

## **AGENDA ITEM 6: WORK PROGRAMME**

### **1. Water Resources Assessment**

Progress has been made in the preparation and publication of material pertaining to Water Resources Assessment (WRA), namely the report entitled Technical Material for Water Resources Assessment (WMO-No. 1095). Background papers on the areal estimation of evaporation, evapotranspiration and soil moisture; network design and optimization; and estimation of snow water content provided as background documents to CHy-14 have also been prepared.

There had been plans to hold both a regional and a global workshop on Water Resources Assessment in late 2013, but due to already busy schedules and other delays, these meetings have not been held. Planning is now underway to possibly hold these meetings early in 2015. In the interim, some discussions have been held with experts to determine what type of manual could be prepared and if so what process would be most suitable for its preparation, given the difficulties that we have faced in the past. The Advisory Working Group (AWG) will be discussing this at their meeting in September 2014. Mr Sung Kim and Mr Antonio Cardoso Neto, both members of the AWG and responsible for this topic area, will report on progress achieved under the Water Resources Assessment thematic area.

CHy-14 considered the material prepared in advance of its session on WRA and indicated that there was more to water resources assessment than conducting a water balance. It commented that a manual needed to be more comprehensive in scope, encompassing both water availability and use, and be dynamic (that is, capable of being updated at a variety of time and space scales) in nature. Building on the existing Technical Report (WMO-No. 1095) and available procedures and documentation, guidance material should be prepared that would help NHSs to enter a more modern era of water resources assessment that is more dynamic in nature, reflects advances in real-time monitoring and products derived there from, and incorporates the needs of the hydrological community and users of water information, particularly with respect to their regulatory and policy-oriented mission responsibilities, improving the generation of information needed for decision making processes.

#### ***Environmental Flows***

There have been various interests expressed by various Regional Working Groups on Hydrology. The development of guidance material for determining adequate ranges of flows for rivers, streams and wetlands that will maintain adequate stream health, water quality and ecological status along with guidance on formulating policies to make these determinations, taking into consideration the interactions with groundwater, is required.

The Working Group will discuss water resources assessment and reflect on those aspects that are of most direct importance to the Region. Topics can include, but are not restricted to:

- Water resources assessment guidance
- Environmental flows

## **2. Flood Forecasting**

### ***Flood Forecasting Initiative***

The WMO Flood Forecasting Initiative (FFI) is being implemented through the elements of the “Strategy and Action Plan for the Enhancement of Cooperation between National Meteorological and Hydrological Services for Improved Flood Forecasting” which was endorsed by Cg-XV. (<http://www.wmo.int/pages/prog/hwrrp/documents/FFInitiativePlan.pdf>)

A WMO Region-specific Activity Plan had been compiled in line with the guidance provided under Resolution 3 (CHy-XIII) “to supplement the Strategy and Action Plan on the Flood Forecasting Initiative with a detailed activity plan that will assist Members in establishing flood forecasting systems”.

The overarching Advisory Group for the Flood Forecasting Initiative (FFI-AG), as decided by Congress (Resolution 15 (Cg-XVI)), met in October 2013.

An Intercomparison of Flood Forecasting Models has been compiled as a result of a workshop on this topic held in Koblenz, Germany in September 2011. This intercomparison will assist Members in the selection and application of flood forecasting models under different flood situations, environmental and institutional settings and a variety of professional capabilities in NHSs. Materials for capacity building that would enable users to effectively use the guidance document will be prepared.

Doc 3 has already described a range of initiatives under the FFI.

### ***Flash Flood Guidance System (FFGS)***

A Memorandum of Understanding exists to establish a cooperative initiative among the WMO, the Hydrologic Research Center, US NOAA National Weather Service and USAID/OFDA for the Flash Flood Guidance System with Global Coverage Project. The project is being implemented through a number of regional or “sub-regional” components. The purpose of each component is to develop and implement a regional flash flood guidance and early warning system. The approach entails development, based on the already existing infrastructure at global scale, of regional technology, training, protocols and procedures to address the issues of mitigating the impacts of flash floods and the application of such a system allowing the provision of critical and timely information by the National Meteorological and Hydrological Services (NMHSs) of the participating countries.

To accomplish this, the World Meteorological Organization (WMO) will cooperate with the Hydrologic Research Centre (HRC), San Diego, USA to implement a flash flood guidance and early warning system designed along the lines of similar systems that have been made operational in different parts of the world. In cooperation with a designated Regional Centre, normally located within one of the participating countries, the project will be executed by the participating national hydrometeorological services with the HRC providing technical assistance in cooperation with NOAA/National Weather Service for the system implementation and training; and WMO providing technical backstopping and supervisory services including Monitoring & Evaluation of the project. USAID/OFDA is providing funding support for the project.

