

WORLD METEOROLOGICAL ORGANIZATION
WEATHER, CLIMATE AND WATER



**ELEVENTH MEETING OF THE RA IV
WORKING GROUP ON HYDROLOGY**

(KINGSTON, JAMAICA, 23-25 JANUARY 2018)

DRAFT REPORT

Session I: Opening and organization of the meeting (Chair: Mr. José Zúñiga)

Opening addresses

1. At the kind invitation of the Government of Jamaica, the Meeting of the RA IV Working Group in Hydrology was held in Kingston on 23-25 January 2018.

2. Mr. José A. Zúñiga, RA IV Hydrological Adviser and Chairman of the Working Group on Hydrology (WGH), opened the meeting and thanked the Government of Jamaica, Mr. Evan Thompson (Permanent Representative of Jamaica with WMO) and Mr. Peter Clarke (deputy director of the Water Resources Authority, in representation of Mr. Herbert Thomas, Hydrological Adviser of Jamaica) for their kind invitation, as well as WGH members and WMO Secretariat staff for attending and supporting the meeting. The Chair of WGH noted that this meeting was a great opportunity to develop a strategy to address the main concerns of RA IV Members in hydrology and water resources, define the regional priorities on hydrology and come up with a work plan for the coming years. In addition, Mr. Evan Thompson welcomed the participants to the WGH meeting noting that he was very pleased that Jamaica was hosting a WMO meeting on water and hydrology, considering that Jamaica's indigenous name means "land of wood and water". He also highlighted some local current challenges and issues on water resources that make Jamaica an interesting scenario to hold this meeting. Mr. Paul Pilon, Chief of WMO Hydrological Forecasting and Water Resources Division, welcomed the meeting participants on behalf of the Secretary-General of WMO, Prof. Petteri Taalas, and thanked Mr. Thompson for offering to host the meeting. Mr. Pilon indicated that it was a good moment to hold the meeting considering that the Regional Association IV meeting was recently held in 2017, thus providing a good opportunity to discuss and possibly update the regional priorities on hydrology and water resources. The issues of primary interest to National Hydrological Services and the challenges of RA IV to engage both the Members in the region, and the WMO Commission for Hydrology (CHy) should be addressed. Mr. Pilon mentioned that the discussion should deal not only with the identification of the main topics, issues and priorities in the Region but also how to bring in and engage the right people to work and actually solve those issues. The mechanisms to address these issues, how to get the necessary resources and the metrics to determine the level of achievement should also be established. Finally, Mr. Peter Clarke welcomed the participants to Jamaica, mentioning the fruitful relationship existing between the National Meteorological Service and the Water Resources Authority of Jamaica.

Organization of the meeting and procedural matters

Objectives

3. The objectives of this meeting of the WGH were to:
- Present the WMO structures on Hydrology and Water Resources (WMO Commission for Hydrology, WMO Hydrology and Water Resources Programme, RA IV Working Group on Hydrology, Virtual Hydrology Forum);
 - Discuss the top-most priorities, targets, current initiatives and possible strategies in hydrology and water resources in RA IV;
 - Review all WMO-related hydrological initiatives under implementation/development in RA IV (FFGS, FFI, HydroHub, SHP);

- Review possible collaborations and partnerships within RA IV and with other organizations;
- Revise and approve the WGH Work Plan for the period 2017-2021.

Agenda

4. The Agenda of the meeting was adopted by the participants. A copy of the Agenda is included as Annex I.

Participants

5. The list of participants is included as Annex II.

Introductory presentations

6. After brief introductions of participants, Mr. Zúñiga presented some background to the current meeting, recalling that the last meeting of a WGH was held in El Salvador in 2015 and that a final report was prepared and is available online. Also that in the Seventeenth Session of the Regional Association IV (RA IV) held in San Jose, Costa Rica, from 27 to 31 March 2017, it was decided to reestablish the RA IV Working Group on Hydrology, and after a regional consultation, he was appointed as the new Regional Hydrological Adviser. Mr. Zúñiga noted how much National Hydrological Services (NHSs) contributed to the protection and development of the Members of this region, but also that in many occasions this work was not as visible as it should be, pointing out the need for better communication and outreach mechanisms. The opportunities of regional collaboration should also be explored, in order to exchange knowledge on successful experiences and best practices, in order to perform more effectively.

7. The meeting was informed that according to the respective terms of reference, the composition of the WGH includes representatives from North America (Mexico and United States), Central America (Belize and El Salvador), the Caribbean (Curaçao and Sint Maarten and Jamaica) as well as the Regional Hydrological Adviser. In addition, the Virtual Hydrology Forum was created during the previous intersessional period to improve the communication and coordination among NHSs, thereby strengthening the collaboration among all NHSs across the region.

