

WORLD METEOROLOGICAL ORGANIZATION



WORKING GROUP ON HYDROLOGY

**REGIONAL ASSOCIATION VI
(EUROPE)**

**Průhonice, Prague, Czech Republic
4 - 7 May 2005**

FINAL REPORT

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ANNEX 1 - LIST OF PARTICIPANTS

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1. OPENING OF THE MEETING

1.1 The tenth session of the Working Group on Hydrology (WGH) of the WMO Regional Association VI (Europe) was held at the Hotel Floret in Pruhonice, Prague from 4 to 7 May 2005. A list of participants is attached as Annex 1 to this report.

1.2 The Chairman of the Working Group, Mr J. Kubat, welcomed the participants to the meeting and thanked them for their interest and efforts to participate in the session and wished them a successful meeting and a pleasant stay in Prague. He invited Dr I. Obrusnik, Director of the Czech Hydrometeorological Institute and Permanent Representative of Czech Republic with WMO and member of WMO Executive Council, to address and officially open the meeting.

1.3 In his opening remarks, the Permanent Representative of the Czech Republic with WMO Mr Obrusnik, on behalf of the Czech Hydrometeorological Institute, welcomed the participants to Prague and informed them that the Czech Republic has one of the oldest hydrological and meteorological services in Europe, which created very early a state water management plan with the help of the Czech hydrological service. It is more than 50 years since operational hydrology and meteorology have been joined under one Service. This joint service provided the country with efficient and timely warning services, during the recent catastrophic floods of 1997 and 2002, which hit the Czech Republic.

1.4 As the head of one of the institutions, benefiting from the activities of WGH, and also as a member of the Executive Council of WMO, he noted that the tenth session in Prague meant a jubilee meeting of top hydrologists from Region VI. He appreciated and recognized the work of the Group which has contributed to progress and development in hydrology and management of water resources and always supported technological and methodological activities. It also provided support to transfer such technologies to member services and other developing countries from different WMO Regions.

1.5 He suggested that the Group links its activities to monitoring of changes of hydrosphere influenced by a possible climate change, its impact on resources and the water cycle, enforcement of EU Water Framework Directive (WFD), disaster reduction, impact of floods and droughts and support of hydrological services for sustainable use of water. He concluded by wishing participants a successful meeting and fruitful discussions.

1.6 Mr M. Tawfik, on behalf of the Secretary-General of WMO, expressed WMO's appreciation to the Government of the Czech Republic and in particular the Czech hydrometeorological Institute for hosting the meeting. He thanked the group for its role in promoting close cooperation between the hydrological and meteorological communities, particularly in the area of flood forecasting. He urged the meeting to take this opportunity of such a gathering of experts to enforce the role of this group more adequately for the need of the region.

1.7 He requested some guidance from experts regarding the formulation of the statement on the scientific basis and limitation of hydrological modelling, priority areas for the implementation of the new strategy on education and training in hydrology and water resources, the development of the WMO information system, and the implementation of WMO flood forecasting initiative. He concluded by assuring the participants of WMO's support for their activities and wished them successful deliberations.

1.8 Mr J. Hodovsky, representative of the Ministry of Environment of the Czech Republic, in his remarks welcomed the participants and informed the meeting that the Ministry supports and encourages any events related to CHMI. He briefed the meeting on the effects and

damage caused by the recent series of floods in the Czech Republic. He highlighted the importance of improving the forecasting and warning service provided by CHMI in reducing the number of casualties. He wished the participants a successful meeting.

1.9 Mr D. Pokorny, representing the Ministry of Agriculture, briefed the meeting on the distribution of the water sector among the different Ministries in the Czech Republic. He added that the Ministry of Agriculture is responsible for water resources treatment and plays an important role in the management chain, especially in issues related to water treatment. He highlighted the importance of the hydrological data as an important factor for the development in any water management system. He wished the participants fruitful discussions.

1.10 The UNESCO representative, Mr J. Vrba, also made a presentation on the IHP phases 6 and 7 and its background since 1975. He highlighted strong relations between WMO and UNESCO, particularly in supporting IGRAC (International Ground Water Resources Centre) and the preparation of the World Water Development report and the Flood Initiative.

2. ORGANIZATION OF THE WORK OF THE SESSION AND APPROVAL OF THE AGENDA

2.1 The meeting agreed with the organization of the work of the session and adopted the agenda with minor changes. The new Agenda is attached in Annex 2.

2.2 Ms Zs. Buzás (Hungary) and Mr M. Puupponen (Finland) agreed to act as Rapporteurs for the meeting.

3. REPORT OF THE CHAIRMAN OF THE WORKING GROUP ON HYDROLOGY

3.1 The Chairman of the Working Group, Mr Kubat, started his presentation by an introduction of WMO structure and constitutional bodies. He reported on the activities of the group and briefed them on the terms of reference of each rapporteur and the sub-group. He informed the meeting that during the intersessional period he has been in contact and met with all the members of the group. He stressed the importance of personal contact which facilitates the coordination of activities and results in effective work for the group.

3.2 He also reported on his participation in the Executive Council sessions and the Commission for Hydrology.

4. CONSIDERATION OF THE RELEVANT DECISIONS OF Cg-XIV, XIII-RA VI, CHy-XII, EC-LIV, EC LV AND EC-LVI

4.1 The WMO Secretariat informed the meeting of major decisions taken by Cg-XIV, XIII-RA VI, CHy-XII, EC-LIV, EC-LV and EC-LVI, which were relevant to the regional aspects of the hydrology and water resources programmes.

4.2 The meeting noted the ninth session of the WGH in Berlin, Germany, February 2002, had been organized in parallel with UNESCO IHP meeting. Participants considered that such arrangements were not effective because they were split between the two meetings and attendance in one meeting affected the other. Participants of the meeting supported cooperation between the two agencies in the field of hydrology but they recommended to organize the sessions of the Working Group on Hydrology and UNESCO IHP meetings separately on different dates and to invite representatives of each group to the events.

4.3 The meeting noted the adoption of Resolution 24 (Cg-XIV) to use the subtitle "Weather, Climate and Water" on all official documentation, correspondence and publications. It was agreed that the adoption of the subtitle has provided recognition of WMO in the field of water.

4.4 It was noted that EC-LVII stressed the need for raising HWRP profile within WMO through its active participation in cross-cutting issues such as the Natural Disaster Prevention and Mitigation Programme, allocating more resources to it, and bringing synergy between the NHSs and NMSs to work closer together. The meeting also emphasized the need for the HWRP to establish itself as a leader in water resources assessment and flood forecasting and management making use of WMO's unique position as the leader in weather climate and water issues. It encouraged the programme to work with international organizations active in the water sector to leverage its position and gain visibility which could help in reaching out to extrabudgetary resources.

