



REGIONAL ASSOCIATION II (ASIA) WORKING GROUP ON HYDROLOGICAL SERVICES

Final Report of the Second Session

**Gyeongju, Republic of Korea
14 to 16 April 2015**



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1. OPENING OF THE MEETING

1.1 At the kind invitation of the Han River Flood Control Office (HRFCO), Ministry of Land, Infrastructure and Transport (MOLIT), Republic of Korea, the second session of the Working Group on Hydrological Services (WGHS) of the WMO Regional Association II (Asia) was held in Gyeongju, Republic of Korea, from 14 to 16 April 2015.

1.2 The session was opened at 09:00 a.m. on Tuesday 14 April 2014 at the Mars Hall, Main Building of the Daemyung Resort in Gyeongju and Room 201 Gyeongju Hyundai Hotel in Gyeongju, Republic of Korea.

1.3 In his welcome remarks, Mr Sung Kim, Senior Research Fellow, Korea Institute of Civil Engineering and Building Technology (KICT), highlighted the importance of this second session the WGHS, as it permitted reporting on progress and fine-tuning work plans. He also noted that work activities needed to be completed by 2016 prior to the next meeting of RA II. He recalled that there was a requirement to provide a final report for the WGHS associated with the RA II meeting, and he wished to discuss later in the meeting the possibility of holding a third session of the WGHS to assist in its preparation. He also noted that this session of the WGHS also was strongly linked with the on-going meetings of the 7th World Water Forum (WWF7), with the WGHS contributing to the Regional Session entitled “Hydrological Services in Asia under Rapidly Changing Conditions”. He also noted that this also provided an opportunity for the WGHS to attend some of the forum’s sessions.

1.4 The representative of WMO, Mr Paul Pilon, thanked Mr Kim for hosting the meeting of the Working Group, and welcomed everyone to the second session on behalf of the Secretary-General WMO, Mr Michel Jarraud. He reiterated the importance of the work of the Regional Association and, in particular, the work of the WGHS. He concurred with Mr Kim that this meeting afforded an excellent opportunity to check on progress and to adjust the work plans, as well as to provide participants of the WWF7 with insights on the activities of the WGHS and the importance and relevance of these efforts for others in the region as well as throughout the world.

1.5 Mr Zhiyu Liu, Vice-president CHy, also thanked HRFCO, MOLIT, Republic of Korea, for its generosity in hosting the meeting. He welcomed the participants to the meeting and indicated that he was attending as an observer, with the goal of forging stronger links between CHy and the RA II WGHS. Mr Liu indicated that throughout the meeting he would introduce activities of CHy, and he would also bring to attention activities that might be missing. He indicated that he looked forward to learning of the progress of the WGHS and what could be achieved over the next eighteen or so months.

2. ADOPTION OF THE AGENDA AND ORGANIZATION OF WORK

2.1 The session was attended by 13 participants from three countries of the RA II. Mr Zhiyu Liu attended the meeting in his capacity as Vice-president of the WMO Commission for Hydrology (CHy).

2.2 The list of participants is given in Annex 1 to this report. Mr P. Pilon acted as Secretary for the meeting and Mr Sung Kim chaired the sessions of the WGHS.

2.3 The WGHS discussed the agenda and adopted it (Annex 2). Mr Kim briefly mentioned that he had reported to the RA II Management Group on the activities of the WGHS, including its intended participation in WWF7. Participants also agreed on the working hours, noting that should time permit, participants would attend sessions of the WWF7. It was also noted that all presentations made and material provided during the meeting can be downloaded from the following URL¹:

<http://www.wmo.int/pages/prog/hwrrp/RA2/RAII-WGH-Gyeongju.php>

The site also includes all presentations made by WGHS at the WWF7 Regional Session entitled “Hydrological Services in Asia under Rapidly Changing Conditions”, as well as the session outcomes presented to the Asia-Pacific Regional Synthesis and Commitment Session WWF7.

2.4 After an initial discussion, participants agreed that the main deliverables of this meeting were:

- i. Adjusted individual work plans including statements on progress made to date;
- ii. Discussion and agreement on individual presentations to be delivered during the Regional Session; and
- iii. Discussion and agreement on main outcome messages to be delivered to the Asia-Pacific Regional Synthesis and Commitment Session.

3. REVIEW AND ADJUSTMENT OF WORK PROGRAMME

3.1 The work plans of all members present were reviewed and adjusted as required during the meeting. The revised work plans appear herein. The work plans of those members who were absent, namely Messrs Muhammad Riaz and Tran Thuc, and Ms Irina Dergacheva, were revised by Mr Sung Kim through correspondence with said members following the conclusion of the meeting. All revisions to their work plans are also contained herein.

¹ Note : The WMO Secretariat is currently redesigning its web presence, and the URL listed may not work when the redesign takes effect. Should the URL not work, the cited material for the Regional Association II WGHS can be located by referring to the activities of the Regional Working Groups on Hydrology under the Hydrology and Water Resources Programme.