8. Some observations were made regarding the strategy to follow during the meeting and development of a new work plan, taking into account the main issues experienced by the previous working group. It was recalled that although many topics were discussed and an extensive work plan was developed, most of the actions proposed were not fully achieved. Therefore, the meeting is advised that, in addition to defining priorities and identifying valuable programs under implementation worldwide that can be adopted in this region, it is also important to learn from the experience of the previous period and discuss and establish how things are intended to be carried out.

Session II: WMO Structures on Hydrology and Water Resources (Chair: Mr. José A. Zúñiga)

Presentations

9. Presentations were made by Mr. Paul Pilon and Mr. José A. Zúñiga on the WMO structures on Hydrology and Water Resources: (1) the Commission for Hydrology (CHy), (2) the Hydrology and Water Resources Programme (HWRP), (3) the RA IV Working Group on Hydrology (WGH) and the Virtual Hydrology Forum (VHF). The work and achievements of the WGH and VHF during the period 2013-2017 were presented by Mr. Federico Gómez-Delgado. All the presentations are available [here](#).

10. The first two presentations described the alignment of the CHy with WMO strategic priorities and gave an overview of its activities. Information was provided on related systems and programmes: the Global Hydrological Status and Outlook System (HydroSOS), WMO Hydrological Observing System (WHOS), WHYCOS, HydroHub, Flood Forecasting Initiative (FFI), the Disaster Risk Reduction (DRR) Roadmap and the hydrological component of the Global Data Processing and Forecasting System (GDPFS). They also made reference to the report of the Fifteenth Session of the CHy held in Rome, from 7 to 13 December 2016 and its programme of work. They also presented the activities supported by the WMO Secretariat, such as the Associated Programme on Flood Management (APFM) and the Integrated Drought Management Programme (IDMP), as well as the development of technical documents on relevant topics like hydrological normals, sediment transport measurements, probabilistic hydrological forecasting, public-private partnerships and environmental flows. Activities implemented with Member leadership include guidelines to represent water availability and water supply reliability, hydrological aspects of rainfall harvesting, data rescue and guidelines for filling in missing data, design discharge estimation in consideration of climate variability and change, and training and data exchange tools to support IWRM.

11. The two last presentations described the terms of reference and composition of the RA IV WGH and VHF for the current intersessional period, the WGH work plan and achievements for the previous period (2013-2017). It also noted the priority topics that were classified into five main categories: 1) "Data Collection, Processing, Quality; Retrieval, Storage" and "Hydrometry"; 2) "Hydrological Prediction and Forecast"; 3) "Drought Forecasting and Early Warning System"; 4) "Flood Risk Analysis and Management"; and 5) "Capacity Building on Integrated Water Resources Management". The previous strategy for the development of these activities was also discussed, with each member of the WGH as responsible for leading a particular priority area. In essence each member was to be a project leader/manager. It was highlighted that during the RA IV-17 held in March 2017, the RA IV WGH was not only maintained, but hydrology and water resources was identified as one of the four regional priorities to be considered in developing both the WMO Strategic Plan for 2020-2023 and the Operating Plan 2020-2023 for RA IV.

Conclusions and recommendations (Session II)

12. The main conclusions and recommendations following session II were:
- An overview of the achievements of the different expert groups and initiatives developed by the CHy suggests that the RA IV WGH should adopt similar strategies

to achieve advances at the regional level. The first step is to have a clear definition of the top most priorities and the goals to be achieved, followed by identifying concrete targets and outcomes for each goal. The next step would be to invite some members and individuals that already have experience on the subject, to contribute.

- Regional priorities identified for the previous period remain relevant, but further discussions are necessary to update them, as well as there being a need to formulate a strategy to carry out the proposed activities.
- This strategy should allow experts throughout the Region to become involved and take action in hydrological activities.
- CHy should be approached to undertake some of its initiatives in RA IV particularly where the WGH can assist in their implementation.
- Monitoring and evaluation procedures are necessary, in order to allow the President of RA IV, the Regional Hydrological Adviser and the WGH to deliver concrete results to the Region, as requested.
- The active participation of WGH members in the discussion of strategic but also technical issues through the VHF was important in the previous intersessional period. For the current period, in addition to the VHF, different mechanisms and technologies were offered by the WMO Secretariat for the WGH to coordinate and to assist it in making all necessary decisions through virtual meetings.

