations in 1973, with the prior authority of the WMO Executive Committee. The agreement established a mechanism for the close harmonization of the programmes of the two organizations in the planning and implementation stages.

18.3.2 The Commission noted that the first major joint endeavour of the above-mentioned Unesco/WMO agreement had been an international conference, convened jointly by Unesco and WMO in September 1974 in order to evaluate the results of the IHD and to discuss future programmes in hydrology of both organizations. Of particular
interest to the Commission was the fact that, in addition to evaluating the results of the IHD, the Conference had reviewed and discussed the future programmes of both Unesco and WMO in the field of hydrology and water resources. It had recommended to the Unesco General Conference a detailed plan of the first phase of Unesco's long-term International Hydrological Programme (IHP) (1975-1980). This detailed plan had been preliminarily harmonized by the above-mentioned Unesco/WMO mechanism with the priorities within the WMO Operational Hydrology Programme (OHP) prepared by CHy. The Commission noted that it was on the basis of the recommendations of the conference and the plan prepared by CHy that Congress had adopted, in its Resolution 26 (Cg-VII) (see agenda item 4.1), the priorities for the activities within the OHP which served as a basis for all the decisions of the Commission on its programme for the next intersessional period. In this connexion the Commission noted with great satisfaction that the two programmes, the IHP of Unesco and the OHP of WMO, by virtue of the joint planning endeavour, were basically complementary and together constituted the major part of internationally co-ordinated activities in the field of hydrology and water resources. Several delegations expressed their great satisfaction at this co-ordination and co-operation between Unesco and WMO. The Delegation of the U.S.A. particularly stressed the valuable co-operation in areas concerning methods of computation of elements of hydrological régimes for purposes of water planning.

18.3.3 The Commission noted that Congress had adopted Resolution 28 (Cg-VII) - Water resources development programmes, in which it invited Members to arrange for their Meteorological and Hydrological Services to participate in the work of the national committees for the International Hydrological Programme of Unesco, and decided that WMO should continue to collaborate, within its field of competence, with other international organizations in projects concerning hydrology, water resources and related environmental problems. It also requested the Executive Committee and the Secretary-General, as appropriate, to arrange for WMO co-operation in projects of Unesco's IHP and a joint project with FAO, and with other UN organizations as appropriate, within existing budgetary limitations. The representative of Unesco stressed the great contribution that WMO and particularly CHy was making to projects of the IHP and congratulated the Commission on these activities. He noted with appreciation that the decisions made at the session corroborated the constant growth of this contribution.

18.3.4 In order to assist the Executive Committee and the Secretary-General in carrying out the above-mentioned Congress decisions, the Commission examined the ways in which the Commission's bodies could contribute to the Unesco IHP and programmes of hydrology of other organizations under the appropriate agenda items. Under this agenda item the Commission examined a consolidated list of proposed activities in co-operation with Unesco's IHP and programmes in hydrology of other organizations as included in the document of the Secretary-General. The Commission considered that, in a large number of these activities, working groups and rapporteurs of the Commission could make a significant contribution and requested the president to co-ordinate these contributions as necessary and appropriate. The Commission decided to include this list as an annex (see Annex XIV (CHy-V) to this report) and recommended to the Executive Committee and Secretary-General that this list serve as a basis for co-operation between WMO and Unesco within Unesco's International Hydrological Programme. The Commission noted that this co-operation would find its expression in joint organization of meetings on global and regional scales and other joint actions as might arise at any level of the activities of both organizations.
18.3.5 The Commission finally noted that the working agreement between the WMO and Unesco Secretariats provided for the establishment of a Joint Unesco/WMO Liaison Committee for Hydrological Activities. It noted with satisfaction that the president and vice-president of CHy were members of this Liaison Committee, thus ensuring the effective co-ordination of CHy activities with those of Unesco's IHP. It noted and fully endorsed the decision of the twenty-seventh session of the WMO Executive Committee that the Secretary-General was in the best position to arrange for the co-operation of WMO technical commissions other than CHy in programmes in hydrology jointly implemented by WMO and Unesco and other international organizations.

18.3.6 The Commission noted that, within the agreement mentioned in the preceding paragraphs, joint convening of international conferences on hydrological programmes was being planned every five to six years. As the last joint Unesco/WMO conference had been held in 1974, if the interval between the two conferences were to be six years, the next conference would have to be held in 1980. Since the next scheduled session of the Commission for Hydrology was also to be held in 1980, the Commission considered that it would not be appropriate to hold two separate meetings of such importance in the same year. It therefore recommended that the Executive Committee and the Secretary-General, when starting the planning of the joint WMO/Unesco conference, negotiate with Unesco in order to hold the two meetings in conjunction or to hold the conference either in 1979 or in 1981. The Commission noted, however, that holding the two meetings in conjunction might present some problems as the total duration of both meetings might make it prohibitive for many delegates to attend both.

18.4 Co-operation with other international organizations in water resources
(Agenda item 18.4)

18.4.1 Under this agenda item the Commission noted the information submitted by the Secretary-General that co-operation with other organizations of the United Nations system and with governmental organizations had also been widely developed since CHy-IV.

18.4.2 The Commission noted with satisfaction that co-operation with FAO in water resources projects had been formalized within the general agreement between the two organizations. Several projects on water quality of common interest to WHO and WMO as well as to UNEP were being actively developed and the Commission provided for inputs into these projects by its bodies in the relevant resolution. The Commission noted in particular the importance of WMO co-operation with UNEP within the field of competence of the Commission concentrating on mitigation and prevention of natural disasters and questions concerned with the protection of the environment. The Commission discussed co-operation between WMO and the Regional Commissions of the United Nations (ECA, ESCAP, ECLA, ECE) and the liaison of WMO with sub-regional governmental organs in large international basins such as the Danube, the Rhine, the Niger, and the Mekong under agenda item 18.2 and also under the relevant agenda items of the session.

18.4.3 The Commission noted that close relationships and co-operation continued between WMO and the hydrological scientific non-governmental organizations of which the leading role was played by the International Association of Hydrological Sciences of the IUGG and also with ICSU itself. Co-operation with the International Commission on Irrigation and Drainage (ICID) and with the International Organization for Standardization (ISO) was subject of discussion under the relevant agenda items. The
Commission noted with satisfaction that these activities were beneficial both for the Commission and for the international organizations concerned. It fully endorsed the decisions of Congress and the Executive Committee that such co-operation should be continued and further developed in the future.

18.5 United Nations Water Conference (Agenda item 18.5)

18.5.1 The Commission was informed by a document of the Secretary-General that the General Assembly of the United Nations, in its Resolution 3513 (XXX), had requested the Secretary-General of the UN to co-operate with the organizations concerned in the preparation of the UN Water Conference to be held in 1977 in Argentina. Several items of the agenda of this conference, as agreed by the resolution, were of direct interest to WMO, including "Outlook for the future: availabilities and demands (of water)" and "Review and evaluation of known and predictable technologies for increasing the availability of water". The first topic concerns, inter alia, inventories of water resources through meteorological and hydrological networks and operation of relevant services; the second involves several hydrological and meteorological techniques such as flood forecasting and artificial enhancement of precipitation and weather modification in general. In Resolution 28 (Cg-VII) Congress had decided that WMO should support and participate in preparations for the conference. In this connexion the Commission noted that the conference was to be held at the technical level. The Commission agreed that it was important that Meteorological and Hydrological Services should be in a position to present to the conference a strong case for the strengthening of their activities at the national as well as the international level.

18.5.2 The Commission noted that, in addition to documents submitted to the Water Conference by the organizations of the UN system as a whole, in which WMO fully co-operated, national organizations had been invited to provide the conference with supporting documentation within their fields of competence. The Commission noted and fully endorsed the recommendation by ACOH that the WMO Secretariat, in co-operation with relevant CHy rapporteurs and ACOH members, prepare and submit to the UN Water Conference, free of charge, certain documents, some in the form of publications on:

(a) Statistical information on activities in operational hydrology (including detailed information on the status and efficiency of hydrological networks throughout the world);

(b) Casebook on organization of hydrometeorological and hydrological services;

(c) Evaluation of economic benefits of Hydrological Services.

18.5.3 The Commission further considered that, in view of the possible economic benefits for WMO Members from the successful implementation of IOHS (see paragraph 4.1.3), preliminary information on this project should be submitted to the conference with an indication that it is up to the WMO governing bodies to make appropriate decisions on the implementation of this project. The Commission considered that in this way the activities of WMO and of CHy in particular would be highlighted and brought to the attention of policy-making national authorities which would no doubt favourably reflect on the support of governments and appropriate national Services for the activities of the Commission. The Commission incorporated its views on the most important issues in Recommendation 11 (CHy-V).
19. SCIENTIFIC LECTURES (Agenda item 19)

An International Seminar on Organization and Operation of Hydrological Services was held on 15 and 16 July 1976, in conjunction with the session of the Commission. The seminar took place at the invitation of the Government of Canada and discussed and exchanged national experiences in different types of organizational structures and operational procedures of Hydrological Services. This seminar replaced the usual scientific lectures on the agenda of WMO technical commissions. In this connexion the Commission was informed that, on the recommendation of ACOH, reports reflecting the above experience from 12 invited countries are to be published in a casebook of established solutions to institutional and organizational problems encountered by WMO Members in setting up their Hydrological Services.

20. NOMINATION OF RAPPORTEURS AND WORKING GROUP MEMBERS (Agenda item 20)

20.1 The Commission recognized the outstanding services given by the previous CHy Advisory Working Group and, in Resolution 15 (CHy-IV), re-established this working group and recommended that the president of CHy, in consultation with the Secretary-General, should take all possible steps to hold its yearly meetings. In view of the complexity of the tasks of the Commission and also taking into consideration that it is covering a whole field similar in extent to that of meteorology, the Commission expressed the hope that its request for a yearly meeting of the Advisory Working Group would meet with the understanding of the Executive Committee of the Commission's need, as had been the case in the past.

20.2 The Commission established the following seven working groups and appointed rapporteurs to carry out its programme between the fifth and sixth sessions, as set forth in their respective terms of reference:

Advisory Working Group of the Commission for Hydrology
(Resolution 15 (CHy-V))

Working Group on the Guide and Technical Regulations
(Resolution 1 (CHy-V)) and its annex listing the terms of reference of the following:

Rapporteur on Standardization
Rapporteur on Accuracy of Hydrometric Measurements

Working Group on Network Design and Areal Assessment of Hydrological Elements
(Resolution 2 (CHy-V)) and its annex listing the terms of reference of the following:

Rapporteur on Network Design and Evaluation
Rapporteur on Network Design under Special Conditions
Rapporteur on Environmental Monitoring
Rapporteur on Areal Assessment of Evaporation and Soil Moisture
Rapporteur on Areal Assessment of Precipitation

Working Group on Improvement and Standardization of Instruments and Methods of Observation for Hydrological Purposes (Resolution 4 (CHy-V)) and its
annex listing the terms of reference of the following:

- Rapporteur on Sediment Transport
- Rapporteur on New Methods of Discharge Measurement
- Rapporteur on Levels and Discharge Measurement under Difficult Conditions
- Rapporteur on Intercomparison of Principal Hydrometric Instruments
- Rapporteur on Groundwater
- Rapporteur on Remote Sensing of Hydrological Elements

Working Group on Hydrological Data Transmission, Processing and Retrieval (Resolution 7 (CHy-V)) and its annex listing the terms of reference of the following:

- Rapporteur on Application of WWW to Operational Hydrology
- Rapporteur on Design of Automatic Telemetering and Satellite Data-transmission Systems
- Rapporteur on Standardization of Primary Data Processing
- Rapporteur on Hydrological Codes

Working Group on Design Data for Projects (Resolution 9 (CH-V)) and its annex listing the terms of reference of the following:

- Rapporteur on Extremes of Precipitation
- Rapporteur on Standardization of Requirements for and Accuracy Levels of Hydrological Design Data
- Rapporteur on Secondary Data Treatment Procedures
- Rapporteur on Extrapolation of Design Data
- Rapporteur on Cost/Benefit Assessment of the Application of Hydrological Data in Water Resources Management Projects

Working Group on Hydrological Forecasting (Resolution 10 (CHy-V)) and its annex listing the terms of reference of the following:

- Rapporteur on Multi-purpose Simulation Sub-system
- Rapporteur on Models for Snowmelt Runoff
- Rapporteur on On-the-line Forecasting Systems
- Rapporteur on Forecasting of Low Flows and Related Aspects of Droughts
- Rapporteur on Long-range Water Supply Forecasting
- Rapporteur on Flash Floods

20.3 In addition to the rapporteurs who are members of the working groups listed above, the following eight rapporteurs were appointed:

- Rapporteur on Accuracy of Point Precipitation Measurement (Resolution 3 (CHy-V))
- Rapporteur on Water-quality Monitoring (Resolution 5 (CHy-V))
Rapporteur on Operation of Hydrometric Networks (Resolution 6 (CHy-V))

Rapporteur on Streamflow/Water-quality Relationship (Resolution 8 (CHy-V))

Rapporteur on Forecasting of Ice Conditions (Resolution 11 (CHy-V))

Rapporteur on Hydrological Aspects of Weather Modification (Resolution 12 (CHy-V))

Rapporteur on Hydrological Maps and Mapping Activities (Resolution 13 (CHy-V))

Rapporteur on Training in Hydrology (Resolution 14 (CHy-V))

20.4 As far as possible, the chairmen and members of working groups, as well as the rapporteurs, were designated during the session. The president was authorized to complete the designations and to designate substitutes, should any of those selected be unable to serve, taking into consideration, in these cases, proposals of Members. The Commission suggested that the order of priority of working group meetings be considered by the president of CHy and the Advisory Working Group. With regard to the participation in CHy working groups of experts nominated by other UN and non-governmental organizations, the Commission noted that the existing working arrangements between WMO and these organizations provided for such participation when items of agreed common interest are under consideration.

21. REVIEW OF PREVIOUS RESOLUTIONS AND RECOMMENDATIONS OF THE COMMISSION AND OF RELEVANT EXECUTIVE COMMITTEE RESOLUTIONS (Agenda item 21)

21.1 In accordance with the normal WMO practice, the Commission reviewed the resolutions and recommendations adopted at its second and third sessions with a view to eliminating the obsolete ones. The 47 resolutions adopted at its fourth session have either been superseded by resolutions of the fifth session or become obsolete. The Commission therefore decided, in its Resolution 16 (CHy-V), not to keep in force any of its prior resolutions.