WORKPLAN: Chairperson of WGHS

Sung KIM

Actions	Activities	Outputs	Resources	Milestones	Linkages	Progress
<ul style="list-style-type: none"> • Represent WGHS as and when required, (e.g. at MG and EC) • Attend meetings of chairpersons of Working Groups • Other duties as required of chairpersons WGHS (see General Regulation 168 (b)) 	<p>1. In his capacity as Hydrological Adviser, to assist the president of RA II in accordance with the duties stipulated in Regulation 168 (b) of the WMO General Regulations</p>	<ul style="list-style-type: none"> • Hydrology and Water Resources issues remain a key aspect of the work of RAI • NMHSs are assisted in fulfilling their roles and responsibilities • WGHS is adequately represented within the RAI environment 	<ul style="list-style-type: none"> • Resources are provided to meet the needs of the theme leaders in doing the work of the Working Group • Secretariat support 	<ul style="list-style-type: none"> • Meetings and other activities according to the WMO Schedule of Meetings • Report at WGHS meetings • Report at MG Sessions • Report to RAI-16 (2016) 	<ul style="list-style-type: none"> • WGHS • RAI • MG • EC 	<ul style="list-style-type: none"> • On-going
<ul style="list-style-type: none"> • Chair theme leaders meetings of the WGHS to develop implementation plan • Report to MG meeting for consultation • Submit report 	<p>2. To develop a Working Group implementation plan in consultation with the president and the Management Group of the Association, with reference to the key performance indicators/ targets and action plans under the respective expected results of the RA II Strategic Operating Plan, to undertake work on the various theme areas under the charge of the Working Group</p>	<ul style="list-style-type: none"> • WGHS implementation plan 	<ul style="list-style-type: none"> • Resources are provided to meet the needs of the theme leaders in doing the work of the WGHS 	<ul style="list-style-type: none"> • WGHS meeting (Sept. 2014) • WGHS implementation plan (Oct 2014) • Report at MG Sessions for consultation and submit a report to RA II president (2014) 	<ul style="list-style-type: none"> • WGHS • RA II • MG 	<ul style="list-style-type: none"> • Attended RA II Management Group meeting in Doho - Dec 2014
<ul style="list-style-type: none"> • Attend EC meeting if required • Develop WGHS work plan in consideration of CHY and other regional WGHS activities • Organize WGHS meeting 	<p>3. To participate in Executive Council sessions, when invited, representing the regional interests in relation to hydrology and water resources and to coordinate the WGHS activities with the Commission for Hydrology and other regional Working Groups on Hydrology</p>	<ul style="list-style-type: none"> • Meeting report • WGHS implementation plan 	<ul style="list-style-type: none"> • Resources are provided to meet the needs of the theme leaders in doing the work of the WGHS 	<ul style="list-style-type: none"> • WGHS meeting (Sept 2014) • WGHS implementation plan (Oct 2014) • Report at MG Sessions for consultation and submit a report to RA II president (2014) 	<ul style="list-style-type: none"> • WGHS • RAI • MG 	<ul style="list-style-type: none"> • Oct 14 Meeting Report of WGHS and implementation plan • Reported to RA II MG Dec 2014 and submitted report
<ul style="list-style-type: none"> • Develop WGHS activity report with input from theme leaders 	<p>4. To submit to the President of the Association every year an Annual Report by 31 Dec and a final report in time for</p>	<ul style="list-style-type: none"> • WGHS activity report 	<ul style="list-style-type: none"> • Resources are provided to meet the needs of the WGHS theme 	<ul style="list-style-type: none"> • Submit annual report to RA II President and WMO Secretariat (Dec 2014 and 2015) 	<ul style="list-style-type: none"> • WGHS • RAI • WMO 	<ul style="list-style-type: none"> • Dec 2014 report submitted

Actions	Activities	Outputs	Resources	Milestones	Linkages	Progress
	<p>presentation to the 16th Session of the Association, both copied to the WMO Secretariat, with inputs from theme leaders under the Working Group</p>		<p>leaders</p>	<ul style="list-style-type: none"> • Submit final report to RAIL president and WMO Secretariat (2016) 		

WORKPLAN: Vice Chairperson of WGHS (RA II)

Muhammad RIAZ

Activities	Actions	Outputs	Resources	Milestones	Linkages	Progress
1. To assist the chairperson WGHS in accomplishing his work related to the group activities	<ul style="list-style-type: none"> As delegated by the chairperson 	<ul style="list-style-type: none"> Not specified 	<ul style="list-style-type: none"> As appropriate 	<ul style="list-style-type: none"> As appropriate 	<ul style="list-style-type: none"> Chairperson 	<ul style="list-style-type: none"> On-going
2. To review the reports sent by various Theme leaders through the Chairperson	<ul style="list-style-type: none"> Summary of review 	<ul style="list-style-type: none"> Report 	<ul style="list-style-type: none"> Chairperson Theme Leaders RA II Secretariat CHy 	<ul style="list-style-type: none"> Not specified 	<ul style="list-style-type: none"> Chairperson Theme Leaders RA II Secretariat CHy 	<ul style="list-style-type: none"> On-going
3. To review and develop the Hydrological Parts of S.O.P.	<ul style="list-style-type: none"> Review if required 	<ul style="list-style-type: none"> Review report 	<ul style="list-style-type: none"> RA II Strategic Operation Plan RA II MG 	<ul style="list-style-type: none"> Not specified 	<ul style="list-style-type: none"> Chairperson 	
4. To put up suggestions and collaboration in strengthening of Flood Forecasting & Warning System amongst Member States	<ul style="list-style-type: none"> Review related reports 	<ul style="list-style-type: none"> Suggestions 	<ul style="list-style-type: none"> Theme Leaders reports in RA II CHy report 	<ul style="list-style-type: none"> Submission of report by 2016 	<ul style="list-style-type: none"> RA II WGHS CHy 	
5. To assist the Chairperson on matters related in combating marine pollution	<ul style="list-style-type: none"> Review S.O.P. and some suggestions 	<ul style="list-style-type: none"> Suggestions 	<ul style="list-style-type: none"> S.O.P 	<ul style="list-style-type: none"> Suggestions by the end of 2014 	<ul style="list-style-type: none"> S.O.P WGHS 	

