INTERNATIONAL HYDROLOGICAL PROGRAMME

21st IHP Regional Steering Committee meeting for Southeast Asia and the Pacific

Gyeongju, Republic of Korea, 4 and 5 October, 2013

FINAL REPORT

IHP-VII Regional Steering Committee Meeting No. 21
Regional Steering Committee for Southeast Asia and the Pacific
UNESCO Jakarta Office, 2013

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ANNEXES

The 21st IHP
Regional Steering Committee Meeting for
Southeast Asia and the Pacific

Gyeongju, Rep. of Korea
4 and 5 October 2013

Chairman:	Mr. Trevor Daniell (Australia)
Secretary:	Mr. Yasuto Tachikawa (Japan)
UNESCO Representatives:	Mr. Shahbaz Khan (Jakarta Office)
Countries Represented:	Australia, China, Indonesia, Japan, Korea (Republic of), Lao PDR, Malaysia, Mongolia, Myanmar, Philippines, Thailand, Vietnam. (See Annex 1 for the list of participants)
Observing Countries and Organizations:	APCE, HTC

1 OPENING

The chairman of the organizing committee and local host, Mr. Soontak Lee (Rep. of Korea), opened the meeting at 9:38 am on 4 October 2013 and welcomed the participants. In his welcoming remarks, he highlighted that the IHP Regional Steering Committee for SEAP has played important role since 1993 in promoting science and technology application, developing regional work plan and finding solutions.

The chairman of the RSC, Mr. Trevor Daniell (Australia) gave his opening comments and introductions.

2 ELECTION OF RAPPORTEUR

It was agreed that the task of Rapporteur would be carried out by Mr. Leonardo Liongson (Philippines) and Ms. Yan Huang (China). The Rapporteurs will pass or prepare resolution and develop one paragraph (10-15 lines) for each country report.

3 ADOPTION OF AGENDA

The draft agenda was presented by the Chairman and adopted by the members. See Annex 2 for the adopted Agenda.

4 SECRETARIAT REPORTS

4.1 UNESCO JAKARTA OFFICE REPORT

Mr. Khan presented his report with the following key points:

Activities since last RSC meeting in Malaysia:

- Action taken in refining mapping against IHP-VIII themes with projects and timelines. Forms have been circulated among the 21st IHP RSC participants;
- Mr. Daniell made presentation in response to promote use of appropriate procedures for the conversion of rainfall intensities to flood design hydrographs

in Australia on rainfall-intensities. A few countries conducted studies. Non-stationeries in IFDs are not much in progressing;
- In response to action item on the validation of contents from the report for the Flood forecasting and warning system activity. China and Korea did not carry out the validation; Thailand found some mistakes in the report. It is time to move on, put a line before it is published;
- All country sent links to the secretariat to be included in the RSC new webpages.

Organized training courses, workshops and meetings and supported travel for 23 participants.

Jakarta office activities are funded by extra-budgetary and emergency funds (researches):
- Land disaster;
- SWITCH-in-Asia;
- 9th Steering Committee Meeting on IWRM guidelines at river basin level;
- Participatory Point-of-interest mapping in flood management;
- Review and evaluation on activities supported by the Japanese Fund in Trust (FIT)

Publications:

- Proceedings of last year's International conference and final report of the 20th IHP RSC Meeting;
- Brochure: beyond 2015.

Mr. Khan also mentioned about the new additional projects under Indonesia Funds.
See Annex 3 for detailed presentation.

4.1 UNESCO BEIJING OFFICE REPORT

The report was presented by Mr. Hans Thulstrup as the successor of Mr. Ramasamy Jayakumar in UNESCO Office, Beijing. New activities which previously carried out in Ireland was initiated by UNESCO Beijing, in addition to other activities such as organizing international training workshop in Lanzhou, working with Institute of Chinese Science and Technology, and celebration of the World Water Day. See Annex 4 for detailed presentation.

5. COUNTRY REPORTS

Countries were requested to present their report in maximum 4 minutes and followed by discussion. Record written below focuses on the forthcoming activities. See Annex 5 for complete country reports.

Australia
Conference Activities in 2013-2014:
- MODSIM2013 congress will be held in Adelaide, South Australia, from Sunday 1st to Friday 6th December 2013. The theme for this MODSIM2013 event will be Adapting to Change: the multiple roles of modeling;
- Water Sensitive Urban Design 2013 WSUD 2013 Key dates, 25–29 November 2013 and the 8th International Water Sensitive Urban Design Conference 2013 https://www.engineersaustralia.org.au/events/conferences;
- 35th Hydrology and Water Resources Symposium 2014 (HWRS 2014)

Perth, Western Australia to be held 17-23 February 2014 at the Pan Pacific Hotel. Website: http://www.hwrs2014.com/;