4.5 The meeting was pleased to learn that Mr B. Stewart (Australia) and Mr J. Wellens-Mensah (Ghana) were elected respectively President and Vice-President of the Commission for Hydrology (CHy).

4.6 The meeting noted that the Commission had established an Advisory Working Group (AWG), composed of nine members, and five Open Panels of CHy Experts (OPACHE) on five thematic areas: basic systems (hydrometry and hydraulics), water resources assessment and water use, hydrological forecasting and prediction, disaster mitigation – flood and droughts (hydrological aspects) and analysis of hydrometeorological data for variability and trends. The Commission also included in its future plan of work activities associated with WHYCOS, international data access and exchange, capacity building and technology transfer, and the development of the sixth edition of the Guide to hydrological Practices.

4.7 The meeting appreciated the Commission's concerns regarding the decline of financial support provided to the organization of the sessions of Regional WGHs and their subgroups. The meeting requested the Regional Hydrological Advisor to the President of RA VI to adopt a proactive approach and provide inputs to the president of RA VI in his reports to EC.

4.8 It was noted that the Commission adopted criteria for the selection of pristine basins and also adopted a WMO Strategy on Education and Training in Hydrology and Water Resources. The strategy aims at assisting Members in assessing their education and training needs so that NHSs can effectively contribute to integrated water resources management in their countries. A questionnaire was circulated to participants to prioritize the education and training activities supported by WMO in the next biennium 2006-2007.

4.9 The meeting noted the results of the questionnaire on the exchange of hydrological data and product which was circulated to all Members including Region VI. The results showed that there is a widespread need for international data exchange and that the majority of the respondent countries are satisfied with the present level of exchange, although almost all of them place restrictions of some sort on it. Resolution 25 (Cg-XIII) was reasonably widely known, and most of the countries recognized that it has or potentially could have in future a positive impact on the exchange of data and products. The type of data most commonly exchanged are water level and discharge, while the strongest needs expressed are for more timely forecasts and information on water quality, including warnings on accidental pollution of water bodies.

4.10 The meeting agreed that the exchange of hydrological and meteorological data and products is a vital requirement to reduce flood losses, maximize successful management of rivers and support hydrological studies but also for improving the understanding of potential changes of the global water and energy cycle. It also requested the Member countries to

implement Resolution 25 (Cg-XIII) in dealing with data exchange activities with other countries, the research community and international data centres. It is very important that Hydrological and Meteorological Field Data should be transferred to the Hydrological Forecast Departments on time. The meeting also noted that many NHMSs were facing problems in developing standards for hydrological data and information exchange and invited the Secretariat to develop further efforts in that direction, in cooperation with NMHSs.

4.11 The meeting noted that the CHy requested the AWG to compile a discussion paper on the advantages and disadvantages of changing the name of the Commission for Hydrology to the "Commission for Hydrology and Water Resources", in line with the programme and department names and the inclusion of the term "water" in the Organization's subtitle. It was a common view of the meeting to keep the name of the commission without any changes.

4.12 The meeting was pleased to note that with the aim of strengthening cooperation between the activities of regional WGHs and those of CHy, several regional experts have been involved and participated in the activities of CHy working groups. Six experts from region VI contributed new or revised chapters to the new edition of the Guide to Hydrological Practices, and eleven performed peer review. Messrs M. Morell and P. Givone (France) represented CHy in several meetings on the development of the WMO Information system.

5. CONSIDERATION OF ACTIVITIES OF THE RAPORTEURS OF THE WORKING GROUP AND OF THE CHAIRMEN OF THE SUBGROUPS

5.1 Report on Public Relations and Visibility of National Hydrological Services

5.1.1 Mr P. Givone (France) as Rapporteur on Public Relations and Visibility of National Hydrological Services and vice chairman of the Group presented his report.

5.1.2 He informed the meeting that the very broad and detailed ToR have not been achieved due to some difficulties to establish appropriate contact with the relevant people really in charge of this topic within the NHSs. So the report had been compiled from a general analysis of the main questions at general level of recommendation.

5.1.3 "How to improve the visibility of the National Hydrological Services among the general public?" is a recurrent question for years. It's nowadays a major topic, since the satisfaction of end-users, which have specific needs, is more and more important to guarantee a strong support to the NHSs.

5.1.4 For historical reasons, the NHSs are still mainly oriented to providing informations in situation of crisis (floods, droughts, accidental pollutions, ...) and the general public is almost never the first recipient of this information, which is also a of very technical content for other Technical Services. Contrary to Meteorological Services, NHSs haven't the appropriate products to communicate to general public on a daily regular, basis, and in the minds of general public the precipitation is still "NHSs come only when crisis situations occur", attitude which can lead to very negative results.

5.1.5 However, in some cases such as navigation purposes, the NHSs have the opportunity to communicate with end-users on a daily basis, but the end-users are professionals and not GP, even if the recreational purposes are increasing.

5.1.6 In any case, the NHSs do have the skills to design specific products for GP communication, but these developments need resources, and there are difficult decisions to make before starting these investments.

5.1.7 On the other hand, the Water Authorities, which are acting at a local and basin scale, have to start participatory and negotiated processes to improve public relations regarding all water management related activities. A relevant technical, political and social framework to do so is the Water Framework Directive of EU, or any similar set of rules in non EU member states.

5.1.8 A good way for the NHSs to improve visibility and set up efficient communication towards GP using relevant and dedicated products is to work in close cooperation with Water Authorities in the way of sustainable water development based on participatory actions.

5.1.9 The meeting had a long discussion on the topic. Several examples on successful practices and products were given. However, demands for resources related to development may become a problem. Many participants supported the idea that NHSs should put more effort in public visibility. This can be done e.g. by developing web services and giving hydrological reviews, forecasts and warnings. In addition to basic hydrometric data, such as water level and discharge, other variables should also be reported. Maps and graphs are helpful tools for the public. When data is free of charge, it supports wide use. Disaster warning will stay a very important task. One important component of public visibility is school education related to water resources.

5.2 Report of the Rapporteur on Potential Extreme Floods

5.2.1 Mr B. Ozga-Zielinski (Poland) as Rapporteur on Potential Extreme Floods presented his report. In order to meet the requirements specified in the ToR, Mr Ozga-Zielinski, contacted experts from various countries of Europe who were willing to serve as Associate Experts in the field of Extreme Potential Floods. The associate experts who served the subgroup during inter-sessional period 2002-2005 are Ms M.J. Adler (Romania), Mr H. Buiteveld (The Netherlands), Mr A. Dubicki (Poland), Mr H. Engel (Germany), Ms R.P. Mic (Romania) and Messrs A. Kesim, H. Ozguler and A. Ugurlu (Turkey).