Activities	Actions	Outputs	Resources	Milestones	Linkages	Progress
1. Assessment of basin-wide water resources availability, including use of climate predictions (3.3.2)	<ul style="list-style-type: none"> Prepare assessment and outlook of basin-wide availability water surplus and deficits on a national level in a regional context including the use of climate scenarios. (Priority C) 		<ul style="list-style-type: none"> RA II 		<ul style="list-style-type: none"> RA II CHy 	
2. Assessment of basin-wide water resources availability, including use of climate predictions (3.3.2)	<ul style="list-style-type: none"> Set up knowledge base to adapt to changes in water resources availability (trends, outlook) (Priority A) 	<ul style="list-style-type: none"> Report related to the case studies 	<ul style="list-style-type: none"> RA II HRFCO MOLIT(ROK) KICT(ROK) 	<ul style="list-style-type: none"> Develop new system by Dec 2015 Collection case studies by July 2016 Evaluate model performance by Sept 2016 Final report on new model in Nov 2016 	<ul style="list-style-type: none"> RA II AWG 	<ul style="list-style-type: none"> Case studies being collected Use some of the modules from KICT CAT (Catchment Hydrologic Cycle Assessment Tool)
3. Implementation of Water Resources Assessment (WRA) (3.3.3)	<ul style="list-style-type: none"> Provide guidance materials for WRA linking to Climate extended range prediction <ul style="list-style-type: none"> Downscaling monthly and seasonally prediction WRA models WRA (Priority B) 	<ul style="list-style-type: none"> Guidance for WRA 	<ul style="list-style-type: none"> China HRFCO MOLIT(ROK) KICT(ROK) 	<ul style="list-style-type: none"> Provide draft technical report in Nov 2016 	<ul style="list-style-type: none"> RAII CHy 	
4. Development of national and regional capacity building programmes and related training activities for hydrological services (3.3.4)	<ul style="list-style-type: none"> Provide training material for a training course related to the advances in WRA: <ul style="list-style-type: none"> Downscaling methods for extended range prediction Data collection WRA methods WRA Information system (Priority B or C) 	<ul style="list-style-type: none"> Training Course 	<ul style="list-style-type: none"> WMO Regional Training Center in Nanjing 	<ul style="list-style-type: none"> Training Course in Jun 2016 		

Activities	Actions	Outputs	Resources	Milestones	Linkages	Progress
<p>1. Improvement in hydrological warnings capability through enhanced and effective cooperation with other NMHSs (2.1.1)</p>	<ul style="list-style-type: none"> • To prepare recommendations on the use of numerical weather prediction outputs in flood forecasts (Priority A) • Document approaches to ascertain the deterministic error of each ensemble element of a NWP output, for example over the previous thirty day period, using this deterministic signal to provide a weighting on the confidence of the forecasted ensemble elements (Priority A) • Use WMO FFI as platform [for a and b above] (Priority A) • Organize training course for Members (Priority C) 	<ul style="list-style-type: none"> • Recommendations on the use of NWP outputs in flood forecasting systems • Document on the approaches to establishing the deterministic error in NWP outputs and for their use in establishing enhanced accuracy of hydrological forecasts 	<ul style="list-style-type: none"> • HMC of Russian Federation 	<ul style="list-style-type: none"> • Gathering of background material and documents on the FFI and associated activities - January 2015 • Preparation of Draft Recommendations – Oct 2015 • Gathering of materials - September 2015 • Develop system for 3 rivers • Operational testing of system June-Sept 2015 • Preparation of Draft Report on procedures – February 2016 	<ul style="list-style-type: none"> • OPACHE's • International Flood Initiative – WMO 	<ul style="list-style-type: none"> • Background material and documents on the FFI and associated activities were gathered. Preparation of 1st draft of Recommendations on the use of numerical weather prediction outputs in flood forecasting is in progress. The 1st part of the Draft Recommendations for the long-term hydrological forecasting has been prepared. • Gathering of materials on the approaches to establishing the deterministic error in NWP outputs with the purpose for their use in establishing enhanced accuracy of hydrological