- 2013 Asia Pacific Water Industry Modelling Conference the premier event in Asia Pacific for infrastructure modelling and management. The conference will be held on 4 & 5th September, 2013 at the Sofitel Hotel in Brisbane, Australia. http://www.asiapacificwater.com/overview/;
- WASH 2014 - Water, Sanitation and Hygiene for Everyone, Everywhere 24-28 March 2014, Brisbane, Australia.
  Web: www.wash2014.com.au;
- NOM5 Down Under - 5th IWA Specialist Conference on Natural Organic Matter Research
  1-4 October 2013, Pan Pacific Hotel, Perth, Western Australia
  Website: http://www.awa.asn.au/NOM2013/;
- FENNER CONFERENCE FOR 2013 Shine Dome, the Australian Academy of Science, Canberra 10, 11 October 2013 "Population, Resources And Climate Change – Implications For Australia's Near Future";
- Stormwater 2014 - National Conference on Urban Water Management Hosted by the Stormwater Industry Association 13th - 17th October 2014, Hilton Adelaide, South Australia.

Activities Planned for 2013-2014:

- Transference of the outcomes of update of ARR to the International Community;
- Continuation of assistance to Pacific Island Projects;
- Continuation of involvement in Asian Pacific FRIEND and Global FRIEND 2014 Conference (Trevor Daniell is Chief editor of Proceedings);
- Continuation of involvement in HELP;
- Participation in the IHP Intergovernmental Council of 2014.

Activities envisaged in the long term

- No information available at this time.

Question: How hydrological network work in Australia and how it can benefit the region?

- Lot of work done in various organization on monitoring and modeling work;
- All data are in the same database, all data can be used in all research and routing works (forecasting).

China

Activities such as cooperation, researches, training programmes etc., are very active and self-contained within China, although those activities are all highly related to the IHP national committee, it is developing by itself without taking notice or association with IHP. The 12th 5-year national hydrology plan is found highly in light with the IHP VIII phase strategic plan and themes which gives high attention on water security from quantity and quality point of view. It need to point out that maybe IHP used to play important role in gathering scientists and industrial organizations at a world-wide level (or AP regional level), but from China develop mode such mode doesn't seem to find its position in the current development status or in the forthcoming activities.

Indonesia

Activities foreseen for 2013-2014:

- Asia Pacific Centre for Ecohydrology, Indonesian National Committee for IHP-UNESCO, Indonesian Institute of Sciences, Indonesian National Committee of Indonesia, will continue to conduct ongoing research on Ecohydrology Demosite "Sediment Deposition System on Saguling Reservoir";
- Participation in IHP-RSC meeting Asian Pacific FRIEND;

- Participation in IHP-Training course;
- Conducting International seminar on Ecohydrology, in cooperation with the Ministry of Education and Culture of Indonesia;
- Conducting regional training on ecohydrology, in cooperation with UNESCO Jakarta Office and KNIU;
- Constructing the building of APCE Secretariat in Cibinong Sciences Centre Area.

Activities envisaged in the long term:

- Participation in IHP-RSC activities and IHP Intergovernmental Council meetings.

Japan

Activities planned until December 2013:

- The 23rd IHP Training Course with the theme "Ecohydrology for River Basin Management under Climate Change" will be held in Dec. 2-13, 2013 (see Annex I of Japan Country Report).

Activities foreseen for 2013 – 2014:

- Groundwater-surface water interaction research in arid/semi-arid regions (Mongolia, Tunisia, China) in collaboration with Alliance for Research on North Africa and Japan-China Center on Hydrological Cycle Research, University of Tsukuba;
- The 21st Session of the IHP Regional Steering Committee (RSC) for Southeast Asia and the Pacific will be held in Rep. Korea in 2013;
- FRIEND-Water2014: 7th Global FRIEND-Water Conference, 24-28, February, 2014.

Activities envisaged in the long term:

- Participation in IHP-VIII projects and RSC activities;
- Information dissemination through a web page of the National Committee;
- Activities relating to "Sustainability Science" that is a key promotion by the Japanese Commission for UNESCO.

Proposed PantaRhi (IAHS next decade working targets: understanding, prediction and practice). The co-leader of target 3 "Practice" suggests organize working group for PantaRhi at AP region.

Malaysia

Year 2012

- 3rd IHP Malaysia Technical Talk – 21 Dec 2012 at DID Malaysia

Presentation papers:

i. Sewerage Industry in Malaysia – Issues, Challenges and Way Forward

ii. Distributed Hydrology Modelling using Radar Rainfall data versus Conventional Lumped Model using Rain Gauge data – Case study of Sungai Johor Basin

- Seminar on Flood Disaster Prevention organized by DID-UNITEN with Japan Embassy cooperation – 20 Nov 2012 at DID Malaysia.

Presentation title: Latest Satellite Technology for Natural Disaster Mitigation.

- Malaysia UNESCO Day – 3-4 Nov 2012 at KLCC
- Learning for Change Workshop: Education for Sustainable Development in Malaysia organized by UKM Lestari – 4-6 Dec 2012 at UKM

Year 2013

- 1st National Water Watch Program for Young Leaders Camp for the Southern Region in Malacca – 21-23 May
- River Expedition Programme for the Secondary Schools – River for All.

