



WORLD METEOROLOGICAL ORGANIZATION

Weather, Climate and Water

11TH SESSION OF THE WORKING GROUP ON HYDROLOGY REGIONAL ASSOCIATION I (AFRICA)

16 – 20 November 2015, Accra, Ghana



FINAL REPORT

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1. OPENING SESSION (agenda item 1)

1.1 At the kind invitation of the Government of Ghana, the eleventh session of the WMO RA I (Africa) Working Group on Hydrology (WGH) was held in Accra, Ghana from 16 to 20 November 2015. It was attended by twenty one (21) participants from eleven (11) countries including a representative of the Global Water Partnership (GWP) and an invited former consultant of the Monitoring of Environment and Security in Africa (MESA) Programme. The list of participants is given in Annex I of this report.

1.2 The session was opened by Gp. Capt. Stephen Komla, Director-General of Ghana Meteorological Agency and the Permanent Representative (PR) of Ghana with WMO at 10:30 a.m. on Monday 16 November 2015 at Erata Hotel located in Accra, Ghana. In his opening address the PR of Ghana recalled the increasing frequency of occurrence climate extremes in Africa and expressed the hope that the session will deliberate on these issues and propose concrete actions to address some of the impacts of these climate extremes. He acknowledged the efforts of WMO in spearheading activities in climate and water information, through the National Meteorological and Hydrological Services (NMHSs) for the socio-economic development of African countries. He wished the delegates fruitful deliberations and officially declared the meeting opened.

1.3 The WMO representative, Mr Julius Wellens-Mensah, Chief of Basic Systems in Hydrology, on behalf of the Secretary-General of WMO extended the gratitude of WMO through the PR of Ghana to the government and people of Ghana and the local organizer of the meeting, the Hydrological Services Department, for hosting the meeting. He informed the delegates of the purpose and objectives of the meeting. He underlined that the expected outcomes of the meeting are a work programme and plan of action for the next four years to address issues on hydrology and water resources in Africa within the mandate of WMO.

2. ORGANIZATION OF THE WORK OF THE SESSION AND APPROVAL OF THE AGENDA (agenda item 2)

2.1 Dr Ashraf Zakey, who is the Chairman of the WMO RA I (Africa) Working Group on Hydrology, chaired the Session. He thanked the delegates for honouring the invitation to attend the meeting and looked forward to a successful outcome where new ideas and areas of research will be identified and discussed. He introduced the agenda of the meeting which was reviewed and adopted without any changes.

2.2 At the invitation of the Chairman, Mr Julius Wellens-Mensah introduced the agenda for the meeting and guided the meeting through the proposed programme of work for the meeting. He explained that participation in the meeting is based on a core membership of experts appointed by the Management Group for Regional Association I (Africa) and a select group of experts representing the five sub-regions of Africa, namely, Northern, Southern, Western, Eastern and Central Africa. The meeting reviewed and adopted the agenda together with the time schedule for the work of the sessions without any changes. The agenda is given in Annex II. The meeting also appointed Eng. Nebert Wobusobozi of Uganda and Mr Jean Bienvenu Dinga of Congo as English and French rapporteurs respectively.

3. CONSIDERATION OF THE RELEVANT DECISIONS OF CHy-14, RA I-16, Cg-17 and EC-67 (agenda item 3)

3.1 The session was briefed on the relevant decisions and outcomes of the Fourteenth Session of the WMO Commission for Hydrology (CHy-14), the Sixteenth Session of the Regional Association I, Africa (RA I-16), the Seventeenth Session of WMO Congress (Cg-17) and the Sixty-Seventh Session of the WMO Executive Council (EC-67) related to the Hydrology and Water Resources Programme of WMO.

Relevant Decisions of CHy-14

3.2. The fourteenth session of the Commission for Hydrology (CHy) re-established an Advisory Working Group (AWG) composed of ten members and identified four Open Panels of CHy Experts (OPACHes) to deal with five thematic work areas, namely:

- (i) Quality Management Framework – Hydrology (QMF–Hydrology);
- (ii) Data Operations and Management;
- (iii) Water Resources Assessment;
- (iv) Hydrological Forecasting and Predictions; and
- (v) Water, Climate and Risk Management.

3.3 The Commission elected Mr Harry Lins (USA) as president of CHy and appointed Mr Johnson Maina (Kenya) as AWG member co-responsible for Hydrological Forecasting and Predictions. The session encouraged Members to nominate experts to the OPACHes set up for each thematic area, and to contribute actively to the work programme.

3.4 The Session commended the number of manuals and guidelines which have been published or are under development in the framework of the QMF-H and their usefulness in support of day-to-day activities of NHSs. It was pleased to note that the extensive training material on the Manual on Stream Gauging (WMO-No. 1044) had been translated into French. The French version of the Manual on Flood Forecasting and Warning (WMO-No. 1072) is currently being finalized. It encouraged the Secretariat to translate other QMF-H publications into French to ensure wider use and benefits and encouraged Members to volunteer translating those more relevant for the Region into French.