Activities	Actions	Outputs	Resources	Milestones	Linkages	Progress
2. Issuance of flood, flash and urban warnings and constantly improving upon them (2.2.5)	<ul style="list-style-type: none"> • To document experiences in the use of the Flash Flood Guidance System (FFGS) in various countries by reviewing use of the Flash Flood Guidance System (FFGS) in the various countries (Priority A) • To investigate the potential use of FFGS in Central Asian countries and facilitate its understanding by operational hydrologists in the region (Priority A) • To develop recommendations on use of hydrological forecasts (including probabilistic forecasts) in flood management (Priority A) • Develop user-oriented flood forecasting products (Priority C) • Conduct missions to Members in developing countries or least developed countries (Priority C) 	<ul style="list-style-type: none"> • Report documenting experiences, including recommendations on approaching implementation of FFGS and its use • Recommended path forward for advancing the adoption of the FFGS in Central Asia. • Conduct kick-off meeting of senior meteorologists and hydrologists within Central Asia on the FFGS project • Report containing recommendations on use of hydrological forecasts (including probabilistic forecasts) in flood management, based on experiences of Roshydromet 	<ul style="list-style-type: none"> • Working meeting with hydrologists and meteorologists of the Central Asia countries on use the FFGS in operative hydrological practice • Funding for kick-off meeting for Central Asia FFGS 	<ul style="list-style-type: none"> • Background material and documents on the FFGS and associated activities - May 2015 • Preparation of Draft Document – July 2015 • Discussions with potential collaborating NMHSs in Central Asia - May 2015 • Preparation of Draft Recommendations – July 2015 • Conduct kick-off meeting - May 2015 • Report prepared by March 2016 		forecasts is in progress.
3. Improvement in capacity for water-related disaster management (hydrological extremes) [with theme on hydrological droughts]	<ul style="list-style-type: none"> • Organize a workshop [or two workshops] on the provision of input and support to disaster management [on community-based flood and drought 	<ul style="list-style-type: none"> • Increased capacity for water-related disaster management 	<ul style="list-style-type: none"> • Resources to conduct necessary workshops through 	<ul style="list-style-type: none"> • Training session on Integrated Flood Management dealing with development of 	<ul style="list-style-type: none"> • APFM • IDMP • NMHSs • WMO 	<ul style="list-style-type: none"> • The development of the plan to organize bilateral

Activities	Actions	Outputs	Resources	Milestones	Linkages	Progress
(2.1.3)	management including participation of NMHSs, emergency services and disaster management groups] (Priority B)		collaboration with APFM and IDMP	community capacity - Sept 2016 <ul style="list-style-type: none"> • Training session on Integrated Drought Management dealing with development of community capacity – November 2016 		Russia-China training sessions is in progress (to take place in Moscow in April 2016)

Activities	Actions	Outputs	Resources	Milestones	Linkages	Progress
1. Monitoring and Warning Systems for Droughts (2.3.1.)	(a) Develop indicators for the determination of the onset of hydrological droughts: <ul style="list-style-type: none"> - Collection, analysis and systematization of data to identify indicators for the determination of the onset of hydrological droughts - Identify the types of Hydrological drought is characteristic of the Asian region - Study of the conditions of formation of hydrological drought (Priority A) 	<ul style="list-style-type: none"> • Report on the Indicators for the determination of the onset of hydrological droughts 	<ul style="list-style-type: none"> • WGHS RA II • OPACHE • Uzbekistan experts • Materials for IDMP • Materials for HMNDP 	<ul style="list-style-type: none"> • Preparing of the data and information to develop indicators for the determination of the onset of hydrological droughts - Oct 2015 • Draft Report – Dec 2015 	<ul style="list-style-type: none"> • OPACHE's • WGHS • RAI • WMO 	<ul style="list-style-type: none"> • Data were collected and systematized in order to identify indicators for the determination of the onset of hydrological droughts. Types of typical hydrological drought for the Central Asian region were determined. • Collection of materials to determine the conditions for the formation of hydrological drought and development of indicators to determine the beginning of the hydrological drought.
	(b) Prepare guidance for the development of drought monitoring networks : <ul style="list-style-type: none"> - Gathering information about the status of drought monitoring networks in Asian region - Identification of gaps and needs of the national hydrometeorological services to improve the drought monitoring networks (Priority B) 	<ul style="list-style-type: none"> • Guidance materials for the development of drought monitoring networks 	<ul style="list-style-type: none"> • WGHS RAI • OPACHE • Uzbekistan experts • Materials for IDMP • Materials for HMNDP 	<ul style="list-style-type: none"> • Information for the development of drought monitoring networks – April 2016 • Draft Report - May 2016 	<ul style="list-style-type: none"> • OPACHE's • WGHS • RAI • WMO 	
2. Enhanced preparedness	(a) Document national guidance	<ul style="list-style-type: none"> • Guidance materials 	<ul style="list-style-type: none"> • WGHS RAI 	<ul style="list-style-type: none"> • Draft Report - July 	<ul style="list-style-type: none"> • OPACHE's 	

Activities	Actions	Outputs	Resources	Milestones	Linkages	Progress
to predict and manage hydrological droughts and knowledge for decision making (3.4.1.)	materials to manage droughts: - survey on current status - analysis - identify good practice (Priority C)	to manage droughts	<ul style="list-style-type: none"> • OPACHE • Uzbekistan experts • Materials for IDMP • Materials for HMNDP 	2016 <ul style="list-style-type: none"> • Report - Sept 2016 	<ul style="list-style-type: none"> • WGHS • RAI • WMO 	

WORKPLAN: Assessment of Changes in Climate Extremes, their Impacts on Water Resources, and Translating Climate Information into action in Water Resources Management