5.2.2 On the basis of review of research carried out on hydrological design data as well as an international survey on best available practices and national standards in estimation of hydrological design data for extreme floods occurrences, the *Guidelines for Flood Frequency Analysis – Long Measurement Series of River Discharge* has been developed by the Institute of Meteorology and Water Management (IMGW), Poland and published in 2005. The above-said *Guidelines* are recommended to be used for applications concerning structures designed for water management.

5.2.3 A review of literature concerning research on PMP/PMF has been undertaken taking into account internationally recognised methods of PMP/PMF estimation and its applications throughout the world, i. e. in Australia, Canada, China, India, New Zealand, United Kingdom and United States. Based on acquired knowledge and experience, an attempt to develop the method of PMP/PMF estimation for small river basins in Poland has been made. In 2003 the research report on River-flooding potential in terms of the safety of water management structures and flooding risk - Introduction to methodology was prepared by IMGW, an English version of the report being published. The new approach called Maximum Credible Precipitation (MCP) and Maximum Credible Flood (MCF) model is presented in the above-said report.

5.2.4 Mr Zielinski reported that, he had communicated with recognised researchers to canvass opinions and comments on future research priorities. It was agreed that the development of PMP/PMF (MCP/MCF) method (model) would be continued in case of large river catchments and flood frequency analysis should be carried out in cases of short measurement series of river discharge and ungauged basins (sites).

5.2.5 To meet the requirement of ToR concerning catalogue of extreme floods, the World Catalogue of Maximum Observed Floods was prepared and compiled by Mr J.A. Rodier and Mr M. Roche in 1984 and reviewed and updated in 2003 by Mr Reg Herschy, issued by IAHS Press in 2003 as IAHS Publication 284.

5.2.6 The Rapporteur on Extreme Potential Floods recommended:

- To continue work on PMP/PMF (MCP/MCF) derivation, particularly in case of large river catchments;
- To prepare guidelines for flood frequency analysis in cases of short measurement series of river flows and ungauged basins (sites);
- To improve communication between experts of working groups to achieve better cooperation and exchange of information;
- To organize workshops on specific topics concerning scientific research in the field of interest of the working groups.

5.2.7 The report was considered to be a good base for further discussion. Problems of linking probabilities and the concept of probable maximum events were discussed. Relationships between extreme flood events and climate change should form one main topic. It was agreed, that the guidelines and software, developed in Poland in connection with the work, should become a HOMS component.

5.3 Report of the Rapporteur on Climate and Water

5.3.1 The report was prepared by Ms T. Helmi, Mr O. Varis, and Mr. T. Kokkonen, and presented by Mr T. Kokkonen. It was based on a questionnaire sent to 53 countries and responded to by 10, which set the return rate at 19%. The responses with regard to whether consideration of climate change and variability had resulted in a change in operational practices of national hydrological services were quite varied. Still, it was evident that potential impacts of climate variability and change on water resources had been thoroughly considered in all countries returning the survey. While most of respondents expected changes in the hydrological regime, concerns regarding uncertainty and scale of climate model results were clearly expressed.

5.3.2 The uncertainty associated with climate projections, and the need for downscaling procedures pose difficulties in adapting operational practices to predicted changes in the climate. Furthermore, as changes in land-use and climate are interrelated, an Integrated Flood Management should recognize that the system is subject to influences both natural – such as climate variability - and artificial - such as land use. In the report there is a list of publications addressing operational hydrological practices and their possible adaptation to climate variability and/or change.

5.3.3 The general view of the meeting was that the impact of climate change is seldom taken into account in flood analyses. As the results were considered to be very important, the meeting asked the rapporteur to extend the survey using the working group network and update the report.

5.4 Report of the Rapporteur on Water Quality Assessment

5.4.1 Mr P. Rončák (Slovak Republic) as Rapporteur on Water Quality Assessment presented his report. He reported that the activities of the topic group were coordinated with the subgroup on Institutional Aspects of Monitoring and Assessment to avoid the overlapping and allow synergy. He informed the meeting that he participated directly on the meeting of the subgroup.

5.4.2 He reported that in the review of the situation in the RA VI countries, the involvement of the NHSs in the implementation of WFD is vital to keep track of monitoring and assessment, at least related to the quantitative quality elements (hydrology, water continuum, hydromorphology). The Group highly recommended continuing working in this topic. Furthermore, it is recommended also to organize a pilot project (3 – 4 countries) on the comparison of the quality of the water quality devices and equipments used for monitoring.

5.4.3 The report stressed the fact, that NHSs have knowledge that should be used in water quality assessment. It was agreed that more emphasis should be put on groundwater. The adoption of the EU Groundwater Daughter Directive will support this objective.

5.5 Report of the Rapporteur on Drought Assessment and Forecasting

5.5.1 Ms G. Monacelli (Italy) as Rapporteur on Drought Assessment and Forecasting presented her report. She reported that the study was carried out using an Index (WDI – Water and Drought Index), which systematically assesses some significant aspects of water and drought policy and management on a national level, in Region VI of the WMO. Finally the Index provides transparent, comprehensible, and accessible environmental information on drought issues to the general public and stimulates debate on how to improve the strategies of water management and combating drought.

5.5.2 The WDI could be applied to all countries of Region VI of the WMO (Europe). In this first phase 22 countries have been considered including, Armenia, Cyprus, Finland, France, Georgia, Germany, Greece, Hungary, Israel, Italy, Jordan, Lebanon, Malta, Netherlands, Poland, Portugal, Republic of Moldova, Romania, Spain, Syrian Arab Republic, Turkey, United Kingdom of Great Britain and Northern Ireland. The report was based on contributions given by only seven countries. Later on, the rapporteur received new information which will be used for updating.

5.5.3 The collection of information was carried out by the Italian Hydrological Service of APAT (Agency for the Protection of the Environment and for Technical Services), and the results will be given to CHy of the WMO for a joint decision on the distribution modalities.

5.5.4 The working group discussed different aspects of drought. In connection with Med-HYCOS, relationship between natural and human impacts was raised. The document “Towards a European Drought Policy”, prepared by EurAqua might be relevant for the topic and the topic should be linked to the virtual European Drought Centre, established by the NE FRIEND Low flow group (<http://www.geo.uio.no/edc/>).