Relevant Decisions of RA I-16

3.5. The Association noted that during the last intersessional period, the needs of Members in the Region were adequately addressed by the Hydrology and Water Resources Programme, as adopted by Sixteenth Congress.

3.6. The Association noted that although the RA I Working Group on Hydrology (RA I WGH) was re-established at RA I-XV, it has not been active. However, the Chairperson of the Working Group, who is also the Regional Hydrological Advisor, Mr Frigui Hassen Lofti (Tunisia), played an active role in representing the hydrological community of the Region in Hydrology and Water Resources activities of WMO. The Association took note of the participation of the Chairperson in EC sessions, the planning meeting of the Advisory Working Group of CHy and the WHYCOS International Advisory Group (WIAG). The Chairperson also developed a paper on the vision of Hydrology and Water Resources in Africa that identified the challenges NHSs and NMHSs face in delivering on their mandates.

3.7 The Association re-established the WGH with the following core membership:

- (i) Expert on hydrological prediction and forecasting, Mr Moussa Kourouma (Guinea);
- (ii) Expert on integrated water resource management, development and service delivery, Dr George Lugomela (Tanzania);
- (iii) Expert on hydrological monitoring and data management, Dr Jean Claude Ntonga (Cameroon);
- (iv) Expert on water and climate, Dr Ashraf Zakey (Egypt); and
- (v) Expert on integrated high/low flow forecasting, Mr Agostinho Vilanculos (Mozambique).

Dr Ashraf Zakey was designated as the Chairman of the Working Group and the Regional Hydrological Adviser to the President of RA I.

3.8. The Association established a Management Group of 9 persons of which the Chairman of the WGH is a member.

Relevant Decisions of Cg-17

3.9 Congress noted that the Commission had aligned its activities with the priorities as established in the WMO Strategic Plan and, in particular, the importance placed on the Commission's contributions to the Global Framework for Climate Services (GFCS) and the WMO Global Integrated Observing System (WIGOS).

3.10 Congress urged the president of CHy to continue guiding WMO Hydrological Observing System (WHOS) as the hydrological input to WIGOS to full implementation. WHOS is conceived as a portal to facilitate access to already available on-line real-time and historical data, drawing from the water information systems of countries around the world that make their data freely and openly available, including HYCOS projects. Congress adopted the Hydrology and Water Resources Programme as per Resolution 4.1(5)/1 (Cg-17) – Hydrology and Water Resources Programme and the programme description given in Annex II to the Report of the Sixteenth World Meteorological Congress.

3.11 Congress requested the Executive Council and Secretary-General to take all the necessary actions to arrange for the implementation of the Hydrology and Water Resources Programme and to assist the Commission for Hydrology and all bodies concerned in its implementation; ensure that WMO continues playing an active role in UN-Water, the inter-agency coordination mechanism of the United Nations system on water-related issues; continue to provide support to regional activities of the Hydrology and Water Resources Programme; and support cooperation between WMO and other governmental and non-governmental organizations on hydrology and water resources.

3.12 Congress requested the president of the Commission for Hydrology to encourage and support active collaboration between the Commission and the regional associations, in particular their working groups related to hydrology and/or water resources management.

3.13 Congress endorsed the efforts underway by CHy to prepare a report on the "Decision-support for the Selection of Flood Forecasting Models". This guidance material is intended to assist Members in the selection and application of flood forecasting models

under different flood situations, as well as, environmental and institutional settings, including a variety of professional capabilities in NHSSs.

Relevant Decisions of EC-67

3.14 The Executive Council established its working structures, comprising of panels of experts, working groups, task teams and committees.

3.15 The Council appointed the president of CHy, Mr Harry Lins, as a member of the EC Panel of Experts on Capacity Development and the vice-president of CHy, Mr Zhiyu Liu, as a member of the EC Panel of Experts on Education and Training.

4. REPORT ON ACTIVITIES RELATED TO WMO's HYDROLOGY AND WATER RESOURCES PROGRAMME IN THE REGION (agenda item 4)

4.1 The session was presented with an overview of the general UN system and the anchorage of WMO in relation to other bodies and organs of the system. The structures of WMO and its constituent bodies and their functions were explained to the session and further informed of the role of WMO in the field of Hydrology and Water Resources which is derived from the WMO convention article 2 (e): "**to promote activities in operational hydrology and close co-operation between Meteorological and Hydrological Services**". The meeting was then briefed on the present activities of WMO related to the Hydrology and Water Resources Programme.

4.2 The meeting was informed that the Programme is implemented through four mutually supporting components namely: Basic Systems in Hydrology, Hydrological Forecasting and Water Resources Management, Capacity Building in Hydrology and Water Resources Management, and Cooperation in Water-related Issues.

Basic systems in Hydrology

4.3 The program provides guidance to and support for NHSS in the development and maintenance of their activities for the provision of data and products with an emphasis on quality assurance. It coordinates and supports a global World Hydrological Observing System (WHYCOS) for improving basic observation activities and strengthening international cooperation and data exchange. It also undertakes standardization and regulatory activities through issuance of operational manuals.