WANG Guoqing and TRAN Thuc

Activities	Actions	Outputs	Resources	Milestones	Linkages	Progress
<p>1. Improvement in adaptation capacity of water resources systems in a changing climate (2.1.2)</p> <p>2. Assessment of basin-wide water resources availability, including use of climate predictions (3.3.2)</p> <p>3. Improvement in capacity for water-related disaster management (Hydrological extremes) (2.1.3)</p>	<ul style="list-style-type: none"> • Assessment of changes in climate - Data and method of climate study: Data inventory, climate variables, methods – (Priority A) - Trend of some climate variables: temperature, rainfall and other extremes – (Priority A) - Changes in atmospheric circulation affecting climate extreme: e.g., Monsoon, typhoon and tropical depression, El Nino and Southern Oscillation – (Priority C) - Change in climate affecting natural physical environment: e.g., drought, extreme rainfall, flood, sea water level – (Priority C) 	<ul style="list-style-type: none"> • Assessment report on climate change for participating countries 	<ul style="list-style-type: none"> • WGHs • WMO Secretariat • NHRI, China • CMA, China • IMHEN, Viet Nam • Other countries 	<ul style="list-style-type: none"> • Report to be submitted (May 2015) • Reports to: AWG-II • Documents as required • Workshop if needed 	<ul style="list-style-type: none"> • WGHs • RA2 • WMO Secretariat • CHY 	<ul style="list-style-type: none"> • In progress
	<ul style="list-style-type: none"> • Conduct climate projections – (Priority A) - Statistical downscaling - Dynamic downscaling 	<ul style="list-style-type: none"> • Climate change scenarios for participating countries 		<ul style="list-style-type: none"> • Report to be submitted (May 2015) 		
	<ul style="list-style-type: none"> • Assessment of potential hydrological impacts of climate change on water resources of some selected river basins – (Priority A) - Temperature - Rainfall - Evapotranspiration - Flood and inundation - Drought - Water Resources 	<ul style="list-style-type: none"> • Report on the impacts of climate extremes and climate change to water resources 		<ul style="list-style-type: none"> • Report to be submitted (Dec 2015) 		
	<ul style="list-style-type: none"> • Translating climate and climate change information into actions in water resources development and 	<ul style="list-style-type: none"> • Report of case study 		<ul style="list-style-type: none"> • Report to be submitted (Feb 2016) 		

Activities	Actions	Outputs	Resources	Milestones	Linkages	Progress
	management – (Priority A) <ul style="list-style-type: none"> • Case study for one river basin in Vietnam 					
4. Development of national and regional capacity building programs and related training activities for hydrological service (3.3.4)	<ul style="list-style-type: none"> • Synthesize report from individual reports from participating countries in the RA II – (Priority A) 			<ul style="list-style-type: none"> • Report to be submitted (May 2016) 		
	<ul style="list-style-type: none"> • Lessons learnt and experience sharing – (Priority B) 					

Activities	Actions	Outputs	Resources	Milestones	Linkages	Progress
1. Reliability of quality control procedure applied on data collected from hydrological stations (2.2.1)	<ul style="list-style-type: none"> - Assess the performance of hydrometric instruments and techniques of observations (Priority C) - Prepare documentation for the inter-comparison of instruments and methods of observation (Priority C) 					
2. Hydrometric measurements with quality and accuracy (2.2.2)	<ul style="list-style-type: none"> - Provide guidance on the use of appropriate instruments and methods of observation in diverse conditions (Priority A) - Collection of existing technical information in IRDMIS <ul style="list-style-type: none"> ➤ Measurement instrumentation (ADVM) ➤ Methods of discharge calculation ➤ Construction and operation of IRDIMS - Case study on measurement by IRDMIS (52 sites) <ul style="list-style-type: none"> ➤ Measurement of tidal influenced discharge ➤ Measurement under backwater conditions caused by weirs, sluice gates, and river junctions ➤ Evaluation of measurement results ➤ Development of index velocity ratings - Writing Technical report about construction and management by field characteristics 	<ul style="list-style-type: none"> • Provide Technical report and guideline to design, install and operate facilities for Integrated Real-time Discharge measurement system(IRDIMS) • Software System and manual for data QC and evaluation of IRDIMS • Technical report 	<ul style="list-style-type: none"> • Republic of Korea(ROK) 	<ul style="list-style-type: none"> • Provide Technical report and guideline with case studies - Nov 2016 • Collection of the existing technical information of IRDIMS - Dec 2015 • Collection of construction, measurement cases and management of IRDIMS (52 sites more) - Dec 2015 • Writing technical report about construction and management by field characteristics - Nov 2016 	<ul style="list-style-type: none"> • CHy • ROK 	<ul style="list-style-type: none"> • In progress