Currently there are two projects being implemented in RA II, these are the MRCFFG and the South Asia FFG. Countries involved in the South Asia include Afghanistan, Bangladesh, Bhutan, India, Nepal, Pakistan, and Sri Lanka. A project also is under discussion in Central Asia and could involve Kazakhstan, Kirghizstan, Tajikistan, Turkmenistan, and Uzbekistan.

### ***Flood Management***

The Associated Programme on Flood Management (APFM) has made significant progress in the form of providing flood management policy guidance, technical tools and capacity building. The APFM is being undertaken in partnership with the Global Water Partnership. The

operationalization of the HelpDesk for Integrated Flood Management is the backbone of the initiative. The HelpDesk provides technical assistance and disseminates information and guidance material. ([www.apfm.info](http://www.apfm.info)).

### ***DEWETRA Platform***

At CHy-14, Italy offered to make the DEWETRA platform freely available to members of CHy. The DEWETRA platform is a real-time integrated system for hydro-meteorological and wildfire risk forecasting, monitoring and prevention. It has the capability to ingest data from different sources and produce several types of integrated maps, useful for risk-management decision makers. As a follow-up to the offer above, WMO organized a Workshop in Rome in October 2013, where representatives of 15 countries, from all RAs, were introduced to the system and the procedures to be followed in case they were interested in requesting it for their country were explained. A Cooperation Agreement between WMO and the Italian Department of Civil Protection (the “owner” of the software) was signed and the first installation mission was undertaken in May 2014 in the Philippines, with the next scheduled for August 2014 in Ecuador. The Working Group will discuss Flood Forecasting and reflect on those aspects that are of most direct importance to the Region for inclusion in the development of the work plan.

### **3. Hydrological Aspects of Drought**

There have been recent developments in the establishment of an Integrated Drought Management Programme (IDMP) in association with the Global Water Partnership and UNESCO, based on and inspired by the development and success of the APFM. In order to address the issue of national drought policy, Cg-XVI had recommended the organization of a “High Level Meeting on National Drought Policy (HMNDP)”. Accordingly, WMO and the Secretariat of the United Nations Convention to Combat Desertification (UNCCD), in collaboration with a number of UN agencies, international and regional organizations and key national agencies, had organized a High Level Meeting on National Drought Policy (HMNDP) from 11 to 15 March 2013.

The Working Group will discuss hydrological aspects of drought in the region and reflect on those aspects that are of most direct importance. Elements that can be achieved should be captured for possible inclusion in the work plan.

### **4. Hydrological Responses to Climate Variability and Change and Promotion of the Use of Climate Information by Water Managers**

#### ***Extended Hydrological Forecasts***

Two expert meetings had been organized on this topic, in Guayaquil, Ecuador, in January 2010, and in Melbourne, Australia, in July 2011. The first of these had initiated a pilot experience in the West Coast of South America, where, with the collaboration of the Centro Internacional para la Investigación del Fenómeno de El Niño (CIIFEN), the International Research Institute for Climate and Society (IRI) and the Institut de recherche pour le développement (IRD), through training of local hydrologists, and their participation in regional Climate Outlook Fora (COFs), an attempt at establishing operational Extended Hydrological Predictions (EHPs) for the region was under way. See <http://www.wmo.int/pages/prog/hwrrp/DevelopmentofHydrologicaloutlooks.php> for more details. The aim of the Melbourne meeting was to identify requirements and current gaps of methods currently available for extended hydrological forecasts and establish action plans for the preparation of relevant guidance material and case studies.

The Melbourne meeting made a number of conclusions and recommendations addressing, among others, the definition of extended hydrological forecasts and its scientific basis, the

relation with users and stakeholders, including understanding their requirements and properly communicating products usability and limitations, the development of appropriate delivery processes and procedures and feedback mechanisms. Extended hydrological forecasts, beyond being an important activity on their own right, are also a tool of relevance to develop and implement adaptation strategies to climate change and variability, and therefore an important contribution to the implementation of the Global Framework for Climate Services (GFCS).

### ***Flood frequency Estimation***

Work on this topic was conducted through alignment with the European Cooperation in Science and Technology (COST) initiative on flood frequency estimation (FLOODFREQ COST Action). One objective of that Action is to develop and, if possible, test a scientific framework for assessing the ability of methods to predict the impact of environmental change on future flood frequency characteristics.

A technical note on Stationarity and Non-Stationarity (provided as background document to the session) has been prepared by the AWG in response to increasing interest in this topic within the hydrological community.

### ***Climate and Meteorological Information Requirements for Water Management***

The paper prepared on this topic by Mr James Dent (UK) has been published as a Technical Document.

EC-64 has established a Task Team on the WMO Policy for International Exchange of Climate Data and Products to Support the Implementation of the GFCS. The president of CHy, or his designate from the AWG, will represent CHy on this Task Team.