Hydrological forecasting and water resources management

4.4 The program supports application of hydrological modelling and forecasting techniques; risk assessment and management approaches to the risk reduction of water-related disasters; and advocacy and support for adopting Integrated Flood Management approaches; as well as a better understanding of the implications of climate variability and change on water resources management. All WMO flood forecasting initiatives such as Flash Flood Guidance System (FFGS), the Associated Program on Flood Management (APFM) and activities related to Extended Hydrological Prediction (EHP) and the development of Hydrological Outlooks are also supported under this program.

Capacity building in Hydrology and Water Resources Management

4.5 The program facilitates rational development and operation of NHSs including staff training and education and creates public awareness of the importance of hydrological work and provision of support through technical cooperation activities. It implements a capacity building strategy based on a demand-driven approach, cost effectiveness (short duration courses, train the trainers, roving seminars, etc.), promotion of distance learning activities and support to the establishment of new WMO RTCs with a special focus in hydrology and water resources and promotion of partnerships.

Cooperation with other bodies and international organizations

4.6 This activity is aimed at increasing the effectiveness and visibility of activities of NHSs through inter-organizational collaboration in the field of water. Under this activity WMO has working arrangements with UNESCO, UNEP, Global Water Partnership (GWP), AMCOW, IGAD, SADC, IAHR, IAHS and with Global Data Centres such as GRDC, IGRAC, HYDROLARE, as well as, with River Basin Organisations including Niger Basin Authority and Volta Basin Authority.

5. REPORT ON WMO CAPACITY BUILDING ACTIVITIES IN HYDROLOGY AND WATER RESOURCES

5.1 WMO's activities in Hydrology and Water Resources including opportunities for WMO fellowships, distance learning and roving seminars in the Region was presented to the session. The meeting was informed of the WMO Strategy on Education and Training in Hydrology and Water Resources which was first adopted by the CHy in 2004 and revised in 2008 and 2012 for the period 2013-2016.

5.2 The meeting was informed of the programme in Distance Learning (DL) in HWR which involves hydrology courses based on suites of existing COMET modules. Under the distance learning programme, eleven (11) participants from eight institutions covering all WMO regions have been trained to deliver DL courses based on WMO/COMET model. Following this course, the RTC in Nairobi Kenya has delivered a 6-week course from 15 April to 31 May 2013 to 55 participants from 18 African countries thus demonstrating the potential of the multiplier effect of the training of trainers and the distance learning format. The meeting was informed that WMO will continue to organize more DL courses.

5.3 The meeting was informed that, in cooperation with the International Office for Water (OIEau) and the Congo-Oubangui-Sangha Commission (CICOS), WMO organized training courses on the management of national hydrological services (Kinshasa, Democratic Republic of Congo, 10-13 April 2012); hydrological network design, quality assurance and Integrated Water Resources Management (Kinshasa, Democratic Republic of Congo, 5-7 June 2013); and design and management of hydrological information systems (Yaoundé, Cameroon, 25-29 November 2013).

5.4 The meeting was informed of the cooperation agreed between the International Association for Hydro-Environment Engineering and Research (IAHR) and WMO for the development of a course on stream gauging based on the 2nd edition of the WMO Manual on Stream Gauging. The meeting was further informed of WMO fellowship opportunities and cost-sharing arrangements for undergraduate and post-graduate studies in IHE, Delft, Netherlands and University of Hannover, Germany. Access to these courses is through

requests submitted through Permanent Representatives (PRs) of countries and on condition that successful candidates sign undertakings to return home after completion of studies.

5.5 The meeting was also informed of Regional and In-Country Training activities on open-source database management software for Meteorology, Climate and Hydrology (MCH) that has been conducted in different WMO Regions and is available to Members on request. The meeting was further informed that a training workshop on MCH had been organized in Accra, Ghana (13-17 August, 2012) on a trial basis and was now being extended to other African countries. There are plans to replicate the training in other countries in both English and French in Africa. WMO is also promoting the adoption of MCH by NMHSs in all Regions and HYCOS Projects. The meeting encouraged Members to take advantage of the availability of this open source software noting that MCH had been developed to enable transfer of data from CLICOM to MCH.

5.6 The meeting was informed that sub-regional training on stream gauging has been conducted in Accra, Ghana (10–16 December 2012) for English-speaking West African countries, namely, Ghana, Liberia, Nigeria and Sierra Leone and in Benin (13-18 July 2015) for French-speaking African countries, and brought together 25 professional technicians and hydrologists from 15 countries: Benin, Burkina Faso, Burundi, Cameroon, Central African Republic, Chad, Congo, The Democratic Republic of the Congo (DRC), Côte d'Ivoire, Djibouti, Gabon, Guinea, Mali, Senegal and Togo. Similar training workshops are planned for the SADC and IGAD sub-regions.

5.7 The session was informed that Italy had offered to make the DEWETRA platform freely available to Members. The DEWETRA platform is a real-time integrated system for hydrometeorological and wildfire risk forecasting, monitoring and prevention. It has the capability to ingest data from different sources and produce several types of integrated maps for risk-management decision-makers. The session was further informed that as a follow-up to the offer, WMO had organized a workshop in Rome, Italy (28-30 October 2013) for 15 countries, from all WMO Regions, including three from Africa (Tunisia, Senegal and Zambia), that introduced the system and the procedures to be followed to implement it. A Cooperation Agreement between WMO and the Italian Department of Civil Protection ("owner" of the software) has been signed. The meeting noted with thanks the offer of the Government of Italy making the DEWETRA platform available to Members and encouraged Members to take advantage of this offer according to their needs.

