

WORLD METEOROLOGICAL ORGANIZATION



WORKING GROUP ON HYDROLOGY

Regional Association VI (Europe)

Eighth Session

**Helsinki, Finland
(21-25 October 1997)**

REPORT

1. OPENING OF THE SESSION

1.1 The eighth session of the Working Group on Hydrology (WGH) of the WMO Regional Association VI (Europe) was held on the premises of the Finnish Environment Institute (FEI) in Helsinki, Finland, from 21 to 25 October 1997. A list of participants is contained in Annex I to this report.

1.2 In opening the session, Prof. F. Nobilis, the Acting Chairman of the Working Group, welcomed the participants, especially those who were attending for the first time. He noted that their expertise, activities and optimism were necessary for the promotion of operational hydrology in situations of restricted funds, staff cuts and organizational changes.

1.3 The opening of session was addressed by Dr E. Jatila, Permanent Representative of Finland with WMO and by Dr L. Kauppi, Director General of the Finnish Environment Institute. In his remarks Dr Jatila stressed the value of and the need for, cooperation in meteorology and hydrology both at international and national level. He cited the European Centre for Medium-range Weather Forecast (ECMWF), EUMETSAT and the EUMETNET as good examples of cooperation in meteorology. He noted, however, that there is still scope for improved cooperation between hydrology and meteorology in Europe. In this context he noted that some of the programmes developed under the EUMETNET, as well as in the Terms of Reference of the EUMETSAT Satellite Application Facilities (SAFs), although not explicitly addressing hydrology, contained hydrological components. He suggested that it might be appropriate to identify new potential areas of cooperation to ensure that the interests of the hydrological community are adequately included in these undertakings. He observed that the institutional arrangements, very common in Eastern Europe, of combined Hydrometeorological Services provided the good basis for cooperation and expressed his wish that similar cooperation could also develop between Meteorological and Hydrological Services when they are separate institutions.

1.4 Dr L. Kauppi in welcoming the participants, recalled that the longest tradition of the FEI is in the field of hydrology and that water related questions have a prominent role in the work plan of FEI. She recalled that in recent years several natural phenomena, among which the most important were algal blooms of unprecedented magnitude in the Gulf of Finland, brought water related issues clearly into focus and provided a strong signal for greater attention to water resources. She cited several European experiences of cooperation in the field of hydrology and water related issues such as EURAQUA. She also recalled the important links between water and health and the activities jointly carried out with the WHO and the ECE. In this context she called for a closer cooperation between WMO and the ECE, in particular in the monitoring and assessment activities in support of the Helsinki convention for the protection and use of transboundary watercourses and international lakes.

1.5 Mr J.L. Bassier, speaking on behalf of the Secretary-General of WMO, thanked the FEI for its invitation to host the meeting in Finland. He expressed also the appreciation of WMO to the rapporteurs and co-rapporteurs for their efforts in preparing the working papers and reports, and to their Governments for making their services available. He also highlighted a number of items in the

agenda which called for special consideration. In particular, the international exchange of hydrological data, the regional implementation of components of the WHYCOS programme, the needs of the region for operational hydrology and the WMO Fifth Long-Term Plan.

1.6 The session paid tribute to the late Prof. Franz Bultot (Belgium) for his valuable work as chairman of the working group during the period 1986 to 1994 and for his important contributions to both the regional and global programmes of WMO. The meeting also expressed its appreciation to Prof. Franz Nobilis (Austria) for readily accepting to act as chairman of the working group since November 1994.

2. ORGANIZATION OF THE WORK AND APPROVAL OF THE AGENDA

2.1 The session adopted the agenda (Annex 2) and work plan. It also established three sub-groups for in depth discussions on the 5LTP, the international exchange of hydrological data, and the needs of operational hydrology in the region and the future activities of the working group.

2.2 A technical visit was organized on the afternoon of Friday 24 October to the production facilities of VAISALA Ltd, the Finnish manufacturer of meteorological and hydrometeorological equipment.

3. CONSIDERATION OF THE RELEVANT DECISIONS OF CG-XII, THE EXECUTIVE COUNCIL AND RECOMMENDATION OF CHy-X AND OTHER WMO BODIES

3.1 Mr Bassier informed the session about the main decisions of the Cg-XII (Geneva, June 1995) related to the HWRP, the institutional cooperation between national Hydrological Services and between Hydrological Services and Meteorological Services, the Fourth Long Term Plan (4LTP). The outcomes of the CHy-X (Koblenz, Germany, December 1996) and of the EC-XLIX (Geneva, June 1997) were also summarized.

3.2 The meeting noted, in particular, the call to the Members to support to the Global Runoff Data Centre (GRDC) in Koblenz (Germany), the endorsement by Cg-XII of WHYCOS as an important component of the OHP, the importance being attached to environmental matters and the request to strengthen the HWRP. The adoption of Res. 40 (Cg-XII) on the international exchange of meteorological data and products was underlined. The role of the Hydrological Advisers was recognized in promoting the cooperation between Hydrological and Meteorological Services.

3.3. Prof. Nobilis, Chairman of the Working Group, reported on his attendance at the last three sessions of the Executive Council in 1995, 1996 and 1997, and stressed the role of the Regional Hydrological Advisers in support to the activity of the President of the CHy. He also informed the meeting on the activities of the Working Group on Regional Cooperation of the Danube countries in the field of hydrology.

3.4 The meeting expressed concern at the low level of representation of hydrologists in RA meetings and therefore strongly recommended that hydrologists be included in the national delegations to sessions of RA VI.

3.5 Ms Zs. Buzás (Hungary) informed the meeting that on the initiative of the Austrian, Hungarian and Slovakian Hydrological Services, representatives of the Danube Basin National Hydrological Services (NHSs) held an informal meeting as forum of the Danubian Hydrological Services in Budapest (Hungary) on 29 May 1997 at the invitation of the Hungarian NHS. Ten of the 17 Danubian countries were represented. The Forum agreed as the main principle not to duplicate the hydrological programmes of WMO, UNESCO and other international organizations. The next meetings will be held in Austria (1998) and Slovakia (1999), respectively.