21.2 The Commission agreed that none of the recommendations adopted at its prior sessions should be retained in force, as they were considered obsolete. This view was also incorporated in Resolution 16 (CHy-V).

21.3 After examining the resolutions adopted by the Executive Committee in response to the recommendations of its previous sessions, the Commission considered that Resolution 12 (EC-XXIV) would no doubt be examined by the Executive Committee in connexion with several recommendations adopted by the Commission at its fifth session and that the views of the Committee would be incorporated in a new resolution. Resolution 12 (EC-XXIV) would then not need to be kept in force. The Commission thus adopted Recommendation 12 (CHy-V).
22. ELECTION OF OFFICERS (Agenda item 22)

Mr. R. H. Clark (Canada) and Mr. N. O. Popoola (Nigeria) were elected president and vice-president, respectively, of the Commission for Hydrology.

23. DATE AND PLACE OF THE SIXTH SESSION (Agenda item 23)

In the absence of any formal invitation from Members represented at the session, the Commission agreed that the sixth session be held in 1980 and that the precise date and place should be decided by the president of the Commission in consultation with the Secretary-General.

24. CLOSURE OF THE SESSION (Agenda item 24)

24.1 In closing the session, the president, on behalf of the delegates, reiterated his warm appreciation to the Government of Canada for its kind hospitality. He thanked the vice-president of the Commission and members of the Advisory Working Group for their excellent collaboration during the two inter-sessional periods he had presided and stressed that the co-operation between the delegates was instrumental in the success of the fifth session of the Commission. He also thanked the Secretary-General of WMO and the Secretariat for the excellent assistance provided and efficient work during the last inter-sessional period. On behalf of the participants, Dr. J. Rodier expressed his great appreciation to Prof. E. G. Popov for his untiring efforts and the efficient way in which he had conducted the work of the Commission during the previous eight years. On behalf of the Secretary-General of WMO, Professor J. Nemecek expressed thanks to the Government of Canada for the hospitality provided and stressed the effective backing given by the local secretariat which had contributed to the success of the session.

Mr. J. Bruce, Director General of the Inland Waters Directorate of Environment, Canada, and Principal Delegate of Canada, speaking on behalf of the host country, expressed his appreciation to the WMO Secretariat for its efficient collaboration during the session and extended his best wishes to all participants for a safe journey home.

24.2 The fifth session of the Commission for Hydrology closed at 5.30 p.m. on 16 July 1976.
RESOLUTIONS ADOPTED BY THE SESSION

Res. 1 (CHy-V) – WORKING GROUP ON THE GUIDE AND TECHNICAL REGULATIONS

THE COMMISSION FOR HYDROLOGY,

NOTING:

(1) Resolution 26 (Cg-VII),

(2) The report of the Working Group on the Guide and Technical Regulations,

CONSIDERING:

(1) That the guidance material published by WMO has proved to be exceedingly valuable on a world-wide scale and in particular to developing countries,

(2) That continuing action is required to improve, extend and update the Guide to Hydrological Practices and the Technical Regulations for operational hydrology,

(3) That the Guide should be kept as concise and as practical for use as possible,

(4) That Technical Regulations find their basis in guidance material,

(5) That the working group has proved to be effective in dealing with both types of material,

DECIDES:

(1) To re-establish the Working Group on the Guide and Technical Regulations with the following terms of reference:

(a) To finalize, as a matter of first priority and in consultation with appropriate working groups and rapporteurs, the material for the Guide available from CHy-IV working groups and rapporteurs concerning:

(i) Analysis and modelling of hydrological systems;

(ii) Water quality (including temperature);
(iii) Applications to water management;

(iv) Proposals concerning transfer of large volumes of non-real-time hydrological data;

and to submit the above material for approval by the president on behalf of the Commission;

(b) To review, consolidate and edit with respect to substance material prepared by other working groups and rapporteurs for inclusion in the Guide and to recommend subjects for which new or revised material should be prepared for the Guide;

(c) To ensure continuing review of the Technical Regulations in Hydrology with a view to incorporating additions as may seem appropriate, based on guidance material as it becomes available, particularly on the following topics:

(i) Accuracy of measurements of basic hydrological elements;

(ii) Sediment transport;

(iii) Water quality;

(iv) Groundwater;

(d) To prepare an Annex to the Technical Regulations in Hydrology containing all necessary recommended practices to support the appropriate Technical Regulations of Volume III, where they are stated in terms of accuracy of performance of a given instrument or method, and to circulate the text of this Annex to the members of the Commission for their comments before submission to Eighth Congress;

(e) To submit to CHy-VI draft material and proposed amendments to the Guide and Technical Regulations;

(2) To request the working group:

(a) To examine on the basis of the reports of the rapporteurs included in the working group the efforts of CHy in the fields of accuracy of hydrometric measurements and standardization and to make recommendations with regard to needs and priorities in the future;

(b) To submit a final report to the president of CHy not later than six months before the sixth session of the Commission;
(3) To invite the following experts to serve on the working group:

M. Jacobs (Israel) (chairman)
H. H. Barnes (U.S.A.) Rapporteur on Standardization*
R. Herschy (U.K.) Rapporteur on Accuracy of Hydro-
metric Measurements*
E. V. Burjak (U.S.S.R.) Member
S. A. Acheampong (Ghana) Member
J. W. van der Made (Netherlands) Member

* The terms of reference of the rapporteurs are given in Annex VI.

Res. 2 (CHy-V) – WORKING GROUP ON NETWORK DESIGN AND AREAL ASSESSMENT OF HYDROLOGICAL ELEMENTS

THE COMMISSION FOR HYDROLOGY,

NOTING:

(1) Resolution 26 (Cg-VII),

(2) The report of the Rapporteur on Casebook on Hydrological Network Design Practice,

(3) The report of the Rapporteur on Information Transfer and Network Design,

CONSIDERING:

(1) That the design and operation of networks and techniques of information transfer are one of the priorities agreed by Cg-VII for the OHP,

(2) That the Guide, Technical Regulations and Casebook need amplification on problems of network design,

(3) The importance of areal assessment of hydrological elements, which is closely connected with the design of networks for these elements,

DECIDES:

(1) To establish a Working Group on Network Design and Areal Assessment of Hydrological Elements with the following terms of reference:

(a) To monitor the entire process of standardization within CHy in the field of network design and information transfer;
(b) To prepare a section on conjunctive design of climatological and streamflow data networks, including those for special purposes, for inclusion in the Guide;

(c) To review material prepared by its members for inclusion in the Guide and Technical Regulations and to submit it to the chairman of the Working Group on the Guide and Technical Regulations;

(d) To review the reports prepared by its members, in particular the report on hydrological network design, and to submit them, as appropriate, to the president of CHy;

(e) To co-operate with the IHP Working Group on the Assessment of Quantitative Changes in the Hydrological Régime of River Basins due to Human Activities in the preparation of a chapter on networks;

(f) To submit a final report to the president of the Commission not later than six months before the sixth session of the Commission;

(2) To request the chairman of the working group to serve as the editor of the WMO Casebook on Hydrological Network Design Practice and to assist the WMO Secretariat with network statistics;

(3) To invite the following experts to serve on the working group:

- J. C. Rodda (U.K.) (chairman)
- M. Moss (U.S.A.) Rapporteur on Network Design and Evaluation*
- I. F. Karasev (U.S.S.R.) Rapporteur on Network Design under Special Conditions*
- R. Brémond (France) Rapporteur on Environmental Monitoring*
- Miss D. Jurak (Poland) Rapporteur on Areal Assessment of Evaporation and Soil Moisture*
- K. Ishizaki (Japan) Rapporteur on Areal Assessment of Precipitation*

* The terms of reference of the rapporteurs are given in Annex VII.

Res. 3 (CHy-V) - RAPPORTEUR ON ACCURACY OF POINT PRECIPITATION MEASUREMENT

THE COMMISSION FOR HYDROLOGY,

NOTING:

(1) Resolutions 1 and 2 (CIMO-VI),
(2) The report of the CHy Working Group on Meteorological Instruments and Methods of Observation for Hydrological Purposes,

CONSIDERING:

(1) That accurate measurement of precipitation is of primary importance to all activities in operational hydrology,

(2) That there is close co-operation between CHy and CIMO, particularly in the implementation of the international comparisons of national precipitation gauges with reference pit gauges,

DECIDES:

(1) To appoint a Rapporteur on Accuracy of Point Precipitation Measurement with the following terms of reference:

(a) To keep abreast of the work of CIMO and to ensure liaison between CHy and the CIMO Sub-group on Requirements, Accuracy and Quality Assurance and the CIMO Working Group on Measurements of Precipitation, Evaporation and Soil Moisture, and to prepare relevant material for the Guide;

(b) To review recent methods serving to characterize the accuracy of point precipitation measurement, taking into consideration the probability of the distribution of the errors and the level of confidence, and to report on them to the Commission;

(c) To submit a final report to the president of the Commission not later than six months before the sixth session of the Commission;

(2) To invite Mr. Boris Sevruk (Switzerland) to serve as Rapporteur on Accuracy of Point Precipitation Measurement.
DECIDES:

(1) To establish a Working Group on Improvement and Standardization of Instruments and Methods of Observation for Hydrological Purposes with the following terms of reference:

(a) To monitor within CHy the processes of standardization of instruments and methods of observation for hydrological purposes;

(b) To assist the president of CHy and the WMO Secretariat and to co-operate with the relevant WMO bodies in the implementation of projects concerned with (a) above;

(c) To review material prepared by its members and to submit it to the chairman of the Working Group on the Guide and Technical Regulations;

(d) To submit a final report to the president of the Commission not later than six months before the sixth session of the Commission;

(2) To invite the following experts to serve on the working group:

O. Starosolszky (Hungary) (chairman), Rapporteur on Sediment Transport*
M. J. Green (U.K.) Rapporteur on New Methods of Discharge Measurements*
M. Fuschini Mejia (Argentina) Rapporteur on Levels and Discharge Measurements under Difficult Conditions*
G. Smoot (U.S.A.) Rapporteur on Intercomparison of Principal Hydrometric Instruments*
Y. Bachmat (Israel) Rapporteur on Groundwater*
A. G. Konovalov (U.S.S.R.) Rapporteur on Remote Sensing of Hydrological Elements*

* The terms of reference of the rapporteurs are given in Annex VIII.

Res. 5 (CHy-V) – RAPPORTEUR ON WATER-QUALITY MONITORING

THE COMMISSION FOR HYDROLOGY,

NOTING:

(1) The report of the Rapporteur on Measurement of Water Quality (including Temperature),
(2) The report of the Working Group on Hydrological Instruments and Methods of Observation.

(3) The request of the WMO Executive Committee included in paragraph 6.1.2, general summary, abridged report of EC-XXVIII,

CONSIDERING:

(1) That there is a need for the completion of guidance material on the design of networks, instruments and methods of observation for water quality,

(2) That there is an urgent need for intensified studies of interchange of pollutants between the atmosphere and fresh water bodies,

DECIDES:

(1) To appoint a Rapporteur on Water-quality Monitoring with the following terms of reference:

(a) To finalize the draft Technical Note on Water-quality Measurements using the available draft material (prepared during the past inter-sessional period) expanding it briefly to include also aspects concerning groundwater quality measurements;

(b) To review the existing draft material on water quality for Chapter 2 of the Guide to Hydrological Practices and to finalize it in a format suitable for inclusion in the fourth edition of the Guide;

(c) To collect information on the transfer of pollutants from the atmosphere to fresh water bodies with respect to precipitation, air-water interface and snowmelt contributions and to coordinate his work with other WMO constituent bodies and other organizations of the UN system;

(d) To keep abreast of the development and programmes of other international agencies in the field of water quality and to assist the president of CHy and the Secretariat in the implementation of inter-agency projects concerned with water-quality monitoring;

(e) To submit the material from (b), (c) and (d) above to the chairman of the Working Group on the Guide and Technical Regulations;

(f) To submit a final report to the president of the Commission not later than six months before the sixth session of the Commission;

(2) To invite Mr. H. R. S. Page (U.K.) to serve as Rapporteur on Water-quality Monitoring.
Res. 6 (CHy-V) - RAPPORTEUR ON OPERATION OF HYDROMETRIC NETWORKS

THE COMMISSION FOR HYDROLOGY,

NOTING the report of the Rapporteur on Operation of Hydrometric Networks,

CONSIDERING:

(1) That work should be continued within the OHP in the field of operation of networks,

(2) That there is a need for studying the socio-economic aspects of the operation of hydrometric networks,

DECIDES:

(1) To re-appoint a Rapporteur on Operation of Hydrometric Networks with the following terms of reference:

(a) To prepare material on operation of hydrometric networks for inclusion in a WMO Operational Hydrology Report with particular reference to:

(i) Cost of stream gauging, including installation, maintenance and operation;

(ii) Operation under difficult conditions;

(iii) Water quality;

(b) To prepare a report on the social and economic aspects of hydrological data collection;

(c) To co-ordinate his work on (a) and (b) with the Working Group on Network Design and Areal Assessment of Hydrological Elements and to seek advice from ACOH, as appropriate;

(d) To prepare a report on (a) in a form suitable for inclusion in the Casebook on Hydrological Network Design Practice and to submit it to the chairman of the Working Group on Improvement and Standardization of Instruments and Methods of Observation for Hydrological Purposes for submission to the editor of the Casebook;

(e) To prepare material on (a) for inclusion in the Guide;

(f) To submit a final report to the president of the Commission not later than six months before the sixth session of the Commission;
(2) To invite Mr. G. Teixeira de Souza (Brazil) to serve as Rapporteur on Operation of Hydrometric Networks.