6. REPORT OF THE PAST CHAIRMAN OF THE WORKING GROUP ON HYDROLOGY

6.1 The Secretariat informed the meeting that the Chairperson of the previous Working Group, Mr. Hassen Lofti Frigui, had been assigned new responsibilities by his country and was unable to attend the session. The activity report of Mr Hassen Lofti Frigui was then presented to the meeting by the Secretariat. It analysed the challenges facing by water resources management in the Region and made recommendations to address some of these problems.

6.2 Mr Hassen Lotfi Frigui observed that Africa is the second largest continent after Asia with a land area of 20 million km², freshwater resources of 4,000 km³ and 10% of global renewable resources, yet only 4% of the available water resources are used due

partly to inadequate water resources assessment activities in the Region. He specifically identified the issue of understaffing, aging staff and lack of adequate equipment and financial resources to carry out effective water resources assessment activities, including monitoring of hydrological networks for data collection and use.

6.3 Mr Frigui finally made the following recommendations:

- (i) improving the system for monitoring, collection, development and modernization of the measurement networks;
- (ii) improving knowledge of water resource assessment and monitoring;
- (iii) developing and strengthening capacity for adaptation in order to manage floods, droughts, pollution, desertification and climate change;
- (iv) raising financial resources, strong political commitment and awareness among states and financing bodies for the long-term planning, sustainability and continuity of hydrological monitoring activities;
- (v) strengthening the framework for cooperation at local, national, regional and international level on the exchange of data and experiences – key elements of the WMO vision; and
- (vi) strengthening and developing regional components of the WHYCOS programme.

7. WMO WHYCOS PROGRAMME WITH FOCUS ON HYCOS PROJECTS IN THE REGION

7.1 The Secretariat made a presentation on the WMO WHYCOS Programme with particular emphasis on HYCOS components already developed or being implemented in Africa, as well as, those under preparation. The WGH members were briefed on the programme's background, objectives and steps of development of new HYCOS projects, current status and progress in implementation of various HYCOS projects. The session was informed that WHYCOS is intended, to improve the observation networks to address the lack of observation data and also strengthen the technical capacity of NHCs. The WGH was further informed that the review of the WHYCOS programme confirmed that it has been particularly useful for sourcing funding to support the NHCs and promoting regional cooperation in recent decades. The review also noted that HYCOS projects have impacted positively on the institutional and technical capabilities of NHCs of countries and promoted the strengthening of international cooperation in trans-boundary basins.

7.2 The session was informed that after successful implementation of SADC-HYCOS phases I and II, SADC, with the support of WMO, has secured funds for implementation of phase III. The session also noted that the IGAD-HYCOS project is being implemented with WMO as the executing agency and with financial support from the European Union (EU). The first phase is expected to end in March 2016 with the possibility of a no-cost extension.

7.3 The WGH noted that the Niger-HYCOS Phase II is approaching completion of the field activities and that the Niger Basin Authority (NBA) and the member countries have expressed interest to continue with Phase III of Niger-HYCOS. WMO is assisting in the preparation of the project proposal for Phase III.

7.4 The WGH noted that field activities are still ongoing in the Volta-HYCOS project with funding support from the African Water Facility. The session also noted with

satisfaction that Gabon had requested and obtained its integration with the Congo-HYCOS during the preparatory phase of the project thus integrating the Ogooué river basin in the proposed Congo-HYCOS project.

7.5 The WGH members noted that WMO is assisting LCBC in the development of the Lake Chad-HYCOS project. The session was pleased to note that the project document has been validated by LCBC and its member's countries and WMO is assisting LCBC in sourcing funds for the development and implementation phases. The other HYCOS projects in Africa under consideration are the Senegal-HYCOS and Nile-HYCOS projects. The session requested WMO to consider developing a HYCOS project for Madagascar and the Indian Ocean islands countries off the coast of East Africa, namely, Reunion, Mauritius, Comoros, Mayotte and Seychelles. It was however clarified that the request had to come from the countries.

7.6 The meeting noted that considerable progress had been achieved in various HYCOS components and appreciated the continued technical support of WMO towards implementation of these components in Africa.

7.7 The session appreciated the role of Secretariat in supporting Members in the development and implementation of the WHYCOS programme and requested WMO to continue promoting and encouraging countries to embrace the programme to improve hydrological data collection and exchange.

7.8 The session expressed its gratitude to the French Development Agency, the African Water Facility / African Development Bank and the EU in providing financial support for the implementation of HYCOS projects in Africa and raised concerns about sustainability of HYCOS projects once external funding comes to an end. It proposed that WMO should continue to play an advocacy role in securing the support of governments to provide adequate funds for monitoring hydro-meteorological networks in Africa.