3.6 Mr A. Muzic (Slovenia) informed the meeting that an Emergency Warning and Alarm System was being installed in 1997 and is partly in operation in the Danube basin. It is a useful tool in the case of water pollution accidents on transboundary rivers. It directly involves more Hydrological Services of the basin.

3.7 Prof. Hofius, President of the CHy, made a short presentation on the activities of the Commission and on the main decisions taken during its tenth session (Koblenz, Germany, December 1996). Particular mention was made of the proposed two new components programmes of the HWRP, namely "*Applications of hydrology for the sustainable development and protection of area under stress*" and "*Capacity building*". Recalling that operational hydrology is an integral part of the work of WMO, he expressed his concern at the current level budgetary provision for the HWRP, which was considered largely inadequate to support the programme.

4. WORK PROGRAMMES OF THE RAPORTEURS

4.O Under this agenda item the working group considered the draft technical reports prepared by the various rapporteurs and co-rapporteurs. A summary of the content of each report and the comments and recommendations thereon are provided hereunder.

4.1 Hydrological Networks

4.1.1 The meeting was informed of the activities and outcomes of two hydrological networks intercomparison projects implemented by CHy: the Basic Hydrological Network Assessment Project (BNAP) and the Operational Network Design Techniques (HYNET). A report based on the results of BNAP and entitled "The Adequacy of Hydrological Networks: A Global Assessment" was published as WMO/TD-No. 740. The HYNET project is continuing with the participation of only seven countries. Members of RA VI were urged to participate in the project.

4.1.2 The meeting was pleased to note that the "Casebook on Operational Hydrological Networks in RA VI" by V.Vuglinsky et al, was published in 1995 as WMO/TD-No. 47.

4.1.3 The meeting was informed of the WMO Hydrological Information Referral Service (INFOHYDRO), a meta-database held in the WMO Secretariat which contained information on national, regional and international hydrological agencies, networks and data centres of WMO Members.

4.1.4 The meeting was further informed that WMO was undertaking a global study of the current situation regarding hydrological networks as a contribution to two major international events early in 1998. These events are: a UN/EU Workshop in Harare in January and a Ministerial Conference in Paris or Marseille in March. Both of these events will address the issue of "Information management and the need for an adequate knowledge base". To assist WMO in this study Members of RA VI were requested to update the available INFOHYDRO information which was distributed to the countries represented at the meeting.

4.1.5 The group considered the draft report by T.Günther (Germany) et al. entitled "Network and Data Requirements for an Operational Estimation and Forecast of Snow Cover Development and Areal Meltwater Release (Project SNOW-D)". The report discussed some recommendations and conclusions for the design and operation of special networks and reporting systems providing necessary hydrometeorological input for the operational flood-forecasting. The model system SNOW enables blanket coverage and grid-oriented result data. Using output data of the regional NWP model the project SNOW-D yields forecasts of precipitation supply (rainfall plus meltwater release). The resolution of meteorological model is in the order of 10 km or higher between every gridpoint. This resolution will highly improve the estimation of areal distribution of precipitation and snowmelt release. The procedure also allows a major improvement in the near future when the meso-(local-) scale analysis is introduced in operational meteorological forecasting models. The information from all types of real-time observations, i.e data from automatic ground-based observations and from remote sensing can be fully used for flood-forecasting. The group agreed that there is a need for a more effective use of available meteorological data and products (meteorological model output) for flood-forecasting, especially in transboundary river basins. It therefore requested its members to support communication and cooperation between Meteorological and Hydrological Services in this special field of application. The report should be made available to the International Commissions of European River Basins and some regional flood-forecasting centres for evaluation.

4.1.6 The meeting considered the draft report on "Design and Operation of Hydrological Networks in River Basins with Disturbed Regimes - the Experience in RA VI" prepared by V.Vuglinsky (Russian Federation) with information provided by T. Günther (Germany) and A. Tollan (Norway). The report discusses the networks for estimating the impact of man's activity on the hydrological cycle and the requirements for information for water management in watersheds with disturbed hydrological regimes. The report observed that in many cases there were no specially designed networks to meet the hydrological data needs for various sector of economic activity. The data needs are met from networks established for research and for monitoring the natural regimes of water bodies. In some cases the hydrological networks provided inputs mainly to the leading sectors of the economy. The study showed that in Europe, agriculture, industrial and municipal water supply and reservoir runoff control were the most common examples of man's influence on water resources.

4.1.7 The meeting was informed by Mr M. Puupponen (Finland) of the experience of the Nordic Working Group on Hydrometric Networks in the development of hydrometric monitoring in the Nordic Countries. Its report No. 42 was distributed to delegates.

4.2 Weather Radar Data for Hydrology and Water Resources

4.2.1 The meeting had before it a report entitled "Requirements and Applications of Weather Radar Data to Hydrology and Water Resources" prepared by R. J. Moore et al. The draft report had been considered at the previous session of the working group four years earlier but the report had only been finalized in 1997. The group felt that some of the information contained in this report might be outdated and superseded by the report discussed in paragraph 4.2.2. below. The group did not feel that the report should be considered for hard copy publications but proposed that it should preferably be made available on the WMO Web page.

4.2.2 The working group further considered the draft report prepared by F. Helloco, J.L. Chèze and C. Merlier (France). The report presented an evaluation of the progress in the use of weather radars in hydrology since the last working group session in 1993. It is partly based on a questionnaire sent out by WMO.

4.2.3 The radar networks and the coverage has unquestionably improved. The practices are not unified, but the efforts in the search for compatibility are significant. The correction of radar errors (ground clutter, masking, attenuation, vertical profile of reflectivity) are still under study by many teams. The main problem lies in the difficulties to separate errors of different kinds. Significant improvements are expected from the new polarization parameters. The requirements from hydrology have not evolved: however, more attention should be paid to the information dissemination to the end-users. New laws for the quality of waste waters could enhance the need for accurate measurements. The current operational use of radar hydrology remains generally qualitative, despite promising experiments in some countries.