5.6 Report of the Chairman of the Subgroup on Institutional Aspect of Monitoring and Assessment

5.6.1 Mr A. Snorrason (Iceland) as Chairman of the Subgroup on Institutional Aspect of Monitoring and Assessment presented the report of the sub-group. The meeting had a long discussion on the report and its recommendations. The role of NHSs in the implementation of the Water Framework Directive (WFD) of the European Union (agenda item 6.1) was also widely covered. The WFD process was considered to have great importance in the region, because even if the directive will not be implemented by all RA VI members in the near future, WFD is expected to guide future development in most countries. It will also form a new institutional and operational environment for water related issues. The main concern is, that NHSs in the region can and should give strong technical and co-operational contribution for the process, but their current status and visibility is weak. On the other hand, NHSs should be able to prepare themselves for the requirements that WFD will raise. The technical strengths of NHSs were recognized, and they are well documented in the Subgroup report. The importance of EU directives in the water sector will be increased by other (supporting) directives (groundwater, flood, soil and data infrastructure).

5.6.2 Many comments addressed the need for WMO's strong commitment and political role in the WFD process. The recent Memorandum of Understanding between WMO and the European Commission will give excellent support for this goal. At the same time, it is crucial for the RA VI WG on Hydrology to form a dynamic network that will be able to control and allocate resources for co-operational and technical development.

5.6.3 The chairman of the Subgroup will finalize the report, and therefore he encouraged participants of the meeting to support missing national contributions to complement the institutional mapping. The work of the Subgroup was a follow-up for the report "Integration of Environmental Monitoring Networks", prepared for the previous meeting of RA VI WG on Hydrology. As many of the above concerns and objectives are described in this report, the publication of this paper would serve as reference of RA VI for the future.

5.7 Report of the Chairman of the Sub-group on Flood Forecasting and Warning

5.7.1 Mr I. Karro (Sweden) as the Chairman of the Sub-group on Flood Forecasting and Warning presented the report of the Sub-group. He highlighted the importance of close co-operation between hydrologists and meteorologists both in operational forecasting as well as research and development. He also stressed the importance of having clear responsibilities between the actors participating in producing and issuing warnings. He also highlighted the importance of identifying end users of warnings and their needs. He identified number of ongoing activities in the field of Flood Forecasting and Warning and proposed that the ToR for future work in the subgroup should be reviewed to avoid duplication of work.

5.7.2 Many countries gave information about their national practice in field of flood forecasting and warning. The institutional structure differs from country to country but it was commonly agreed upon that in any structure the key question is good co-operation between meteorologists and hydrologists, their institutions and their departments. The meeting stressed that for providing better hydrological forecasts, hydrologists need timely and reliable meteorological information, free of charge in the spirit of Resolution 40 (Cg-XII). The question of the responsibility for flood forecasting and warning in emergency situation was also discussed. The participants agreed that flash floods need different management and better understanding with more detailed information of the local situation.

5.7.3 Mrs Frédérique Martini, Direction de l'Eau du Ministère de l'Ecologie et du Développement Durable, Paris, France, made a presentation on the European exchange circle on flood forecasting initiative (EXCIFF). The meeting noted that the EU Water Directors accepted the EXCIFF initiative in December 2004. Summary of the presentation is under item 8.2.2. Based on the outcome of its 1st workshop (14-15 April 2005, Toulouse, France) it was common opinion that the future tasks of EXCIFF can/should be linked to WMO and RA VI WGH (like public relations, education, data management and standardization, forecasting methodology etc.) and even though this EU Initiative is open to all countries and more efforts should be made to involve non-EU countries.

6. DISCUSSION ON THE IMPLEMENTATION OF THE HYDROLOGY AND WATER RESOURCES PROGRAMME IN RELATION TO THE NEEDS OF THE REGION

6.1 Role of NHSs in the implementation of the Water Framework Directive of the European Union

6.1.1 The meeting was pleased to note that the WGH, through its subgroup on Institutional Aspect of Monitoring and Assessment, has gained an observer status in the Strategic Coordination Group (SCG) of the Common Implementation Strategy (CIS) of the EU-Water Framework Directive (WFD).

6.1.2 It also noted that in December 2003 WMO and the European Commission signed a Memorandum of Understanding concerning the framework and arrangements for cooperation between the two organizations. It identifies a number of areas of cooperation, among which strengthening of ground and space based monitoring networks, assessment and management of water resources, preparedness and response to natural disasters including flood and droughts and capacity building. It also sets a legal framework for financial cooperation in projects of mutual interest.

6.1.3 It also noted that engagement of NHSs in the implementation process of the WFD differ from country to country. In many countries NHSs are responsible for monitoring water quantity and quality and they are involved into preparation of monitoring programmes in compliance with WFD. The term for submitting to EU competent authorities the programmes is December 2006.

6.2 Cooperation with the United Nations Organizations and other Regional and International Organizations

6.2.1 The meeting noted that WMO, jointly with ISDR, took the lead in planning the celebrations for World Water Day 2004 with the theme "water and disasters". The emphasis in the awareness campaign was 'be informed and be prepared'. WMO prepared an Information kit and established a website (www.waterday2004.com).

6.2.2 It also noted that the United Nations General Assembly has proclaimed the period from 2005 to 2015 as the International Decade for Action "Water for Life", starting on World Water Day, 22 March 2005. WMO jointly with ISDR will contribute on the theme of disaster risk reduction.

6.2.3 The meeting noted the CHy-XII agreement with UNESCO to organize a joint meeting of CHy AWG and IHP Bureau in place of the planned sixth UNESCO/WMO International Conference with a view to contributing towards better planning of joint initiatives.

6.2.4 The meeting noted that the "Joint UNESCO/WMO Flood Initiative (JUWFI)" subsequently extended to other UN agencies and renamed "International Flood Initiative" (IFI) was launched during the World Conference on Disasters Reduction in January 2005 by Mr K. Matsuura, Director General of UNESCO and Mr M. Jarraud, Secretary-General of WMO. The initiative will promote an integrated approach to flood management to maximize the long-term benefits of floods and minimize the hardship, loss of life and damage to goods and assets that result from floods. It will focus on research, training, information networking, promoting good governance and providing technical assistance.

6.2.5 The meeting noted that in recognition of the important role of the ACC sub-committee on water resources, the UN Secretariat decided to re-establish the sub-committee as UN-Water. WMO's strong support and efforts were instrumental in the establishment of UN Water.