8. MESA AND OPPORTUNITIES FOR SATELLITE APPLICATIONS IN HYDROLOGY AND WATER RESOURCES (agenda item 8)

8.1 A presentation was made on the Monitoring of Environment and Security in Africa (MESA) programme by Dr Stephen Donkor, a former consultant with MESA. He gave the background of the MESA Programme which originated from the Copernicus Global Monitoring for Environment and Security Programme for Land, Marine Monitoring and Atmosphere Monitoring for emergency management, security and climate change. The presentation placed particular emphasis on access to satellite data for applications in hydrology and meteorology. The presentation also provided information on the TIGER project in Africa which has a strong capacity building component, as well as, information on the various existing funding opportunities for African countries. The meeting appreciated the information provided in the presentation and requested Secretariat to follow up and provide information on capacity building and available funding opportunities and disseminate such information to countries in the RA I.

9. WMO FLOOD INITIATIVE (agenda item 9)

9.1 The Secretariat presented WMO's activities in flood management including initiatives on Flood Forecasting, the Flash Flood Guidance System (FFGS) and the implementation of the Associated Programme on Flood Management (APFM). The

meeting was informed of the availability of the Manual on Flood Forecasting and Early Warning which outlines examples of practices and technologies to reflect different levels of development and ranges of needs and capacities. The meeting took note of the on-going process to develop a decision-aiding tool for the selection of flood forecasting models.

9.2 The meeting was briefed on the implementation of the projects on Flash Flood Guidance System (FFGS) to enhance the capacity of NMHS to issue flash flood warnings and alerts to mitigate adverse impacts of hydro-meteorological hazards. FFGS projects are currently covering 52 countries and with the potential to save lives and decrease economic losses for up to 2 billion people. The meeting noted that the Southern Africa Flash Flood Guidance System (SARFFGS) is being implemented in the Southern African region in South Africa, Botswana, Lesotho, Malawi, Mozambique, Namibia, Swaziland, Zambia and Zimbabwe. The meeting was informed of opportunities to implement the FFGS in other regions of Africa upon request to WMO.

9.3 The meeting was further briefed on the joint initiative between WMO and Global Water Partnership (GWP) on the Associated Programme on Flood Management (APFM) whose mission is to support countries in promoting and implementing the integrated flood management concept within the overall framework of integrated Water Resources Management. The meeting was informed of an integrated flood management (IFM) initiative for the Volta Basin supported by GWP and WMO and covering Benin, Burkina Faso, Côte d'Ivoire, Ghana, Mali and Togo. Technical assistance for the project has been identified and the Islamic Development Bank and USAID have been approached for funding. As with most WMO programmes the APFM provides guidance on developing IFM strategies and plans, as well as, offer training for short courses and workshops for different target groups. The meeting was also informed of the APFM HelpDesk for Integrated Flood Management (www.floodmanagement.info) which is **not** a mechanism for responding to flood emergencies but intended to provide advice to Members in the areas of flood management policy and strategy, and capacity building in support of flood management. The HelpDesk draws on the professional capacity of its multidisciplinary support-based partners – including highly specialized centers of excellence, established development partners, national governments and international organizations – to provide a demand-driven mechanism for addressing flood management issues.

10. COOPERATION WITH OTHER UN BODIES AND INTERNATIONAL ORGANIZATIONS IN PROJECTS RELATED TO HYDROLOGY AND WATER RESOURCES (agenda item 11)

10.1 A presentation was made to the session on WMO's cooperation with other WMO bodies and international organizations working in the fields of hydrology and water resources. The objective of the cooperation is to increase the effectiveness and visibility of the activities of NHTs through inter-organizational collaboration in the field of water. The cooperation with UN bodies is mainly through the UN-Water mechanism which has an extensive outreach of 31 member agencies and 27 partners. WMO is currently Coordinator of UN-Water Thematic Priority Area on Water and Climate Change and the Chair the UN-Water for the past 4 years.

10.2 Beyond the UN-Water mechanism, WMO also has a Working agreement with UNESCO and have jointly published the International Glossary of Hydrology and the UNESCO/WMO Handbook on Water Resources Assessment – review of national

capabilities, as well as, collaborating in the International Flood Initiative. The collaboration with UNEP is in the area global water quality assessment reporting.

10.3 The meeting was informed that WMO has cooperation agreements and collaborates with Global Data Centers, namely, the Global Runoff Data Centre (GRDC) in Koblenz hosted by Germany, the Global Precipitation and Climate Centre (GPCC) in Frankfurt hosted by Germany, the International Groundwater Resources Assessment Centre (IGRAC) in Delft hosted by The Netherlands and the Hydrology of Lakes and Reservoirs (HYDROLARE) Centre in St. Petersburg hosted by Russia.

10.4 The meeting was also briefed on WMO's Cooperation with the Global Water Partnership (GWP), the African Ministerial Conference on Water (AMCOW) and the World Water Council. WMO also has working arrangements with several River Basin Organizations and Commissions including the Nile, Lake Chad, the Niger and the Volta Basins. WMO also cooperates with IGOs and NGOs undertaking related activities in hydrology such as the International Association for Hydro-Environment Engineering and Research (IAHR), the International Association of Hydrological Sciences (IAHS).