4.2.4 Based on the discussion the working group felt that there was need to (i) encourage the

continuation of the research on the correction of radar errors of all types, including further research on polarization data and on the inclusion of radar data into mesoscale models, (ii) define or use general quality indexes for areal rainfall in order to compare and evaluate the various software, (iii) assess the sensitivity of current hydrological models to rainfall input, and encourage the definition of future models more adapted to the spacial distribution of rainfall, and (iv) favour studies or actions on information dissemination from meteorologists to end users during unusual hydrological events.

4.3 Water Quality Monitoring, Forecasting and Control

4.3.1 A draft report on the subject was prepared by the rapporteur. T. Moth Iversen (Denmark). The rapporteur was unable to attend the session to make his presentation and therefore there was no discussion on the report.

4.3.2 The report reviews the water quality practices relating to groundwater, inland surface water and marine surface water in the RA VI countries. Reference is made to the existing institutional framework. The report further discusses the objectives of the water quality related programmes of the European Environment Agency (EEA) and the UN Economic Commission for Europe (ECE). International cooperation, objectives of monitoring and the existing monitoring networks and practices are also discussed. The report presents a number of conclusions and emphasizes the need for harmonization of the relevant activities of the various regional bodies concerned. The meeting was informed of the Workshop on Advances on Water Quality Monitoring held in Vienna in March 1994. It noted that copies of the report were available free of charge from the WMO Secretariat.

4.3.3 The meeting was pleased to note the cooperation between WMO and ECE in the area of water quality monitoring and assessment in Europe. It noted also with satisfaction WMO's collaboration with the GEMS-Water programme which is jointly sponsored with UNEP, WMO and UNESCO. The close collaboration between the GRDC and the WHO Collaborating Centre for Water Quality in Burlington, Canada was also noted.

4.4 Regional Aspects of HOMS

4.4.1 Dr J. Hladny (Czech Republic) presented a draft report on the subject which reviewed the activities related to HOMS in the region. The report recognizes the important contribution which the RA VI region is making to the development of HOMS. This is demonstrated by the fact that RA VI has contributed some 54 % of the components in the HRM and had made over 55 % of the total HOMS transfers during the current intersessional period.

4.4.2 In addressing the HOMS technology requirements of various users, the meeting was pleased to note that the rapporteur had developed one matrix to assess the availability of HOMS technology and another to assess the technology needed. This search system enables not only the prompt selection of components but also the identification of gaps in required technology. The group recommended that the system be further examined, in consultation with a view to recommending its

use to HNRCs.

4.4.3 The group expressed its satisfaction with the "Implementation plan for HOMS: 1997 - 2000" adopted by CHy-X. It felt that the needs of the region are adequately reflected. In this regard, the working group recommended that a meeting of representatives of the European HNRCs be convened at an early date to discuss HOMS implementation in the region.

4.4.4 The meeting was informed about the System for Technology Exchange for Natural Disasters (STEND) which was a special project implemented by WMO within the framework of the IDNDR. The meeting urged that adequate linkages be established between HOMS and the other technology transfer systems such as STEND, CLICOM, KIT (UNESCO).

4.4.5 Mr Law (UK) expressed the view that the HRM and the HOMS Newsletter should be made more easily accessible. He recommended that the use of the Internet could be a way forward in making HOMS information available using e-mail messaging about newsletter publication and adding HOMS component software downloading. This should have the added advantage of reducing the work load of the HOMS Office in the WMO Secretariat.

4.5 Climate and Water

4.5.1 The chairman of working group as co-rapporteur of this topic informed the meeting on the background to the work of the sub-group. Based on the First Conference on Climate and Water (Helsinki, Finland, 1989), the sub-group members (R. Lemmelä, E. Kuusisto, M. Spreafico, H. Liebscher and F. Nobilis) prepared a first report published in 1991. A second report "Climate and Water in Europe: Some Recent Issues" was published in 1994. A third report "Climate and Water in Europe: Water Quality and Aquatic Ecosystems" was distributed prior to the meeting of the working group to all members. The last two reports will be presented as outputs of the working group at the next session of RA VI (Israel, May 1998).

4.5.2 The work of the group will continue after the Second International Conference on Climate and Water (Espoo, Finland, 17-20 August 1998). Using the information and the recommendations of the Conference as a basis, the fourth report will be published in the same manner as the previous three. The Conference is being organized by the Helsinki University of Technology (HUT) in cooperation with WMO, UNESCO, IAMS, IAI, ETNET, CHR, Austrian National Committee of IHP, the Academy of Finland (National Committee for IHP), Finnish Ministry of Environment, Finnish UNESCO Commission, Finnish Geophysical Society and Keski-Uusimaa Point Municipal Board for Water Pollution Control.

4.5.3 The working group was informed of recent developments regarding WCP and especially on the activities related to the WCP-Water. Special emphasis was given to those projects which are of interest to the working group. It was noted that the seventh planning meeting on the WCP-Water was held in May 1997 in Koblenz (Germany) and that the following new projects were proposed:

- (i) El Niño Southern Oscillation
- (ii) Global Digital Water Atlas
- (iii) Trends in Regional Runoff
- (iv) Social Dimensions of Water Use
- (v) Three regional projects (Central Europe) analyzing climate change impacts.
 - Climate change impacts on flow regimes in Central Europe.
 - Snow conditions of the Alps and flow conditions of the Danube
 - River ice conditions with special regard to navigation on the Danube
- (vi) Application of a water balance model in hydrological practice

The report of this meeting will be published as report WCASP - No. 45 and can be obtained from the WMO Secretariat.

4.5.4 The meeting noted that nearly all these proposed new projects were of interest to the working group and that the rapporteurs to be nominated at the next session of RA VI should participate in this work.

4.5.5 With regard to the “Global Digital Water Atlas”, the working group noted that in several countries such digital water atlases are also being developed on a national scale. The working group was informed that Germany was interested in organizing a workshop on this subject in 1999, with special emphasis on Central Europe. Due to the fact that EEA is considering similar activities, the wish was expressed to invite EEA to collaborate in the work in this field.