Organized by Universiti Sains Malaysia and UNESCO-IHP Malaysia – 19-20 May

- 1stIHP Malaysia Technical Talk – 23 April
Presentation papers:
i. SgKlang Towards WQ Class IIB - River Of Life (River Cleaning) by Mr. Sanusi Sulaiman (SYABAS)
ii. River of Life by DatoHj. MohdAzmi Ismail (DID)

- 2nd IHP Malaysia Technical Talk – 18 Jun
Presentation papers:
i. River Sediment Management by Prof. Ismail Abustan (USM)
ii. Lake Ecosystem And Changing Environment : A Case Of Bukit Merah Reservoir by Dr. ZatiSharip (NAHRIM)

Future activities

Discussion: Mr. Daniell suggested sharing the copy of the flood hydrograph guideline to test IFDs in this region; project is conducted by a working group in the center of hydrology of Malaysia.

Mongolia

- Organize seminar involving governmental, non-governmental and donor organizations and agencies to Share the information for open-discussion and to disseminate the outcomes water related projects and activities to the public and make a link;
- Implement project to improve “water education” to raise the public awareness.

Myanmar

Activities foreseen for 2014-2015 (comment from chairman: IHP national committee is becoming more active)

- The MNC-IHP will try to implement the water related activities in line with the themes of IHP;
- IHP national committee will continue to encourage scientific and technical symposia and workshops;
- The members of MNC-IHP will attend the 22nd Regional Steering Committee for South-east Asia and the Pacific;
- The members of MNC-IHP will participate in the international and national activities of IHP;
- Hydrological Division will upgrade the flood early warning system and flood monitoring system;
- Remote Sensing and GIS Division will produce the flood risk maps and flood assessment maps in order to reduce the loss of life and properties.

New Zealand

The New Zealand delegate is absent however they submit country report for the meeting. Future activities are as follows:

Activities foreseen until December 2013:

- New Zealand Hydrological Society Annual Symposium: ‘The Joint Conference for the New Zealand Hydrological Society and the Meteorological Society of New Zealand will be held between 19 and 22 November 2013 in Palmerston North, New Zealand’. The conference theme is Water and Weather: Solutions for health, wealth and environment;
- 21st Regional Steering Committee Meeting: Unfortunately New Zealand attendance at the 21st RSC meeting in Gyeongju, Republic of Korea Malaysia from

30 September to 5 October 2013 and associated meetings was not possible due to an acute medical situation.

Activities planned for 2014

- Scientific activities planned at the national level are, as explained in Section 1.1.3, within the context of the research programme funded by MBIE. A significant proportion of this activity will be in areas that are included within the IHP, but are not explicitly implemented as a component of the IHP. Implementation of science programmes (CWMS, LAWF) will be a strong focus in 2014 ;
- Future activities are expected to depend very much on decisions reached by the Regional Steering Committee, and we are committed to participate in its deliberations, with the intention of being involved in future scientific work at the regional level;
- NIWA Courses: A range of training courses will be offered by NIWA. For a full list of courses refer to the NIWA web site (www.niwa.co.nz). These courses are also open to overseas participants.

Activities envisaged in the long term, Continuation of the:

- Upgraded research programme on extreme rainfall and flood design;
- NZAID funded Pacific Hydrological Training Programmes as required;
- NZAID funded monthly "Island Climate Update" publication with stronger links to end users'
- Regular New Zealand "Climate Update" and "Climate Outlook" (web) publications;
- Regular "Freshwater Update" (web) publication;
- Canterbury Water Management Strategy (CWMS).

Philippines

Summarized activities related to IHP Philippines National Committee, including:

- National Academy of Science and Technology (NAST) – scientific meetings with main water theme; roundtable discussions (RTDs) on flood control & drainage; water supply & sanitation; irrigation (next in October 2013);
- Philippines Water Partnership (PWP) & Global Water Partnership-Southeast Asia (GWP-SEA) SC Meeting with participation in the ADB Water Week 2013; Securing Water For All, 11-15 March 2013, ADB Headquarters, Pasig City, Metro Manila, Philippines.
- University of the Philippines Diliman (UPD) & Department of Science and Technology (DOST):
    - Project NOAH – National Operational Assessment of Hazards – 6-hour early flood warning systems in 18 major river basins;
    - Project DREAM - LIDAR Survey of major rivers basins, training and applications for flood hazard risk mapping;
    - University-based researches in hydrology and water resources.
- National Water Resources Board (NWRB):
    - Reforms in the Water Sector - Philippine Development Plan (2011-2016);
    - The Integrated Water Resources Management (IWRM) Plan Framework.
- Department of Interior and Local Government (DILG):
    - MDGF-Enhancing Access to & Provision of Water Services with the Active Participation of the Poor - aims to enhance the provision of and access to water services in 36 waterless communities.
- Department of Public Works and Highways (DPWH):
    - Short-listed Structural Mitigation Measures – Metro Manila and adjoining regions. Proposed Non-Structural Measures;

- Effective Flood Control Operation and Warning System (EFCOS) improvement;
- Improvement of Management Information System (MIS) for Disaster Risk Management;
- Fort Bonifacio Retarding Tank - a model urban rainwater catchment system;
- National Sewerage and Septage Management Program (NSSMP).

