

**WORKPLAN: Focus Area: Hydrological Applications, Products and Services (updates in red)**

Activities	Actions	AWG Member	Outputs	Milestones	Status
<p><b>A) APFM:</b>  <b>1) work with APFM on provision of guidance and training material on E2E EWSs for Flood Forecasting through the IFM HelpDesk, and other topics such as preparation of guidelines on how to formulate numerical weather prediction information for use in flood forecasting, consistent with the FFI-AG Work Plan of 2016-2019.</b>  <b>2) Represent CHy on the APFM AC/MC meetings.</b></p>	<p>A1                      -provide reliable and easy access to E2E EWS for FF products (linked to E3 mentioned below);</p> <p>A2                      - represent CHy AWG on the APFM AC/MC meetings (together with the President of CHy);</p> <p>A3                      - implementation of new APFM strategy on project development;</p>	<p>A1                      · H. Kim</p> <p>A2                      · H. Lins                      · H. Kim</p> <p>A3                      Link to E4</p>	<p>web portal (possibly using the IFM Helpdesk) for the CoP with easy access to available materials and technologies, and communication means with end users;</p>	<p>APFM AC/MC meeting (now SBP Forum) web portal;</p>	<p>1) There were two meetings of APFM (the last APFM AC/MC meeting, 4~5 Sept 2017, Geneva and the 1st SBP (Support Base Partners) Forum 2nd 24 Aug, 2018 Stockholm). The external core financial contributions came to an end in 2017, a new governance structure was proposed and adopted for the APFM. No more AC/MC but started SBP Forum and developed a new business model. APFM (partnership with GWP-West Africa and Volta Basin Authority) submitted the project proposal 'Integrating Flood and Drought Management and Early Warning for Climate Change Adaptation in the Volta Basin' to the Adaptation Fund in Aug 2018. The decision on the submitted proposal is expected in Oct 2018. The APFM and IDMP are to integrate the HelpDesks and already jointly present in social medias such as Facebook and Twitter. Applying 3 pillars for APFM.</p> <p>2) Hwirin attended on the APFM meetings with Harry Lins, Paul and Giacomo.</p> <p>3) Web portal activity linked to E3 A joint Pres CHy/Chair UNESCO-IHP/GWP ExSec meeting might be held to further discuss synergies on this topic by the end of the current year.</p>