Res. 7 (CHy-V) - WORKING GROUP ON HYDROLOGICAL DATA TRANSMISSION, PROCESSING AND RETRIEVAL

THE COMMISSION FOR HYDROLOGY,

NOTING:

(1) The report of the Working Group on Data Treatment,

(2) Resolution 26 (Cg-VII) - WMO Operational Hydrology Programme,

CONSIDERING:

(1) That there is a need for development of operational data treatment procedures and facilities especially through the use of WWW facilities,

(2) That standard procedures are needed for the transfer of real-time and non-real-time data, especially using WWW facilities,

DECIDES:

(1) To establish a Working Group on Hydrological Data Transmission, Processing and Retrieval with the following terms of reference:

(a) To monitor and provide a forum for discussion of the activities within CHy concerning hydrological data transmission, processing and retrieval, including use of WWW facilities;

(b) To review reports prepared by its members and any proposals concerning standardization practices and procedures such as computer-compatible data formats used for transfer of large volumes of data;

(c) To review material prepared on this subject for inclusion in the Guide and the Technical Regulations and to submit it to the chairman of the Working Group on the Guide and Technical Regulations;

(d) To submit a final report to the president of the Commission not later than six months before the sixth session of the Commission;
(2) To invite the following experts to serve on the working group:

H. L. Ferguson (Canada) (chairman),
A. Flanders (U.S.A.) Rapporteur on Application of WWW to Operational Hydrology*
V. A. Semyonov (U.S.S.R.) Rapporteur on Design of Automatic Telemetering and Satellite Data Transmission Systems*
M. Martin (France) Rapporteur on Standardization of Primary Data Processing*
J. Nana-Tchoudja (Cameroon) Member
S. Benarafa (Morocco) Member

(3) To assign to the chairman of the working group a co-ordinating role in relation to the tasks of the rapporteurs, as well as his role in the tasks of the working group as a whole.

* The terms of reference of the rapporteurs are given in Annex IX.

Res. 8 (CH-V) – RAPPORTEUR ON STREAMFLOW/WATER-QUALITY RELATIONSHIP

THE COMMISSION FOR HYDROLOGY,

NOTING:

(1) The report of the Working Group on Hydrological Design Data for Water Resources Projects,

(2) The report of the Rapporteur on Streamflow/Water-quality Relationship,

CONSIDERING:

(1) The processes associated with inland water-quality changes and closely linked with hydrological and meteorological phenomena,

(2) The co-operation of WMO with other organizations concerned with problems of inland water pollution,

DECIDES:

(1) To re-appoint a Rapporteur on Streamflow/Water-quality Relationship with the following terms of reference:

(a) To revise and expand suitably the report on "Relationships between hydrologic data, hydrologic projects and water quality" by including more case studies and examples and to co-operate with Unesco in preparing a chapter on the interrelationship between sediments and water quality as a contribution of Unesco to this report;
(b) To prepare a report on the application of hydrological forecasts to streamflow/water-quality relationship;

(c) To prepare, in co-operation with the WMO Secretariat and relevant Unesco/IHP bodies, a report on monitoring of transport of pollutants through rivers to the oceans, and to consider a joint report with Unesco on this subject;

(d) To extract material for the Guide from the report on "Methods for calculating, forecasting and monitoring salt-water intrusion into estuaries";

(e) To keep abreast of the activities of the CoSAMC Rapporteur on Applications of Meteorology to Effects of Industrial Energy Sources on the Environment, in studying the effects of thermal load in rivers and water bodies on the local climate, particularly in respect to changes in fog frequency and intensity that may result;

(f) To assist the WMO Secretariat in its participation in multi-agency projects on water quality and pollution;

(g) To advise and participate in the work of other WMO bodies, as requested;

(h) To submit a final report to the president of the Commission not later than six months before the sixth session of the Commission;

(2) To invite Mr. K.-H. Schmidt (Fed. Rep. of Germany) to serve as Rapporteur on Streamflow/Water-quality Relationship.

**Res. 9 (CHy-V) - WORKING GROUP ON DESIGN DATA FOR PROJECTS**

**THE COMMISSION FOR HYDROLOGY,**

**NOTING:**

(1) Resolution 26 (Cg-VII),

(2) The report of the Working Group on Hydrological Design Data for Water Resources Projects,

**CONSIDERING:**

(1) That the problem of guidance material on hydrological and meteorological data for design of water resources projects, especially with scarce observations, is of considerable concern to many Members, particularly in developing countries, and is an important part of the WMO Operational Hydrology Programme,
(2) That the annex to the Guide dealing with these problems requires continuous updating and expansion,

DECIDES:

(1) To establish a Working Group on Design Data for Projects with the following terms of reference:

(a) To review the reports prepared by the members of the working group under their respective terms of reference;

(b) To revise the annex and relevant chapters of the Guide on the basis of the contributions submitted by its members. For this purpose, co-operation should be sought from the CHy Rapporteurs on Streamflow/Water-quality Relationship, on Water-quality Monitoring, on Sediment Transport, on Areal Assessment of Precipitation, and on Derivation of Areal Assessment of Evaporation and Soil Moisture;

(c) To prepare, in co-operation with the WMO Secretariat, guidance material on the methodology for the estimation of hydro-power potentials;

(d) To submit, as soon as possible, the material prepared under (b) above to the chairman of the Working Group on the Guide and Technical Regulations;

(e) To submit a final report to the president of the Commission not later than six months before the sixth session of the Commission;

(2) To invite the following experts to serve on the working group:

B. M. Dobroumov (U.S.S.R.) (chairman)
J. M. Raffo del Campo (Argentina) Rapporteur on Extremes of Precipitation*
O. Pfafstetter (Brazil) Rapporteur on Standardization of Requirements for and Accuracy Levels of Hydrological Design Data*
W. S. Eichert (U.S.A.) Rapporteur on Extrapolation of Design Data*
B. Wingaard (Norway) Rapporteur on Secondary Data-treatment Procedures*
P. M. Ashton (Canada) Rapporteur on Cost-benefit Assessment of the Application of Hydrological Data in Water Resource Management Projects*

*The terms of reference of the rapporteurs are given in Annex X.
THE COMMISSION FOR HYDROLOGY,

NOTING the reports of the Working Group on Hydrological Forecasting and of relevant rapporteurs,

CONSIDERING:

(1) That activities in hydrological forecasting are acquiring increasing importance,

(2) That activities in hydrological forecasting are a substantial part of the WMO Operational Hydrology Programme and were assigned top priority by the End-of-Decade Conference,

(3) That the updating of guidance material on hydrological forecasting is a continuing requirement,

DECIDES:

(1) To re-establish the Working Group on Hydrological Forecasting with the following terms of reference:

(a) To revise and update, as a matter of first priority, Chapter 6 ("Hydrological forecasting") of the Guide to make it compatible with the new section on "Analysis and modelling of hydrological systems" proposed for inclusion in Chapter 5 ("Hydrological analysis") of the Guide and to submit these revisions and amendments to the president of the Commission for his approval on behalf of the Commission;

(b) To define the requirements for meteorological data on tropical cyclones needed for hydrological forecasts in areas prone to tropical cyclones and submit them to the president of CHy for transmission to other WMO bodies involved in tropical meteorology;

(c) To identify approaches for assessment of combined storm-surge/flood effects, so that they can be included in guidance prepared under the WMO Tropical Cyclone Project;

(d) To assist the Secretary-General in conducting a survey on the needs for and possibilities of issuing hydrological forecasts in terms of probability, including possible use of operational quantitative precipitation forecasts;
(e) To prepare draft definitions of standard forecasting terms for the range of forecasts (short, extended, long, seasonal) for use in hydrological forecasting, taking into account experience in meteorological forecasting, and submit them to the president of CHy for approval on behalf of the Commission;

(f) To follow the developments in cost-benefit analysis of hydrological forecasting and present to CHy-VI suggestions for possible studies in this field, in particular for hydrological forecasting for navigation, hydro-power and flood-damage reduction;

(g) To recommend further material, as appropriate, for inclusion in the Guide and Technical Regulations;

(h) To submit a final report to the president of the Commission not later than six months before the sixth session of the Commission;

(2) To invite the following experts to serve on the working group:

E. L. Peck (U.S.A.) (chairman), Rapporteur on Multi-purpose Basin Simulation Sub-system*

A. P. Zhidikov (U.S.S.R.) Rapporteur on Models for Snowmelt Runoff*

E. Bobinski (Poland) Rapporteur on On-the-line Forecasting Systems*

M. J. Lowing (U.K.) Rapporteur on Forecasting of Low Flows and Related Aspects of Droughts*

M. Dyhr-Nielsen (Denmark) Rapporteur on Long-range Water-supply Forecasting*

A. J. Hall (Australia) Rapporteur on Flash Floods*

* The terms of reference of the rapporteurs are given in Annex XI.

Res. 11 (CHy-V) - RAPPORTEUR ON FORECASTING OF ICE CONDITIONS

THE COMMISSION FOR HYDROLOGY,

NOTING:

(1) The report of the Rapporteur on Forecasting of Ice Formation and Ice Break-up,

(2) The report of the Working Group on Hydrological Forecasting,

CONSIDERING the need for guidance material on new methods of long-term forecasts of ice conditions and short-term forecasts of frazil ice,
DECIDES:

(1) To appoint a Rapporteur on Forecasting of Ice Conditions with the following terms of reference:

(a) To prepare material on new methods of long-term forecasts of ice conditions and short-term forecasts of frazil ice;

(b) To prepare material on the effect of thermal load on fluvial ice conditions;

(c) To keep abreast of the activities of the IAHS Commission on Snow and Ice and the IAHR Committee on Ice Problems;

(d) To co-ordinate his work with that of the Working Group on Hydrological Forecasting and the Rapporteur on Water Quality Monitoring, as appropriate;

(e) To submit a report on (a) and (b) above to the president of the Commission;

(f) To prepare material on (a) and (b) above for inclusion in the Guide;

(g) To submit a final report to the president of the Commission not later than six months before the sixth session of the Commission;

(2) To invite Mr. B. M. Ginzburg (U.S.S.R.) to serve as Rapporteur on Forecasting of Ice Conditions.

Res. 12 (CHy-V) - RAPPORTEUR ON HYDROLOGICAL ASPECTS OF WEATHER MODIFICATION

THE COMMISSION FOR HYDROLOGY,

NOTING:

(1) Recommendation 3 of the End-of-Decade Conference,

(2) Resolution 28 (Cg-VII),

CONSIDERING:

(1) The interest expressed by Members in the feasibility of increasing water supply through artificial augmentation of precipitation,

(2) The need to evaluate the economic significance of artificially augmented precipitation on water resources management,
DECIDES:

(1) To appoint a Rapporteur on Hydrological Aspects of Weather Modification with the following terms of reference:

(a) To keep abreast of developments in the WMO Weather Modification Programme, particularly with regard to the economic significance of artificially augmented precipitation for water resources and the hydrological consequences derived from the Precipitation Enhancement Project (PEP) experiment, as well as hydrological methods for evaluation of this experiment;

(b) To ensure liaison with the WMO bodies responsible for the implementation of the PEP and to provide hydrological expertise to the project as requested;

(c) To advise and assist the president of the Commission and the WMO Secretariat in all matters concerning climatic change, in particular with regard to the activities of the Executive Committee Panel of Experts on Climatic Change;

(d) To submit a final report to the president of the Commission not later than six months before the sixth session of the Commission;

(2) To invite Mr. J. C. Schaake (U.S.A.) to serve as Rapporteur on Hydrological Aspects of Weather Modification.

Res. 13 (CHy-V) - RAPPORTEUR ON HYDROLOGICAL MAPS AND MAPPING ACTIVITIES

THE COMMISSION FOR HYDROLOGY,

NOTING:

(1) The report of the Rapporteur on Maps and Mapping Techniques for Hydrological Purposes,

(2) The joint Unesco/WMO mapping activities,

CONSIDERING:

(1) The responsibilities of WMO concerning the preparation of hydrological maps of an operational nature,

(2) That co-ordination of hydrological mapping activities within WMO and with Unesco is required to ensure a well-integrated approach and to avoid redundancy and misunderstanding,
RESOLUTION 14

DECIDES:

(1) To appoint a Rapporteur on Hydrological Maps and Mapping Activities with the following terms of reference:

(a) To keep abreast of mapping activities of other WMO bodies and prepare material for the WMO regional climatic atlases as needed.

(b) To develop, in co-operation with Unesco, appropriate guidelines and specifications for small- and large-scale hydrological maps, as required by regional associations;

(c) To contribute, as required, to the IHP Project on Hydrological Mapping;

(d) To submit a final report to the president of the Commission not later than six months before the sixth session of the Commission;

(2) To invite Mr. C. Laboranti (Argentina) to serve as Rapporteur on Hydrological Maps and Mapping Activities.

Res. 14 (CHy-V) – RAPPORTEUR ON TRAINING IN HYDROLOGY

THE COMMISSION FOR HYDROLOGY,

NOTING:

(1) The report of the Rapporteur on Training in Hydrology,

(2) The report on WMO activities in education and training relevant to operational hydrology,

CONSIDERING:

(1) That training of specialists is the prerequisite for any development of activities of Members in the field of operational hydrology,

(2) That, within the IHP programme and in the activities of Unesco, considerable attention has been devoted to the promotion of training and education,

(3) The urgent need and high priority for training of hydrological technicians,
DECIDES:

(1) To re-appoint a Rapporteur on Training in Hydrology with the following terms of reference:

(a) To assist the president of the Commission and the Secretary-General of WMO in promoting training of personnel and preparing training material on different subjects of operational hydrology, in particular on network design, collection, processing and storage of data, hydrological forecasting and algorithmic language;

(b) To assist in introducing operational hydrology and hydrometeorology in the WMO training centres and to recommend relevant material to be included in the WMO publications on training. This work should be undertaken in close co-operation and in accordance with the work of the Executive Committee Panel of Experts on Meteorological Education and Training;

(c) To follow the development and to co-operate on problems of hydrological education with bodies established for this purpose by national and international organizations, in particular to co-operate with the IHP working groups on this subject;

(d) To submit a final report to the president of the Commission not later than six months before the sixth session of the Commission;

(2) To invite Mr. A. Bellocq (France) to serve as Rapporteur on Training in Hydrology.