Activities	Actions	Outputs	Resources	Milestones	Linkages	Progress
	<ul style="list-style-type: none"> - Improve sediment measuring techniques (Priority B) - Collection of existing technical information <ul style="list-style-type: none"> ➤ The status of existing sediment measurement techniques ➤ The status of new technologies and their applications ➤ The status of analysis methods - Case studies on sediment measurements under various conditions (15 - 20 sites) <ul style="list-style-type: none"> ➤ Analysis of river construction effect on characteristics of sediment load, focused on 4 major river projects in Korea ➤ A comparative analysis on sediment load by sequence of rainfall event - Writing Technical report about sediment measurement method and analysis of field characteristics 	<ul style="list-style-type: none"> - Technical report on sediment measurement methods 	<ul style="list-style-type: none"> - Republic of Korea (ROK) 	<ul style="list-style-type: none"> - Provide technical report and guideline with case studies - Nov 2016 	<ul style="list-style-type: none"> - CHy - ROK 	
	<ul style="list-style-type: none"> - Assess the accuracy and use of space-based observation (Priority C) 					
<p>3. Calculation of run-off with quality and accuracy (2.2.3)</p>	<ul style="list-style-type: none"> • Focus on the development of rating curve - Collection of existing technical information (Priority B) <ul style="list-style-type: none"> ➤ On major procedures for rating curve development ➤ On tools for rating curve development - Case analysis with various field conditions <ul style="list-style-type: none"> ➤ On development of rating curves when backwater conditions exist (weir, junctions) - Writing technical report on rating curve development 	<ul style="list-style-type: none"> • Report on methods to develop rating curves 	<ul style="list-style-type: none"> • Republic of Korea (ROK) 	<ul style="list-style-type: none"> • Provide Technical report and guideline with case studies - Nov 2016 	<ul style="list-style-type: none"> • CHy • ROK 	
	<ul style="list-style-type: none"> • Detect trends and variability in selected river basin in the region (Priority C) 					
	<ul style="list-style-type: none"> • Provide guidelines for calculating runoff data accuracy (Priority C) 					

Activities	Actions	Outputs	Resources	Milestones	Linkages	Progress
4. Establishment of Quality Management Frameworks for Hydrology using current guidance materials for hydrology and water resource management (3.3.3)	<ul style="list-style-type: none"> Encourage and facilitate exchange and training on relevant know-how (Priority C) 					
5. Development of national and regional capacity building programmes and related training activities for hydrological services (3.3.4)	<ul style="list-style-type: none"> Encourage and facilitate exchange and training on relevant know-how (Priority C) 					

WORKPLAN: Sediment Disasters and Mass Movements

Tai-Hoon KIM

Activities	Actions	Outputs	Resources	Milestones	Linkages	Progress
<p>1. Issuance of landslide/debris flow warnings and consistently improving upon them</p>	<ul style="list-style-type: none"> • Collect and disseminate materials for assessment of sediment disasters (Priority A) • Investigate warning technologies based on adaptive concepts (Priority B) • Generate sediment disasters risk map (Priority C) 	<ul style="list-style-type: none"> • Guidance materials for implementation of adaptive sediment disasters risk management tools with identification, reduction and evacuation 	<ul style="list-style-type: none"> • Republic of Korea (ROK) • National Disaster Management Institute (NDMI) 	<ul style="list-style-type: none"> • Case study report for present systems for sediment disasters management - May 2015 • Analyzing models for the integrating system - Oct 2015 • Report for adaptive sediment risk management tools - Aug 2016 	<ul style="list-style-type: none"> • SOP 2.2.6 • RA II • WMO Secretariat • ROK (MPSS) 	<ul style="list-style-type: none"> • In progress
<p>2. Improvement in capacity for sediment disaster management (2.1.3 in OP)</p>	<ul style="list-style-type: none"> • Attend seminars on sediment disasters in order to communicate and cooperate among member countries (Priority A) • Share and bring related technologies to developing countries (Priority B) 	<ul style="list-style-type: none"> • Workshop on the provision of sharing knowledge for sediment disasters (e.g. attend workshop of TC DRR) • ODA projects which transplant knowhow to developing countries 	<ul style="list-style-type: none"> • Republic of Korea (ROK) • National Disaster Management Institute (NDMI) • WMO/ESCAP Typhoon Committee, Disaster Risk Reduction (TC DRR) 	<ul style="list-style-type: none"> • Report for feasibility survey for ODA projects by April 2016 • Attend Workshop of TC DRR on May 2015 • Strategy plan for distributing adaptive sediment risk management tools - Oct 2016 • Submission draft to MG for review (TBA) 	<ul style="list-style-type: none"> • SOP 2.1.3 • RA II • WMO Secretariat • TC DRR • ROK (MPSS and KOICA) 	<ul style="list-style-type: none"> • In progress

Activities	Actions	Outputs	Resources	Milestones	Linkages	Progress
3. Optimization of disseminating sediment disasters related information	<ul style="list-style-type: none"> Collect and analyse disseminating methodologies and related policies for sediment disasters information that alarm people not to be involved to the designated areas 	<ul style="list-style-type: none"> Standard Operation Plans for sediment disasters information by public broadcasting system and other media (e.g., Facebook, Twitter, etc.) 	<ul style="list-style-type: none"> Republic of Korea (ROK) National Disaster Management Institute (NDMI) 	<ul style="list-style-type: none"> Summary report for present disseminating codes and regulations by June 2015 Report about the effective disseminating framework by Dec. 2015 	<ul style="list-style-type: none"> Above SOP RA II WMO Secretariat TC DRR ROK (MPSS) 	<ul style="list-style-type: none"> In progress

4. PRESENTATIONS FOR WWF7 REGIONAL SESSION AND MAIN MESSAGES

4.1 The group was provided with some suggested revisions and approaches to be taken in finalizing their presentations for the WWF7 Regional Session on “Hydrological Services in Asia under Rapidly Changing Conditions”. Discussions were also held on establishing the key messages (outcome statements) to be conveyed to the audience by way of each presentation and for the Expert Panel Discussion. The individual final presentations made at the Regional Session can be downloaded from the url provided in paragraph 2.3.