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<p><b>B) WMO Hydrological Status and Outlook (Including Sub-seasonal to Seasonal Hydrological Prediction):</b></p> <p><b>1) Oversee the establishment and work of the expert Task Team coordinating the pilot phase of the initiative;</b></p> <p><b>2) Improve the utility of sub-seasonal to seasonal forecasts for hydrological and water resources management applications;</b></p>	<p>B1 - Establish Expert Task Team (ToR and Membership).</p> <p>B2 - Establish the necessary links between this initiative and other related activities, including: a) WMO activities such as GFCS, WIGOS and GDPFS. b) external scientific initiatives and include outcomes from hydrological testbeds currently under development.</p> <p>B3 -Technical scoping of the initiative, including: a) Specifications of climate and hydrological data required for service development and delivery. b) Specification of the status, sub-seasonal and seasonal approaches to be used</p>	<p>B1 Task Team (Chair: A. Jenkins) overseen by AWG Members: N. Tuteja T. Kanyike H. Dixon</p> <p>B2 N. Tuteja and Task Team</p> <p>B3 Task Team monitored by N. Tuteja</p> <p>B4 Task Team monitored by N. Tuteja</p> <p>B5 Task Team monitored by N. Tuteja</p> <p>B6 Task Team monitored by T. Kanyike</p> <p>B7 Task Team monitored by Lead AWG</p>	<p>Technical specification reports assessing: a) Target users and their requirements. b) data specifications c) modelling approaches d) dissemination methods e) capacity development needs related to the project</p> <p>A WMO web portal for the system.</p> <p>Two demonstration pilot projects describing hydrologic status, sub-seasonal and seasonal prediction performance providing regular openly accessible assessment of regional hydrological status and (if possible) outlook via a central</p>	<p>Expert Task Team established – September 2017</p> <p>Short progress reports every year</p> <p>Reports on system requirements – December 2018</p> <p>Product delivery web portal – December 2018</p> <p>Staged completion of Pilot Projects: a) Pilot Project established – December 2017 b) Pilot Project providing status assessments – June 2020</p> <p>Seasonal Hydrologic Prediction Guidelines published (12 months)</p> <p>Hydrologic Community Requirements document for Seasonal to Sub-Seasonal predictions</p>	<p><b>B1: Task Team established following Initial Planning meeting in Entebbe, Uganda in September 2017. Task Team has held two face-to-face meetings - Entebbe, Sept 2017 and Wallingford, April 2018.</b></p> <p><b>B2: The Task Team met in April 2018 and invited Paul Davies (CBS) to define the links with other WMO activities. Some of the Work Packages include members that have worked with different external initiatives and will look into drawing their experiences and results into HydroSOS.</b></p> <p><b>B3-B5 This will be monitored throughout the development of activities of Work Packages.</b></p> <p><b>B6: Two basins were selected for this scoping phase of HydroSOS: South Asia and Lake Victoria Basin (LVB). The Secretariat is currently preparing ToRs for undertaking an assessment of national hydrometeorological capacities for water resources and an assessment of user needs. Regarding the GBM, Nepal, Bhutan and Bangladesh have provided focal points from their Services to liaise with Guna Paudyal (leader of Work Package</b></p>

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	<p>in the initiative based on the existing WMO material on SHP.</p> <p>B4 - Monitor and support the Expert Task Team's work establishing reliable and routine data streams for: a) Observation monitoring information b) Hindcast and forecast information</p> <p>B5 - Design and develop an operationally ready seamless water status and forecasting system.</p> <p>B6 - Development of at least two demonstration pilot projects in significant water supply regions around the world.</p> <p>B7 - Provide input to the Task Team's work developing an implementation plan for the System beyond 2020 and present to CHy-16</p>	<p>Members</p> <p>B8 a) CHy Review process and undertake necessary revisions b) Jan D. c) N. Tuteja</p>	<p>WMO website.</p> <p>- An implementation plan for submission to CHy-16 detailing the potential development into an operational system after 2020.</p> <p>- Related WMO Guidelines and other documents (outlined in Actions) published.</p>		<p>3a -for GBM-). The process of assessment of the existing modelling and data availability in those countries is being started. Regarding the establishment of the LVB, Tom: 1.1. Participated in planning meetings (Uganda &amp; UK), 1.2. Provided updated workplan for Lake Victoria region to take HydroSOS forward. However implementation had stalled due to lack of resources- 1.3. Collected some information on existing models within the region through extended network in the region.</p> <p>B7: to be done further before the end of this phase of HydroSOS</p> <p>B8: The Guidelines on SHP have been reviewed and comments are to be shared with authors. The document on downscaling guidelines has been archived until further notice.</p> <p>Verification guidelines: Build upon work done in HydroSOS, HEPEX, Springer book chapter drafted by Narendra and work that will be done</p> <p>Second quarter 2019: next meeting of HydroSOS work packages</p>