Res. 15 (CHy-V) - ADVISORY WORKING GROUP OF THE COMMISSION FOR HYDROLOGY

THE COMMISSION FOR HYDROLOGY,

NOTING the report of the president of the Commission,

CONSIDERING:

(1) That the Advisory Working Group has been an invaluable aid to the president in the tasks devolving upon him during the inter-sessional period,

(2) That Congress has recognized the advantages of having this type of working group,
DECIDES:

(1) To re-establish the Advisory Working Group of the Commission for Hydrology with the following terms of reference:

(a) To assist the president in proposing or in taking action on urgent matters referred to the Commission which cannot be dealt with adequately by the regular working groups or by correspondence;

(b) To assist the president in reviewing the progress of the work of the Commission, in particular of its working groups and rapporteurs, and in planning its future programmes;

(c) To assist the president in the selection of experts and consultants for particular assignments;

(d) To assist the president in maintaining a continuing review of the activities of the Commission related to the IHP and other programmes of international co-operation in hydrology;

(e) To review the recommendations of ACOH and take appropriate action on matters which are of concern to the Commission in connexion with ACOH activities;

(f) To serve as a steering committee for the preparation and development of IOHS;

(g) To arrange for the preparation of material on rapid assessment of water availability for water supply to the population;

(h) To co-ordinate the work of the working groups and rapporteurs in order to ensure that no duplication of effort occurs in their work;

(2) That all working groups and rapporteurs, at the request of the president of the Commission and its Advisory Working Group, acting in the capacity of steering committee for IOHS, should prepare material needed for the detailed plan and development of IOHS within their terms of reference, as a matter of priority;

(3) To invite the following experts to serve on the working group:

R. H. Clark (Canada) (chairman)
N. O. Popoola (Nigeria)
E. G. Popov (U.S.S.R.)
R. A. Clark (U.S.A.)
O. Starosolszky (Hungary)
J. C. Rodda (U.K.)
Res. 16 (CHy-V) - REVISION OF THE RESOLUTIONS AND RECOMMENDATIONS OF THE COMMISSION FOR HYDROLOGY

THE COMMISSION FOR HYDROLOGY,

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

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

DECIDES:

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

(2) To note with satisfaction the action taken by the competent bodies on all its recommendations, which are now redundant.
RECOMMENDATIONS ADOPTED BY THE SESSION

Rec. 1 (CHy-V) - INTEGRATED OPERATIONAL HYDROLOGICAL SYSTEM (IOHS)

THE COMMISSION FOR HYDROLOGY,

NOTING:

(1) Resolutions 26 and 28 (Cg-VII),

(2) The forthcoming United Nations Water Conference (Argentina, 1977) and resolutions of other relevant United Nations conferences such as the UN Conference on Human Settlements (Habitat),

CONSIDERING:

(1) Increasing needs for hydrological information and forecasts for design, development and operation of water resources management projects, water supply and flood protection,

(2) The need for further improvement of collection, transmission and processing of meteorological and hydrological data and thus the creation of an integrated operational system in this field,

(3) The results already obtained with respect to methodology and preparation of guidance material concerning network design, data collection, transmission and processing, and modelling of hydrological processes within the activities already carried out by the WMO Commission for Hydrology,

RECOMMENDS:

(1) The development of an "Integrated Operational Hydrological System" (IOHS - provisional working title) along the lines included in the annex to this recommendation, as a co-operative effort of Members and co-ordinated by WMO;

(2) That the Secretary-General, in co-operation with the president of CHy and its Advisory Working Group, assisted by all relevant CHy working groups and rapporteurs and in consultation with ACOH, and within the available financial resources, initiate the preparation of a detailed plan for the development of IOHS, together with a cost-benefit study, and submit it to the Executive Committee and Cg-VIII for approval. Before this submission, the plan should be circulated to the members of CHy for review, comments and support;
RECOMMENDATION 2

(3) That the Secretary-General consider the possibility of experiments of feasibility of installation of IOHS in a few test river basins, preferably in WMO technical co-operation projects, and submit the preliminary results and findings to the president and the Advisory Working Group in order that they be taken into account in the preparation of the plan for IOHS prior to its submission to Cg-VIII.

See Annex XII.

Rec. 2 (CHy-V) - AMENDMENTS AND ADDITIONS TO WMO TECHNICAL REGULATIONS FOR HYDROLOGY

THE COMMISSION FOR HYDROLOGY,

NOTING:

(1) Resolution 2 (Cg-VII),

(2) The report of the Working Group on the Guide and Technical Regulations,

CONSIDERING the need to strengthen, improve and expand the Technical Regulations in hydrology to take account of developments in operational hydrology,

RECOMMENDS:

(1) That the existing Regulation 5.1.2 of Volume III of the Technical Regulations be amended to read as follows: "Information on artificial control and regulation of streamflow or water level and on ice conditions" and that this amendment be submitted to Eighth Congress for approval;

(2) That an annex to Volume III of the Technical Regulations, containing all necessary, detailed, recommended practices and procedures to support the appropriate Technical Regulations of Volume III, where they are stated in terms of accuracy of performance of a given instrument or method, be submitted to Eighth Congress for approval and subsequent publication;

(3) That Eighth Congress be requested to delegate to the Executive Committee authority for subsequent future approval of additional material and amendments to the annex indicated in RECOMMENDS (2) above;

(4) That the Universal Decimal Classification (UDC) in hydrology given in Table IV of Appendix A of the International Glossary of Hydrology (WMO-No.385), with modifications as appropriate, be submitted to Eighth Congress for publication as an appendix to Volume III of the Technical Regulations for hydrology;

(5) That the selective list of recommended symbols, units and conversion factors given in Tables 1.1 to 1.4 inclusive of Chapter 1 of the third edition of the Guide to Hydrological Practices (WMO-No.168) be submitted to Eighth Congress for publication as an appendix to Volume III of the Technical Regulations for hydrology.
Rec. 3 (CHy-V) – INSTRUMENTS AND METHODS OF OBSERVATION OF METEOROLOGICAL ELEMENTS FOR HYDROLOGICAL PURPOSES

THE COMMISSION FOR HYDROLOGY,

NOTING:

(1) The report of the Working Group on Meteorological Instruments and Methods of Observation for Hydrological Purposes,

(2) The priorities within the WMO Operational Hydrology Programme approved by CG-VII with respect to instruments and methods of observation of meteorological elements of the hydrological cycle,

CONSIDERING that CIMO-VI, by Resolution 2 (CIMO-VI), entrusted to its Working Group on Measurements of Precipitation, Evaporation and Soil Moisture, under DECIDES (1) (g), the consideration of instrumental aspects of the meteorological part of the hydrological cycle that may be referred to CIMO by other constituent bodies of the Organization,

RECOMMENDS:

(1) That the president of CIMO take action as appropriate on:

(a) Objective assessment of exposure of precipitation gauges for needs of hydrology;

(b) Ascertaining and improvement of accuracy of precipitation (liquid and solid) measurement at a point;

(c) Means of measuring and recording rainfall intensity;

(d) Standardization of evaporation measurement and estimation of evaporation;

(2) That CIMO-VII, when considering the above subjects and entrusting action on them to its working groups or rapporteurs which it may wish to appoint for this purpose, consider the possibility of inviting the president of CHy to designate CHy experts to cooperate with these bodies in order to ensure that the requirements of operational hydrology be taken into account;

(3) That CIMO-VII, when considering the report of its Working Group on Measurements of Precipitation, Evaporation and Soil Moisture on action taken within its terms of reference on DECIDES (d) and (e), consider the view of CHy-IV that the use of indirect means, in particular the energy-budget technique (Bowen ratio), for determining evaporation should be encouraged. (At the same time, direct measurement of evaporation by means of pans serves an invaluable purpose (a) for estimation of evaporation from reservoirs in areas where all relevant meteorological data are not normally available or (b) in cases when there is a need for estimation of coefficients to be used with the Penman equation in areas where such coefficients for evaporation from free water surfaces are not available.)
Rec. 4 (CHy-V) - INTERCOMPARISON OF PRINCIPAL HYDROMETRIC INSTRUMENTS

THE COMMISSION FOR HYDROLOGY,

NOTING:

(1) The report of the Working Group on Hydrological Instruments and Methods of Observation and the report of the Rapporteur on Intercomparison of the Principal Hydrometric Instruments,

(2) The work already accomplished by WMO in the first phase (national level) of its Project on Intercomparison of Principal Hydrometric Instruments,

(3) The recommendations of ACOH on this project,

CONSIDERING:

(1) That the first phase of the WMO Project on Intercomparison of Principal Hydrometric Instruments was limited to comparisons of tests of current meters and water-level recorders owned by the participating countries (national level),

(2) That such a project should be continued in a second phase involving international exchange of instruments,

(3) That consideration should be given to the comparative testing of additional hydrometric instruments,

RECOMMENDS:

(1) That the Secretary-General arrange for the continuation (second phase) of the international project for comparative tests of principal hydrometric instruments;

(2) That advice be sought from ACOH regarding the administrative aspects of the organization of the project.

Rec. 5 (CHy-V) - REGIONAL EXCHANGE OF HYDROLOGICAL DATA

THE COMMISSION FOR HYDROLOGY,

NOTING the report of the Rapporteur on Requirements for Transmission of Data for Hydrological Purposes,

CONSIDERING:

(1) That hydrological data transmission matters concern mainly the regional associations,

(2) That the regional Working Groups on Hydrology are already engaged in assessing the transmission in facilities and requirements,
RECOMMENDATION 6

RECOMMENDS:

(1) That the regional associations, through their respective Working Groups (Rapporteur) on Hydrology, in close collaboration with the regional Working Groups on Meteorological Telecommunications, should:

(a) Outline regional five-year plans in co-operation with international river-basin commissions for the implementation of WMO facilities as they affect the international exchange of hydrological data;

(b) Identify regional and national requirements for data transmission using the WMO Global Telecommunication System;

(2) Strengthening co-operation between the regional Working Groups on Hydrology and the regional Working Groups on Meteorological Telecommunications;

(3) That the regional association Working Groups (Rapporteur) on Hydrology should define the requirements as regards the programme for the dissemination of coded hydrological information for international basins for which these exchanges are recognized as being necessary.

Rec. 6 (CHy-V) - INTERCOMPARISON OF CONCEPTUAL MODELS FOR SNOWMELT RUNOFF

THE COMMISSION FOR HYDROLOGY,

NOTING:

(1) Recommendation 3 of the End-of-Decade Conference,

(2) That the successfully completed WMO Project on Intercomparison of Conceptual Models used in Operational Hydrological Forecasting did not include models for snowmelt runoff,

CONSIDERING that the results of this project are of considerable interest to many Members for the improvement of their hydrological forecasting practices,

RECOMMENDS:

(1) That the Secretary-General initiate a project on intercomparison of conceptual models for snowmelt runoff along lines similar to those followed in the implementation of the WMO Project on Intercomparison of Conceptual Models used in Operational Hydrological Forecasting;

(2) That the Executive Committee authorize the convening of a restricted technical meeting in which invited experts and representatives of agencies having participated in the project would evaluate the results of the project and formulate relevant conclusions and recommendations;
Rec. 7 (CHy-V) – COMPOSITION OF THE EXECUTIVE COMMITTEE PANEL OF EXPERTS ON WEATHER MODIFICATION

THE COMMISSION FOR HYDROLOGY,

NOTING:

(1) Resolution 26 (Cg-VII),

(2) Resolution 11 (EC-XXVIII),

CONSIDERING:

(1) That the appropriate hydrological factors need to be taken into account during the implementation of the PEP experiments,

(2) That there is a need for hydrological expertise in the WMO bodies responsible for the scientific and technical aspects and the co-ordination of these activities,

RECOMMENDS that the Executive Committee consider the possibility of including an expert hydrologist in its Panel of Experts on Weather Modification.

Rec. 8 (CHy-V) – EDUCATION AND TRAINING IN OPERATIONAL HYDROLOGY

THE COMMISSION FOR HYDROLOGY,

NOTING:

(1) The report of the Rapporteur on Training in Hydrology,

(2) The report on WMO activities in education and training relevant to operational hydrology,

CONSIDERING:

(1) The differences between the approaches to the training of meteorological and hydrological personnel,

(2) That methodological support by the WMO Secretariat would contribute to the activities of Members in education and training in operational hydrology,

(3) The urgent need for training of hydrological technicians,

(4) The need to prepare syllabi for training in operational hydrology,
RECOMMENDATION 9

RECOMMENDS:

(1) That the personnel of Hydrological Services be classified into three categories: professional hydrologists, hydrological technicians and hydrological observers;

(2) That a proposed new Chapter 5, "Curricula for training of professional personnel in operational hydrology", and revised curricula for training meteorological personnel (Classes I to IV inclusive) in specialization in hydrometeorology, as well as the definition of "hydrometeorology" as approved by CHy-V, be submitted to the Executive Committee Panel of Experts on Meteorological Education and Training and subsequently included in the revised version of the Guidelines for the Education and Training of Meteorological Personnel, the title of which, in view of the above, should be changed to "Guidelines for the education and training of personnel in meteorology and operational hydrology";

(3) That in the new Chapter 5 account be taken of the different requirements, depending on the objective of training: research-oriented operational-hydrologists, or hydrologists responsible for the fieldwork in the development and operation of hydrological networks;

(4) That the Secretary-General consider:

(a) Ways of providing assistance to Members' projects on training in hydrology and water resources, which would benefit developing countries and, in particular, investigate possibilities of organizing postgraduate courses in the field of operational hydrology including courses in Spanish in Latin America;

(b) The possibility of increasing activity in the WMO programme in education and training for training hydrological technicians in national regional courses, possibly as a component of the WMO Regional Training Centres.