4.5.6 The meeting took note of the activities within GEWEX. Specific mention was made of the Baltic Sea Experiment (BALTEX) and of the need to establish a link between that work and related activities of the working group.

4.6 Short-range Hydrological Forecasting in Catchments with Modified Regimes

4.6.1 A draft report on the subject was presented by the lead rapporteur, P. Serban (Romania). The report is based on information collected by means of a questionnaire which was circulated to all the countries of the region in June 1996. Seventeen replies were received from 14 countries.

4.6.2 An analysis of the methods of hydrological forecasting showed a close relationship between the operational hydrological models and water management models. This suggested that an optimum operation regime should be established taking account of the hydrological forecasting upstream of the system being considered.

4.6.3 The report proposes new approaches to forecasting both water quantity and water quality parameters and the need to assist countries which plan to use models for such purposes.

4.6.4 The working group welcomed the proposal of the rapporteur that information be collected on combined models for forecasting water quantity and water quality parameters and that a report be prepared on the experience in RA VI in this field.

4.7 Operational Hydrological Reference Basins (OHRB)

4.7.1 The group was informed that the Technical Report in the Hydrology and Water Resources series entitled "*Hydrological Observation Requirements in Operational Hydrological Reference Basins*", prepared by Prof. M. Spreafico (Switzerland) during the previous intersessional period, had been published in 1994.

4.7.2 The rapporteur, Prof. Spreafico, presented a report on the Operational Hydrological Reference Basins. The report introduced the general characteristics of the OHRB and a set of proposed criteria to be applied in the selection of a OHRB, with a view to the establishment of an international measurement network. The criteria included the hydrological regime, nature of bedrock, climatological characteristics, influence of human activities, length of the available records, surface, etc. The report noted that the relative importance of the criteria might vary as a function of the purpose and area of the OHRB, i.e. determination of water balance or determination of sediment transport. The report provided also a summary of the activities and investigations so far carried out concerning OHRB. Particular emphasis was given to the review of earlier and recent activities in the field of hydrological monitoring in small basins, which lead to the publication of the earlier report (see 4.7.1) and the presentation and discussion of OHRB concept in several international institutions and programmes as IHP, FRIEND, AMHY, CHR. The risk of duplication of activities with other programmes, in particular the Northern European FRIEND, FRIEND AMHY and the European Network of Experimental and Reference Basins (ERB) was underlined.

4.7.3 The report concluded that the participation of at least ten countries was required if the study is to be continued and be representative.

4.7.4. The following countries have confirmed their participation in the project: Austria, Bulgaria,

Croatia, Czech Republic, France, Germany, Italy, Norway, Romania, Slovakia, Slovenia and Switzerland.

4.8 Sediment Transport

4.8.1 The meeting was informed that the WMO “Manual of Operational Methods for the Measurement of Sediment Transport” which was published in 1989 was currently being revised and updated as a task of the CHy.

4.8.2 A draft report on sediment transport was presented by B. Minárik (Slovakia). The report consist of two parts. In the first, the techniques for the measurement of suspended sediments and bedload are reviewed. Reference is made in particular to the experiences carried out by the Rhine riverine countries within the framework of the International Commission for the Hydrology of the Rhine Basin (CHR). The report presents the results of a CHR study group on sediment observation and further discusses the methods and instruments used for sediment observation in Switzerland, Germany and The Netherlands. The methods adopted in mountain streams of the alpine part of the Rhine basin and in lakes and reservoirs are presented. The second part deals with sediments transport regime in the Danube river and the influence of anthropogenic activities thereon, in particular, dredging and construction and operation of dams. The methods for measuring suspended sediments in the Danube basin countries are also briefly described.

4.9 The WG recommended that the draft technical reports be finalized based on the discussions during the session and submitted to the next session of RA VI.

5. WORLD HYDROLOGICAL CYCLE OBSERVING SYSTEM (WHYCOS)

5.1 WHYCOS Programme, launched by the WMO with the support of the World Bank, the European Commission and other donor agencies was the subject of a short presentation by Mr T. Abrate. The meeting was informed of the programme’s objectives which aims at improving cooperation at the river basin, regional and global level, contributing to the establishment of consistent and reliable water data information systems and laying the basis for integrated, inter-sectoral and inter-country water resources development and management. The immediate objectives of the implementation of WHYCOS are: the establishment of a network of key stations equipped with multi-sensor Data Collection Platforms (DCPs) and satellite transmission capabilities; the development of distributed data-banks; the implementation of regional computer networks; the strengthening of NHSs and the dissemination of products and information to the general public and decision makers. The programme is being developed through regional components (HYCOS) independently implemented according to the requirements and priorities of the various regions, but within the common WHYCOS framework. A coordination mechanism to ensure such guidance, which includes the establishment of a WHYCOS International Advisory Group (WIAG) is currently under consideration within WMO Secretariat. Under the chairmanship of the president of CHy the WIAG will undertake periodical review of the development of the programme and recommend

strategies for a coordinated development of the various components. The meeting was informed of the status of the implementation of the various HYCOS components. Of particular interest to the RA VI was the status of implementation of MED-HYCOS. This was proceeding satisfactorily with the installation of the DCPs and making the data available on the project's Web site. The extension of the project to cover the Black Sea basin was being considered for funding by the World Bank.

5.2 The working group was informed of the proposal submitted by Poland to WMO Secretariat for the development of a BALTIC-HYCOS. This proposal was circulated to all countries of the Baltic Sea basin to ascertain their interest. To date 9 countries have indicated their support for such a project. The meeting recognized that the project would be a useful complement to the ongoing BALTEX project. The working group welcomed the offer by Sweden to assist in the preparation of a first draft project document and to host the first meeting to discuss this proposal.

5.3 In the discussion on the development of the various regional components, Prof. Hofius stressed the need to take account of the sustainability of the programme when the external assistance would no longer be available. The group recognized the need for close coordination among the individual HYCOS components and recommended, in this connection, that the WIAG meet at least once a year.