Session III: Top-most priorities, targets, outcomes, actions and strategies (Chair: Mr. Roberto Cerón)

Discussion

13. With a view of the WMO Strategic Plan 2016-19 and the Operating Plan for the Enhancement of NMHSs in RA IV for the same period, the discussion during this session dealt with the different topics that the WGH considered as a priority, but also with the need of being realistic regarding the very limited amount of resources available to develop new activities, in addition to what those NHSs are already undertaking. The meeting noted that although every NHS is developing valuable initiatives individually at the national level, there is the need to improve sharing of information at the regional level. Then a valid question was asked on how to showcase these contributions at the regional level. The VHF was mentioned as a useful tool for this, maybe also allowing for the seeding for future projects. However, other mechanisms could be used.

14. The discussion helped to identify the interest of the WGH in several topics. For instance, the different issues of data measurement, collection and processing; covering variables like groundwater level, streamflow and precipitation. Also topics like training and capacity development, seasonal hydrological prediction, improvement of meteorological and climate services (so that they provide suitable products for the use by hydrologists for water resources management), continued efforts on data rescue and their respective storage in readily usable electronic formats, and selected topics of sediment yield and dynamics were also mentioned.

15. It was noted that although practical guidance in classical methods and techniques in hydrology is useful, it is critical to adapt and to make use of new technologies. For example, this would be not only for field measurements but also remote sensing technologies and their combined use. Use of satellite observations to augment in situ precipitation measurement is one example. Information and training for the staff on these new technologies is highly required. An example was given in meteorology, where technologies continuously change the way NMSs do their jobs. The recent launch of the GOES-16 satellite is an example of useful technology that promotes significant changes in operational meteorology.

16. The question of whether it is possible to establish some best practices was raised. A possibility is adapting best practices that others are doing and converting these into transferrable knowledge. The United States was mentioned as a good example of a developer of technology that collaborates in their adoption and use by other countries: for instance, recently Jamaica was provided with training and technology by USGS technicians. However, WMO guidelines and standards should be observed by developers and recipients, to avoid contradictions or duplications. How RA IV Members can be involved and benefit from ongoing WMO/partners projects was also part of the discussion (for instance, the FFGS, the impact-based forecasting project, the 3D printed weather stations and the seasonal hydrological prediction). The example of a Canada funded project on the Global Framework for Climate Services was mentioned, with several Caribbean countries being the direct beneficiaries of WMO guidance for the kick off of their own National Consultation on Climate Services and National Climate Outlook Forums.

17. It was reiterated that training is of fundamental importance, but the question remained as to what the focus should be. Subsequently, the importance of flood forecasting and flood management, including the development of national flood management plans, was raised as being of concern to many Member in RA IV, with a need to better understand methods and approaches so that activities are actionable. The WMO Secretariat recalled that the CHy Advisory Working Group work plan had one activity area focusing on advancing End-to-End Early Warning Systems (E2E EWS) for flood forecasting (through a Community of Practice approach), with two CHy Task Teams currently working in this area. One is developing guidance material to assist Members in assessing their national capabilities in E2E EWSs, while a second Task Team is focusing on interoperable technologies (models and platforms) operationally used to forecast floods. It was felt that a regional assessment of E2E EWS capabilities might lead to a regional overview of strengths and weaknesses resulting in a regional roadmap on how to best address the latter. It was recognized that to appropriately apply such recommended practices and procedures, it would be necessary to adopt the Quality Management Framework for Hydrology (QMF-H).

18. The discussion on assessment of national capabilities spawned a discussion on QMF-H, as a paradigm change was viewed as being necessary to develop a work culture of willingness to adopt change so as to follow best practices. It was noted that QMF in meteorology had accomplished this for aviation, due to external pressures. It was generally agreed that the working group should have as one potential focus area E2E EWS for flood forecasting with a QMF-H perspective of best practices. The first step would be in undertaking the national assessment of capabilities leading to improved national early warning systems, with a strategy to focus initially on this for the members of the WGH, where subsequently this could be extended to other Members of the Region. Once

it is known which other countries would be interested in this effort, through the working group's experience, it could be applied in a standardized manner.

19. Drought was also mentioned as an important topic in the Region. In many Caribbean countries (for example, Barbados, Granada, St Kitts, Dutch Islands) there are no rivers, so sustainable management of the groundwater reserves is needed particularly during prolonged dry spells. The relevance of groundwater measurement data, including extraction and consumption data, and their analyses was again considered very important for sustainable management of the resource. In these discussions, flood forecasting and management was also mentioned again as an important topic, emphasizing the need to achieve a streamlined approach with realistic and meaningful actions. It was felt that it would be beneficial to adopt a regional framework for a common approach to be applied across the Region on national assessments as a first step.

20. The meeting discussed the need to achieve tangible gains, and how experts could be brought together around these topics to do so. Limitation of time is a reality, so in order to bring in experts the possible benefits of their participation should be highlighted: champion experts should be identified in different countries.