6.2.6 Mr M. Puupponen (Finland) informed the meeting about the work of CEN Technical Commission on Hydrometry, established in 1994. Its purpose is to produce European standards for hydrological measurements. The current number of member countries is 28, but during the work, only 5 to 10 countries have actively participated in the process. The number of produced CEN standards is less than 10. A strong input by the NHSs of the member countries would certainly support the work and lead to better efficiency. Consequently, the hydrological community would gain by improved visibility and status. The meeting agreed, that such contribution would be needed and individual services were encouraged to contact their national standard bodies and participate in the work of the commission.

6.3 WMO Flood Forecasting Initiative

6.3.1 The meeting noted that in 2003 WMO launched a Flood Forecasting Initiative with the principal objective of strengthening the cooperation between national Hydrological and Meteorological Services to deliver timely and more accurate products and services required in flood forecasting and warning. The initiative will be implemented through the organization of a number of regional workshops, attended by experts directly involved in the preparation of forecasts, and will be concluded by a final global conference in 2006. The results of the conference will serve as inputs in the review of cooperation mechanisms between NMHSs, and in the promotion of the application of NWP products for flood forecasting.

6.3.2 The meeting was pleased to learn that WMO is planning to organize three workshops for RA I, RA II and RA VI during 2005 and requested WMO to involve the WGH in such activities.

6.4 Associated Programme on Flood Management

6.4.1 The meeting was informed that the Associated Programme on Flood Management (APFM), a joint initiative of the World Meteorological Organization (WMO) and the Global Water Partnership (GWP), was established in order to promote the concept of Integrated Flood Management (IFM) and to show practical steps for putting IFM concept into practices.

6.4.2 It noted that APFM was launched in August 2001 with funding from the Governments of Japan and the Netherlands. In the framework of the programme's activities nineteen case studies on existing flood management policies have been completed (three of them in Europe: Italy, Turkey and United Kingdom) and four pilot projects have been implemented (South East Asia, Kenya, South America and Central and Eastern Europe). A concept paper on IFM has also been prepared, as well as four documents on legal, ecological, economical and social aspects of IFM.

6.4.3 Dr K. Hajtasova (Slovakia), in her capacity as coordinator for the APFM Pilot Project in Central and Eastern Europe briefed the meeting on the project's objectives, activities and the current status. The meeting noted that seven countries from the Region (Bulgaria, Czech Republic, Lithuania, Poland, Romania, Slovakia, and Slovenia) are participating in the Project and have sent their reports. The synthesized document is currently under preparation. Moreover, a workshop with stakeholders in particular countries is being organized.

6.5 European Flood Alert System

6.5.1 The meeting noted that WMO has participated in the closing conference of the European Flood Forecasting System (EFFS) programme, held in Rotterdam, in March 2003 and has contributed in the preparation of the conference proceedings, especially concerning the peer review process of the papers.

6.5.2 Following to EFFS the European Flood Alert System (EFAS) has been launched and supported by European Commission. Its work on EFAS was started at the beginning of 2003 with the building up of data infrastructure and the set-up of the model on a European scale. The EFAS was developed and tested in the Institute of Environment and Sustainability of the EU Joint Research Centre (JRC) in Ispra.

6.5.3 At present the system runs twice a day using forecasting data from the European Centre of Medium-Range Weather Forecasts (ECMWF) and the German Weather Service (DWD) giving precipitation forecast with a lead-times of 10 and 7 days respectively. The spatial resolution of the system is 5 km, and a 1km resolution is in preparation. A high-resolution quantitative database for meteorological and hydrological data is being constructed. The pilot basins at present are the Elbe and the Danube river catchments.

6.5.4 The representative of the Joint Research Centre (JRC), Mr A. De Roo presented the current status of the European Flood Alert System, which aims to support the NHSs by providing medium-range flood alerts (beyond 48 hours leadtime), for the larger European river basins. EFAS is supported by DG Environment and the European Parliament.

6.5.5 At present, EFAS uses ECMWF deterministic and EPS forecasts and the DWD LM and GM forecasts, to produce probabilistic flood forecasts. Memoranda of Understanding are in preparation with NHSs after which alert reports can be sent in case of forecasted flood events. Following the development and pre-operational testing, EFAS will be transferred to a third party after 2006.

6.5.6 The meeting agreed that JRC will regularly inform the WMO RA VI Hydrology Working Group via the bi-monthly EFAS bulletins, and asked the WG members to provide feedback. JRC would like to establish collaboration with the WMO GPCC (Global Precipitation and Climate Centre) and the WMO-GRDC (Global Runoff Data Centre) to improve the runoff and precipitation data availability for validation and near-real-time updating purposes.

6.6 Guide to Hydrological Practices, Technical Regulation and INFOHYDRO

6.6.1 The meeting noted that the CHy AWG in cooperation with the Secretariat decided to give priority to the preparation of the sixth edition of the Guide. A Review Committee had been established under the chairmanship of Prof. K. Hofius and composed of experts from India, South Africa, Uganda, Canada and Venezuela.

6.6.2 The meeting also noted that the first meeting of the Review Committee was organized in Geneva in July 2003 to develop the structure and table of contents of the new edition. The new edition will be in two volumes: Volume I Hydrology for measurements to hydrological information (10 chapters); Volume II Management of water resources and the application of hydrological practices (7 chapters). The Review Committee also identified the lead author for each chapter. The Secretariat informed the meeting about the current status of the draft and requested contribution from interested experts in the group on five specific chapters where the identified authors failed to deliver their contributions. Some participants expressed interest to assist the Secretariat in the preparation of the missing chapters.

6.6.3 The meeting noted that the CHy decided to assign the responsibility to the AWG to make recommendations for any amendments to the Technical Regulations considered to be urgent. It also noted that once the revised and simplified version of INFOHYDRO is ready the RAs WGH should contribute to the revised version in each region and the vice/president with the assistance from the WMO Secretariat should compile a global version.

6.7 WHYCOS and other cooperation projects

6.7.1 The meeting was pleased to note that the implementation of the WHYCOS programme has continued with the development of new components, mainly in Africa, Asia and Central America with financial support from the EU, and the Governments of France and of the Netherlands.

6.7.2 The meeting also noted that a comprehensive report on the status of the HYCOS components is being prepared and will be submitted to next EC in May 2005. The report covers the current status of implementation of regional components, their success and pitfalls, the issues of data exchange and standardization, and the long-term sustainability. The report states there is no progress in the realization of new European HYCOS components, such as Baltic-HYCOS and Danube-HYCOS. WMO Secretariat is also preparing guidelines on the development, implementation and governance of HYCOS components.