5.4 Mr Law (UK) noted the need for HYCOS projects not to be delayed by bureaucratic regulations. He noted that already semi-professional individuals who possess automatic weather stations and a modem-equipped computer were putting data onto the World Wide Web. The "amateur" Climatological Observers' Link in the UK has 300 members with about ten observers across Europe and a few more in USA and Australia. Its hard copy monthly bulletin and e-mail network of daily observations bypasses formal meteorological agency channels. University weather observers were also putting near-real-time data onto the Web (e.g. Loughborough and Reading Universities). He observed that it could not be long before individual river observers followed that public domain route to publication.

5.5 The meeting noted that the available information material on WHYCOS prepared for the World Day for Water 1997 was addressed to the general public and did not provide enough details on the Programme. It was therefore recommended that the WMO Secretariat should make available detailed information on the technical aspects of the Programme in a suitable form.

6. INTERNATIONAL EXCHANGE OF HYDROLOGICAL DATA AND PRODUCTS

6.1. The president of CHy introduced this item. He informed the working group of the Resolution 40 of the WMO Twelfth Congress (Cg-XII). The Annex 4 to this resolution states that "Hydrological data and products, at this stage, are not included in the application of the practice". Cg-XII therefore requested the WMO Executive Council to invite the president of CHy to continue his work on this matter. The Commission adopted, at its tenth session (Koblenz, December 1996), a draft resolution on the exchange of hydrological data which is similar to Resolution 40 of Cg-XII and follows the same spirit, namely, "free and unrestricted data exchange for vital purposes".

6.2 The WMO Executive Council at its XLIX session, welcomed this draft resolution but it suggested that CHy specifies the data which should be exchanged and this refers specifically to “Further adopts” (1), (2) und (3) of the draft resolution.

6.3 The President of CHy further informed the working group of the resolution XII-4 of the IHP Intergovernmental Council of UNESCO regarding the exchange of hydrological data and information. This resolution invites the Members of UNESCO to review their policies for the international exchange of hydrological data so that they may be supportive of the research being undertaken on major global issues. The working group was also informed about the outcome of a discussion on the same topic of the WGH-RAV.

6.4 The question of the international exchange of hydrological data was the subject of an in-depth discussion by a sub-group. The composition of the sub-group is provided in annex 3. The views and recommendations of the meeting on this matter are provided in Annex 4 to this report. The recommendations called for the establishment of a group of experts for analyzing the information needs of the above mentioned activities and for preparing a proposal on the basic set of data and products that should be involved into the global data exchange. On the basis of this set of data and products the Members should prepare their own set of basic data and products. It also recommended that support be provided to countries where hydrological archives are still in paper form in order to transfer their database into electronic form for the easy data exchange. The working group requested that this recommendation be submitted for the attention of the CHy-AWG.

7. FIFTH WMO LONG-TERM PLAN (5LTP)

7.1 The meeting was informed of the WMO Long-Term Plan. It noted that this plan covers a period of 10 years and is updated every four years. The current 4LTP cover the period 1996-2005. The WMO Congress has requested that the Regional Associations provide a forum for consideration of the regional aspects of the plan. The 5 LTP was currently being prepared for the period 2000 - 2009 with detailed inputs required for the first four years 2000 - 2003. The WG was therefore requested to review the draft proposals of the 5 LTP and provide inputs as appropriate.

7.2 A sub-group was established for an in-depth examination of the draft proposals. The composition of the sub-group is provided in Annex 3.

7.3 The report of the sub-group was considered by a full session of the WG. The proposals of the group as adopted by the session, are contained in Annex 5 to this report.

8. NEEDS OF OPERATIONAL HYDROLOGY IN THE REGION

8.1 The needs of the region were addressed at an in-depth discussion of a sub-group

established during the session. The composition of the sub-group is given in Annex 3. The proposals of the sub-group, as adopted by the working group, are presented in Annex 6 to this report. The proposals provided the basis for consideration of future activities of the working group. In this connection, particular attention should be given to the proposal that the various topics and issues be addressed at a closed workshop of heads of hydrological network operations which should be organised by the Regional Association, in collaboration with the European Environmental Agency. The working group proposed that the needs of the region be also taken into account in preparing proposals for the 5LTP.

9. CO-OPERATION WITH OTHER WMO BODIES AND INTERNATIONAL ORGANIZATIONS IN PROJECTS RELATED TO HYDROLOGY

9.1 The working group was informed on the continuing cooperation with other international organizations. Concerning UNESCO, with which the links are the closest, the meeting was informed of the publication in 1997 of the English version of the second edition of the "Handbook for the national evaluation of water-resource assessment capability". The French and Spanish versions are being prepared by UNESCO and WMO respectively.

9.2 The group noted the publication of the "Comprehensive Assessment of the Freshwater Resources of the World" prepared under the auspices of Administrative Committee on Coordination - Sub-Committee on Water Resources. It was presented to the 1997 session of the UN Commission on Sustainable Development (CSD), and the Special Session of the UN General Assembly in June 1997 and is available in the six official languages of the UN. Copies are available on request. Also under the auspices of the ACC Sub-Committee a monograph entitled "*World Water Resources of the Twenty-first Century*" has been produced and will be published by UNESCO in 1997.

9.3 The group was informed of the availability of public awareness material which was prepared for the "World Day for Water". The meeting noted that the theme "*The World's Water - is there enough?*" for World Day for Water in 1997 reflected the current concern about the global freshwater resources. The meeting was informed that the theme for the World Day for Water 1998 is "Groundwater - the invisible resource".

9.4 The meeting was informed of the success of a training course on hydrology held in Ljubljana, Slovenia, 15-19 September 1997. Mr A. Muzi_ expressed appreciation for the support provided by WMO and indicated the readiness of his country to host similar courses in the future. Similar views were expressed by Ms Zs. Buzas regarding the International Postgraduate course on Hydrology held in Budapest, Hungary. It was noted that the twenty ninth course will be held from 1 February to 31 July 1998.