### ***Global Framework for Climate Services (GFCS)***

The Secretariat will provide information on the GFCS and the Intergovernmental Board of Climate Services.

The Working Group will discuss *Hydrological Responses to Climate Variability and Change and Promotion of the Use of Climate Information by Water Managers* and reflect on those aspects that are of most direct importance to the Region. Topics can include, but are not restricted to:

- Extended hydrological Prediction
- Climate data requirements
- Flood Frequency
- GFCS

## **5. Improved Accuracy of Hydrometric and Sediment Observations including Space-Based Technologies**

### ***Access to and use of Satellite Data***

With respect to satellite applications in hydrology, better communication with the satellite community is required to understand the capabilities and limitations of satellite data. In particular improved estimates of areal precipitation; altimetric observations of water levels in large rivers, lakes and reservoirs; soil moisture; and snow cover characteristics – snow cover boundaries and snow water equivalent would seem to be the four top requirements from the water sector regarding satellite data. Improved practices and procedures are required to make satellite-based information and products for hydrological purposes available to National Meteorological and Hydrological Services (NMHSs). Improved cooperation with space agencies is required to further

develop further and promote satellite-based applications in hydrology and water management, thus promoting the development of hydrological observations that are complementary to terrestrial observations.

### ***Use of Radar Data***

The WMO Commission for Instruments and Methods of Observation (CIMO) has initiated activities in order that remote sensing measurements meet the same standard of accuracy and homogeneity as terrestrial observations (CIMO-XV Abridged Final Report, paragraphs 5.17 – 5.20) and, considering the increasing use and demand of reliable radar data for nowcasting in operational hydrology, the Commission envisaged the opportunity of a wider use of radar quality data for such an application and invited Members that had developed good practices in this area to support the AWG member responsible for Data Operations and Management in providing guidance, advice and training in this regard during the next intersessional period.

### ***CHy Project to Assess the Performance of Flow Measurement Instruments and Techniques***

Progress has been achieved in the implementation of the work plan of the project for the assessment of the performance of flow measurement instruments and techniques. CHy-14 was informed that the report entitled *Guidelines for the Assessment of Uncertainty of Hydrometric Measurements* (WMO-No. 1097) had been published. In February 2009, the AWG, on behalf of CHy, adopted the uncertainty analysis framework for flow measurements as developed by the project and described in the Guidelines mentioned above, which is based on the Guide to the Expression of Uncertainties in Measurements (GUM, 1993). The adopted report describes in detail the approaches to estimating uncertainty and outlines step-by-step procedures for its practical implementation. A suite of three detailed examples is also included.

The Project has developed a work plan that comprises 6 Project Outputs. These contain outputs such as the report on the survey on field discharge measurement instrumentation and techniques used operationally, the development of a database of discharge techniques, as well as the progress achieved in the development of an Uncertainty Analysis Decision-Aid Tool (UADAT), the preparation of guidelines for conducting and reporting on the calibration and verification of the performance of discharge measurement instruments, and the initiation of work in preparing guidelines for the estimation of uncertainty analysis of discharge determination via various techniques. The Project's work plan and its reports on progress for all of the above mentioned POs are available at the project Website: <http://www.wmo.int/pages/prog/hwrrp/Flow/index.php>

The Commission adopted Resolution 2 (CHy-14) – Project for the Assessment of the Performance of Flow Measurement Instruments and Techniques, which appears as Appendix I below. In the period since CHy-14, five teleconferences and one face-to-face meeting have thus far been held. A work plan has been developed and has been finalized and is ready for consideration by the Advisory Working Group. It contains several items requested for inclusion by CHy-14, including:

- (a) Design of regattas (intercomparisons of flow measurement techniques) and guidance on conducting them to answer specific questions;
- (b) Extension of the scope of PO 6 to techniques other than stage-discharge relations, first priority being index-velocity method as it was identified in the survey as being the next most commonly employed approach;
- (c) Documentation of approaches and examples are needed in task 6 c) to illustrate the estimation of uncertainty of discharge time series;
- (d) In PO 6), exploring approaches for treatment of non-stationary rating curves;

- (e) Addressing the issues of:
  - (i) Influence of bad streamflow gauging location on uncertainty, and
  - (ii) Environmental factors that can influence the operator's uncertainty;
- (f) Establishing of approaches to estimate the uncertainty for other acoustic instruments and measurement protocols (i.e., transects). Evaluate uncertainties for directly measured and unmeasured areas of the cross section using alternative measurement algorithms. Estimate the total discharge for the cross-section and its uncertainty;
- (g) Compiling a short document on References and Reference Standards in laboratories and regattas (limitations of the practices of averaging in measurements, transference process for the references, traceable standards);
- (h) Considering the establishment of a collaborative, international, community-built database for Uncertainty Analysis (UA) in hydrometry.