21. After these first discussions some questions were raised, like which topics throughout the meeting will be prioritized as being the most critical ones, and how the experts in the region should be invited to join. It was suggested to invite experts of the CHy to participate in specific regional priorities, since the inclusion of external experts would help to identify strengths and weaknesses in the national or regional practices and would also help to identify possible solutions. Some of these activities could be confidential (not for public disclosure). Finally, a preliminary list of priorities from this session was defined, while a new survey was discarded as being an inappropriate mechanism in making the final prioritization.

Conclusions and recommendations (Session III)

22. The main conclusions and recommendations following session III were:

- The WGH decided to identify the priority issues instead of launching another survey. These priorities should be included in a new work plan spanning a period of time that coincides with the intersessional period of the RA IV.
- Considering the previous decision and the importance of the criteria and contributions of the RA IV Members not represented in this WGH, special dialog and consultation mechanisms should be implemented, such as videoconferences and others, in which all hydrological advisors are invited to participate. This would help promote different initiatives to be developed according to the prioritization made by the WGH.
- One priority focus area is on E2E EWS for flood forecasting with a QMF-H perspective of best practices, with the first step being the assessment of national capabilities which would lead to a regional roadmap for improvements to national to regional systems.

Sessions IV, V and VI:

WMO-related hydrological initiatives under implementation/ development in RA IV (Chair: Mr. José A. Zúñiga)

Hydrological initiatives at national level that could be implemented at the regional or sub-regional levels (Chair: Ms. Martha Pinedo)

Collaborations and partnerships within RA IV and with other organizations (Chair: Mr. José A. Zúñiga)

Presentations

23. Presentations were made by Mr. Paul Pilon on behalf of Mr. Mark Smith (USA), Mr. Harry Lins (CHy) and on his own behalf (1) the Flash Flood Guidance System (FFGS), (2) the Flood Forecasting Initiative (FFI), (3) the Global Hydrometry Support Facility (HydroHub) and (4) the WMO Global Hydrological Status and Outlook System (HydroSOS). Mr. Kenneth Kerr offered a presentation on climate prediction and its possible application in operational hydrology, while Mr. Roberto Cerón talked about the generation of seasonal hydrological outlooks by the Central America Hydrological Forum. All the presentations are available [here](#).

24. Applications of the FFGS in Central America (operational), Haiti and Dominican Republic (under development), and Chiapas-Mexico (operational) were presented. Besides the products currently available (Satellite Precipitation, Flash Flood Guidance, Forecast Mean Areal Precipitation, Forecast Flash Flood Threat, Average Soil Moisture, Flash Flood Risk Map and Landslide Threat Index), additional advances in the system were presented: Multi-NWP Model Ingestion, Landslide Susceptibility Mapping, Urban Flash Flood Early Warning System, Expandable and Scalable Riverine Routing and Inclusion of Seasonal and Sub-seasonal Climate Prediction. The linkages between the WMO Severe Weather Forecasting Demonstration Project (SWFDP) and Regional FFGS were also discussed.

25. The origins, rationale and terms of reference of the FFI initiative were presented, as well as the scope and action domains of the FFI Strategy and Action Plan (SAP). The relation of FFI with other flood-related initiatives like CHAMP, SWFDP, CIFDP, FFGS was explained. The presentation on the WMO HydroHub explained the relatively new concept of an innovation hub for hydrometry, including a Hydrological Services Information Platform and a Helpdesk. Its main goals, work principles and current activities were described, as well as its relation with the World Hydrological Cycle Observing System (WHYCOS) and the WMO Hydrological Observing System (WHOS). A presentation on HydroSOS explained how this initiative intends to monitor and predict the national to global hydrological variability through a status and outlook system. The HydroSOS Work Package Structure was explained, and the CHy efforts on Guidelines for Seasonal Hydrological Prediction was introduced.

26. The presentation on the possible role of climate prediction in operational hydrology went through the state of the art, usability, usefulness and availability of climate predictions. In particular, subjective verification has demonstrated that climate forecasting has good skill in the region. It was stated that climate prediction information is now being provided with certainty (or uncertainty) quantified in a clear and easily understandable format, which may allow hydrologists to employ a paradigm shift in their use. Then, hydrological stakeholders need to be part of the process that build awareness,

understanding, interpretation and application of tailored climate information to enhance operational decision making in hydrology and water resources management. Finally, an overview was given on how Central America is generating seasonal hydrological predictions through its Hydrological Outlook Forum, based on rainfall prediction maps provided by the Central American Climate Outlook Forum.