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	<p>B8</p> <ul style="list-style-type: none"> <li>- Complete related WMO Guidelines. including:</li> <li>a) Reviewing the Seasonal Hydrological Prediction Guidelines.</li> <li>b) Completing the Downscaling Guidelines.</li> <li>c) Developing sub-seasonal and seasonal hydrological verification guidelines to enhance end-user confidence (link with E5).</li> </ul>				<p>A tentative budget should be developed to quantify resources needed for the implementation of HydroSOS at the meeting</p> <p>Need for a bare bone map of current streamflow conditions based on data currently available online for pure demonstration purposes. Resource requirements will be discussed in the context of next meeting.</p>
<p><b>D) DRR:</b>  <b>1) contribute to the development of identifiers for cataloguing of hazardous events (promote hydrological perspective) and</b>  <b>2) lead the finalization of the Manual on Flood Risk Mapping, including</b>  <b>3) investigating the applicability of Common Alerting Protocols (CAP);</b></p>	<p>ACTIVITY D1</p> <ul style="list-style-type: none"> <li>- Contribute to DRR Programme including representing CHY on DRR FP RA-TC-TP and EAGs</li> <li>- Contribute to the catalogue</li> </ul> <p>ACTIVITY D2</p> <ul style="list-style-type: none"> <li>- Finalize the manual</li> <li>- form a drafting team with new members (CHY-15 meeting volunteers M. Bussetini (Italy), Mexico – contact delegate for OPACHE member);</li> </ul> <p>ACTIVITY D3</p> <ul style="list-style-type: none"> <li>- collect material on alerting protocols used in operational</li> </ul>	<p>D1</p> <ul style="list-style-type: none"> <li>· Jan D. (lead)</li> <li>· Marcelo (assist)</li> <li>· Yuri (assist)</li> </ul> <p>D2</p> <ul style="list-style-type: none"> <li>· Marcelo (lead)</li> <li>· Yuri (assist)</li> <li>· Tom</li> </ul> <p>D3</p> <ul style="list-style-type: none"> <li>· Jan D. (lead)</li> </ul>	<p>D1</p> <ul style="list-style-type: none"> <li>- Appropriate representation of hydrological aspects within DRR</li> <li>- Revised hydrological hazard definitions;</li> </ul> <p>D2</p> <ul style="list-style-type: none"> <li>- Manual on FRM;</li> </ul> <p>D3</p> <ul style="list-style-type: none"> <li>- material and recommended alerting protocol for operational hydrology;</li> </ul>	<p>D1</p> <ul style="list-style-type: none"> <li>- Review of draft catalogue – J.Danhelka</li> <li>- proposed new hydrological hazard definitions to AWG (input to review of Technical Regulatory Materials);</li> </ul> <p>D2</p> <ul style="list-style-type: none"> <li>- New Draft of Manual – AWG-2;</li> <li>- Finalized Flood Risk Mapping Manual – CHY-16;</li> </ul> <p>D3</p> <ul style="list-style-type: none"> <li>- List of alerting protocols used – AWG-2;</li> </ul>	<p>D1: There was a meeting of the group on cataloguing that took place in Geneva in November 2017. WG agreed on the principles to use UUID (Universal Unique Identifier) that was later agreed by EC-70. J. Danhelka participated in the meeting and contributed to the document writing. Secondly RAVI decided to launch UUID prototype for RAVI – J. Danhelka represents hydrology there.</p> <p>D2: The writing of the Manual on Flood Risk Mapping is progressing steadily, with great contribution and involvement of the whole team, and a strong support of the Secretariat. An estimated 75/80% of the manual is already made. The remaining 20/25% is accounted for by: three chapters to be written (out of 13 + 2</p>