6.7.3 It was noted with satisfaction that WMO Secretariat is providing support to the riparian countries of the Sava River (Albania, Bosnia-Herzegovina, Croatia, Serbia-Montenegro and Slovenia) in developing a project for cooperation in the development and upgrading of a hydro-meteorological information and forecasting system, to support the implementation of the Framework Agreement on the Sava River Basin and the activities of the Interim Sava Commission. Three planning meetings have been held, in Dubrovnik (Croatia, November 2003), Sarajevo (Bosnia and Herzegovina, June 2004) and Belgrade (Serbia and Montenegro, December 2004). WMO is in contact with EU to identify the most appropriate funding mechanisms for the project. It is also consulting with concerned countries to develop comprehensive project documents for fund raising.

6.8 HOMS

6.8.1 The meeting was informed that the HOMS Reference Manual (HRM) is currently having 180 components revised and updated after 2001. Unfortunately the replenishment of the HRM with new components is not satisfactory as very few national HOMS National Reference Centers (HNRC) are contributing. The Secretariat urged and encouraged the RA VI WGH to contribute new components to HRM.

6.8.2 The meeting also noted that CHy-XII recommended to retain in the HRM components for which technical support was no longer available from the originating NHRC but which had proven very useful and were in high demand by HOMS users. It also decided to modify the HOMS selection criteria, by adding a new, general section to the HRM for components "under testing". The meeting agreed that the HOMS concept was still a fundamental pillar of the capacity building activities of the HWRP and urged members to contribute new components in selected areas to HRM.

6.8.3 It suggested that materials produced through the activities of the RA VI WGH should be considered as HOMS components.

6.9 WMO Natural Disaster Prevention and Mitigation Programme

6.9.1 The meeting noted that through Resolution 29 Cg-XIV WMO has established a Natural Disaster Prevention and Mitigation Programme to develop an organization-wide coordinating framework to enhance WMO's contribution to the natural disaster risk reduction activities at the international, regional and national levels.

6.9.2 The meeting also note that at its fifty-sixth session the Executive Council established an Advisory Working Group, chaired by Dr I. Obrusnik (Czech Republic) with the mandate to overview the activities of the Programme.

6.9.3 The meeting was pleased to note that in the framework of this programme a session on "Integrated flood risk management through appropriate knowledge sharing and capacity building systems" was organized by the Government of Japan, the World Meteorological Organization and the Australian Bureau of Meteorology during the World Conference on Disasters Reduction (Japan, January 2005).

6.9.4 The meeting was also informed that WMO has been asked to assist in the conceptual preparation of the Fourth World Water Forum (Mexico, March 2006), particularly in the development of the Thematic Area on Risk Management, a clear recognition of the leading role the Organization is seen as having in this field. A Baseline Document on the subject has been prepared and assistance is being provided in the organization of thematic sessions both of the virtual forum and of the WWF4 itself.

6.10 WMO Information System

6.10.1 The meeting noted that WMO has started discussions and consultations among Members in view of the development of the Future WMO Information System (FWIS). The FWIS is designed to cover the data needs of all WMO programmes. To govern the process of development of FWIS an Inter-Commission Team on FWIS has been established; Mr P. Givone has been designated by the president of the Commission for Hydrology to represent CHy in this team. Mr Givone informed the meeting about the background of FWIS and his first participation in the meeting, which was held in January 2005 in Geneva and informed the meeting that the next meeting is planned for October 2005 in Boulder, Colorado, USA.

7. DISCUSSION OF FUTURE ACTIVITIES OF THE REGIONAL ASSOCIATION VI IN THE FIELD OF HYDROLOGY AND WATER RESOURCES

7.1 The meeting was informed that the Fourteenth Session of WMO Regional Association VI was planned for 7 to 15 September 2005 in Germany. It therefore agreed that the draft report of the tenth session of RA VI WGH should be finalized by the end of May 2005 and circulated to chairmen and all the working group members.

7.2 Having considered the reports of the chairmen of the two sub-groups and the rapporteurs and the discussions during the session, the meeting agreed to continue with the scientific topics and the institutional aspects as identified during the last inter-sessional period for their future activities. These activities are related to:

- (1) water and climate,
- (2) water monitoring and assessment,
- (3) potential extreme floods,
- (4) drought assessment and forecasting and warning,
- (5) networking for contributions to water related initiatives, and
- (6) public relations and visibility of NHSs.

7.3 The proposed terms of reference for the future activities are included as Annex 3 of this report. A number of countries expressed interest in participating and contributing to the various activities identified by the group, as indicated in the terms of reference. The Group proposed that the activities relating to flood forecasting and warning being undertaken by a subgroup composed of meteorologists and hydrologists.

7.4 The meeting agreed to recommend to the Regional Association that the Working Group on Hydrology be re-established by XIV-RA VI for the next inter-sessional period. The meeting noted with thanks the remarkable work Mr Kubat has done in leading the Group and for the considerable efforts he has made in fulfilling his duty as chairman. In recognition of his active role and valuable contribution during his chairmanship, the meeting agreed to recommend to the XIV-RA VI to consider his re-nomination. The meeting recognized the work achieved by Rapporteurs and the Chairmen of the subgroups and thanked them for their valuable contribution to prepare and produce their reports. Experts from the WGH expressed interest to be assigned as Rapporteur for specific topics during the next intersessional period. The representative of the Secretariat informed the meeting that experts who are willing to be assigned as Rapporteur or Chairman for the subgroup should convey their interest to the PR in their countries and request him to nominate them during the forthcoming XIV-RA VI, Heidelberg, Germany, September 2005.

8. ANY OTHER BUSINESS

8.1 During the meeting some participants made presentations on their initiatives and institutions of interest to the group.

8.2 The vice-president of the CHy

8.2.1 The Vice-President of Chy, Mr J. Wellens-Mensah presented an overview of CHy activities, the five thematic programme areas of CHy and the approach to implementation through OPACHES. He emphasized the need to establish linkages between CHy and RWGHs and between their activities and work programmes. He further proposed a mechanism for forging and promoting these linkages, namely, through close and effective contact between CHy Vice-President and Chairpersons of RWGHs, identification of common areas of programmes and activities, building synergies between work programmes of CHy and RWGHs, linking experts in the regions with OPACHE leaders and dissemination of relevant information on decisions and recommendations of CHy Advisory Working Group to RWGHs and vice-versa.

8.2.2 Two members of the CHy AWG being present, they briefly elaborated on their thematic remit and on progress in those areas since CHy XII : Ann Calver spoke on the 'Water resources availability and use' theme and Siegfried Demuth on the 'Disaster mitigation' theme.