4.2 Outcome statements from the Regional Session were prepared and presented to the Asia-Pacific Regional Synthesis and Commitment Session at the WWF7 by Mr Sung Kim. The presentation summarizing outcome statements can also be downloaded from the url provided in paragraph 2.3.

5. NEXT MEETING

5.1 Participants were informed that HRFDO, MOLIT, Republic of Korea, might have funding to support a 3rd meeting of the RA II WGHS. Mr Sung Kim noted that it would be best to hold such a meeting possibly the week of 10 or 23 October 2016. It was expressed that the meeting could be held in Thailand at ESCAP. This would allow for the group to present their achievements and to brainstorm on priorities for the WGHS for the next four year period. Having the meeting at that time would also assist Mr Kim in preparing his report for the RA II Session to be held probably near the end of 2016.

6. ADOPTION OF THE REPORT AND CLOSURE OF THE MEETING

6.1 Participants agreed that the final draft report would be circulated to participants allowing a period for Mr Sung Kim to update the work plan with members who were not in attendance. Once their views have been incorporated, the draft report will be circulated to participants with a two week period for provision of revisions. It was agreed that the final endorsement of the report should be sought from the Chair of the Working Group before finalizing it and broadly disseminating it.

6.2 The Chairperson, Mr Sung Kim, thanked the participants and the WMO Secretariat for their contributions and professionalism that made the meeting a success. Mr Kim also thanked the representative of CHy for providing a close link between the work of the Commission and the RA II WGH. He noted with appreciation the links established between the WMO RA II WGHS and the Commission for Hydrology that was made possible through the contributions provided by Mr Zhiyu Liu, Vice-president of CHy. He also thanked Mr Paul Pilon for the effective conduct of the meeting.

6.3 Mr Liu thanked HRFDO, MOLIT, Republic of Korea, for providing funding assistance and for hosting the meeting. He congratulated the participants on the results of the meeting and reiterated the need for continuing an enhanced cooperation between CHy and the RA II WGHS.

6.4 Mr Pilon expressed his gratitude to the HRFDO, MOLIT, Republic of Korea, for providing financial assistance, as without this funding the second session of the RA II WGHS would not have been held. He also thanked Mr Sung Kim, Mr Cheolhee Jang and

all staff in supporting the effective organization of the meeting and for their hard work in organizing the WWF7 Regional Session on Hydrological Services in Asia under Rapidly Changing Conditions. In closing, he underscored the importance of fulfilling the work plans, not only for the benefit of National Hydrological Services in RA II, but for all Regions.

6.5 The meeting closed on 14 April 2015, with participation at the Regional Session and the Asia-Pacific Regional Synthesis and Commitment Session on 16 April 2015. Individuals were available to participate on 16th April at the WWF7.

ANNEX 1: LIST OF EXPERTS

Meeting of RA II (Asia) Working Group on Hydrological Services (WGHS)
(Seoul, Republic of Korea, 30 September - 2 October 2014)

Working Group on Hydrological Services (WGHS)

Chairperson	Dr Sung KIM Senior Research Fellow Korea Institute of Civil Engineering and Building Technology (KICT) 283 Goyangdae-ro, Iisalseo-gu, Goyang-si, Gyeonggi-do 411-712 Republic of Korea Telephone: +82 31 910 0602 Telefax: +82 31 910 0251 E-Mail: sKim@kict.re.kr
(HOST)	
Vice-Chairperson WGHS (absent)	Mr Muhammad RIAZ Pakistan Meteorological Department Flood Forecasting Division 46 Jail Road LAHORE Pakistan Phone: +92 42 99 200 208 fax: +92 42 99 200 209 E-Mail: riaz1962@hotmail.com
Theme Leader in Water Resources Assessment	Ms Ge GAO National Climate Center China Meteorological Administration No. 46 Zhuang-guan-cun Nan-da-jie Haidian District Beijing 100081 China Telephone: +8610 68406915 Telefax: +8610 68406975 E-Mail: gaoge@cma.gov.cn
Theme Leader in Water Resources Assessment	Dr Hwirin KIM Han River Flood Control Office Ministry of Land, Infrastructure and Transport 328, Dongjakdaero, Seocho-gu Korea 137-049 Telephone: +82 2 590 9973 Fax: +82 2 590 9989 Email: hydro@korea.kr
Theme Leader in Hydrological	Dr Guoqing WANG

Responses to Climate Variability and Change and Promotion of the Use of Climate Information by Water Managers

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Theme Leader in Flood Forecasting

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Theme Leader in Hydrological Aspects of Drought (absent)

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Theme Leader in Hydrological Responses to Climate Variability and Change and Promotion of the Use of Climate Information by Water Managers (absent)

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Theme Leader in Sediment Disasters and Mass Movements

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Theme Leader in Improved Accuracy of Hydrometric and Sediment

Dr Youngsin ROH
Hydrological Survey Center

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ANNEX 2: FINAL MEETING AGENDA