Thailand

There are 4 main activities undertaken in the period of Nov 2012- Oct 2013 (Summary by Thailand delegation):

1. Research: with applied projects supported by Thai Royal government
2. Collaboration: with cooperation with monitoring of natural resources and environment, JICA, GIZ, Lao, Germany and Mekong river commission secretariat
3. Training: 3 national training and 3 regional training
4. Participated in 3 country meetings and 4 regional meetings.

Activities planned until December 2014:

- Thai representatives will participate in the 23rd IHP Training Course on "Ecohydrology for River Basin Management under Climate Change, 2-13 December 2013" in Kyoto, Japan.

Activities foreseen for 2013-2014:

- Continuation of Collaboration with RSC for Asia and Pacific;
- Continuation of involvement in Asian-Pacific FRIEND;
- Enhancing activities contributed to IHP-VII;
- Enhancing activities in Flood and Drought Management;
- Continuation of promotion on Integrated Water Resources Management;
- Expansion of an Integrated Water Resources Management implementation to the rest of the country;
- Promotion on Capacity Building on Water Resources Management for River Basin Committee;
- Participate in the international forum/conference on water resources management.

Activities envisaged in the long term:

- Enhancing activities contributed to IHP-VII;
- Enhancing activities in Flood and Drought Management;
- Highlight on Integrated Water Resources Management in 25 river basins;
- Continuation of raising public awareness and education in water resources management;
- Continuation of raising public awareness in efficient water resources management;
- Continuation of raising public participation for better water resources.

Vietnam

Activities planned for 2013-2014:

- Participate in the Study on the Impacts of Mainstream Hydropower on the Mekong River;
- Participate in the compilation and promulgation of the guidelines of the Water Resources Law;
- Develop operation rules for reservoir systems on major river basins;
- Continue to improve warning and forecasting flood in central of Vietnam;
- Develop IDF for Meteorology stations in Viet Nam;

- Adjust warning level at Hydrology stations.

Activities envisaged in the long term:

- Enhance activities contributed to IHP-VIII;
- Water for sustainable cities; Water-related disasters management;
- Promoting and applying new technology and approach in Integrated Water Resources management;
- Assessment of impact of climate change on water resources and hydrological extreme events; Adaptation measures to Climate change;
- Monitoring and assessment of water trans-boundary;
- Developing River Basin Organization (RBO);
- Modernization of Hydro-Met Service;
- Transfer technology and training course in Hydrology and WR.

6 UPDATES FROM THE CENTERS UNDER THE ASUPICES OF UNESCO IN THE ASIA PACIFIC REGION

Two Category II Centers attended the meeting namely Asia Pacific Center for Ecohydrology (APCE) in Jakarta, Indonesia and Humid Tropics Center (HTC) in Kuala Lumpur, Malaysia. The centers delivered presentation/report on their activities as below.

Asia Pacific Center for Ecohydrology (APCE)

The presentation for APCE was carried out by Mr. Hery Harjono as Executive Director. Mr. Harjono explained the background of establishment of APCE, its organisational structure, APCE directive (vision, mission, and value), strategic goals and recent activities. The strategic goals of APCE are to promote local resources base ecohydrological research, strengthen local capacity to adopt ecohydrological concept and approach, provide easy access to local resources based ecohydrological information and knowledge and enhance public awareness of local resources based ecohydrological practices.

- Recent activities: Cultural Landscape and Subak system in Bali (an irrigation system)
- Discussion: IPASS model: Pakistan is applying it well, provide spatial distribution of rainfall. Need good calibration. Need good data. Pakistan is using the model for real time forecasting. Jakarta comments they are encouraging other countries to try this model.

8 REPORT ON THE PREPARATION OF THE 7th WORLD WATER FORUM AND 2ND NAKDONG RIVER INTERNATIONAL WATER WEEK /INTERNATIONAL WATER FORUM 2013 (Na-Ri IWW/IWF 2013)

Mr. Soontak Lee as Co-chair of the International Steering Committee of the 7th World Water Forum shared the progress of the preparation of this important event to be held in Daegu – Gyeongbuk Republic of Korea on 12-17 April 2015 and highlighted that more than 30 thousand people from international organizations, governments, public and private companies, universities, NGOs, etc. will be participated in the 7th World Water Forum. This edition of the World Water Forum will put an emphasis on science and technology through the design of an interface where scientists and engineers can interact with politicians and policy-makers on scientific and technological solutions for water-related challenges. He also mentioned that the Second Stakeholders Consultation Meeting in preparation for the 7th World Water Forum will be held on 27-28 February 2014.

Mr. Lee called for the strengthening of the role of IHP RSC for Asia and the Pacific during the 7th World Water Forum, as it is a good opportunity to share with the international community the challenges related to water resources in the region.