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	hydrology including CAP - develop recommendations on use of alerting protocols in operational hydrology;			- Evaluation of protocols – AWG-2; - recommendations for alerting protocol use in operational hydrology – Cg-18;	annexes), two and a half to be reviewed, and an overall review for consistency and language correction. D3: No commonly used alerting protocols except CAP has been found in the field of operational hydrology. Activity is closely connected with D1 and new GMAS, where CAP has been agreed as the only protocol to be used.  In E1 and E2, definitions are being reworked on urban flooding and flash flood. Provide to D1 when the definitions will be available.  Consider other AWG members for the peer-review process of D2. Or maybe not (potential conflict of interest). Anyway, consider peer-reviewers.
<b>E) Implementation Strategy for the End-to-End Early Warning Systems (E2E EWS) for flood forecasting (using the Community of Practice approach): 1) develop assessment guidelines for NHSs to evaluate their E2E EWS for flood forecasting, furthering the earlier work on “Efficiency of flood forecasting services”</b>	ACTIVITY E0 - Establish CoP approach for FF  ACTIVITY E1 - develop generic and living list of requirements/best practices in E2E EWS for FF (based on existing materials); - prepare assessment guidelines making use of existing material including assessment	. Marcelo Uriburu – Activity Lead Contributors -Y. Simonov, H. Kim, T.Kanyike, N.Tuteja  E0 Marcelo (lead), Tom (assist)  E1 uri (lead)	ACTIVITY E1 - List of best practices (YS); - NHSs assessment guidelines (YS); E2 - Guidance material on platforms and models; - Guidance material (e.g. NWP formulation for FF);	Task team (TT) (work group) is formed to oversee development and implementing of the CoP approach in E2E EWS in FF;  Meeting to develop CoP (ToR) approach 2017?; E1 teleconferences/meeting to finalize NHSs assessment	E0 & E4 A meeting took place in Geneva (13-17 Nov 2017) on Establishing a Community of Practice on Flood Forecasting (CoP FF). It dealt not just with activity E0 but with activities E1 and E2 (reported separately), which explains the participation of the two Task Teams formed to carry out activities E1 and E2 (aka TT E1 and TT E2). The first part (2 days) was conducted using two parallel sessions, devoted (i) to the

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<p><b>(including testing developed procedures) possibly through the establishment of a Task Team/Working Group, consistent with the FFI-AG Work Plan of 2016-2019, 2) develop access to the interoperable technologies including platforms and models for use in flood forecasting; 3) provide access to training and guidance material, in conjunction with item 1.4(g) below, on the aforementioned items; and 4) assist in the development of projects;</b></p>	<p>instructions</p> <p>E2 - inventory and assessment of capabilities of existing platforms and hydrological forecast models; - inventory of existing guidance material (what is available and what is missing), including river-ocean modelling and forecasting; - inventory of existing training material (what is available and what is missing)</p> <p>E3 - design (assemble content) web portal (using existing IFM Helpdesk capabilities) allowing access to technologies (e.g. models), guidance and training material;</p> <p>E4 - seek opportunities for implementing CoP approach using pilot projects based on countries' requests;</p> <p>E5 - Review guidelines for</p>	<p>E2 Hwirin Kim (lead) Y. Simonov (assist)</p> <p>E3 Hwirin Kim (lead)</p> <p>E4 E-team</p> <p>E5 N. Tuteja (lead)</p>	<p>- training material needed to support CoP; E3 - web portal of the CoP with easy access to available materials and technologies, and communication means with end users;</p> <p>E4 3 Members have progressed from assessment to filling identified gaps using CoP approach</p> <p>E5 Develop hydrological flood forecast verification guidelines for contribution to Hydrologic Forecast Verification Guidelines at multiple time scales.</p>	<p>guidelines in advance of FFI-AG3; E2 guidance and training material are available for CHy-16; E2 inventory and guidance material on interoperable platforms and models for CHy-16; E3 Launching of CoP and web portal HelpDesk in 2018; E4 3 pilot projects established CHy16; E5 Reviewed RA II document 2018</p>	<p>Assessment Guidelines for evaluating the NHSs capabilities in E2E Flood Forecasting (Activity E1), and (ii) to interoperable technologies to advance flood forecasting (Activity E2), and the second part (3 days) was conducted in a joint session, devoted firstly to discussing the results of each parallel session, and finally to the implementation of a Community of Practice for the End-to-End Early Warning Systems (E2E EWS) for flood forecasting (Activity E0). After very active discussions, several items (a dozen) have been agreed upon regarding the concepts and practices to be adopted in moving forward with the CoP FF. A list of Action Items arose from the meeting, and a Work Plan was agreed upon by the group. In the process of assessing the Flash Flood Guidance System with Global Coverage (GFFGS), the necessity of establishing a CoP for the GFFGS users (and other stakeholders) was expressed by various interviewees, with the expectation of improving the operations, the interpretation of products and their uncertainty. Provide to D1 when the definitions will be available coming out of terminology discussions in E1 and E2 E1</p>