10. PLAN OF FUTURE WORK OF THE WORKING GROUP

10.1 Having considered its work during the current intersessional period and the needs of the region in operational hydrology as identified in Annex 6 to this report, the working group agreed to recommend to the next session of the RA VI that the WGH be re-established. It recommended that the future activities to be undertaken by the group as listed below. It further recommended that the WG chairman, in consultation with the rapporteurs, develop detailed TOR based on the activities for inclusion in his report to the next session of RA VI.

(a) *Hydrological networks*

- To investigate possible interrelations between hydrological and other environmental monitoring networks, and
- To propose procedures to strengthen the cooperation between network-operating institutions.

(b) *Integration and coupling of hydrological models with meteorological products*

- To collect, analyze and present information from RA VI countries on
(1) the structure of combined models for forecasting water quantity and quality;
(2) the mechanism and systems for using gridded meteorological data, and output from radar and satellite systems.

(c) *GIS applications in hydrology*

- To report on recent developments in RA VI countries on use of GIS in operational hydrology; and
- To investigate the needs and possibilities of producing European, consistent maps of the principal water balance elements.

(d) *Regional aspects of HOMS*

- To promote HOMS activities on the basis of implementation plans for HOMS 1997-2000 with respect to the relevant specific conditions and new possibilities to disseminate HOMS technologies (internet for example),
- To prepare in collaboration with WMO HOMS Office a meeting of representatives of European HNRCs, to consider trends for preparation of integrated component systems, possible international resources and capacities for development of new components and conditions for indicating regional projects,
- To initiate and support development of HOMS technologies, enabling training of personnel involved in forecasting on a hydrological training facilities, and

- To assist in establishing of new HNRCs in those countries of the region where they have not yet been established.

(e) ***Climate and water***

- To prepare a report concerning the experience in RA VI on activities in relation to climate and water, the status of existing climate simulation models, the development of existing climate scenarios for hydrological purposes in RA VI, the progress in respect to converting the results of climate models into hydrological related information, and new methodological tools for the determination of water resources design parameters in the light of potential climate change and in respect of climate change impacts on the water cycle on different scales, on water quality and on ecosystems,
- To follow up on the recommendations of recent inter-governmental meetings concerning climate change effects on hydrological systems. For example, organization of the Second Conference on Climate and Water, Espoo, Finland, August 1998.

(f) ***Extreme floods***

- To prepare a literature study on the influence of human activities on flood risk, based on recent European cases of large floods;
- To evaluate damages and losses incurred, as a possible basis for cost-benefit analyses of flood prevention and forecasting;
- To assess the possibility of mutual flood emergency assistance in cases of floods and inundations (for example flood forecasting, measurements, etc).

(g) ***Operational Hydrological Research Basins (OHRB)***

- To identify the countries willing to contribute to a European OHRB network,
- To collect and compile descriptive data of these basins,
- To prepare an inventory of these basins to be circulated to all RA VI members,
- To assist WMO Secretariat in the inclusion of relevant data on OHRBs in INFOHYDRO,
- To liaise as appropriate with the FRIEND project and other similar network projects in this field within RA VI:

(h) ***Sediment transport***

- To collect appropriate information about the monitoring of sediment transport in RA VI countries,

- To analyse this information with regard to the description of measurement equipment and methods as well as monitoring programmes, and the determination of advantages, limits and accuracy,
- To prepare a report on the results of these analyses,
- To formulate a specific and integrated action plan and
- To initiate appropriate actions to meet the identified requirements, particularly those urgent/emergency requirements at national and regional levels.

(i) ***Joint hydrology liaison group***

Liaison should be established between WMO RA VI/WGH and other formal European bodies with transnational river responsibilities, including

- European Environmental Agency, and its Topic Centre for Inland Waters;
- UN Economic Commission for Europe, concerning its Convention on the Use and Protection of Transboundary Rivers and International Lakes;
- The Secretariat of the Danube Commission, and the Interim Secretariat of the Danube Protection Convention;
- The relevant Commissions of the Rhine, Elbe and Oder.

(j) ***World Wide Web, Hydrology hypertext links***

- To create World Wide Web “hot” links for hydrology,
- To establish relations with others (including UNESCO) with same objectives,
- To announce an electronic virtual conference on this topic, to moderate it as it occurs (before July 1998) so that its refereed output text and hypertext links can be distributed at the software exhibition of the WMO sponsored conference on “Hydrology in a Changing Environment” in Exeter (UK) during July 1998,
- To establish a comprehensive link counter as part of the HH LINKS index page,
- To make efforts to offer a multi-lingual introduction to the English text using official languages.

(k) ***Hydrological data exchange***

- To provide technical guidance on the management of hydrological data exchange **(See recommendations included in paragraph 6.4).**

10.2 The working group was reminded that it is its responsibility to report to the next session of the RA VI to be held in Israel in May 1998. The administrative report describing the work of the group will be prepared and submitted by the Chairman. With regards to the technical reports, the group urged that its lead rapporteurs amend them in accordance with the discussion and comments during the session and submit them to the Secretariat at least in December 1997, i.e. six months prior to the session of the RA VI.

10.3 The group recommended that rapporteurs, once established after RA VI meets in 1998 should plan to complete their work with a written report before the next meeting of the WGH in 2001. However, reports are not expected from topics h, i, j as their outputs are to be of a different form.

10.4 The WG recommended that the RA VI may consider designating experts instead of rapporteurs following the procedures of CHy.

11. ADOPTION OF THE REPORT AND CLOSURE OF THE SESSION

11.1 The working group adopted the report of its eighth session together with its annexes and requested WMO Secretariat to make any editorial changes deemed necessary. The group recommended that, after approval by the president of the RA VI, the report should be circulated to the members of the working group and to all Members of RA VI.