27. It was noted that a good translation of climate predictions to on the ground operational hydrological decision making must be based on (1) routine communication between the national climatological provider and the NHS of hydrological department, (2) monthly tailored climate services/discussions, (3) development of standard operating procedures (SOPs) that enable integration of climate predictions into operational models, (4) development of Memorandum of Understandings (MOUs) between both Services or departments, (5) active participation of hydrologists at National Climate Outlook Forums and Regional Climate Outlook Forums, (6) establishment of a set of performance metrics to quantify the impacts and benefits of applying climate information to the process of operational hydrological decision making.

Conclusions and recommendations (Sessions IV, V and VI)

28. The implementation of any of the WMO initiatives in hydrology that were presented in these sessions could be achieved through regional and subregional agreements, or even action of individual Members, to express to WMO their interest in such initiatives. For each case, this should be done through the President of the Regional Association or through the Permanent Representative, respectively. Various possible activity areas were thought to be of particular relevance to the region. It was felt that a broad FFGS application over the entire Caribbean area, building on the accomplishments of existing initiatives, would be of interest and benefit the Region. Possible topics for inclusion in the Virtual Forum included: extended hydrological prediction, promotion of the use of Climate Prediction Tools, activities of the HydroHub, and dynamic downscaling.

Visit to Jamaica National Hydrological Service (Chair: Mr Geoffrey Marshall)

29. A visit was paid to the Water Resources Authority of Jamaica (WRA), with the kind hosting of Mr. Peter Clarke and the Permanent Representative of Jamaica with WMO, Mr. Evan Thompson. Several presentations were given on different topics and activities in hydrology and water resources at WRA. After a session of questions and comments, a visit was made to a hydrological gauging station on the outskirts of the city of Kingston.

Session VII: Development of WGH/VHF strategy and work plan (Chair: Mr. José A. Zúñiga)

Discussion

30. The discussion on the regional priorities was reopened, in order to develop a new work strategy and plan. Then, topics like data collection and standardization of collection methods, standard databases and data management systems for hydrology,

data rescue, discharge measurements for high flows, seasonal hydrological prediction, FFGS (in combination with the SWFDP for the Caribbean), sharing experiences and technology were brought up. Mention was again made of the need for a Caribbean-wide FFGS application in concert with a broader applied SWFDP for the Caribbean. It was noted that this need should be raised to the regional management table. It was noted that within the Caribbean, the HDRFFGS was noted as proving to be successful, and as well Dominican Republic was advancing on riverine forecasting, through funding made available by Canada. It was thought that the Regional Office could organize a teleconference meeting on advancing an FFGS application for the Caribbean, where Haiti and Dominican Republic could share their experiences. It was also thought that the teleconference might also result in the formation of a Development Team to advance this issue. With regards to data sharing, it was mentioned that the Vice-president of the CHY was leading an initiative for data sharing, and the WGH could contact him to further explore the possibility of implementing this in the Region. The creation of a complete inventory of the observing networks in the different Members, including radars (for instance), was also mentioned as an interesting topic, as well as the development of national flood management plans (and policies), riverine flood forecasting Early Warning Systems (EWS), and protection of the gauging infrastructure. In the case that coastal flooding is an issue, the CIFDP project could be relevant. There is only one CIFDP application in the Caribbean. Extending such early warning capability more broadly in the Region would require an expression of interest. On broader implementation of CIFDP in the Caribbean region, hydrological aspects that affect the coastal inundations should be included. Drought is always a relevant topic, which can be very political sometimes. It was asked if there was a framework or strategy available on how to handle drought that could be advance practices in the region.

31. The WMO Secretariat mentioned that there are material already in place to assist countries in developing national drought policies and plans and suggested to consult the documentation of the Integrated Drought Management Programme (IDMP). For flooding, the Associated Programme on Flood Management (APFM) could be of help on advancing national policies and plans, but the WGH would first need to know which countries have such plans in place. Considering what has been agreed on the Sendai Framework for Disaster Risk Reduction and on the Sustainable Development Goals (SDGs), if there is no national policy on flood management, then a recommendation is expected to be given at the national level by the NHSs. NHSs should act as advisers, possibly generating inputs such as flooding risk maps and EWS for flood forecasting. Depending on the particular competencies in each country, NHSs could become involved in flooding management and policy making. Regarding SDGs, NHSs should be involved and provide objective indicators for the achievement of SDGs.

32. In the Caribbean, the contributions of the Caribbean Institute for Meteorology and Hydrology were noted, since they have worked on flooding mapping over the region and enhanced the hydrological applications in benefit of its Members. Then the WGH could use what they have done. Based on the experience of Trinidad and Tobago, a benefit was also observed in developing capacities at the national level in the Caribbean, since it is composed by small countries and this should facilitate individual islands to forecast for themselves. An exchange could also be promoted across sub regions, since Costa Rica and El Salvador, for example, have developed competencies on flood EWSs, while Dominican Republic is developing such systems, that could be shared with other Members and sub regions.