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	<p>verification of hydrological forecasts (RA II) consistent with product requirements – coastal hydrologic services, very short range high temporal resolution hydrologic forecasts for flash flood guidance (link to B3 c).</p>				<p>Team of six members was formed (plus a few experts from E0, which expressed willingness to help and share their experience). Structure of the assessment guidelines was developed (10 sections covering the main pieces of the flood forecasting chain), covering all major flood types. Each section represents a table (or matrix) with relevant questions for each flood type and flood mechanism relevant for a country or basin. Four teleconferences were organized (as of 1.10.2018). Draft assessment guidelines are developed and being reviewed (first round of review). The assessment guidance material is being developed at the moment (first draft is ready). Harmonize this activity with HydroHub, especially for what concerns assessment of hydrometry networks.</p> <p>E2 &amp; E3</p> <p>Task Team on Interoperable Models and Platforms (TT E2) was formed with 5 experts. TT E2 developed definitions and criteria for Interoperable Technologies during Geneva meeting (Nov 2017). Hydrological Model template was determined and Hydraulic, Reservoir, Platform, terminology and definitions have been reviewed and revised through 7 teleconferences (Mar,</p>



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					<p>Apr, Jun, Jul, Aug, Sep 2018). A small group is working for the guidance material NWP formulation for FF. the draft table of contents will be finalized in October 2018.</p> <p>NHS will be contacted to collect information on operational models and platforms used at the national/local level for its consideration and potential inclusion in the inventory. Potentially avoid overcharging the HAs with requests for information, and try to aim at the heads of forecasting. Make use of the RAs WGH to identify who should be contacted.</p> <p>E4</p> <p>E5</p> <p>Narendra to provide short comments to the RA II WGH before the meeting. Narendra will consult with Yuri and Paul and Hwirin and Sung Kim before sending the final report to the President.</p>
<p><b>F) FFI: ensure that all major projects under FFI (CIFDP, FFGS, SWFDP) include the requirements and reflect best practices for effective and sustainable flood forecasting, including</b></p>	<p>ACTIVITY F</p> <p>Hold FFI-AG3</p> <p>- Provide advice and guidance on implementation of the CIFDP and its subprojects according to the CIFDP-PSG work</p>	<p>F</p> <p>Y. Simonov</p> <p>(President Chairs FFI-AG)</p> <p>N. Tuteja to contribute to hydrological forecast</p>	<p>- CIFDP sub-projects implemented;-</p> <p>Independent assessment of CIFDP</p> <p>- guidance material on riverine-ocean modelling and</p>	<p>- CIFDP-C review of existing forecasting capabilities – July 2017;</p> <p>- CIFDP-B status review – November 2017;</p> <p>- proposal is developed and</p>	<p>FFI-AG3 was held (Dec, 2017), where WMO flood forecasting activities were shaped. FFGS review is being carried out – Y. Simonov is 1 of 3 independent reviewer. CIFDP initiatives are being conducted according to CIFDP Project Steering Group Workplan (subprojects implementation support,</p>