WMO-GWP Collaboration

10.5 A representative of GWP, Mr. Maxwell Boateng-Gyimah presented to the session GWP's cooperation with WMO in activities in Africa. He briefed the meeting on GWP-WMO experiences in implementing the APFM and the integrated Drought Management Programme (IDMP) in Africa and with AMCOW in the Water, Climate and Development Programme.

10.6 He informed the Session that the APFM and IDMP provide a technical resource for management of water extremes through expert advice from joint a technical support unit of GWP and WMO in Geneva. The programmes also provide project preparation and capacity development opportunities, as well as, publishing guidelines and tools. Each programme has an extensive outreach partnering with over 20 organizations. APFM has supported countries like Kenya and Zambia in preparing flood management strategies and continues to offer strategic advice on flood management through its interactive HelpDesk. IDMP has drawn world-wide appeal since its launch at the High Level Meeting on National Drought Policies held in Geneva in 2013 attended by 414 participants from 87 countries. The IDMP approach puts emphasis on proactive rather than reactive actions and ensures both horizontal and vertical integration of players, policies and experiences

11 THE STATE OF NATIONAL HYDROLOGICAL SERVICES AND WATER RESOURCES MONITORING IN AFRICA (agenda item 10)

11.1 The participants made presentations on the state of National Hydrological Services, their operations, the status of hydrometric monitoring networks and activities, the challenges faced by the Services, as well as, strategies to address these challenges. In all, ten presentations from Burkina Faso, Cameroon, Congo, Ghana, Guinea, Madagascar, Mozambique, Nigeria, Tanzania, and Uganda were made. It emerged that all the countries are making strenuous efforts to keep their hydrometric networks functioning, albeit, with some challenges. The challenges identified by the countries include:

- Lack or dwindling funding from national and external sources;
- Difficulties in paying gauge readers and observers;
- Inadequate qualified and aging staff to handle field measurements, water quality and sediment monitoring, remote sensing, GIS applications, and installation and configuration of automatic hydrometric stations;
- Vandalism of installed field equipment by some local residents;
- Aging and inadequate equipment for field installations and measurements;
- Abandonment of hydrometric monitoring stations due to lack of resources;
- Absence of efficient hydrological information system for effective dissemination of hydrological information to end-users;
- Absence of collaboration with other national and international institutions involved in water resources assessment;
- Difficulty to convey to governments the importance of collecting data on water for socio-economic development and the well-being of society.

11.2 In the view of participants, the above state of affairs has hampered effective water resources assessment in their countries for socio-economic development, coping with water-related disasters such as floods and droughts, and adaptation to impacts of climate variability and change. Having identified the challenges, the participants made suggestions to overcome these challenges as summarized below:

- Increased funding portfolio from both national and international sources;
- Recruitment and training of appropriate personnel for field installations and measurements, water quality and sediment monitoring, remote sensing, GIS applications, and installation and configuration of automatic hydrometric stations;
- Human capacity building at both professional and technician levels;
- Ensuring the payment of allowances to gauge readers and observers to ensure the quality of the data;
- Acquisition of hydrological database equipment, software and hydrological information systems to improve data processing and analysis, and strengthen data dissemination;
- Strengthening collaboration with other institutions at both national and international levels;
- Raise awareness of local residents against acts of vandalism;
- Strengthening capacities, including training of the personnel of the Services, to carry out water quality and sediment monitoring and analysis;
- Need to rationalize hydrometric networks and prioritize stations according to available resources while keeping in mind the minimum requirements for network densities;
- Need to take advantage of opportunities offered by HYCOS projects and other bilateral or multilateral funded projects on water; and
- WMO Support to National Hydrological Services for advocacy for with governments and authorities on the importance of collecting data on water resources for socio-economic development and well-being of society and the need to fund data collecting activities.

12. FUTURE WORK PROGRAMME OF THE WORKING GROUP (agenda item12)

12.1 This agenda item started with presentations by the five core members of the Working Group on their assigned areas of responsibility and outlines of activities to be carried out in the Region for the realization of the goals of the Working

Group. The assigned areas of responsibilities of the five core experts are (i) hydrological prediction and forecasting of normal range activities (Mr. Moussa Kourouma); (ii) integrated low and high flow forecasting (Mr Agostinho Vilanculos); (iii) integrated water resource management, development and service delivery (Dr. George Lugomela); (iv) hydrological monitoring and data management (Dr Jean Claude Ntonga); (v) water and climate (Dr Ashraf Zakey).

After extensive discussions the meeting agreed on the following proposals for the future activities of the Working Group to be led by the five experts in the next four years.