9 OVER OF 2014 IHP ACTIVITIES IN THE REGION AND POSSIBLE CONTRIBUTIONS

In his intervention, Mr. Shahbaz Khan of UNESCO Office, Jakarta, mentioned that Asia-Pacific is urbanizing at unprecedented speed, with an urban population of 43%. He noted that Asia holds half of the world's cities including 6 of the world's 10 largest cities and that half of Asia's population will be living in cities by 2020. China alone will have a billion urban people in 15 years from now.

Mr. Khan noted that the challenges are in term of water quantity and quality and that these challenges include global and regional pressures such as:
- Sharp increase in water use
- Depletion of Groundwater sources
- Food security
- Climate change – extreme events
- Rapid urbanisation – water footprints
- Massive Pollution of Vital Water Resources
- Nitrogen, pesticides, endocrine disruptors
- Biodiversity loss

10 COMMUNUCATION UPDATES FOR RSC-STATUS OF NEW WEB PAGE AND ACTIVITY

Comments by specific countries:

Australia: Research covers every focal area – but coordination is difficult. Activities are not internationally based. There are also trans-boundary problems between states which in the past prevented information sharing but under new arrangements this has been improved.

China: Management, not just infrastructure, and water resources e.g. (North–South transfer complete 2014) are important. Some 4000 site monitoring sites for rainfalls are being installed in small catchments to deal with lack of information. This is a part of a 5-year national plan. International works include Mekong River inter-boundary work and river boundary work with North Korea. China would deliver to all themes of IHP-VIII.

Indonesia: Many actors are dealing with water. Focus is on improving information, enhancing groundwater sustainability and quality. Improved governance is a priority.

Japan: Climate change dataset is a priority. Climate change dataset has been developed from Global Climate Models, using numerical methods. These datasets are to be used by hydrologists and ecologists.

Lao P.D.R: Lao government goal is to develop water resources to achieve social economic goals.

Malaysia: National resources study to 2015 has been completed. National water resources policy is formulated. Issues and strategies paper will be formulated for government. Scarcity and quality are major themes. Ecohydrology is a major theme; also looking for water security.

Mongolia: Water quality degradation – pollution from mining, agriculture and industry – has occurred. There is a need to develop a model of surface water-groundwater interactions in arid & semi arid areas. Implementation of water education and awareness, and contributions to its management are priorities.

Myanmar: Has formed a committee. Collaboration between Republic of the Union of Myanmar and Japanese government is under way. Monitoring water quality, low flows, climate change impact on floods and development of flood forecasting tools are a priority. Assistance from Japan on making meteorological observations has been received.

New Zealand: Transition of Adaptive Integrated Water Resources Management (AIWRM) is under way in one region. This is a "science informed" process rather than "science led". Science includes both bio-physical and social sciences. Theme 6 is especially appropriate for NZ.
HELP project in Motueka indicated a long term engagement with UNESCO programme.

Philippines: Bridging gap between research and construction. IHP-VIII maps across in many areas. Activities in focal areas is scattered among various agencies and universities. On theme 6, Philippines is working at multiple levels, from middle and high schools to institutes of higher learning.

Republic of Korea: Next step is to collect information over this year. No specific projects have been identified yet.

Thailand: Main activities are risk management and adaptation to climate change. People affected by events are important. There are efforts to lesson effects on people and to make sure consequences of events are reduced in the future. Focal areas are water quality, integrated watershed resource management and improvement of human capacity.

Vietnam: Climate change assessment on water resources, risk management and adaptation to climate change has been carried out. Other focal areas include development of water quality management programmes for specific reservoir systems and assessment of upstream and downstream abstractions. A range of activities and education map to IHP-VIII. A handbook on water resources for schools is being compiled.

ACTION ITEM 1: All countries to refine mapping against IHP-VIII themes with projects and timelines and submit to UNESCO Jakarta before the next RSC meeting.

11 FUTURE OF CATALOGUE OF RIVERS

Mr. Daniell noted that IHP-VIII starts in a year (2014) so it is timely to start a list of topic areas with a common element.

Republic of Korea is developing a timeline and will have something available for the next meeting.

China – Bottom up approach of interest, but difficult; currently Integrated Water Resources Management is the focus. Emphasise the need for member countries to contribute effectively

Philippines – Education is the most common theme among member countries and integrates people across disciplines.

Mongolia – Support water education.

Chair summary: Have material ready for IHP working group request. A group is forming at the end of 2012/early 2013. Should education be a theme? Risk of affected people? Adaption of processes to climate change? AIWRM (mapped from HELP)? It is recommended to keep links from HELP and FRIEND to demonstrate continuity. He suggested that the member countries may follow the Republic of Korea model of working with the national IHP committee and working groups to generate ideas.

Mr. Khan said we should narrow ourselves down to hydrology. Other inter-governmental programmes need to be included. Mr. Khan indicated the Man And the Biosphere (MAB) programme. There could be an opportunity to bring together IHP and MAB groups together in Southeast Asia next year.