Rec. 9 (CHy-V) - TECHNICAL ASSISTANCE TO DEVELOPING COUNTRIES

THE COMMISSION FOR HYDROLOGY,

NOTING:

(1) Resolution 31 (Cg-VII) - Participation of the World Meteorological Organization in the United Nations Development Programme,

(2) Resolution 33 (Cg-VII) - The WMO Voluntary Assistance Programme,

(3) Recommendation 5 of the International Conference on the Results of the International Hydrological Decade and on Future Programmes in Hydrology,
CONSIDERING:

(1) That many developing countries are still in need of assistance for establishing and/or developing their Hydrological Services and networks to the level at which they could provide the maximum benefit for increasing the rate of their economic and social development and welfare,

(2) That the primary objective of technical assistance is for each country to be ultimately able to plan, implement and operate its own hydrological programmes,

RECOMMENDS THAT THE SECRETARY-GENERAL:

(1) Keep the hydrological advisers to the permanent representatives with WMO and directors of Hydrological Services informed of:

(a) Changes in the UNDP procedures and the schedule of country programming in their own countries;

(b) The rules and procedures for the utilization of the VAP in application of WWW to hydrology and of possibilities of obtaining technical assistance from the WMO regular budget, in particular for long-term and short-term fellowships in operational hydrology;

(2) Assist Hydrological Services in formulating and developing projects in operational hydrology under funds-in-trust arrangements and ensure as in the past timely and efficient execution of approved projects;

(3) Study the possibilities of substantially increasing the part of the regular budget available for assistance to developing countries when submitting to Eighth Congress his budgetary estimate proposals for the eighth financial period;

(4) Consider the establishment of a monitoring programme for the assessment of needs of developing countries requiring assistance and Members willing to provide assistance in all fields of operational hydrology, particularly in education, training and equipment, and provide assistance and advice to Members in identifying and defining specific requests under this programme and in its subsequent implementation;

(5) Formulate and submit to Eighth Congress through the Executive Committee proposals for the support and implementation of the Integrated Operational Hydrological System (IOHS) in the framework of VAP, as a part of WWW applications to hydrology in accordance with Recommendation 1 (Chy-V);

(6) Provide technical advice to developing countries in the planning and implementation of their hydrological activities and continue his efforts in increasing the awareness of the governments of the importance and relevance of these activities to the national economic and social development;
(7) Study ways of establishing and/or developing national or regional training facilities for hydrological technicians including instrument technicians;

(8) Develop further the co-operation between WMO and the Regional Economic Commissions, with particular reference to the development and implementation of regional projects in the field of hydrology and water resources development.

Rec. 10 (CHy-V) - WMO REGIONAL ASSOCIATION WORKING GROUPS ON HYDROLOGY

THE COMMISSION FOR HYDROLOGY,

NOTING:

(1) That all regional associations of WMO have established Working Groups or a Rapporteur on Hydrology, the groups being open to all experts of their Region,

(2) That several technical reports from regional working groups have constituted an input to the activities of CHy,

(3) Resolution 27 (Cg-VII),

CONSIDERING the importance of the implementation of the WMO OHP at the regional level,

RECOMMENDS:

(1) That all efforts be made to increase the representation of the Hydrological Services of Members in the regional working groups as a necessity for the success of their work;

(2) That the regional associations' Working Groups and Rapporteur on Hydrology co-operate with CHy on subjects included in the annex* to this recommendation.

* See Annex XIII.

Rec. 11 (CHy-V) - WMO CO-OPERATION WITH THE IHP OF Unesco AND OTHER INTERNATIONAL ORGANIZATIONS

THE COMMISSION FOR HYDROLOGY,

NOTING Resolution 28 (Cg-VII),

CONSIDERING with great satisfaction the working agreement between WMO and Unesco on co-operation and co-ordination in the field of hydrology and water resources,
RECOMMENDATION 12

RECOMMENDS:

(1) That the list of joint Unesco/WMO projects shown in the list figuring in the annex* to this recommendation serve as a basis for cooperation between WMO and Unesco within Unesco's International Hydrological Programme;

(2) That careful consideration be given to the timing of the next joint Unesco/WMO conference on future programmes in hydrology, which is considered to be held in accordance with the agreement indicated under CONSIDERING above, in view of the fact that it is expected that CHy-VI will be scheduled for 1980;

(3) That, in agreement with Cg-VII decisions, WMO co-operation in the field of hydrology and water resources with other international governmental and non-governmental organizations be further developed, particularly with respect to the activities of the Commission for Hydrology.

*See Annex XIV.

Rec. 12 (CHy-V) - REVISION OF RESOLUTIONS OF THE EXECUTIVE COMMITTEE BASED ON PREVIOUS RECOMMENDATIONS OF THE COMMISSION FOR HYDROLOGY

THE COMMISSION FOR HYDROLOGY,

NOTING with satisfaction the action taken by the Executive Committee on the previous recommendations of the Commission for Hydrology,

CONSIDERING that these recommendations have become redundant in the meantime,

RECOMMENDS that Resolution 12 (EC-XXIV) be no longer considered necessary.
ANNEX I

Annex to paragraph 5.1.4 of the general summary

PROPOSALS FOR ADDITIONAL MATERIAL TO BE PREPARED FOR THE GUIDE TO HYDROLOGICAL PRACTICES

Chapter 2

(a) Measurement of flow of small streams, including ephemeral streams;
(b) Measurement and estimation of runoff from industrial and urban catchments;
(c) Selection of hydrometric instruments (taking into account the results of the WMO Project on Intercomparison of Hydrometric Instruments) related to physical and climatic conditions and accuracy requirements;
(d) Summary of accuracy requirements for measurement of different hydrological elements.

Chapter 3

(a) Further elaboration on types of hydrological observing station (such as water-management stations for different purposes);
(b) Operation of hydrometric networks.

Chapter 5

(a) Basic statistical techniques to evaluate long-term variations in runoff resulting from climatological and man-made changes;
(b) Reference to additional computational methods such as Pearson Type III.

Annex

Stationarity and effects of trends on data.
## ANNEX II

Annex to paragraph 5.3.1 of the general summary

**WMO PUBLICATION SERIES AS APPLIED TO STANDARDIZATION IN THE FIELD OF HYDROLOGY**

<table>
<thead>
<tr>
<th>Type of WMO Publication</th>
<th>User of Publication</th>
<th>Level of Standardization of Publication; Adopted by:</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>1. Technical Regulations</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Content: Definitions of technical terms, recommendations concerning hydrological observing networks and stations; hydrological observations, warnings and forecasts as well as meteorological observations and forecasts for hydrological purposes.</td>
<td>Generally applicable to all Hydrological Services</td>
<td>Highest level of standardization. It is desirable that given rules be implemented by all national Hydrological Services. Adopted by: Congress.</td>
</tr>
<tr>
<td><strong>1 (a) Annexes to Technical Regulations</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Content: All necessary detailed standard and recommended practices and procedures to support the appropriate Technical Regulations.</td>
<td>As (1) above</td>
<td>Adopted by: Executive Committee if authorized by Congress.</td>
</tr>
<tr>
<td><strong>1 (b) Appendices to Technical Regulations</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Content: Texts which are appended to the Technical Regulations and have the same status as the Technical Regulations to which they refer.</td>
<td>As (1) above</td>
<td>As (1a) above.</td>
</tr>
<tr>
<td><strong>2. Guide to Hydrological Practices</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Content: General information about practices, procedures and instrumentation for carrying out hydrological work. Not a manual but rather a supplement to Technical Regulations.</td>
<td>Some as above but less needed by Services having national guides.</td>
<td>Next to highest level of standardization. The practices, procedures and instrumentation described are recommended as reliable for implementation by all national Hydrological Services. Adopted by: Commission for Hydrology.</td>
</tr>
<tr>
<td><strong>2 (a) Annexes to the Guide to Hydrological Practices</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Content: Now used for material not sufficiently standardized for main text of the Guide.</td>
<td>Applicable mainly to all Services without national operational manuals.</td>
<td>Presently at a level just below that of the main text of the Guide. Adopted by: Commission for Hydrology.</td>
</tr>
<tr>
<td><strong>3. Manuals</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Content: Describes in greater detail the practices and procedures contained in the Guide.</td>
<td>Same as (5)</td>
<td>As (2) above, but covering a specific topic in detail. Adopted by: President of Commission for Hydrology.</td>
</tr>
</tbody>
</table>

*Not yet existing in the field of hydrology.
<table>
<thead>
<tr>
<th>Type of WMO publication</th>
<th>User of publication</th>
<th>Level of standardization of publication; adopted by:</th>
</tr>
</thead>
</table>
| 4. Casebooks                   |                                                           | For general guidance and/or for information  
Adopted by: President of the Commission for Hydrology and/or Secretary-General |
| **Content:** Used at present to survey selected theoretical and operational methods and techniques used in certain fields of hydrology | Applicable or of interest to all Services |                                                                         |
| 5. Operational Hydrology Reports |                                                           | Same as (4)                                                                             |
| **Content:** General reports on various aspects of hydrology prepared by individuals or working groups. Replacing the WMO/IHO reports series. It is also used to report on ongoing projects | Most useful for developing Services. When reporting on current projects it is of general interest |                                                                         |
| 6. Technical Notes             |                                                           | Same as (4)                                                                             |
| **Content:** A high-level scientific publication used for reporting most important activities of WMO technical commissions. A limited number of Technical Notes published each year | Same as (5) |                                                                         |
| 7. White-cover series          |                                                           | General information  
Adopted by: Secretary-General                                                              |
| **Content:** Proceedings of symposia, conferences, etc. | Of general use to all Hydrological Services |                                                                         |
| 8. Training-manual series      |                                                           | Not applicable  
Adopted by: Secretary-General                                                               |
| **Content:** Lecture notes (based on practical problems) for teaching meteorology and hydrology at various technician and professional levels | Mainly of use for developing Services |                                                                         |
ANNEX III

Annex to paragraph 14.1.3 of the general summary

LIST OF LARGE-SCALE HYDROLOGICAL MAPS FOR USE IN HYDROLOGICAL FORECASTING AND FOR THE DESIGN OF WATER-RESOURCES PROJECTS

1. Large-scale hydrological maps that may be required for hydrological forecasting purposes:

(a) Forest cover of catchment area with indications of type of tree species and forest density;

(b) Soil cover with indication of soil types and structure;

(c) Distribution of water equivalent of snow by ten-day periods and the commencement of snowmelt;

(d) Depth of frozen soil by ten-day periods;

(e) Soil moisture at the beginning of snow cover for the regions where thaws do not occur and monthly maps of soil moisture for the regions where frequent thaws are observed during winter-time;

(f) Dates of the establishment and disappearance of snow cover;

(g) Annual snowmelt runoff depth for the flood period;

(h) Soil-moisture conditions at beginning of flood season;

(i) Distribution of precipitation over the catchment area on an annual and seasonal basis (different seasons);

(j) Distribution of runoff depth over the catchment area on an annual and seasonal basis (different seasons);

(k) Areas inundated by historical floods and extreme observed water levels;

(l) Areas inundated by floods of selected frequencies with emphasis on damage-prone areas.
2. Large-scale project-oriented hydrological maps that may be required for planning and designing water-resources projects:

(a) **Base maps**

Maps with a basic scale of 1:1 000 000 showing political boundaries, geographical co-ordinates, principal watershed boundaries, principal streams and hydrological and meteorological observing stations as follows:

(i) Hydrological observing stations

- Hydrometric stations
- Water-quality measuring stations
- Evaporation- and soil-moisture measuring stations
- Hydrological stations for specific purposes

(ii) Meteorological observing stations

- Synoptic stations
- Climatological stations
- Precipitation stations
- Snow-cover measuring stations

Where larger or smaller scales are more appropriate, some exact multiple of the above scale should be preferred.

(b) **Precipitation maps**

(Scale 1:1 000 000, if possible) showing the following:

- Mean annual precipitation isohyets for a specified base period, including mean monthly precipitation block diagrams for key stations

- Maximum precipitation isohyets for return periods of 2 to 100 years for various durations from 5 minutes to 72 hours. Where short-interval precipitation data are very scarce, durations of one day and three days should be used.

- Coefficient of variation of annual precipitation is of secondary importance.
(c) **Evaporation maps**

(Scale 1:1 000 000, if possible) showing the following:

- Mean annual potential evapotranspiration isolines, including block diagrams of monthly depths for key stations
- Mean annual pan-evaporation isolines, including block diagrams of monthly mean depths for key stations

(d) **Runoff maps**

(Scale 1:1 000 000, if possible) showing the following:

- Mean annual runoff-depth isolines for a specified base period, including block diagrams of mean monthly values for key stations
- Coefficient of variation of annual runoff

For each major river system, a diagram showing mean annual runoff depth as a function of drainage area (logarithm) would be useful for regions where it is necessary to draw runoff maps for a specified catchment size.

(e) Maps to the same scale, if possible, showing some water-quality parameter such as average annual total dissolved solids along streams, perhaps by colour code.
## ANNEX IV

Annex to paragraph 15.2.3 of the general summary

### LIST OF TECHNICAL REPORTS AND GUIDANCE MATERIAL IN HYDROLOGY

PREPARED BY CHy, WITH RECOMMENDED PRIORITIES FOR PUBLICATION

DURING THE PERIOD 1976-1980*

---

I. Publications being prepared on the recommendation of CHy-IV and in accordance with further decisions of the president of CHy

<table>
<thead>
<tr>
<th>Priority</th>
<th>Subject (paragraph of CHy-V report)</th>
<th>WMO series</th>
<th>Status</th>
</tr>
</thead>
<tbody>
<tr>
<td>(a)</td>
<td>Manual on stream gauging (8.0.2)</td>
<td>OHP</td>
<td>Final draft</td>
</tr>
<tr>
<td>(a)</td>
<td>Snow-cover measurements and areal assessment of precipitation and soil moisture for hydrological purposes (7.0.2)</td>
<td>TN</td>
<td>Final draft</td>
</tr>
<tr>
<td>(a)</td>
<td>Technical papers for the Casebook of hydrological network design practices</td>
<td>OHP</td>
<td>Ready for print</td>
</tr>
<tr>
<td>(a)</td>
<td>Snow studies by satellite (Final report of the WMO project) (9.1.6)</td>
<td>TN Final draft</td>
<td>Not decided</td>
</tr>
<tr>
<td>(a)</td>
<td>Casebook on operational assessment of areal evaporation (14.2.1)</td>
<td>OHP</td>
<td>Material collected, outline prepared</td>
</tr>
</tbody>
</table>

---

* Notes:

1. The above list does not include publications already approved by the president of CHy and which are at the printing stage in the WMO Secretariat;

2. The president of CHy, in consultation with the CHy Advisory Working Group, may, as appropriate, change the order of priority of the publications;

3. (a) First priority; (b) Second priority; (c) Third priority.
(a) New methods in hydrological forecasting (11.0.1) TN Final draft
(a) Remote sensing applications to hydrology (9.1.5) TN Final text
(a) WMO hydrological codes for hydrology (9.2) Partly ready
(a) Measurement of sediment transport (8.4) OHP First draft
(b) Water-quality measurements (8.5) TN First draft