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<p><b>urban areas, consistent with the FFI-AG Work Plan of 2016-2019.</b></p> <p><b>1) Co-chair the Project Steering Group (PSG) of CIFDP, participate in CIFDP sub-projects, coordinate closely with OPACHE member(s) participating in CIFDP and similarly contribute to the SWFDP and other projects/activities, ensuring improved flood forecasting early warning systems;</b></p>	<p>plan;</p> <ul style="list-style-type: none"> <li>- develop hydrological aspects of new or existing CIFDP proposals</li> <li>- support the independent review/assessment of the CIFDP for the development of a sustainable coastal/riverine forecasting programme;</li> <li>- support FFGS implementation and training including mudflow/debris flow</li> <li>- preparation and provision of hydrological forecasting requirements on how to formulate numerical weather prediction information for use in flood forecasting to the SWFDP Steering Group;</li> <li>- provide advice and guidance to major projects (e.g., CREWS funded) on ensuring use of best practices for effective and sustainable flood forecasting;</li> </ul>	<p>requirements for NWP</p>	<p>forecasting;</p>	<p>seeking funding for the CIFDP-C riverine component – March 2018;</p> <ul style="list-style-type: none"> <li>- Shanghai proposal is received and reviewed – 2018;</li> <li>- CIFDP-C status review – April 2018;</li> <li>- CIFDP-F hydrological forecasting approach is assessed – June 2017;</li> <li>- new governance structure of CIFDP is proposed jointly with JCOMM MC;</li> </ul>	<p>participation in JCOMM management committee meeting).</p> <p>CIFDP (and FFGS) review expected towards end of October. These reviews will be followed by a second level review to assess the overall integration and sustainability of CIFDP, FFGS and SWFDP. Outcomes of the reviews will be presented to Congress 18 by Pres. CHy.</p> <p>Narendra has provided some work done on the use of NWP data for ensemble water forecasting for the short range, medium range and long range time scales. Some of these preliminary ideas have been shared with Hwirin, Yuri and Paul Pilon. These together with ideas from AWG colleagues will be used to develop specifications for NWP requirements, a task that we have committed to undertake. 10-15 pages document under preparation. 1 pager to be prepared for the SWFDP Steering Group.</p>

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<p><b>G) WRM and drought: develop and/or recommend tools for water resources assessment and planning to assist decision-making including under climatic variability and change, such as preparing guidelines for assessing hydrological drought severity and impacts for water resources management, possibly through the use of hydrological drought indicators. This could be achieved through the establishment of a Community of Practice on Droughts;</b></p>	<p>G1 Tools - Enhance Dynamic Water Resources Assessment Tool (DWAT): develop water resources assessment tool and manual; also apply the DWAT to various WMO member countries</p> <p>G2 Prepare guidance material for indicators - Broader in scope than drought (sector indicators dependent on water resources)</p> <p>G3 CoP Drought - Develop CoP Drought -Review of available documentation</p>	<p>G1 · H. Kim (DWAT)</p> <p>G2 · Tom · N. Tuteja</p> <p>G3</p>	<p>G1 DWAT Application and manual</p> <p>G2 Guidelines including methods for assessment of hydrological indicators for IWRM</p> <p>At least one demonstration case study</p>	<p>G1 - Draft manual of DWAT - September 2017 - DWAT workshop - October 2017 - Development of snowmelt function - September 2018 - DWAT webpage – by December 2019</p> <p>G2 - Guidance material prepared – Draft by 2018; final document by AWG - 3</p> <p>G3 -E0 completed and used as possible example - Possible G2-G3 meeting in 2018</p>	<p>G1 1) DWAT English manual and software tool are being reviewed by 3 CHy experts (Yuri, Marcelo, Tom). 2) 1st Global Workshop on DWAT will be held in 28-30 Nov 2018, Bhutan. An ongoing process of improvement will be initiated following this first workshop 3) Additional functionalities (modules) were developed including modeling of snow dynamic processes, and hydrological processes in paddy fields environment and inclusion of parameter optimization techniques.</p> <p>Once finalized, DWAT will be made available through the WMO website.</p> <p>G2 Tom was expected to support others on water resources management indicators, flood, etc upon request. He did not get any request.</p> <p>Clarify with Tom while at the DWAT workshop</p>