12 REPORT FROM THE WORKING GROUP ON IHP VIII IMPLEMENTATION FROM STRATEGIC AND HIGH-LEVEL MEETING ON WATER SECURITY AND COOPERATION, 11 – 13 SEPTEMBER 2013, NAIROBI, KENYA

Mr. Shahbaz Khan and Mr. Soontak Lee report on the meeting

Mr Shahbaz Khan and Mr. Soontak Lee have mentioned that during the Nairobi meeting, the ASPAC region was well represented with participants from different countries and that the support by Member States of the region to IHP activities and related regional IHP key results were shared.

Mr. Khan and Mr. Lee noted that the key challenges and opportunities for IHP-VIII include the increasing frequency and intensity of natural disasters and vulnerabilities to climate change leading to recurring floods and droughts, the need to develop liveable and sustainable cities, the water quality and quantity challenges caused by massive pollution and over-abstraction and unsustainable water management practices and the urgency to catch up on the MDG target on water supply and sanitation challenges for the large number of 'unreached' populations.

14 RSC FUTURE ACTIONS

Actions	Responsible	Deadlines
1. Water Education using hydrological analysis tools	Kenichiro Kobayashi and Hidetka Chikamori	
2. Mapping of projects on to themes of IHP VIII and place it on the web	All countries to provide their mapping sheets to secretariat and to Yasuto Tachikawa	
3. MasterClass for Hydrological Analysis Education	Secretariat with Trevor Daniell	
4. For the World Water Forum contribution	Trevor Daniell to circulate a request to member states	

of RSC - Position paper on adaptation to variability and uncertainty – case studies from member states, - Map our contribution to IHP VIII against World Water Forum goals/themes	(End of November 2013) Secretariat	
5. UNESCO HQ request for regions water related SDG.	The secretariat will refine and expand using mapping matrix the following information.	

Taking into account the themes and focal areas identified for IHP VIII, and considering the ongoing identification of Sustainable Development Goals (SDG) for the post-2015 global development agenda, the 21st meeting of the IHP Regional Steering Committee for Southeast Asia and the Pacific recommends that the following needs be reflected with priority in the SDG process:
- To improve management of water-related extreme events and to adapt to global change, **strengthen operational flood and drought forecasting capabilities.**
- To ensure public understanding of the importance of water security for sustainable development, **develop comprehensive water education curricula and materials for primary and secondary schools.**
- To ensure the appropriate reflection of water security issues at all levels of decision-making, **strengthen water security governance and legal frameworks at local, national and regional levels.**

15 7TH GLOBAL FRIEND FEBRUARY 2014, HANOI, VIETNAM

Mr. Trevor Daniell, Chairperson (Australia) of Flow Regime from International Experimental and Network Data (FRIEND) shared the progresses of the preparation of the FRIEND-Water2014: 7th Global FRIEND-Water Conference. Initially programmed to be organized in February 2014 in Hanoi, Viet Nam, the Conference is now scheduled to be held in Montpellier, France, on 07-10 October 2014, under the topic Hydrology in a Changing World: Environmental and Human Dimensions.

16. ORGANIZATION OF THE 22ND RSC MEETING IN 2014 IN INDONESIA AND ASSOCIATED CONFERENCE

The 22nd RSC Meeting of IHP 2014 will be organized in conjunction with the international conference on Ecohydrology on the topic “Ecohydrology

approaches facing the global water environment environment challenges challenges" in Yogyakarta, Indonesia on 10-14 November 2014.

17 ORGANIZATION OF THE 23RD MEETING

The 23rd Session of the RSC will be held in Myanmar. UNESCO secretariat will work with Myanmar IHP and RSC Chairperson and members to raise funds for the international conference and RSC meeting.

18 ELECTION OF RSC CHAIRPERSON

Professor Kaoru Takara, Member of the Japanese National Commission for UNESCO and Chair of the Japanese National Committee for UNESCO-IHP was elected as new chairperson.

19 CLOSING OF THE MEETING

The chairperson thanked the Korean IHP Committee for organizing the facilities for the RSC meeting and also thanked all the participants for their contributions to the meeting.

ANNEX 1

PARTICIPANTS, 21st MEETING OF THE IHP REGIONAL STEERING COMMITTEE FOR SOUTHEAST ASIA AND THE PACIFIC

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25	Yoowong Kanokwan	Thailand	Kanokwan.yw@gmail.com
26	Premvuti Karoon	Thailand	karoon.p@dwr.mail.go.th
27	Tuyen Hoang Minh	Vietnam	hmtuyen@imh.ac.vn hmtuyenkttv2000@yahoo.com
28	Thulstrup Hans	UNESCO Beijing	h.thulstrup@unesco.org
29	Shah Raza	UNESCO Islamabad	r.shah@unesco.org
30	Khan Shahbaz	UNESCO Jakarta	s.khan@unesco.org