33. The main points under discussion were summarized by the WGH chairperson as follows: (1) on flooding as a general topic to gather information on strengths and weakness and current forecasting approaches, develop a proposal to advance flash flood early warnings across the Caribbean, and assist in developing national flood management plans and policies, with Members also benefiting from experts being trained on these topics within the region, (2) on data collection, interested sub regions should ask for support through the President of RA IV, (3) on seasonal forecasting, there are several tools already developed in Central America and Trinidad and Tobago, as presented. The WGH should also promote an exchange of experiences and technologies at the regional level. The VHF or virtual conferences could be used for this.

34. From the strategic point of view, the WGH should reach out to the NHSs of the countries, and let them know that it is important to get involved in the work of this group. The meeting stated that a more direct link between WMO RA IV WGH and NHSs is needed, so as to improve direct communication with hydrologists. The interaction with the meteorological community should also be improved, for example through a joint SWFDP-FFGS Caribbean wide project. Concerning data rescue initiatives in general, it is important that in addition to PRs (the official National contact point), the NHAs also be informed as well. The generation of MoUs between NHSs and NMSs for exchanging information, data and even research was strongly suggested.

Final agreements (Session VII)

35. The final agreements of the WGH-11 following session VIII were:

- The work plan that was agreed three years ago is cancelled and replaced by the new work plan for 2017-2021 (included as Annex III).
- Select an RA IV expert to be proposed to the HydroSOS TT (2c Work Package) to contribute on the development of the standardized methodologies and work of TT
- A SHP teleconference will be held in RA IV, with all the HAs and PRs invited (July 2018). A WGH meeting will be held before the SHP teleconference (end of April 2018).
- Three champions will be identified and committed to develop a pilot project on SHP (September 2018). A virtual WGH meeting will be held after having appointed the three champions.
- Teleconference(s) to be organized to establish interest in a Caribbean-wide FFGS, with a possible inclusion of an extended SWFDP project. Invitation to be sent to HAs and PRs of Caribbean Members (excluding Hispaniola Island) and other concerned experts (including members of the WGH). Central America (CAFFGS) and Hispaniola FFGS (HRDFFGS) members could be invited to discuss benefits and status of existing FFGS systems in their regions (December 2018).
- A minimum of two virtual WGH meetings will be held per year.
- The WGH members absent in this meeting will be informed about the agreements made here, and they will be invited to future virtual meetings.

- Recommendations will be provided to the President of RA IV, to implement a mechanism to periodically review the availability and willingness of the members of the WGH to continue contributing and being part of it.
- Continue discussing the possibilities of regionally undertaking national assessments of capabilities for E2E EWS for flood forecasting.
- The Regional Hydrological Adviser will track progress made on the activities of the WGH Work Plan.

Session VIII: Meeting report and closure (Chair: Mr. José A. Zúñiga)

Adoption of the Report

36. After distributing by email the WMO Secretariat the English version of the report, and having been reviewed by the meeting participants, it was adopted unanimously by the RA IV WGH.

Closure of the Session

37. The Eleventh Meeting of the RA IV Working Group on Hydrology closed at 17:30 on 25 January 2018.

ANNEX I

FINAL AGENDA

ELEVENTH MEETING OF THE RA IV WORKING GROUP ON HYDROLOGY (WGH RA IV)

23-25 January 2018

Pegasus Hotel, Kingston, Jamaica

Day 1

TIME	ITEM	RESPONSIBLE
Session I: Opening and organization of the meeting		Chair: José A. Zúñiga
08:30 – 09:00	Registration of participants	WMO Secretariat
09:00 – 09:30	Opening remarks	José A. Zúñiga, Paul Pilon, Rep. Jamaica
09:30 – 09:40	Organization of the meeting: <ul style="list-style-type: none"> - Introduction of participants - Introduction/scope of the meeting - Adoption of agenda - Procedural matters 	José A. Zúñiga
Session II: WMO Structures on Hydrology and Water Resources		Chair: José A. Zúñiga
09:40 – 10:00	Presentation: WMO Commission for Hydrology (CHy)	Paul Pilon (for Harry Lins)
10:00 – 10:20	Presentation: the WMO Hydrology and Water Resources Programme	Paul Pilon
10:20 – 10:50	<i>Coffee break / Group photo</i>	-
10:50 – 11:10	Presentation on the RA IV WGH and HF	José A. Zúñiga
11:10 – 11:30	Background: work and achievements of the WGH and HF during the period 2013-2017	Federico Gómez-Delgado
11:30 – 12:30	Why are we here? Discussion, questions and comments	All
12:30 – 13:30	<i>Lunch</i>	-
Session III: Top-most priorities, targets, outcomes, actions, strategies and work plan		Chair: Roberto Cerón
13:30 – 14:15	Discussion on top-most priorities for RA IV in hydrology and water resources	All
14:15 – 15:00	Discussion on possible targets related to the top-most priorities, desired outcomes and concrete actions to achieve them	All