II. Publications recommended by CHy-V

(a) Hydrological network design (6.1.3) Outline prepared
(a) Supplements to Guide to hydrological practices (5.1.5) Guides
(a) Operation of hydrometric networks (8.7) First draft
(b) Hydrological applications of atmospheric vapour-flux analysis (12.2.5) Final text available
(b) State-of-the-art on combined effects of storm surges and floods (Resolution 10 (CHy-V)) Yet to be prepared
(b) Case studies on planning, development and organization of national data banks (9.1.4) Yet to be prepared
(c) Relationship between hydrological data, hydrological projects and water quality (10.3) First draft
(c) Manual on groundwater-observing programmes (8.6) Yet to be prepared
### ANNEX V

Annex to paragraph 15.3.2 of the General Summary

**LIST OF HYDROLOGICAL SYMPOSIA, TECHNICAL CONFERENCES, WORKSHOPS AND SEMINARS PLANNED FOR THE PERIOD 1976-1980**

#### A - Symposia, technical conferences

<table>
<thead>
<tr>
<th>Date</th>
<th>Title</th>
<th>Place</th>
<th>Organizer**</th>
<th>Working languages</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>2-4.VIII.1976</td>
<td>Second International Symposium on Stochastic Hydraulics</td>
<td>Lund, Sweden</td>
<td>IAHR</td>
<td>E</td>
<td></td>
</tr>
<tr>
<td>17-22.X.1976</td>
<td>International Conference on Water-pollution Research</td>
<td>Sydney, Australia</td>
<td>IANPR</td>
<td>E</td>
<td></td>
</tr>
<tr>
<td>14-25.III.1977</td>
<td>UN Water Conference</td>
<td>Mar del Plata, Argentina</td>
<td>UN</td>
<td>E/F/R/S</td>
<td>Discussed under Item 18.5</td>
</tr>
<tr>
<td>2-7.X.1977</td>
<td>Symposium on the Effects of Urbanization and Industrialization on the Hydrological Cycle and Water Quality</td>
<td>Amsterdam, Netherlands</td>
<td>Unesco/WMO/IAHS</td>
<td>E</td>
<td>Under consideration</td>
</tr>
<tr>
<td>1978</td>
<td>Symposium on Research of Régime of Ground-water and its Prediction in Urban and Industrial Areas and in Irrigated Areas</td>
<td>-</td>
<td>Unesco/IAHS</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>1979</td>
<td>Symposium on Specific Aspects of Hydrological Computation for Water Planning</td>
<td>-</td>
<td>Unesco/WMO/IAHS</td>
<td>-</td>
<td>Under consideration</td>
</tr>
<tr>
<td>1980</td>
<td>Symposium on Extrapolation of Data from Representative and Experimental Basins to Large Basins (with special effects of man's activities on hydrological and hydrogeological processes and on the environment)</td>
<td>-</td>
<td>Unesco/FAO/IAHS</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>1980</td>
<td>Symposium on Application of Nuclear Techniques and Instruments in the Study of Surface and Sub-surface Waters</td>
<td>-</td>
<td>IAEA/Unesco</td>
<td>-</td>
<td></td>
</tr>
</tbody>
</table>

*Based on information available in the WMO Secretariat in December 1975.
**The convener is listed first.
<table>
<thead>
<tr>
<th>Date</th>
<th>Title</th>
<th>Place</th>
<th>Organizer*</th>
<th>Working languages</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>27.9-2.10.1976</td>
<td>Unesco-WMO Workshop on the Water Balance of Europe</td>
<td>Varna, Bulgaria</td>
<td>Unesco/WMO</td>
<td>E</td>
<td>Approved by WMO Executive Committee</td>
</tr>
<tr>
<td>19-22.10.1976</td>
<td>International Working Seminar on Snow Studies by Satellites</td>
<td>Geneva, Switzerland</td>
<td>WMO</td>
<td>E</td>
<td>Approved by WMO Executive Committee</td>
</tr>
<tr>
<td>May/June 1977</td>
<td>Workshop on Socio-economic Aspects of Urban Hydrology</td>
<td>Stockholm, Sweden</td>
<td>Unesco</td>
<td>E</td>
<td></td>
</tr>
<tr>
<td>1977</td>
<td>Workshop on Hydrological Problems arising from Development of Energy Resources, including Power Generation, Mining, Hydrology, Geothermal Energy and Energy Storage by Water Impoundment</td>
<td></td>
<td>Unesco/FAO/IAHS</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>1977</td>
<td>Workshop on Results of World Glacier Research</td>
<td></td>
<td>Unesco/IAHS</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>1977</td>
<td>Workshop on Impact of Urbanization on Regional and National Water Planning and Management</td>
<td>Amsterdam, Netherlands</td>
<td>Unesco/UN</td>
<td>E</td>
<td></td>
</tr>
<tr>
<td>1978</td>
<td>Workshop on Use of Mathematical Models and Systems Analysis in Investigations on Representative and Experimental Basins</td>
<td></td>
<td>Unesco/WMO/IAHS</td>
<td>-</td>
<td>Under consideration</td>
</tr>
</tbody>
</table>

* The convenor is listed first.
ANNEX VI

Annex to Resolution 1 (CHy-V)

TERMS OF REFERENCE OF RAPPORTEURS OF THE WORKING GROUP
ON THE GUIDE AND TECHNICAL REGULATIONS

Part A

Terms of reference of the Rapporteur on Standardization

(a) To prepare a summary of accuracy requirements for measurement of different hydrological elements for inclusion in the Guide and on the basis of this material to prepare the relevant items for inclusion in the Technical Regulations;

(b) To monitor and review the entire field of standardization efforts by CHy and particularly that of the CHy Working Groups on Improvement and Standardization of Instruments and Methods of Observation for Hydrological Purposes and on Hydrological Data Transmission, Processing and Retrieval;

(c) To consolidate and review proposals on standards which could be internationally adopted;

(d) To refer the material and the proposals prepared under (a) and (c) to the chairman of the Working Group on the Guide and Technical Regulations;

(e) To keep abreast of the developments of other international organizations, and of ISO in particular, concerning standardization on matters of interest to CHy;

(f) To submit a final report to the Commission through the chairman of the Working Group on the Guide and Technical Regulations, not later than seven months before the sixth session of the Commission.

*
Part B
Terms of reference of the Rapporteur on Accuracy of Hydrometric Measurements

(a) To collect information and to prepare a report on accuracy in discharge measurements including:

(i) Definitions of terms used in accuracy of hydrometric measurements such as "accuracy", "uncertainty", "error", "precision" and "resolution" and statistical aspects of these definitions;

(ii) Determination of the uncertainty values for different types of instruments and methods:
- Current meters;
- Measuring structures;
- Dilution gauging;
- Ultrasonic method;
- Electromagnetic method;

(iii) Uncertainty in the stage-discharge relation (standard error of estimates and standard error of the mean);

(iv) Uncertainty in the daily mean discharge, monthly mean and annual discharge;

(b) To review the levels of accuracy of hydrological observations as specified in the WMO Technical Regulations for hydrology in the light of the state of the art and to prepare proposals for levels of accuracy requirements for various needs of data users;

(c) To co-ordinate the work to be undertaken under (a) and (b) above with the Rapporteur on Standardization and to submit the prepared material to the chairman of the Working Group on the Guide and Technical Regulations;

(d) To assist as required the president of CHy and the WMO Secretariat in questions regarding CIMO activities relevant to accuracy of measurements;

(e) To keep abreast of the work of the ISOTC 113 in the field of accuracy of hydrometric measurements;

(f) To prepare material for inclusion in the Guide and Technical Regulations;

(g) To submit a final report to the Commission through the chairman of the Working Group on the Guide and Technical Regulations, not later than seven months before the sixth session of the Commission.
ANNEX VII

Annex to Resolution 2 (CHy-V)

TERMS OF REFERENCE OF THE RAPPORTEURS OF THE WORKING GROUP ON
NETWORK DESIGN AND AREAL ASSESSMENT OF HYDROLOGICAL ELEMENTS

Part A

Terms of reference of the Rapporteur on Network Design and Evaluation

(a) To prepare a comprehensive technical report that will provide a detailed and
co-ordinated reference in the current status of network design;

(b) To provide technical assistance to the chairman of the working group regarding
materials to be included in future editions of the Casebook on Hydrological
Network Design Practice;

(c) To prepare a revised draft for Chapter 3, "Design of network", of the Guide to
reflect new and proved procedures on network design practices;

(d) To co-operate closely with other members of the working group and in particular
with the Rapporteur on Network Design under Special Conditions;

(e) To submit a report to the Commission through the chairman of the Working Group
on Network Design and Areal Assessment of Hydrological Elements, not later than
seven months before the sixth session of the Commission.
Part B

Terms of reference of the Rapporteur on Network Design under Special Conditions

(a) To assist the WMO Secretariat in providing advice, as requested by Members, regarding network design under special conditions;

(b) To formulate a strategy for the design of networks in regions where few or no data exist and for regulated streams and under other special conditions, and to enumerate techniques that can be used within this strategy;

(c) To examine existing network design techniques for potential application to deal with the growing need for new kinds of water information;

(d) To co-operate with the Rapporteur on Network Design and Evaluation on matters of mutual concern;

(e) To prepare material for inclusion in Chapter 3, "Design of networks", of the Guide;

(f) To submit a final report to the Commission, through the chairman of the Working Group on Network Design and Areal Assessment of Hydrological Elements, not later than seven months before the sixth session of the Commission.
Part C

Terms of reference of the Rapporteur on Environmental Monitoring

(a) To keep abreast, in co-operation with the WMO Secretariat, of the developments at the national, sub-regional, regional and global levels in the field of monitoring of environmental parameters of relevance to the terms of reference of the Commission for Hydrology;

(b) To advise the president of the Commission, the Secretary-General and other relevant WMO bodies on action to be taken in connexion with the developments indicated in (a) above;

(c) To co-operate with the WMO Secretariat in the preparation of a chapter on measuring networks for ascertaining the influence of man on the natural hydrological régime for the relevant Unesco IHP publication;

(d) To propose a definition of various objectives for the design of networks for measuring water quality, and of the parameters to be measured, and on the basis of these objectives to ascertain methods available for water quality measuring network design;

(e) To co-operate with the Rapporteur on Network Design and Evaluation on questions of reliability of water quality and quantity measuring networks;

(f) To ascertain, in co-operation with the WMO Secretariat, experience with the present involvement of Hydrological Services in water quality measuring network design and operation and, on the basis of this experience, to present proposals to the next session of the Commission on possible recommendations of CHy on this subject;

(g) To submit a final report to the Commission through the chairman of the Working Group on Network Design and Areal Assessment of Hydrological Elements not later than seven months before the sixth session of the Commission.

*  *

*  *
Part D

Terms of reference of the Rapporteur on
Areal Assessment of Evaporation and Soil Moisture

(a) To complete the manuscript of the Casebook, presenting typical examples of the most important and useful operational methods applied in various climatic zones, for areal assessment of evaporation in its different forms, including evaporation from free water surface with notes on the variations introduced by countries employing basically the same methods;

(b) To bear in mind, in the fulfilment of (a) above, that emphasis must be placed on those procedures which are of practical use in operational hydrology, and not on problems of achieving greater accuracy and refinement in scientific research;

(c) To keep abreast of the work of the ICID Committee on Evapotranspiration;

(d) To prepare material on methods for network design techniques for soil-moisture observations;

(e) To ensure liaison between CHy and the CIMO Working Group on Measurements of Precipitation, Evaporation and Soil Moisture;

(f) To extract from (a) and (d) above material suitable for inclusion in the Guide and the Technical Regulations;

(g) To submit the material in (f) to the chairman of the Working Group on Network Design and Areal Assessment of Hydrological Elements for further submission to the Working Group on the Guide and Technical Regulations;

(h) To co-operate with the Secretariat, as requested, in WMO participation in the IHP Projects on Water Balance;

(i) To submit a final report to the Commission through the chairman of the Working Group on Network Design and Areal Assessment of Hydrological Elements not later than seven months before the sixth session of the Commission.

* * *
Part E

Terms of reference of the Rapporteur on Areal Assessment of Precipitation

(a) To keep abreast of developments concerning precipitation measurement by radar and other devices;

(b) To prepare a report on the most effective combination of radars, raingauges and streamflow gauges to produce hydrological forecasts;

(c) To extract from the report on (b) above suitable material for inclusion in the Guide;

(d) To submit the reports on (b) above and the material for the Guide to the chairman of the Working Group on Network Design and Areal Assessment of Hydrological Elements;

(e) To keep abreast of the work of CIMO and to ensure liaison between CHy and the CIMO Working Group on Measurements of Precipitation, Evaporation and Soil Moisture;

(f) To submit a final report to the Commission through the chairman of the Working Group on Network Design and Areal Assessment of Hydrological Elements, not later than seven months before the sixth session of the Commission.
ANNEX VIII

Annex to Resolution 4 (CHy-V)

TERMS OF REFERENCE OF RAPPORTEURS OF THE WORKING GROUP ON IMPROVEMENT AND STANDARDIZATION OF INSTRUMENTS AND METHODS OF OBSERVATION FOR HYDROLOGICAL PURPOSES

Part A

Terms of reference of the Rapporteur on Sediment Transport

(a) To complete and finalize the Technical Note on Measurement of River Sediments taking into full account the information available in Member countries.

The Technical Note should also include:

(i) Methods for the estimation of sediment transport under difficult conditions and their respective levels of accuracy;

(ii) A description of the volumetric measurement of sediments in reservoirs and traps and measurements of bed load transport based on geometry and migration velocity of sand banks or dunes;

(iii) Methodology for data processing of suspended sediment discharge;

(b) To assist the president of CHy and the WMO Secretariat, as requested, on activities concerned with WMO’s participation in inter-agency projects related with sediment transport;

(c) To prepare material for inclusion in the Guide and Technical Regulations;

(d) To submit a final report to the Commission through the chairman of the Working Group on Improvement and Standardization of Instruments and Methods of Observation for Hydrological Purposes not later than seven months before the sixth session of the Commission.