11.2 At the closing session, the chairman, Prof. F. Nobils expressed his thanks to all the participants for their useful contribution to the work of the session. He also thanked Dr P. Seuna and the FEI for hosting the session. Prof. V. Vuglinsky and Prof. H. Liebscher, on behalf of the participants expressed their thanks to the Chairman, the FEI and the WMO Secretariat for the effective manner in which the meeting was conducted. Mr J.L. Bassier, on behalf of the WMO Secretariat added his word of thanks to the participants and to the Chairman for their work during the session. He briefly outlined the follow-up actions which will precede the XII-RA VI. He reiterated WMO's appreciation to the Government of Finland and to FEI for hosting the meeting.

11.3 The meeting closed on Saturday 25 October 1997.

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AGENDA

1. Opening of the session
2. Organization of the work of the session and approval of the agenda
3. Consideration of relevant decisions of Cg-XII, the Executive Council and recommendations of CHy-X and other WMO bodies
4. Work Programmes of the rapporteurs
 - 4.1 Hydrological Networks;
 - 4.2 Weather Radar Data for Hydrology and Water Resources;
 - 4.3 Water Quality Monitoring, Forecasting and Control;
 - 4.4 Regional Aspects of HOMS;
 - 4.5 Climate and Water;
 - 4.6 Short Range Hydrological Forecasting in Catchments with Modified Regimes;
 - 4.7 Operational Hydrological Reference Basins (OHRB);
 - 4.8 Sediment Transport.
5. World Hydrological Cycle Observing System (WHYCOS)
6. International exchange of hydrological data and products
7. Fifth WMO Long-Term Plan (5LTP)
8. Needs of operational hydrology in the region
9. Co-operation with other WMO Bodies and international organizations in projects related to hydrology
10. Plan of future work of the Working Group
11. Adoption of the report and closure of the session

**COMPOSITION OF SUB-GROUPS
COMPOSITION DES SOUS-GROUPES**

International Exchange of Hydrological Data and Products

Chairman:	J. Kubát	(Czech Republic)
Rapporteur:	Ms Zs. Buzás	(Hungary)
Members:	G. Batini	(Italy)
	P. Givone	(France)
	I. Grepancevski	(Moldova)
	T. Günther	(Germany)
	K. Hofius	(Germany)
	M. Lacerda	(Portugal)
	H. Madsen	(Denmark)
	A. Muzi_	(Slovenia)
	J. Nilssen	(Sweden)
	P. Seuna	(Finland)
	Ms G. Stvilia	(Georgia)
	D. Trninic	(Croatia)
	Ms M. Tzaneva	(Bulgaria)
	V. Vuglinsky	(Russian Federation)

Fifth WMO Long-Term Plan

Chairman	F. M. Law	(UK)
Rapporteur	A. Tollan	(Norway)
Member: P. Sercl		(Czech Republic)

Needs of Operational Hydrology in the Region

Chairman:	P. Hubert	(France)
Rapporteur	Ms G. Wennerberg	(Sweden)
Members:	F. Helloco	(France)
	J. Hladný	(Czech Republic)
	A. Kruszewski	(Poland)
	B. Minárik	(Slovakia)
	M. Puupponen	(Finland)
	A. Selenica	(Albania)
	R. Skapski	(Poland)
	P. Serban	(Romania)
	A. Snorrason	(Iceland)
	E. Sultanov	(Azerbaijan)

Proposals on "International exchange of hydrological data and products"

1. The sub-group established by the RA VI Working Group on Hydrology at its eight session welcomed the Draft Resolution on the Exchange of Hydrological Data of CHy-X.

2. The sub-group noted that as a part of continued work on the Draft Resolution CHy-X is required to clarify the types of data and products to be exchanged and for what purposes they would be exchanged. The sub-group also considered that it is important to make the following recommendations on this topic.

3. It prepared the following list of hydrological data and products which were recommended for global and regional exchange.

3.1. Basic hydrological data

- discharge
- water level (big reservoirs and lakes)
- groundwater variables *)
- water quality variables *)
- precipitation
- snow cover and water equivalent
- water temperature
- other data (to be specified by international programmes)

3.2. Hydrological products

- processed data (in time and space)
- statistical characteristics
- water balance, hydrological computations and maps
- hydrological forecasts
- other results of hydrological analyses and models

*) these kinds of data have to be defined in more detail

4. It was agreed that hydrological informations (data and products) could be exchanged as follows:

4.1. In real-time (daily or more frequently) for such operational needs as flood protection and water pollution accidents on transboundary rivers and aquifers.

For these purposes there are needs mainly for data covering discharge, precipitation, snow cover, air temperature and water quality parameters (such as toxic compounds etc.) as well as for some

products (e.g. hydrological forecasts).

4.2. Non-real-time for regional and global analyses, scientific and research projects and other non-commercial activities. For these purposes all kinds of data and products could be required according to the project needs.

5. It was agreed that the hydrological information could be exchanged on the following different levels.

5.1. Global level - delivering data globally to data centres (GRDC, GPCC, GEMS ...) and taking data from them

5.2. Regional data (areas of common interest)
- same principles based on regional data centres

5.3. Levels given by bilateral and multilateral agreements between countries
- exchange of data on transboundary rivers and in framework of international basins
- mainly for operational needs (flood protection, water protection) but also for other needs

Conditions and rules for information exchange and usage have to be arranged by means of agreements. Data providers can place preconditions.

6. Respecting free and unrestricted exchange of hydrological information on global regional levels, all data providers can place conditions for re-exportation of their information.

Recommendation 1: Establish a group of experts for analysing the information needs of the above-mentioned activities and for preparing a proposal on the basic set of data and products that should be involved in the global data exchange. On the basis of this set of data and products the Members should prepare their own set of basic data and products.

Recommendation 2: Ensure free and unrestricted exchange of data and products between meteorological and hydrological data centres on national, regional and global level.

Recommendation 3: Support countries where hydrological archives are in paper form for transferring their database into electronic form for easy data exchange. The working group requested that this recommendation be submitted for the attention of the CHy-AWG.