Annex II
AGENDA

No	Agenda Item	Responsible Person	Document/ Presentation
1	Welcome and opening remarks by local host	Soontak Lee	Comments
2	Opening comments on behalf of RSC and introductions	Trevor Daniell Chairperson	Comments
3	Adoption of the Agenda	Trevor Daniell, RSC Chairperson	Draft Agenda
4	Secretariat report	Shahbaz Khan, RSC Secretariat	Presentation
5	Country Reports (4 minutes max) followed by discussion	IHP delegates	Country reports
6	Updates from the centers under the auspices of UNESCO in the Asia Pacific Region present at the meeting	APCE, HTC, ICHARM, I-CWSSM, ICQHS, IRTCES, RCUWM,	Presentation/ reports
7	Report from Asia-Pacific FRIEND	Trevor Daniel	Presentation
8	Report on preparation of the 7th World Water Forum and 2nd Nakdong River International Water Week/International Water Forum 2013(Na-Ri IWW/IWF 2013)	Soontak Lee	Oral report
9	Over of 2014 IHP activities in the region and possible contributions	Shahbaz Khan	Presentation
10	Communication updates for RSC-Status of new web page and activity	Yasuto Tachikawa	Presentation/ Web page
11	Future of catalogue of rivers	Dr. Kenichiro Kobayashi & Hidetaka Chikamori	Presentation
12	Discussion on RSC input to the 7th WWF in Korea in 2015	Soontak Lee	WWF Action Areas
13	Report from the Working Group on IHP VIII Implementation from Strategic and High-Level Meeting on Water Security and Cooperation, 11 – 13 September 2013, Nairobi, Kenya	Shahbaz Khan and Soontak Lee, Vice-Chairperson IGC-IHP Group IV	Report
14	RSC Future Actions	Group Discussion	IHP VIII Document
15	7th Global FRIEND February 2014, Hanoi, Vietnam	Trevor Daniell	Announcement
16	Any other business	All	
17	Organization of the 22nd RSC Meeting in 2014 in Indonesia and associated conference	IHP Indonesia	Presentation
18	Organization of the 23rd RSC Meeting	IHP delegates	
19	Election of RSC Chairperson	IHP delegates	
20	Adoption of Resolutions	IHP delegates	Draft Resolution
21	Closing of the meeting	New Chairperson	

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ANNEX 3

SECRETARIAT REPORT BY UNESCO JAKARTA OFFICE

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UNESCO Jakarta Secretariat Report

November 2012 – September 2013

The 21st Regional Steering Committee for South East Asia and Pacific in Gyeongju City, Rep. of Korea, 3 – 4 October 2013

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Contents of this presentation:

- Action items from the 20th RSC Meeting in Langkawi, Malaysia, 5 – 9 November 2012
- Training courses, workshops, seminars and meetings
- Travel grants
- Activities within UNESCO Office Jakarta
- Review and evaluation meeting on IHP activities supported by the Japanese Fund in Trust
- Publications

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Action Items

ACTION ITEMS	BY WHOM	DATE
1. All countries refine mapping against IHP-VIII themes with projects and timelines and submit to UNESCO Jakarta before the next RSC meeting	All Countries	Before 21st RSC Meeting
2. There is a need to promote use of appropriate procedures for the conversion of rainfall intensities to flood design hydrographs? It was proposed that there was a need to train people on flood hydrograph methodology at a central location or do we send people to individual countries to train people? A Pilot study was proposed to be conducted across 11 countries, first of all to examine particular country IFDs where there is appropriate data. There is a need to look for changes over time in the generation of IFDs.	Dennis Jamieson A number of people were nominated to progress this item.	ASAP

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Action Items (contd.)

ACTION ITEMS	BY WHOM	DATE
3. Flood Forecasting and Warning System. Secretariat to determine if TOR is correct. Is the data analysed correct and any analysis defensible? Need for review of CD content and consideration of issues such as inclusion of comparative analysis. Review by Thailand, Lao P.D.R, Cambodia, RO Korea (Mr. Kim) and China (Ms Yan Huang). Objective to ensure content is correct. Each country + Jaya as an outside person.	Thailand, Lao P.D.R, Cambodia, RO Korea, China, Jayawardena	ASAP
4. RSC New web page: all countries to send RELEVANT links to Mr. Tachikawa for consideration for inclusion. Each country to nominate country contact (NZ M.S., China Yan Huang, Indonesia DA Sutapa, Malaysia Hezlandi, Mongolia Gombo Davaa, Australia Trevor Daniell)	All Countries	ASAP

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Training courses, workshops, seminars and meetings

- 22nd IHP Nagoya Training Course **"Precipitation Measurement from Space and its Applications"** held from 18 November to 1 December 2012 in Nagoya, Japan.(13 participants in Nagoya– 85Online)
- **"Integrated Flood Analysis System Training Course",** in Jakarta, Indonesia, from 15 -17 January 2013 (26 participants)
- The **9th Steering Committee meeting of IWRM Guidelines at River Basin Level** in Jakarta, Indonesia , from 19 to 20 March 2013 (10 participants)
- Side events at the "**2nd Asia Pacific Water Summit**" in Chiang Mai, Thailand, from 16 to 20 May 2013 (150 participants)
- Seminar on **"Geospatial Disaster & UNESCO HELP Basin Water Cooperation, Security and Geohazards"** in Kuala Lumpur, Malaysia, from 17 to 18 June 2013 (80 participants)