* *

*    *

*
Part B

Terms of reference of the Rapporteur on New Methods of Discharge Measurement

(a) To keep abreast of new instruments and new methods for the measurement of water levels and stream discharge;

(b) To prepare material for inclusion in a technical report on the following subjects:
   (i) Continuous discharge measurements by dilutions;
   (ii) Optical current meters;
   (iii) Flow measurements using aircraft;

(c) To prepare material on the above topics for inclusion in the Guide and Technical Regulations;

(d) To submit the material prepared under (b) and (c) above to the chairman of the Working Group on Improvement and Standardization of Instruments and Methods of Observation for Hydrological Purposes;

(e) To submit a final report to the Commission through the chairman of the Working Group on Improvement and Standardization of Instruments and Methods of Observation for Hydrological Purposes not later than seven months before the sixth session of the Commission.

* *

* * *
ANNEX VIII

Part C

Terms of reference of the Rapporteur on Levels and Discharge Measurements under Difficult Conditions

(a) To review practices and methods used for the measurement of levels and discharges under special conditions, including:

(i) Floods and low flows;

(ii) Semi-arid and arid zones;

(iii) Densely forested tropical areas;

(b) To prepare a technical report on the subject listed above;

(c) To prepare material on the above topics for inclusion in the Guide and Technical Regulations;

(d) To submit the material prepared under (b) and (c) above to the chairman of the Working Group on Improvement and Standardization of Instruments and Methods of Observation for Hydrological Purposes;

(e) To submit a final report to the Commission through the chairman of the Working Group on Improvement and Standardization of Instruments and Methods of Observation for Hydrological Purposes not later than seven months before the sixth session of the Commission.

*  

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*
Part D

Terms of reference of the Rapporteur on Intercomparison of Principal Hydrometric Instruments

(a) To review material on intercomparison of the hydrometric instruments using particularly the information gained from the first phase of the project on Intercomparison of Principal Hydrometric Instruments;

(b) To assist the WMO Secretariat in the implementation of the second phase of the Project on Intercomparison of Principal Hydrometric Instruments;

(c) To select for comparative tests additional hydrometric instruments (e.g. ultrasonic flow meters and sediment samplers) and snow density gauges and locations for testing, and to define the guidelines and develop the specifications for comparative tests;

(d) To analyse the data from the tests and prepare a report summarizing results of the analysis;

(e) To extract suitable material from (d) above for inclusion in the Guide;

(f) To submit a final report to the Commission through the chairman of the Working Group on Improvement and Standardization of Instruments and Methods of Observation for Hydrological Purposes not later than seven months before the sixth session of the Commission.
Part E

Terms of reference of the Rapporteur on Groundwater

(a) To prepare an operation manual on groundwater observation programmes, taking into consideration the Unesco publication "Groundwater studies";

(b) To prepare material describing design procedures for integrating surface water and groundwater yield (infiltration, spring flow, base flow and inter-flow) and exchanges between surface and groundwater under natural and man-affected conditions;

(c) To co-operate with the Rapporteur on Forecasting of Low Flows and Related Aspects of Droughts on all matters concerning forecasting of groundwater levels;

(d) To follow international developments in these fields, especially the work of the IHP Working Group on Long-term Predictions of Changes in Groundwater Resources due to Human Activities and to represent WMO, as appropriate, in the implementation of projects of other international organizations concerned with this subject, in particular the IHP projects;

(e) To prepare material on (a) and (b) for inclusion in the Guide;

(f) To submit a final report to the Commission through the chairman of the Working Group on Improvement and Standardization of Instruments and Methods of Observation for Hydrological Purposes not later than seven months before the sixth session of the Commission.

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Part F

Terms of reference of the Rapporteur on Remote Sensing of Hydrological Elements

(a) To finalize the Technical Note "Remote sensing applications to hydrology" prepared by the CHy-IV Rapporteur on Remote Sensing of Hydrological Elements;

(b) To keep abreast of the developments in remote sensing techniques and their application to hydrology;

(c) To advise and assist the chairman of the working group, the president of the Commission and the WMO Secretariat in all matters concerning remote sensing, particularly with regard to the completion of the project on snow studies by satellites and providing input to the hydrological component of the WMO satellite programme;

(d) To provide consultation to CHy bodies concerned with remote sensing;

(e) To extract material from (a) above for inclusion in the Guide;

(f) To submit a final report to the Commission through the chairman of the Working Group on Improvement and Standardization of Instruments and Methods of Observation for Hydrological Purposes not later than seven months before the sixth session of the Commission.
ANNEX IX

Annex to Resolution 7 (CHy-V)

TERMS OF REFERENCE OF RAPPORTEURS OF THE WORKING GROUP
ON HYDROLOGICAL DATA TRANSMISSION, PROCESSING AND RETRIEVAL

Part A

Terms of reference of the Rapporteur on
Application of WWW to Operational Hydrology

(a) To follow WWW developments as they may be related to operational hydrology and to advise the president of CHy on action to be taken by the Commission;

(b) To assist other WMO bodies, particularly WMO regional associations, in the planning and implementation of pilot studies on the application of WWW to operational hydrology in selected river basins;

(c) To maintain close liaison with other CHy working groups and rapporteurs, as appropriate, working in fields related with WWW;

(d) To ensure liaison as appropriate with other WMO bodies responsible for activities within the WWW programme;

(e) To submit a final report to the Commission through the chairman of the Working Group on Hydrological Data Transmission, Processing and Retrieval not later than seven months before the sixth session of the Commission.

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Part B

Terms of reference of the Rapporteur on Design of Automatic Telemetering and Satellite Data Transmission Systems

(a) To keep abreast of the regional plans and studies for automatic transmission of regional observations for international exchange of hydrological data, and to provide general guidance on application of automatic telemetering data-transmission systems in the Regions;

(b) To identify regional and national requirements for hydrological data transmission using the GTS, and to provide an interface with CBS for the purpose of preparing appropriate material for inclusion in the Manual on the GTS, as appropriate;

(c) To keep abreast of developments in the use of satellites for hydrological data transmission and, in close collaboration with the Rapporteur on Remote Sensing of Hydrological Elements, prepare a report especially in connexion with the WMO programme being implemented by the Executive Committee Panel of Experts on Satellites;

(d) To prepare material for inclusion in the Guide;

(e) To submit a final report to the Commission through the chairman of the Working Group on Hydrological Data Transmission, Processing and Retrieval not later than seven months before the sixth session of the Commission.

* *

* * *
(a) To prepare, in co-operation with the WMO Secretariat, material on the planning, development and organization of national hydrological data banks, possibly through a number of case studies of well-developed national banks. These case studies should include information on developing specific data archives for specific elements on the broader concept of co-ordinated data banks;

(b) To assist in the development of standard computer-compatible data formats which could be used for the transfer of large amounts of hydrological and related meteorological data needed for the development and testing of analysis techniques and for project design purposes, bearing in mind the principles outlined in the proposals concerning transfer of large volumes of non-real-time hydrological data prepared by the CHy-IV Working Group on Data Treatment;

(c) To keep abreast of developments in hydrological data processing, archiving and retrieval systems, especially in connexion with the GDPS, and to prepare specifications for the different elements of these systems based on the technical report prepared by the CHy-IV Rapporteur on Hydrological Data Collection and Processing Systems;

(d) To submit a final report to the Commission through the chairman of the Working Group on Hydrological Data Transmission, Processing and Retrieval not later than seven months before the sixth session of the Commission.

* * *
ANNEX IX

Part D

Terms of reference of the Rapporteur on Hydrological Codes

(a) To investigate whether WMO hydrological codes are being used, meet requirements and need amendment;

(b) To develop new codes in accordance with the requirements of the Hydrological Services and propose amendments to the existing codes when necessary;

(c) To keep abreast of the implementation of WMO hydrological codes in different Regions;

(d) To prepare material for inclusion in the Guide, Technical Regulations and Manual on Codes;

(e) To ensure liaison with the CBS Working Group on Codes;

(f) To submit a final report to the Commission through the chairman of the Working Group on Hydrological Data Transmission, Processing and Retrieval not later than seven months before the sixth session of the Commission.
ANNEX X

Annex to Resolution 9 (CHy-V)

TERMS OF REFERENCE OF RAPPORTEURS OF THE
WORKING GROUP ON DESIGN DATA FOR PROJECTS

Part A

Terms of reference of the Rapporteur on Extremes of Precipitation

(a) To prepare a report dealing with probabilistic approaches and statistical procedures for the computation of extremes of precipitation (depth and intensities). This report should include examples of objective tests of applicability of statistical distribution functions to different types of data and different purposes. It should also include homogeneity tests for the available time-series records and recommendations for their selection;

(b) To consider the possibility of preparation of guidance material on the estimation of PMP in tropical regions;

(c) To extract material from (a) above for inclusion in the Guide;

(d) To submit material on (a), (b) and (c) above to the chairman of the Working Group on Design Data for Projects as soon as possible;

(e) To keep abreast of the work of the CoSAMC Working Group on Statistical Methods and the Use of Mathematical Models in Climatology and Special Applications of Meteorology;

(f) To submit a final report to the Commission through the chairman of the Working Group on Design Data for Water Resources Projects not later than seven months before the sixth session of the Commission.

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Part B

Terms of reference of the Rapporteur on Standardization of Requirements for and Accuracy Levels of Hydrological Design Data

(a) To monitor and review the field of standardization of requirements for hydrological data needed in the planning and design of water resources projects;

(b) To review current methods for the determination of accuracy levels of hydrological design data used as input in the planning and design of water resources projects, bearing in mind the needs of users;

(c) To prepare, in co-operation with relevant Unesco IHP bodies, a report on (a) and (b) above for submission to the chairman of the Working Group on Design Data for Projects;

(d) To extract material from (c) above for inclusion in the Guide to Hydrological Practices;

(e) To submit a final report to the Commission through the chairman of the Working Group on Design Data for Water Resources Projects not later than seven months before the sixth session of the Commission.

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Part C

Terms of reference of the Rapporteur on Secondary Data-treatment Procedures

(a) To collect examples of the type of information thought to be appropriate in the description of the procedures used in secondary data treatment for both hydrological and meteorological data, the latter for hydrological purposes. A proposed outline of the contents of these descriptions is given in the appendix to this annex;

(b) To compile a casebook on different ways of solving specified problems on the basis of the examples collected under (a) above;

(c) To finalize the preliminary report reviewing the replies to the questionnaire on secondary data treatment distributed to WMO Members in 1973;

(d) To co-operate with the president of the Commission and with the WMO Secretariat on all matters concerning the possible establishment of an information bank at the WMO Secretariat where interested Members might obtain details on where to acquire advice on solving specified data-treatment problems;

(e) To extract material from (b) above for inclusion in the Guide;

(f) To submit all the material prepared under his terms of reference to the chairman of the Working Group on Design Data for Projects;

(g) To submit a final report to the Commission through the chairman of the Working Group on Design Data for Projects not later than seven months before the sixth session of the Commission.

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Appendix

Specifications for descriptions of algorithms and techniques for analytical methods in secondary data treatment

A. General description of the computation

Objectives and short descriptions of the main programme steps, including a generalized flow chart of the system.

Indication of important algorithms.

References to publications.

B. Input-output requirements

Input: Type of data analysed: intensities, volumes, hourly, daily, etc.

Storage media: cards, magnetic tapes, discs.

Data format.

Output: Description of the output data.

Form of the data: lists, cards, magnetic tapes, discs, charts.

Submit examples.

C. Computer, details

Name of computer.

Kind and number of peripheral units needed for this programme.

Core size needed.

Computer time with and without input-output.

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ANNEX X

Part D

Terms of reference of the Rapporteur on Extrapolation of Design Data

(a) To prepare a report in co-operation with relevant Unesco IHP projects, dealing, in an integrated way, with simultaneous and joint use of simulation, statistical and geomorphological techniques in the extrapolation of design data;

(b) To extract material from (a) above for inclusion in the Guide;

(c) To submit material on (a) and (b) above to the chairman of the Working Group on Design Data for Projects as soon as possible;

(d) To submit a final report to the Commission through the chairman of the Working Group on Design Data for Water Resources Projects not later than seven months before the sixth session of the Commission.

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Part E


(a) To generalize the experience of Members in the use of hydrological data for the design of water-management projects;

(b) To summarize the experience of Members on the methods of cost/benefit assessment of the use of hydrological data for the design of projects for water-resource development and protection, including the use of operational systems;

(c) To submit material on (a) and (b) above to the chairman of the Working Group on Design Data for Projects as soon as possible;

(d) To submit a final report to the Commission through the chairman of the Working Group on Design Data for Water Resources Projects not later than seven months before the sixth session of the Commission.
ANNEX XI

Annex to Resolution 10 (CHy-V)

TERMS OF REFERENCE OF RAPPORTEURS OF THE WORKING GROUP
ON HYDROLOGICAL FORECASTING

Part A

Terms of reference of the Rapporteur on Multi-purpose Basin Simulation Sub-system

(a) To review and evaluate the structure of the models tested in the WMO Project on Intercomparison of Conceptual Models used in Operational Hydrological Forecasting in order to present the various components in a multi-purpose basin simulation sub-system for use in different computers. The sub-system should permit a user to select the model and sub-routines most appropriate to his needs;

(b) To prepare material for inclusion in the Guide;

(c) To submit a final report to the Commission through the chairman of the Working Group on Hydrological Forecasting not later than seven months before the sixth session of the Commission.

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PART B

Terms of reference of the Rapporteur on Models for Snowmelt Runoff

(a) To serve as a focal point for and co-operate with the WMO Secretariat in the initiation of a project on the intercomparison of conceptual models for snowmelt runoff;

(b) To submit a final report to the Commission through the chairman of the Working Group on Hydrological Forecasting not later than seven months before the sixth session of the Commission.

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PART C

Terms of reference of the Rapporteur on On-the-line Forecasting Systems

(a) To collect information from Members on the status of automation in their operational hydrological forecasting systems;

(b) To assess the feasibility of applying fully automated on-the-line systems to developing countries;

(c) To submit a final report to the Commission through the chairman of the Working Group on Hydrological Forecasting not later than seven months before the sixth session of the Commission.