The draft work plan, which is a living document, is available at: [http://www.wmo.int/pages/prog/hwrp/Flow/flow\\_tech/workplan.php](http://www.wmo.int/pages/prog/hwrp/Flow/flow_tech/workplan.php). A community of practice has been launched for the project management committee to facilitate sharing of documents and communications among participants.

The Working Group will discuss this thematic area and reflect on those aspects that are of most direct importance to the Region. Topics can include, but are not restricted to:

- Satellite Data
- Radar Data
- Acoustic gauging – ADVs, ADCPs

## **6. Sediment Disasters and Mass Movements**

The Working Group will discuss this thematic area and reflect on those aspects that are of most direct importance to the Region.

**Resolution 2 (CHy-14)**

**PROJECT FOR THE ASSESSMENT OF THE PERFORMANCE  
OF FLOW MEASUREMENT INSTRUMENTS AND  
TECHNIQUES**

THE COMMISSION FOR HYDROLOGY,

**Noting** the progress achieved by the project during the last intersessional period in preparing guidance material to assist National Hydrological Services (NHSs) in the assessment of the performance of flow measurement instruments and techniques, including advice to NHSs on how to make a simple but sound uncertainty analysis of a discharge measurement,

**Noting further:**

- (1) The recommendations made by the Management Committee as regards the future workplan of the project,
- (2) That the tenure of members of the Management Committee ends during the current session of the Commission,

**Considering** the excellent collaboration established with external organizations, which share the interest of WMO in the objectives of the project, such as the International Association for Hydro- Environment Engineering and Research (IAHR), the International Association of Hydrological Sciences (IAHS), the International Organization for Standardization (ISO), and the Association of Hydro-Meteorological Equipment Industry (HMEI);

**Decides:**

- (1) To continue with the implementation of the project during the next intersessional period;
- (2) To approve the terms of reference and composition of the Management Committee of the project as provided in the Annex to this resolution;

**Requests** the Advisory Working Group (AWG), in its capacity as Steering Committee of the project, to approve, at its first meeting, the final workplan of the project for the next intersessional period, 2013-2016, on the basis of the recommendations of the Management Committee and of the deliberations of the current CHy session; the workplan should include specific activities, deliverables, a timeline and an estimated budget;

**Requests** the Secretariat to provide the necessary support to this important activity, in particular by activating the new composition of the Management Committee as early as possible;

**Urges** members to participate actively in this project, in particular by promoting the utilization of the project outputs at the national level and by contributing their national guidance material to the database of the project;

**Encourages** the participating organizations to continue with their active involvement in the project, in particular by supporting their representatives in the Management Committee, and promoting the initiative among their network of affiliates.

Note: This resolution replaces Resolution 2 (CHy-XIII), which is no longer in force.

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## **Annex to Resolution 2 (CHy-14)**

### **MANAGEMENT COMMITTEE FOR THE COMMISSION'S PROJECT ON THE ASSESSMENT OF THE PERFORMANCE OF FLOW MEASUREMENT INSTRUMENTS AND TECHNIQUES**

#### **1. Terms of reference**

- (1) To provide general guidance to the Project and to develop, update and carry out the project workplan as necessary to take into account the different perspectives of the participating organizations;
- (2) To identify gaps and future requirements in relation to the objectives of the Project;
- (3) To make recommendations to the participating organizations on activities that could be considered by those organizations in support of the Project;
- (4) Individual representatives of participating organizations should provide periodic progress reports to their constituent bodies, as required by them;
- (5) To provide reports on progress and other issues deemed of importance to the president of the Commission for Hydrology, chair of the Steering Committee of the Project.

#### **2. Membership**

- (1) Representative of the International Association for Hydro-Environment Engineering and Research (IAHR);
- (2) Representative of the International Association for Hydrological Sciences (IAHS); (3)
- (3) Representative of the International Organization for Standardization (ISO);
- (4) Representative of the Association of Hydro-Meteorological Equipment Industry (HMEI);
- (5) Representative of the WMO Regional Working Groups on Hydrology;
- (6) Representative of the WMO Commission for Hydrology (Chair).

Other experts may be called upon to assist the Committee in their personal and professional capacity.

The term of membership coincides with the intersessional period of CHy. The same representative may be re-appointed by his/her parental organization for an indefinite number of terms.

If it is considered necessary for the implementation of the project, the president of CHy, after consultation with the four other organizations involved, may revise these terms of reference and the composition of the membership.

#### **3. Secretariat support**

The WMO Secretariat will provide secretarial assistance to the committee through the WMO Hydrology and Water Resources Branch.

#### **4. Modalities of work**

Most of the work will be conducted by e-mail, teleconference and videoconference, with the possibility of holding physical meetings when deemed appropriate by the Chair and if resources are available, but at least twice during an intersessional period, normally in its initial and final years.