8.3 Representative of European exchange circle on flood forecasting (EXCIFF)

8.3.1 The WGH was presented with the European exchange circle on flood forecasting (EXCIFF). EXCIFF is an initiative of the Water Directors of the European Union. It aims at facilitating the exchange of experience and knowledge in flood forecasting in Europe. Its objective is to identify the needs to improve flood forecasting and propose actions undertaken collectively to achieve this improvement.

8.3.2 EXCIFF consists of 22 Member states. It is co-piloted by DG JRC and France. Since its launch in December 2004, EXCIFF has been drawing an overview of the current situation and the main needs in flood forecasting, based on the contributions of the participants of the circle.

8.3.3 The first workshop of EXCIFF was held 14-15 April 2005 in Toulouse. On this occasion several proposals were made to improve ability in flood forecasting. In particular a new EXCIFF activity aiming at designing a "hydrological data quality standard and hydrological data exchange standard" was proposed. Also a new EXCIFF activity focused on "flood forecasting information for the general public" was established. EXCIFF proposed too that an agreement between hydrological and meteorological communities concerning use and exchange of meteorological data be found.

8.3.4 Many other proposals arose from the workshop. All will be submitted to the Water directors soon and the follow-up activities of EXCIFF will then be decided.

8.3.5 During the discussion, Ms Martini recalled that the sub-group on flood forecasting is welcomed to participate at the EXCIFF activity through the rapporteur of the sub-group and anybody else willing to participate.

8.4 Representative of GRDC

8.4.1 The Global Runoff Data Centre (GRDC, <http://grdc.bafg.de>), Koblenz, Germany, operates under the auspices of WMO. Its mandate, i.e. support of Global Change Research

by collecting daily and monthly river discharge data of NHS world-wide, has been reinforced by WMO Resolution 21 (Cg-XII, 1995). Over the last 10 years the amount of data stored in the database increased by a factor of 10 to 250.000 station-years (7200 stations). However, many countries do not contribute regularly, and response to support letters of the WMO SG to PR and HA is marginal. This may be partly due to fragmented responsibilities and not always working lines of reporting.

8.4.2 GRDC participates in GTN-H, contributing the component “Global Terrestrial Network of River Discharge” (GTN-R, <http://gtn-r.bafg.de>) which also became Action Item T4 of the GCOS “Implementation Plan for the Global Observing System for Climate in Support of the UNFCCC”. A recent letter by WMO SG to PR and HA requests collaboration with GRDC in developing GTN-R.

8.4.3 A prerequisite for complex projects is to get overview of available data. GRDC plans the adaptation of an existing web based metadata management system according to the WMO Core Metadata Profile of ISO 19115 (<http://www.wmo.int/web/www/WDM/Metadata/documents.html>) developed by the ET-IDM of WMO-CBS. This profile is currently in version 0.2 and thus there still is opportunity for RAVI-WGH to contribute extensions and adjustments reflecting needs from the HWR sector.

8.5 Representative of GPCC

8.5.1 The Global Precipitation Climatology Centre (GPCC) is operated at the Deutscher Wetterdienst (NMS of Germany) under the auspices of WMO. New results on the spatial distribution of precipitation trends for the global land-surface in the period 1951-2000 have been presented by Mr. Rudolf (DWD, Head GPCC). The gridded precipitation data, summary results and documentation are published in the Internet (<http://gpcc.dwd.de>).

8.5.2 Mr Rudolf appreciated the data contributions so far provided by the Members, in particular from RA VI, and expressed the need for complementation by longer data time-series and by the delivery of regular updates on a yearly basis.

8.6 Representative of IAHS

8.6.1 The representative of IAHS expressed his gratitude to have been invited to the ARVI WG on Hydrology meeting and his satisfaction to see IAHS continuously associated to the hydrological activities of WMO and of its Regional Associations.

8.6.2 He recalled some points about IAHS role since its creation in 1922 and its relationship with WMO, UNESCO and other various water-related Organizations. He informed the Working Group about IAHS past Activities, especially its recent Scientific Assembly held in Brazil, about planned activities like its forthcoming General Assembly to be held at Perugia (Italy) in July 2007 under the theme “Freshwater: Ever Changing and Yet a Cause for Change” and the development of the IAHS PUB (Prediction in Ungaged Basins) Initiative. The IAHS Representative also informed the Working Group about the Publication programme of IAHS Press (E-version of Hydrological Science Journal, New Benchmarks Paper in Hydrology Book Series...) and the ongoing project of digitization of Out of print IAHS Red Books (Presently more than 60 volumes and 23000 pages freely available on the IAHS Web site at <http://iahs.info>).

8.7 Representative of the Rhine Commission

8.7.1 The Chairman of the Rhine Commission offered to host a 2 days workshop on flood forecasting in Switzerland with emphasis on ensemble prediction and uncertainty.

9. ADOPTION OF THE REPORT AND CLOSING SESSION

9.1 The Working Group adopted the report of its session and requested the WMO Secretariat to make any editorial changes deemed necessary and, with the approval of the President of RA VI, to circulate it to all participants and Members of RA VI.

9.2 At the closing session, the chairman thanked the participants for their valuable contributions to the discussions and the deliberations of the meeting. He invited them to maintain their spirit of cooperation as shown during the meeting. He also addressed his thanks to the WMO Secretariat for the support it provided. The representative of WMO Secretariat thanked CHMI and the Czech Republic for the excellent organization of the meeting and the warm hospitality that WMO's delegates enjoyed. He expressed his gratitude to the chairman for the way he conducted the meeting and the excellent work received from Mr Puupponen (Finland) and Ms Buzas (Hungary) in drafting the report. He also thanked the participants for their active participation in the meeting and assured them of WMO's support to the WGH to implement its work plan.