15:00 – 15:30	Discussion on how existing initiatives are accomplishing what is needed for the Members in the Region: do they need adjusting or having new ones brought on line?	All
15:30 – 16:00	<i>Coffee break</i>	-
16:00 – 16:30	Discussion: developing strategies and work plans to make real gains on hydrology in the region, and how to improve the performance and Members' participation on WGH and HF activities	All

Day 2

TIME	ITEM	RESPONSIBLE
Session IV: WMO-related hydrological initiatives under implementation/development in RA IV		Chair: José A. Zúñiga
08:30 – 09:00	FFGS: applications in Central America, the Hispaniola Island, and Mozotal-Mexico	Paul Pilon (for Mark Smith)
09:00 – 09:30	Flood Forecasting Initiative (FFI) and Global Hydrometry Support Facility (HydroHub)	Paul Pilon
09:30 – 10:00	Recommendations of the WMO Commission for Hydrology to produce seasonal hydrological predictions for hydrological and water resources management applications: the WMO Global Hydrological Status and Outlook System	Paul Pilon (for Harry Lins)
10:00 – 10:30	Climate prediction and its possible application in operational hydrology	Kenneth Kerr
10:30 – 11:00	<i>Coffee break</i>	-
11:00 – 11:30	Generation of seasonal hydrological outlooks by the Central America Hydrological Forum	Roberto Cerón
11:30 – 12:30	Discussion, questions and comments	All
12:30 – 13:30	<i>Lunch</i>	-
Visit to Jamaica National Hydrological Service		Chair: Geoffrey Marshall
13:30 – 16:30	Visit to the Water Resources Authority of Jamaica (WRA). Selected presentations on the main topics and major activities on hydrology and water resources at the WRA	WRA Staff

Day 3

TIME	ITEM	RESPONSIBLE
Session V: Hydrological initiatives at national level that could be implemented at the regional or sub-regional levels		Chair: Martha Pinedo
08:30 – 10:00	Selected presentations	TbD
Session VI: Collaborations and partnerships within RA IV and with other organizations		Chair: José A. Zúñiga
10:00 – 10:15	Collaboration with other groups and activities from RA IV: Hurricane Committee, TT DRR, TT GFCS, TT WIS/WIGOS	All
10:15 – 10:30	Collaboration with other organizations: CRRH, CMO-CIMH, UNESCO, GWP, etc.	All
10:30 – 11:00	<i>Coffee break</i>	-
Session VII: Development of WGH/HF strategy and work plan		Chair: José A. Zúñiga
11:00 – 11:30	Strategic Operating Plan for the Enhancement of National Meteorological and Hydrological Services (NMHSs) in RA IV	Federico Gómez (for Juan Carlos Fallas)
11:30 – 12:30	Drafting of the main elements for the development of a Strategic Operating Plan for the WGH/HF	WGH
12:30 – 13:30	<i>Lunch</i>	-
13:30 – 15:00	Revision and approval of the WGH Work Plan for the period 2015-2019 (aligned to the principles established for the WGH Strategic Operating Plan)	WGH
15:00 – 15:30	<i>Coffee break</i>	-
Session VIII: Meeting report and closure		Chair: José A. Zúñiga
15:30 – 16:15	Verification and adoption of the meeting report	WGH
16:15 – 16:30	Closure of the meeting	José A. Zúñiga

LIST OF PARTICIPANTS

WGH Members:

Mr. Roberto Cerón
Gerente de Hidrología, a.i.
Dirección General del Observatorio Ambiental
Ministerio de Medio Ambiente y Recursos Naturales
Kilómetro 5½ Carretera a Santa Tecla, Calle y
Colonia Las Mercedes
Edificio MARN (anexo al Edificio ISTA) No. 2
San Salvador
El Salvador

Tel: +503 2132 9617
E-mail: rceron@marn.gob.sv

Mr. Kenneth Kerr
Meteorologist
Trinidad and Tobago Meteorological Service
South Terminal, Piarco International Airport, Piarco
Port of Spain, Trinidad
Trinidad and Tobago

Tel: +1 868 669-5465/3964
Fax: +1 868 669-4009
E-mail: k_kerr45@hotmail.com

Mr. Geoffrey Marshall
Chief Hydrologist
Planning and Investigations Unit Head
Water Resources Authority of Jamaica
PO Box 91, Kingston 7
Jamaica