Thematic area	Activity	Output	Actor(s)/Collaborators
1. Hydrological prediction and forecasting of normal range activities	1. Organise work on the theme at regional level and report to the Chair	A work plan with time schedule	M. Kourouma
	2. Assess the performance of the various prediction and forecasting tools	A report	M. Kourouma/NMHSs
	3. Select a set of tools for prediction and forecasting	A report with recommendations	M. Kourouma
	4. Assess the performance of seasonal forecasts produced by ACMAD, ICPAC, PRESAC & PRESAO, etc.	A report with recommendations	M. Kourouma/ACMAD/ICPAC/PRESAC/PRESAO
2. Integrated low and high flow forecasting	1. Organise work on the theme at regional level and report to the Chair	A work plan with time schedule	A. Vilanculos
	2. Integrate statistical/empirical rainfall and runoff method for low and high flow estimation	A report	A. Vilanculos
	3. Training on application of the methodology of flow estimation	A training workshop	A. Vilanculos/NMHSs/WMO
3. Integrated water resources management development and service delivery	1. Organise work on the theme at regional level and report to the Chair	A work plan with time schedule	G. Lugomela
	2. Assess the adequacy of institutional framework for water resources management to implement IWRM	A report	G. Lugomela/NMHSs
	3. Conduct a study of the socio-economic benefits of hydrological data		G. Lugomela/NMHSs/WMO
	4. Organise workshop on IWRM best practices across RA I		G. Lugomela/NMHSs/WMO
4. Hydrological monitoring and data	1. Organise work on the theme at regional level and report to the Chair	A work plan with time schedule	J.C. Ntonga

management	2. Analyse status of hydrological networks and make recommendations on Strengthening /rehabilitation of hydrological networks	A report with recommendations	J.C. Ntonga/NMHSs
	3. Compile and elaborate a catalogue of information that responds to the needs of users towards generating funds to support hydrological monitoring activities	A report with recommendations	J.C. Ntonga/MNHS/WMO
	4. Assist in organising training for NMHSs on operational hydrology activities		J.C. Ntonga/NMHS/WMO
	5. Compile, catalogue and analyse hydrological database softwares in use in the Region	A report with recommendations	J.C. Ntonga/NMHSs
5. Water and Climate	1. Organise work on the theme at regional level and share with the other experts	A work plan with time schedule	A. Zakey
	2. Create a framework to improve access to climate change information and data and hydrological science, modelling and assessment tools	A report with recommendations	A. Zakey/NMHSs
	3. Organise training for users of climate data	A training workshop	A. Zakey/NMHSs
	4. Assess climate impact of each climate scenarios on water resources, surface runoff and precipitation over Africa using either statistical or dynamic downscaled tools	A report	A. Zakey
	5. Explore the possibility of linking climate outlooks to water resources availability	A report	A. Zakey
	6. organise training for climate and water resources experts to clarify their needs from each other for the purposes of climate feedback on the water sector	A training workshop	A. Zakey/NMHSs/WMO

12.2 The session designated Mr Sylvester Darko as an additional expert to carry out a web search for open source software for hydrological analyses, modelling, freely available satellite data and GIS tools and share the information with Members. The session also agreed create of a website for the RA I WGH to promote exchange of information and interaction among hydrologists in the Region. Uganda agreed to create

and host the website in partnership with GWP in Uganda. The session agreed on a schedule of yearly reporting by all the experts in order to monitor progress in their activities.

12.3 The session also proposed activities that the NMHSs should continue to carry out as outlined in the Table below:

Activity	Actors / Collaborators
1. Financing/supporting monitoring of gauging stations	NMHSs / Projects
2. Scrutinise hydro-meteorological data and undertake data rescue as appropriate	NMHSs
3. Develop a reference network of hydro-meteorological stations	NMHSs
4. Update rating curves of river gauging stations	NMHSs
5. Carry out filling-in of missing data	NMHSs
6. Rehabilitate and improve the functioning of hydro-met stations	NMHSs
7. Ensure availability of minimum equipment to support hydro-meteorological data collection	NMHSs
8. Promote creation of a fund to support hydrological activities	NMHS
9. Support efforts to undertake water quality and sediment monitoring and analyses	NMHSs
10. Rationalise the hydrometric monitoring networks and stations critical to decision making	NMHS
11. Select stations to support ground-truthing of satellite information	NMHSs / Satellite Community
12. Undertake studies on recalculation of rainfall Intensity-Duration-Frequencies (IDFs) to respond to urban flooding including methodologies	NMHSs
13. Optimise hydrological stations and carry out regionalization of catchments to provide hydrological data and information	NMHSs
14. Develop and promote guidelines on optimisation of the hydrological networks	NMHS / WMO
15. Develop products to support service delivery for revenue generation to support hydrological activities in countries	NMHSs
16. Promote elaboration a catalogue of information that responds to the needs of users towards generating funds to support hydro. Activities	NMHSs / WMO
17. Support the RA I Working Group to undertake training/training of trainers at regional and country levels on specific topics	NMHS / WMO
18. Redistribute information on WMO Quality Management Framework – Hydrology (QMF-	WMO

H)	
19. Enhance the use of Manuals and Guidance materials produced by WMO under the WMO Quality Management Framework- Hydrology (QMF-H)	NMHSs / WMO
20. NMHSs should take advantage of training opportunities available in WMO's Capacity Building Strategy in Hydrology and Water Resources.	NMHSs / WMO

13. TOPICS OF RELEVANCE TO THE REGION TO BE RECOMMENDED FOR INCLUSION IN THE WORK PROGRAMME OF THE COMMISSION FOR HYDROLOGY (agenda item 13)

13.1 The session identified the use of satellite technology and data as a possible avenue to augment hydrological monitoring, particularly, in view of dwindling resources for monitoring the hydrological networks. The session therefore recommended that CHy should monitor the advances in satellite technology and the availability of satellite data for applications in hydrology and water resources.