**Proposals for the “Fifth WMO Long-Term Plan”
(Available in English only)**

Suggested amendments by the RA VI WGH:

- 0.2 line 7: recognized that fresh water *is* a major environmental ...
- 0.5 line 6: Programme on *External Co-operation*
- 0.7 line 3: in the field of *operational* hydrology
- 0.9 *New:*
Hydrology is strongly linked to the needs of society, and public transfer of hydrological knowledge should therefore be as efficient as possible. New ways of communicating hydrological data and products, such as the World Wide Web, should be taken into general use.
- 1.1 Modify to read:
The Programme on Basic Systems in Hydrology provides the basis and framework for the majority of the scientific and technical aspects of WMO activities in hydrology and water resources. It covers the measurement, laboratory analysis, collection, transmission, qualitative assessment, primary data processing, storage and retrieval of data, the implementation of the Hydrological Operational Multipurpose System (HOMS), and the development of the World Hydrological Cycle Observing System (WHYCOS).
- 1.2 (ii) line 2: promote their integration *through GIS*.
- 1.2 (iii) add: data banks; *paying particular attention to regional data bases on groundwater quality.*
- 1.2 At the end of para add:
in order to systematically assess the quantity and quality of water resources.
- 1.2 (iv) delete
- 1.4 At the end of para add:
to avoid the deterioration of networks more emphasis should be given to develop cheaper instrumentation and equipment for hydrological data collection.
- 1.6 line 7: environmental concerns *increase* with time.

- 1.7 Project 51.1. Add after existing text:
Regional, consistent contoured maps of the water balance elements are needed for continental scale water management.
- 1.7 Project 51.2, line 4:
and general manuals. *It is noted that all of these are likely to be affected by global manufacturing trends, favouring low-cost nations.* The transfer..
- 1.7 Project 51.3, line 4:
delete: ~~principally through the Global Telecommunication System (GTS) of WMO.~~
- 2.1 Add to existing para.:
However, it is noted that as yet there are no global centres to cover other key elements of the global hydrological cycle, i.e. evaporation, soil moisture, and groundwater.
- 2.2 New para. between (iv) and (v) :
To make available long-term series of hydrological variables in formats suitable for scientific analysis of clusters and trends.
- 2.3 line 4 from end:
All activities in relation to flood risk assessment and forecasting *should be formally consolidated in a follow-up to the International ...*
- 2.5 Project 52.1, indented para., line 2:
It includes the *better assimilation of meteorological data and knowledge, and investigation of various ..*
- 2.5 New Project 52.3 to be added, with title
Project 52.3 Completion of the network of data centres for hydrology.
(no explanatory text proposed at this stage)
- 3.1 Add to existing text:
The 5LTP must adjust to eventual international agreements to cut emissions that cause global warming. Inevitably the water cycle will be changed in ways both foreseeable and uncertain. Hydropower is likely to be favoured, and cooling water from fossil-fuelled generators may be reduced. Risks of aridity and floods may be changed. It is most likely that the linkage between energy and water will be a focus of study, and it will fall to hydrologists to quantify changes in space and time.
- 3.5 Add to existing text:
.. problem of desertification *and dry land degradation. Implementation of desertification protocols will have to depend on hydrological analysis.*

- 3.7 Project 53.1 line 3
.. rainfall *and snowmelt* data requirements

Add to existing text:

Attention should be given to the risk of culverting rivers under the pressure of city development, and the need to restore green corridors.

- 3.7 New indented text:

The changing flow regimes of many national and international rivers, due largely to abstractions for water use, changes in sediment load, and chemical pollutants, demand special monitoring procedures. This project will include collection, processing, and interpretation of sediment data and water quality

Proposals on “Needs of Operational Hydrology and Future Activities of the Working Group”

1. The working group discussed the needs of operational hydrology in the region and made the following recommendations and comments which might be used in developing the future activities of the working group:
2. The subject of paramount importance is that of national hydrological networks.
3. First of all it appears that certain countries of the region are facing serious difficulties for rehabilitation or even to maintain their national hydrological networks and databases. For these countries (Albania and most countries of the former Soviet Union participating in the meeting), specific and urgent actions should be taken through the official channels of WMO for problem evaluation and support delivery.
4. In all countries more and more environmental data, including hydrological data, are needed. It therefore appears desirable to integrate the networks, whenever and where ever possible (hydrology and meteorology, surface water and groundwater, quantity, quality and even biological aspects).
5. The role and usefulness of the WHYCOS project in the European context have been discussed. It appeared that in Europe the new technology aspect is probably not the most important, but that the project can be instrumental in improving international cooperation especially through standardization and dissemination of hydrological information and can support large regional projects. In this connection support for the further development of MED-HYCOS and implementation of BALTIC-HYCOS is recommended.
6. The definition and recognition of the social role of hydrological services is of great importance. These questions have to be tackled along with institutional and economical aspects (costs - prices) and the problem of hydrological information dissemination (commercial or not).
7. To address all these topics and issues a closed workshop, for heads of hydrological networks operation should be organised by the Regional Association, in collaboration with the European Environmental Agency.
8. The increasing and value use of hydrological models was recognized. Future work should stress to the need for integration or coupling of hydrological and meteorological models and take into account the use of gridded meteorological data and output from radar and satellite systems. The pressing need for water quantity/water quality models must be considered. The time and space

scaling of the models to be used in small research basins as well as in the very large river basins of Europe, for short and long term purposes, must be highlighted.

9. The future work of HOMS in the region should be discussed at meetings of the technology suppliers: These should focus for preparation of new components, possibilities for international resources and capacities to develop of the components and the conditions for initiating regional projects and priority.

10. The meeting felt that there was much overlapping or even duplication of work related to hydrology by international organizations and regional projects. The complexity of the current situation today was fully recognized; the WG recommended that this problem must be considered and seriously addressed by WMO, other international organizations, as well as in every country.

11. As to the extreme floods in the region this summer (1997) a discussion was held as to how to evaluate and learn from these events. The members of RA VI WGH are asked to join or support the existing working group on extreme floods which has been established by the European Geophysical Society to provide it with relevant information from national hydrological services.