World Meteorological Organization
REGIONAL ASSOCIATION II
WORKING GROUP ON
HYDROLOGICAL SERVICES
GYEONGJU, REPUBLIC OF KOREA
14 TO 16 APRIL 2015

RA II - WGHS/Doc. 1

Submitted by: Secretariat
Date: 14.04.2015
Original Language: English
Status: **FINAL**

14th April 2015 (Place: Mars Meeting Room at Daemyung Resort, Gyeongju)

09:00 - 10:00

2nd WGHS Morning Session:

- Introduction and Welcome (TBD)
- Meeting objectives and adoption of the agenda
- Report on activities of the Commission for Hydrology (CHy) as a result of the 2nd AWG Meeting, September 2014
- Report on decisions and recommendations of RA-II, including the RA-II Strategy as a result of the 1st Conference of RA-II, December 2014
- Discussion on follow-up and implementation of action items as a result of the CHy and RA-II sessions
- Discussion on WWF Session for Hydrological Services

10:00 - 12:00

2nd WGHS Morning Session:

Discussion of activities and adjustment of work plans

- Water Resources Assessment
- *Break (15 mins)*
- Flood forecasting

12:00 - 14:00

Lunch

14:00 - 18:00

2nd WGHS Afternoon Session:

Discussion of activities and adjustment of work plans

- Hydrological Aspects of Drought
- Hydrological Responses to Climate Variability and Change and Promotion of the Use of Climate Information by Water Managers for adaptation of climate change in the context of climate variability in hydrological cycle in each country.
- *Break (15 mins)*

- Improved Accuracy of Hydrometric and Sediment Observations including Space-Based Technologies
- Sediment Disasters and Mass Movements
- Wrap up for the day

18:30 - 20:30

Welcome Dinner (hosted by the Director General of the Han River Flood Control Office, Ministry of Land, Infrastructure and Transport)

15th April 2015 (Place: WWF venue Room 201 Gyeongju Hyundai Hotel, Gyeongju)

09:00 - 11:00

Regional Process Session of 7th World Water Forum 2015 (Hydrological Services in Asia under Rapidly Changing Conditions):

09:00 - 09:05

Introduction and Opening (Dr Sung KIM, Korea Institute of Civil Engineering and Building Technology and Chairperson of WMO RA-II Working Group on Hydrological Services)

09:05 – 09:10

Opening Remarks (Mr Ha-joon PARK, Han River Flood Control Office , MOLIT, Republic of Korea)

09:10 - 10:25

Presentations (15 minutes each) (Moderator: Dr Cheolhee CHANG, Republic of Korea)

- WMO Hydrological Services (Dr Paul PILON, WMO)
- Hydrological Practices under Climate Change (Dr Guoqing WANG, China)
- Sediment Disasters (Dr Tai-Hoon Kim, Republic of Korea)
- Flood Forecasting (Dr Sergey BORSHCH, Russian Federation)
- Water Resources Assessment (Dr. Hwrin KIM, Republic of Korea)

10:25 - 10:50

Expert Panel Discussion (Moderator: Dr. Zhiyu LIU, Vice President of WMO Commission for Hydrology)

- Ms. Ge GAO (National Climate Center, China)
- Dr. Yeong-sin ROH (Hydrological Survey Center, Republic of Korea)
- Dr Wolfgang GRABS (International Water Affairs, Germany)

10:50 - 10:55

Questions and Comments by participants

10:55 - 11:00

Concluding Remarks (Dr. Zhiyu LIU, Vice President of WMO Commission for Hydrology)

11:00 - 11:15

Break

11:15 – 12:00	Drafting of Session Outcomes for the Regional Synthesis Session
<i>12:00 – 13:00</i>	<i>Lunch</i>
13:00 - 18:00	<i>Afternoon Session:</i> Individual participation in WWF
Alternative session for Sung KIM and Paul PILON:	
14:40 - 19:00	<i>Asia-Pacific Regional Synthesis and Commitment Session at the 7th World Water Forum:</i>
14:40 - 14:50	Opening remarks (Mr. Yoshiro Mori)
14:50 - 14:55	Remarks (Mr. Jung-moo Lee)
14:55 - 15:10	Regional Water Security Status: Asian Development Bank
15:10 - 16:40	Regional Synthesis: Representatives from 10 session groups
<i>16:40 - 17:00</i>	<i>Break</i>
17:00 - 17:10	Summary of Asia-Pacific regional outcomes of the 7th World Water Forum (Mr. Ravi Narayanan)
17:10 - 18:40	Regional Commitments (High-level Dialogue)
18:40 - 18:55	Audience interactions
18:55 - 19:00	Closing (Mr. Ravi Narayanan)
<u>16th April 2015</u>	(If required or individual participation in WWF)
09:00 - 09:15	Summary of Day 1 and Day 2
09:15 - 10:15	Review of Activities
10:15 - 10:30	Next Steps
<i>10:30 - 10:45</i>	<i>Break</i>
10:45 - 12:00	Drafting of Meeting Report
<i>12:00 – 13:00</i>	<i>Lunch</i>
13:00 - 14:00	Review of Meeting Report
14:00 - 14:30	Adoption of Meeting Report
<i>14:30 - 14:45</i>	<i>Break</i>
14:45 - 15:30	Summary and Closing Remarks
15:30 - 18:00	<i>Afternoon Session:</i> Individual participation in WWF