13.2 The session also recommended that CHy should consider designating a network of heritage stations that should never stop reporting nor be closed down in each WMO Region and promote the idea to other international organizations for support. Such stations could also serve as stations for ground-truthing satellite or remotely-sensed data.

14. ANY OTHER BUSINESS

14.1 Under this agenda item, the session was informed of the importance of OPACHEs to the work of the Commission for Hydrology. Soft copies of OPACHE application forms were made available to the participants and encouraged to sign up for membership of the various OPACHE groups, as well as, share the forms with colleagues in their Services.

14.2 The session was informed of the WMO Hydrological Observing System (WHOS). Having been informed, the session requested CHy to circulate a letter to NMHSs to solicit contribution of data to WHOS.

14.3 The session also raised the question of the need for examination and revision of standards in analysing hydrological and meteorological time series in view of observed and recorded trends arising out of climate change. The session recommended the need to develop guidance material on the subject.

14.4 To improve communication among Hydrological Services, the representative of Ghana was tasked to establish a Facebook communication platform of the Services starting with participants in the meeting and expanding further to include other hydrologists in the Region.

Recommendations

14.5 The session made the following recommendations:

1. NMHSs should make use of guidance materials developed by WMO under the Quality Management Framework-Hydrology (QMT-H) as well as the APFM tools developed by WMO and GWP to enhance service delivery.
2. WMO should organise a course in RA I on groundwater network design, monitoring and analysis of groundwater time series data to contribute to integrated water resources management.
3. Countries should take advantage of HYCOS projects and other bilateral and multi-lateral funding mechanisms for rehabilitation and operation of hydrometric stations.
4. WMO should partner with UNESCO to revive the UNESCO training course for hydrological technicians.
5. WMO should intensify its advocacy role with governments and development partners to provide funds for data collection and water resources assessment activities.
6. Having been informed of the WMO Hydrological Observing System (WHOS), the session requested CHy to circulate a letter to NMHSs to solicit contribution of data to WHOS.

15. CONSIDERATION AND ADOPTION OF REPORT (agenda item 15)

15.1 After consideration of the report, the working group adopted the report of its eleventh session together with its recommendations and requested WMO Secretariat to make any editorial changes deemed necessary. The group recommended that, after approval by the president of the RA I, the report should be circulated to the members of the working group and to all Members of RA I.

16. CLOSURE OF THE MEETING (agenda item 16)

16.1 The WMO representative, Mr Julius Wellens-Mensah thanked the local organizers and the participants for their active participation and valuable contribution to deliberations of the meeting. He also thanked the colleague from GWP and the expert who made a presentation on MESA for sharing their experiences with meeting. He expressed special gratitude to Permanent Representative of Ghana with WMO, the National Hydrological Advisor and to the government of Ghana for hosting the meeting. He expressed sincere gratitude to the local organizing committee for their excellent work and the support they provided to the WMO team and the participants for a successful meeting. Finally, he thanked the Chairman for ably steering the meeting to a successful end and the Rapporteurs for their hard work and substantial contribution to the report.

16.2 The Chairman of the session, Dr. Ashraf Zakey thanked all participants in the meeting for working so hard to have a meaningful and successful meeting and wished them a safe journey home.

16.3 The session closed at on Friday 20 November 2015 at 15:00 hours.

11TH SESSION RA I WORKING GROUP ON HYDROLOGY
ACCRA, GHANA
16-20 NOVEMBER 2015
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WORLD METEOROLOGICAL ORGANIZATION

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RA I WORKING GROUP ON HYDROLOGY**Eleventh session, 16-20 November 2015****Accra, Ghana****PROVISIONAL AGENDA**

1. Opening of the session
2. Organization of the work of the session and approval of the agenda and work programme
3. Consideration of the relevant decisions of RA I-16, Cg-17, EC-67 and CHy-14
4. Report on activities related to WMO's Hydrology and Water Resources Programme in the Region
5. Report on WMO capacity Building Activities in Hydrology and Water Resources
6. Report of the past chairman of the Working Group on Hydrology
7. WMO WHYCOS programme with focus on HYCOS Projects in the region
8. Presentation on MESA and opportunities for satellite applications in Hydrology and Water Resources
9. WMO Flood Initiative
 - Associated Programme on Flood Management (APFM)
 - Flash Flood Guidance System (FFGS)
 - Severe Weather Forecasting Demonstration Project (SWFDP) in Africa
10. The state of National Hydrological Services and water resource monitoring in Africa
11. Cooperation with other WMO bodies and international organizations in projects related to hydrology
12. Work programme of the Working Group for the next four years inter-sessional period
13. Topics of relevance to the Region to be recommended for inclusion in the programme of work of the Commission of Hydrology at CHy-15
14. Any other business
15. Consideration and adoption of the meeting report
16. Closure of meeting