Tel: +1 876 927-0077
Fax: +1 876 977-0179
E-mail: gmarshall@wra.gov.jm

Ms. Martha Pinedo
Meteorological Department, Ministry of Traffic,
Transport and Urban Planning
Klein Kwartier 33
Willemstad
Curaçao

Tel: +599 9 432-5800
Email: martha.pinedo@gobiernu.cw

Mr. José Alberto Zúñiga
Director
Centro de Servicios Estudios Básicos de Ingeniería
Instituto Costarricense de Electricidad
Regional Hydrological Adviser
San José
Costa Rica

Tel: +506 20 00 75 68
Fax: +506 20 00 82 04
E-mail: JZunigaM@ice.go.cr

Local participants:

Mr. Peter Clarke
Deputy Managing Director
Water Resources Authority
Hope Gardens, P.O. Box 91
Kingston 7
Jamaica

Tel: +1 876 927-0077
Fax: +1 876 977-0179
E-mail: petermaclarke@gmail.com

Mr. Evan Thompson
Director
Meteorological Service Division
65¾ Half-Way-Tree Road
Kingston 10
Jamaica

Tel: +1 876 960-8990
Fax: +1 876 960-8990
E-mail: E.Thompson@metservice.gov.jm

WMO Secretariat:

Mr. Paul Pilon
Chief
Hydrological Forecasting and Water
Resources Division
World Meteorological Organization
7 bis, Av. de la Paix, Case postale 2300
CH-1211 Genève 2, Switzerland

Tel: +41 22 730 83 58
Fax: +41 22 730 80 43
E-mail: ppilon@wmo.int

Mr. Federico Gómez-Delgado
Programme Officer
Office for North America, Central America
and the Caribbean
World Meteorological Organization
Apartado Postal 7-3350-1000
10101 San José, Costa Rica

Tel: +506 22 58 23 70
Fax: +506 22 56 82 40
E-mail: fgomez@wmo.int

**WORK PLAN 2017–2021
RA IV WORKING GROUP ON HYDROLOGY AND VIRTUAL HYDROLOGY FORUM
REGIONAL ASSOCIATION IV (RA IV)
WORLD METEOROLOGICAL ORGANIZATION**

LEVEL	PRIORITY	ACTIVITY	INDICATOR	TARGET	DEADLINE	COMMENTS
1	HydroSOS - Seasonal Hydrological Prediction (SHP)	1. Organize a teleconference to discuss the status of SHP in RA IV. Invitation to be sent to RA IV HAs and PRs and other concerned experts (including members of the WGH)	1. A number of champions identified and committed to develop a pilot project on SHP	1. At least three champions identified	1.1 Teleconference: JUL 2018 1.2. Champions identified: SEP 2018	Three WGH members (K.Kerr, G. Marshall and R.Cerón) agreed to be champions and efforts will be undertaken to seek additional champions from the region
		2. Select an RA IV expert to be proposed to the HydroSOS TT (2c Work Package) to contribute on the development of the standardized methodologies and work of TT	2. RA IV expert appointed to the HydroSOS TT 2c Package	2. One expert appointed in FEB 2018	FEB 2018	The WGH decided to appoint K. Kerr as the regional expert proposed to the appointed to the HydroSOS TT (2c Package)
		3. To develop a pilot SHP project proposal	ND	ND	ND	ND
2	Flash Flood Guidance System	1. Teleconference(s) to be organized to establish interest for a Caribbean-wide FFGS. Invitation to be sent to the HAs and PRs of Caribbean Members (including Hispaniola island) and other concerned experts (including members of the WGH and SWFDP). Dominican Republic and Haiti could be invited to present the current status of the FFGS for Hispaniola Island.	1. Number of teleconferences organized	1. At least one teleconference held before the end of 2018	DEC 2018	ND
3	Riverine Flood Forecasting (Early Warning System) including Coastal Inundation Forecasting Demonstration Project	1. Teleconference(s) to be organized to present the E2E riverine flood forecasting experiences under development and operation in RA IV. Invitation to be sent to RA IV HAs and PRs and other experts concerned (including members of the WGH). Dom. Republic and other Members could be invited to present the current status of riverine forecasting in the Region.	1. Teleconference organized	1. The teleconference was held	OCT 2019	ND
4	Quality Management Framework	ND	ND	ND	ND	ND

5	Development of Drought National Mgmt Plans (IDMP)	ND	ND	ND	ND	ND
6	Development of Flood National Mgmt Plans (AFMP)	ND	ND	ND	ND	ND
7	Data rescue	ND	ND	ND	ND	ND
8	Protection of stations	ND	ND	ND	ND	ND

*ND: Not defined.