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* *
Part D

Terms of reference of the Rapporteur on Forecasting of Low Flows and Related Aspects of Droughts

(a) To keep abreast of and collect information on studies carried out in the field of forecasting of droughts and groundwater levels and yield, the latter in cooperation with the CHy Rapporteur on Groundwater appointed by Resolution 4 (CHy-V), and to prepare a report on the application of these studies to low flow forecasting;

(b) To prepare an outline of basic errors commonly committed in correlation of series;

(c) To prepare suitable material from (a) above for inclusion in the Guide and to submit it to the chairman of the Working Group on Hydrological Forecasting;

(d) To co-operate with IAHS in the expansion and completion of the WMO/IAHS report on "Drought conditions in tropical and sub-tropical regions, with special reference to the drought of 1972 in Africa";

(e) To follow related activities of other WMO bodies as appropriate and, in particular, to provide liaison with CAS on matters related to forecasting of continental droughts and desertification;

(f) To co-operate with the Unesco IHP Working Group on Computation of Low Flows and with the IHP Project on Hydrological Aspects of Droughts;

(g) To submit a final report to the Commission through the chairman of the Working Group on Hydrological Forecasting not later than seven months before the sixth session of the Commission.

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Part E

Terms of reference of the Rapporteur on Long-range Water-supply Forecasting

(a) To prepare a state-of-the-art paper on methods for long-range water-supply availability forecasting (two to four months);

(b) To collect information on the feasibility of combining conceptual deterministic models and statistical data simulation for long-range water-supply availability forecasting;

(c) To prepare material for inclusion in the Guide and Technical Regulations;

(d) To submit a final report to the Commission through the chairman of the Working Group on Hydrological Forecasting not later than seven months before the sixth session of the Commission.

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Part F

Terms of reference of the Rapporteur on Flash Floods

(a) To prepare a technical report covering:

(i) Definition of flash floods;

(ii) Historical experience related to flash floods in Member countries;

(iii) Possible non-structural solutions to flash-flood problems:
   - Meteorological and hydrological guidance material, including techniques on flash-flood forecasting;
   - Radar detection techniques;
   - Satellite applications;
   - Establishing networks;
   - Warning systems;

(iv) Community involvement;

(b) To advise the chairman of the working group, the president of the Commission and the WMO Secretariat on relevant developments;

(c) To maintain liaison with the appropriate body of CAS with respect to research on quantitative precipitation forecasts;

(d) To prepare material for inclusion in the Guide;

(e) To submit a final report to the Commission through the chairman of the Working Group on Hydrological Forecasting not later than seven months before the sixth session of the Commission.
INTEGRATED OPERATIONAL HYDROLOGICAL SYSTEM (IOHS)

1. The IOHS is conceived as an operational hydrological facility, the purpose of which is to service water resources management programmes and projects in need of a real-time and/or historical design data base, including an engineering application of hydrology and planning of water resources management and development. It should integrate observing, transmitting, processing and modelling (for the needs of decision-making) sub-systems into a comprehensive, modular system. It is expected to be designed for application in a maximum number of basins with different climatic and physiographic condition, in various stages of development of hydrological information in the basin.

2. The IOHS should be a physical, operational tool consisting of facilities that could be implanted for use at the national and/or regional level in a wide range of diverse conditions. It should be conceived as a dynamic system which can be continuously updated to incorporate new developments in techniques and equipment along the principles which govern the development of WMO with which the IOHS is expected to interface in several of its sub-systems. It is expected that the IOHS will be developed on the basis of existing (off-the-shelf, operationally tested) procedures, techniques and equipment, of different degrees of technological advancement, with the direct cooperation of national Services and institutions of WMO Members. An example of the principle of the IOHS is illustrated in the attached flow-chart.

3. The IOHS could be of particular use for the needs of developing countries, but its modular character, consisting of interchangeable yet mutually compatible elements (sub-systems) should permit its use in all conditions of economic development. While conceived particularly for purposes of hydrological forecasting, it should be able to supply design data and be used for the operation of water resources management projects, assessment of water supply for the needs of population, agriculture or industry, assessment of water resources for planning purposes, etc. Within the scope of WMO's OHP and the activities of CHy, the IOHS should be an integration of the Commission's efforts within the priorities established by CHy-VII, but directed towards maximum operational impact. As it is obvious that every national hydrological and/or water resources Service will have to establish a system similar to the IOHS at some stage in its development, it is assumed that the development of the IOHS, under the auspices of WMO, will represent considerable financial benefit for the majority of WMO Members, particularly for developing countries. Although the ascertaining of the actual cost/benefit effect of the IOHS will be possible only after it has been used in a number of cases with different initial conditions, a preliminary feasibility study should contain a tentative cost/benefit evaluation of the system.
4. The planning and feasibility studies of the IOHS should be co-ordinated by the WMO Secretariat under the guidance of the CHy Advisory Working Group as a steering committee with a direct input from the majority of the CHy working groups and rapporteurs. Furthermore, experimental studies of the system should be conducted in certain river basins, preferably in the WMO technical co-operation projects suitable for installation of the system. The time-schedule for the preparation of the detailed plan for the implementation of the IOHS, including the experiments and relevant studies, should be set so that this plan can be submitted, after circulation to CHy members, to the Executive Committee in time for submission to Cg-VIII, with the execution of the IOHS scheduled to start in 1980, after approval and budget allocation for its implementation by Congress.
ANNEX XII

MAIN FLOW-CHART OF SUB-SYSTEMS (EXAMPLES)

THE SYSTEM

CHy input: material prepared by CHy working groups and rapporteurs

- Working group on networks
- Working group on instruments
- Rapporteurs

- Working group on data transmission and processing

- Working group on design data
- Working group on hydro-forecasting

OBSERVATIONAL FACILITIES (INSTRUMENTS)

DATA BANK

TRANSMISSION OF DATA

PROCESSING OF DATA

GROUNDWATER SOIL-MOISTURE MODELLING

PRECIPITATION EVAPORATION SNOWPACK MODELLING

WATER QUALITY MODELLING

STREAMFLOW WATER-SUPPLY MODELLING

WATER RESOURCES MANAGEMENT DECISION-MAKING

OTHER RELEVANT INPUTS, e.g. WATER USE AND WATER DISPOSAL DATA, ECONOMICS, ETC.

ECONOMIC, SOCIAL, POLITICAL AND ENVIRONMENTAL DECISION-MAKING

DMSS

OFSS

TSS

PRSS

MODSS

Chy Advisory Working Group

Steering Committee
ANNEX XIII

Annex to Recommendation 10 (CHy-V)

SUBJECTS RECOMMENDED BY CHy-V TO BE IMPLEMENTED BY REGIONAL ASSOCIATION WORKING GROUPS ON HYDROLOGY, POSSIBLY IN ASSOCIATION WITH CHy

1. Updating of statistical information on networks (see agenda item 6, CHy-V abridged final report).

2. Contributions to the case studies of examples of hydrometric measurements (including sediments) under difficult conditions (see agenda item 8).

3. Completion and updating of information on national data banks (see agenda item 9).

4. Introduction and further action on improvement of WMO hydrological codes (see agenda item 9).

5. Planning and implementation of pilot studies in selected basins on the application of WWW to hydrology (see agenda item 12).

6. Small- and large-scale hydrological maps and surveys of needs of hydrological maps in different WMO Regions (see agenda item 14).

7. Regional training of hydrological technicians (see agenda item 17).
ANNEX XIV

Annex to Recommendation 11 (CHy-V)

PROPOSED ACTIVITIES IN CO-OPERATION WITH UNESCO IHP AND PROGRAMMES IN HYDROLOGY OF OTHER ORGANIZATIONS

<table>
<thead>
<tr>
<th>WMO IDENTIFICATION CODE</th>
<th>Unesco IHP PROJECT</th>
<th>Unesco IHP PROJECTS TO WHICH WMO MAY CONTRIBUTE</th>
<th>OTHER ORGANIZATIONS INVOLVED</th>
</tr>
</thead>
<tbody>
<tr>
<td>INA 1.1</td>
<td>1.1</td>
<td>Preparation of a state-of-the-art report on methods of computation of water balances, including operational water balances for short periods (ten days, a month, a season, a year) for river basins, on the basis of information collected by participating countries</td>
<td></td>
</tr>
<tr>
<td>INA 1.2</td>
<td>1.4</td>
<td>Methods of computation of large-scale water balances based on air-moisture flux and distributed system modelling</td>
<td>IAHS</td>
</tr>
<tr>
<td>INA 1.3</td>
<td>2.1</td>
<td>Computation of the global and continental water balances</td>
<td></td>
</tr>
<tr>
<td>INA 1.3.1</td>
<td></td>
<td>2.1.1 Global water balance</td>
<td></td>
</tr>
<tr>
<td>INA 1.3.2</td>
<td></td>
<td>2.1.3 Computation of water balances of continents - Phase I: Europe</td>
<td></td>
</tr>
<tr>
<td>INA 1.4</td>
<td>2.3</td>
<td>Computation of water balances of seas and oceans</td>
<td>IOC</td>
</tr>
<tr>
<td>INA 1.5</td>
<td>2.6</td>
<td>Development of hydrological maps and improvement of methodology for hydrological mapping</td>
<td>IAHS</td>
</tr>
<tr>
<td>INA 2.1</td>
<td>3.1</td>
<td>Generalization of results of research for computation of average, maximum and minimum flow under various natural conditions, including the case of inadequate data</td>
<td>IAHS</td>
</tr>
<tr>
<td>INA 2.2</td>
<td>3.4</td>
<td>Fluctuations and long-term trends in the hydrological régime as related to climatic factors</td>
<td></td>
</tr>
</tbody>
</table>

(contd.)
**ANNEX XIV**

### Unesco IHP Projects to Which WMO May Contribute Involved Organizations

<table>
<thead>
<tr>
<th>WMO Identification Code</th>
<th>Unesco IHP Project</th>
<th>Unesco IHP Projects TO WHICH WMO MAY CONTRIBUTE</th>
<th>OTHER ORGANIZATIONS INVOLVED</th>
</tr>
</thead>
<tbody>
<tr>
<td>INA 3.1</td>
<td>4.2</td>
<td>Use of mathematical models and systems analysis in investigations on representative and experimental basins</td>
<td>IAHS</td>
</tr>
<tr>
<td>INA 3.2</td>
<td>6.3</td>
<td>Mathematical modelling for water-quality forecasting in rivers, lakes and reservoirs</td>
<td>WHO, UNEP</td>
</tr>
<tr>
<td>INA 4.1</td>
<td>8.5</td>
<td>Development of new, and improvement of existing, techniques and instruments for observation of groundwater régime, including moisture transmission in the zone of aeration, using geophysical and other research methods</td>
<td>IAEA, UN</td>
</tr>
</tbody>
</table>

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### Related Projects to Be Executed in Co-operation With FAO

<table>
<thead>
<tr>
<th>WMO Identification Code</th>
<th>FAO Project No.</th>
<th>PROJECTS TO BE EXECUTED IN CO-OPERATION WITH FAO</th>
<th>RELATED WMO IHP PROJECTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>INA 5</td>
<td>1.2.2</td>
<td>Standardization of methods of measurement and estimation of crop water requirements</td>
<td>4.3 4.4</td>
</tr>
<tr>
<td>INA 6</td>
<td>1.2.1</td>
<td>Hydrological data collection, processing and presentation for field projects in agriculture</td>
<td>5.2 5.3</td>
</tr>
<tr>
<td>INA 7</td>
<td>1.3.1</td>
<td>Study of droughts and their effects on crops and weather modifiers to increase available water for agriculture</td>
<td>7.3, 9</td>
</tr>
</tbody>
</table>

* * *
<table>
<thead>
<tr>
<th>WMO IDENTIFICATION CODE</th>
<th>RELATED PROJECT NO.</th>
<th>PROJECTS IMPLEMENTED BY MULTI-ORGANIZATION CO-OPERATION</th>
<th>Unesco IHP NO.</th>
<th>CO-OPERATING ORGANIZATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>INA 8.1</td>
<td>3.4</td>
<td>Multipurpose environmental monitoring network design (air-water pollution - physical, chemical and biological) and establishment of scientific principles for organization of stations performing complex observations of the environmental pollution (pollution of surface and sub-surface water)</td>
<td>IV</td>
<td>FAO, Unesco, UN, UNEP, WHO</td>
</tr>
<tr>
<td>INA 8.2</td>
<td>6</td>
<td>Environmental impact of man's activity on pollution of water, including thermal pollution</td>
<td>6</td>
<td>Unesco, FAO, WHO, UNEP</td>
</tr>
<tr>
<td>INA 9</td>
<td>4</td>
<td>Inter-agency co-ordination on standardization in hydrology and related fields, including terminology</td>
<td></td>
<td>FAO, IAEA, Unesco, WHO, ISO, IAHS</td>
</tr>
<tr>
<td>INA 10</td>
<td>7.1</td>
<td>Use of operations research in water resources systems simulation and optimization</td>
<td>3.7</td>
<td>FAO, Unesco, UN, IAHS</td>
</tr>
<tr>
<td>INA 12</td>
<td>7.4</td>
<td>Estimation of the changes in the salty/freshwater balance (for surface and groundwater in deltas, estuaries and coastal zones due to structural works and groundwater exploitation)</td>
<td>5.6</td>
<td>Unesco, FAO, IOC</td>
</tr>
<tr>
<td>INA 13</td>
<td>7.5</td>
<td>Study and mitigation of disastrous effects of droughts (in particular in the Sudano-Sahelian region of Africa)</td>
<td>3.5</td>
<td>FAO, Unesco, UNEP</td>
</tr>
</tbody>
</table>
# LIST OF DOCUMENTS

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<th>Submitted by</th>
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<td>Explanatory memorandum to the provisional agenda</td>
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<td>Rapporteur</td>
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<td>Collection and processing systems, including remote sensing - Report of the Rapporteur on Hydrological Data Collection and Processing Systems</td>
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<td>Secretary-General</td>
</tr>
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<td>Symposia, technical conferences and seminars</td>
<td>15.3</td>
<td>Secretary-General</td>
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<td>8</td>
<td>Technical co-operation and related projects</td>
<td>17</td>
<td>Secretary-General</td>
</tr>
<tr>
<td>9</td>
<td>Hydrological instruments and methods of observation - Report of the Working Group on Hydrological Instruments and Methods of Observation</td>
<td>(8.1) (8.2) (8.3) (8.4) (8.5) (8.6) (8.7)</td>
<td>Chairman, working group</td>
</tr>
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