9.3 The session closed at 13h00 on Saturday 7 May 2005.

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AGENDA

1. OPENING OF THE MEETING
2. APPROVAL OF THE AGENDA AND ORGANIZATION OF THE WORK
3. REPORT OF THE CHAIRMAN OF THE WORKING GROUP
4. CONSIDERATION OF THE RELEVANT DECISIONS OF Cg-XIV, XIII-RA VI, CHy-XII AND EC-LIV, EC-LV, EC-LVI
5. CONSIDERATION OF THE ACTIVITIES OF THE RAPPORTEURS OF THE WORKING GROUP
 - 5.1. Report of the Rapporteur on Public Relations and Visibility of National Hydrological Services
 - 5.2. Report of the Rapporteur on Potential Extreme Floods
 - 5.3. Report of the Rapporteur on Climate and Water
 - 5.4. Report of the Rapporteur on Water Quality Assessment
 - 5.5. Report of the Rapporteur on Drought Assessment and Forecasting
 - 5.6. Report of the Chairman of the Subgroup on Institutional Aspect of Monitoring and Assessment
 - 5.7. Report of the Chairman of the Sub-group on Flood Forecasting and Warning
6. DISCUSSION ON THE IMPLEMENTATION OF THE HYDROLOGY AND WATER RESOURCES PROGRAMME IN RELATION TO THE NEEDS OF THE REGION
 - 6.1. Role of NHSs in the implementation of the Water Framework Directive of the European Union
 - 6.2. Cooperation with the European Commission and other regional and international Organizations
 - 6.3. WMO Flood Initiative
 - 6.4. Associate Programme on Flood Management
 - 6.5. European Flood Alert System
 - 6.6. Guide to Hydrological Practices
 - 6.7. WHYCOS and other cooperation projects
 - 6.8. HOMS
 - 6.9. WMO Natural Disaster Prevention and Mitigation Programme
 - 6.10. WMO Information System
7. DISCUSSION OF FUTURE ACTIVITIES OF THE REGIONAL ASSOCIATION VI IN THE FIELD OF HYDROLOGY AND WATER RESOURCES
8. ANY OTHER MATTERS
9. ADOPTION OF THE REPORT AND CLOSURE OF THE MEETING

PROPOSED TERMS OF REFERENCE OF THE WORKING GROUP ON HYDROLOGY

The Working Group on Hydrology will notify as basic principles of its future activities

- Cooperation with meteorological services at national level
- Cooperation with WMO meteorological and climatic programmes, proper and clear definition of relevant hydrological requirements
- Coordination with CHy activities, to avoid duplications
- Cooperation with UNESCO International Hydrological Programme
- Cooperation with EU bodies dealing with hydrology and water related issues
- Cooperation with European ongoing projects regarding standardization in the field of hydrology

and ask for stronger financial support from WMO for the following priority topics:

i. **Public Relations and Visibility of Hydrological Services**

Considering the need to enhance the visibility of the NHSs and the recognition of their role by national authorities, as well as their involvement in the formulation of new international policy tools concerning water:

- (a) To collect, **analyze** and disseminate information on the activities undertaken by NHSs in the area of public relations, and on tools and approaches used to enhance their visibility and recognition;
- (b) To develop RA VI Working Group on Hydrology Web site, with a link on WMO Web site, as an operational tool for the activities of the Working Group, in particular as concerns the exchange of information, the establishment of an address book, the publication of reports, the provision of links for the hydrological community; including in particular information on the current activities of the NHSs;
- (c) To formulate suggestions for the presentation to the public at large through communication media of daily hydrological bulletins and forecasts for a country or large river basins.

ii. **Networking for contributions to regional initiatives related to Water – in particular to the Water Framework Directive.**

The objective of this proposal is to ensure relevant hydrological contribution for multidisciplinary regional water related programmes or initiatives. On the other hand, it should help to plan and adapt their long term activities. The main task is to develop working relationships and practices to facilitate this development.

- (a) To organize a meeting of the representatives of the WMO, NHSs, DG Environment and EEA in connection with the RA VI meeting in September 2005. That meeting should cover an overview of the activities of the parties involved, the potential hydrological contributions of WMO and NHSs, and the future needs of DG Environment and EEA for hydrological services.

- (b) As a follow-up of the above mentioned meeting, to define and implement, under the leadership of WMO, the necessary policy actions for NHS participation, e.g. formal cooperation agreements between WMO and EC.
- (c) To develop and activate the network of NHSs to communicate, organize and manage activities.
- (d) To attend or organize workshops involving the key parties for cooperation, and active participation. The Netherlands initiative for a conference on hydrological monitoring would serve as an important milestone for the process.

iii. Water Monitoring and Assessment (technical aspects)

Considering the present and anticipated responsibilities of the NHSs in the area of monitoring and water assessment in compliance with the EU Water Framework Directive (WFD):

- (a) To evaluate current methods used for the monitoring and assessment of the surface and ground water;
- (b) To prepare a revue of and proposals on:
 - Monitoring programmes in compliance with the WFD (end of 2006)
 - Methods and criteria for the classification of the state of rivers and groundwater bodies
- (c) To evaluate the influence of monitoring frequency on the assessment of surface and groundwater quality parameters.

iv. Climate and Water

Considering the potential impacts of climate variability and change on water resources, as well as uncertainties involved in assessing the impacts

- (a) To study and report how scenarios provided by regional climate models should be presented to hydrologists and end users dealing with water management
- (b) To study and report how assessments based on environmental simulation models and regional climate scenarios can be condensed and presented to the end-users in a readily comprehensible form
- (c) To liaise with and receive feedback from those experts of the Association working on assessing the effects of climate change on water

v. Potential Extreme Floods

Considering the importance of hydrological design data for the safety of people and security of hydraulic structures (e.g. dams and bridges):

- (a) To update a literature review of research carried out on hydrological design data for extreme floods occurrences;
- (b) To continue a survey on best available practices and standards in estimation of hydrological design data for extreme floods occurrences, even in ungauged basins;

- (c) To carry out an investigation of methods of PMP/PMF derivation and other methods for extreme flood estimation;
- (d) To liaise with experts and programmes on climate change and water with respect to their results concerning potential impacts on floods.

vi. Drought Assessment and Forecasting

In consideration of the increase of water-stress during a period of drought and with a view to ensuring the proper management of water resources during such conditions:

- (a) To review and evaluate meteorological and hydrological forecasting systems in RA VI countries with respect to droughts occurrence;
- (b) To assess the use of satellite data in drought monitoring, assessment and forecasting;
- (c) To identify ways of promoting the exchange of data and products, as well as of forecasts and warnings, during low flow situations;
- (d) To propose ways for ensuring effective cooperation with other international and regional bodies involved in drought assessment and mitigation;
- (e) To review and evaluate activities undertaken by end-user, in cooperation with NHSs, to mitigate the impacts of drought;

vii. Subgroup on Flood Forecasting and Warning

The subgroup is considered to be composed from meteorologists and hydrologists with the aim to improve the capability of NMHSs in flood forecasting and warning for different types of floods:

- (a) To study and report the present applications of:
 - the development and operational use of common probabilistic methods
 - the development and operational use of ensemble forecasting
 - the development and operational use of methods for estimating, calculating the uncertainty in the forecasts
- (b) To promote co-operation between meteorologists, hydrologists and end-users, both in operational activities as well as in research and development
- (c) To co-operate with relevant actors in the area of flood forecasting and warning, mainly with respective member of CHy AWG on flood forecasting and with EU Expert Circle on Flood Forecasting (EXCIFF) **and the European Flood Alert System (EFAS) initiative.**