TOTAL PARTICIPANTS 354

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22nd IHP e-training course

- 11 Universities from 6 countries were connected through SOI Asia, NRENs and INHERENT
- The e-lectures provided opportunities to 85 additional participants from the region
- The lecture material and e-course recordings are available for downloading at IHP Nagoya Forum website

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IFAS Training Course Indonesia

- 26 Participants from 8 River Basin Organizations, 3 Regional Water Resources Agencies, 3 Research Institutes, and 2 State-owned-companies;
- Mostly are civil engineers and handle data collection, archiving and analysis on rainfall, river discharge and surface water data;
- According to them, major constraints in data collection and archiving is lack of technical expertise and lack of data maintenance, therefore trainings on these issues are important.

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2nd Asia Pacific Water Summit

- Organized 3 side events:
  - Focus area session on "IWRM Process for a Water Secure World"
  - Technical workshop on IWRM1: Transboundary Data Sharing for Integrated Water Resources Management
  - Technical workshop on Capacity Building for IWRM

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"Geospatial Disaster & UNESCO HELP Basin Water Cooperation, Security and Geohazards"

- Eighty presenters and participants from various government agencies, universities, private agencies and others
- Outcomes are two synthesis documents on:
  - Geospatial Disaster Technologies
  - Stormwater Management Ecohydrology

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Travel Grants

- Six participants from 6 countries were supported to attend the *"UNESCO-IHP 20th Regional Steering Committee Meeting for SEAP"* in conjunction to the 2nd International Conference on Water Resources (ICWR2012) *"Sharing Knowledge of Issues in Water Resources Management to Face the Future"* and IHP- Disaster Reduction Hyperbase Workshop, held from 5 to 9 November 2012, in Langkawi, Malaysia.
- Five participants were supported through Japanese FIT to attend the 22nd IHP Training Course on *"Precipitation Measurement from Space and its Applications"* from 18 November to 1 December 2012 in Nagoya, Japan
- Seven UNESCO IWRM Steering Committee members were supported to attend the *9th Steering Committee meeting of IWRM Guidelines at River Basin Level* in Jakarta, Indonesia from 19 to 20 March 2013
- Five panellists were supported to attend the "Integrated Water Resources Management at the 2nd Asia Pacific Water Summit" in Chiang Mai, Thailand, from 16-20 May 2013 (5 participants)

Total Travel Grants: 23

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Activities within UNESCO Jakarta

- Due to UNESCO financial crisis, activities within UNESCO Jakarta was supported by Extrabudgetary Funds (JFIT Funds) and Emergency Funds
- Activities under Extrabudgetary (JFIT Funds):
  - Regional Steering Committee Meeting
  - IHP and IFAS Training Courses
  - Research on Land-based disasters and extreme events
  - SWITCH-in-Asia
- Activities under Emergency Funds
  - Steering Committee meeting of UNESCO IWRM Guidelines at River Basin Level
  - Participatory Point-of-Interest Mapping in Flood Management

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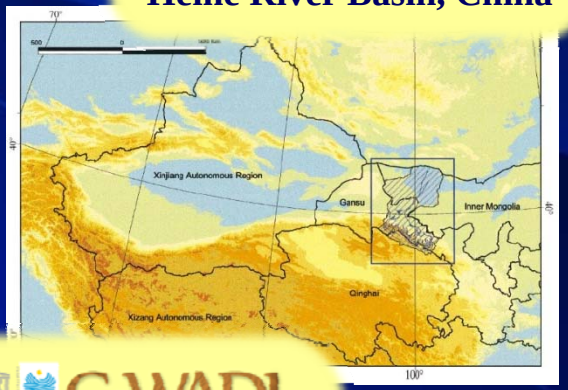
Research on Land-based disasters and extreme events

3 pilot projects in water scarce areas

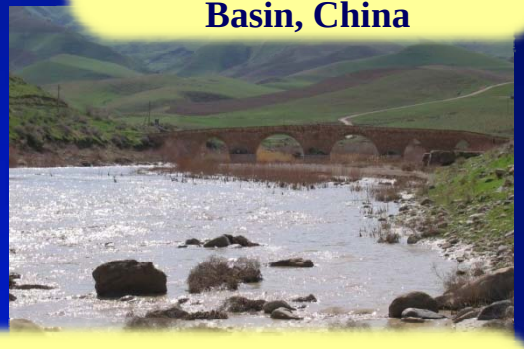
Heihe River Basin, China



Managing Aquifer Recharge

G-WADI

Kashafroud River Basin, China



Collaboration with 2 Field Offices (Beijing and Tehran

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SWITCH-in-Asia

Polluted Hanoi Lakes

Learning Alliance Meetings

SWITCH-Angkor:
Balance human activities and preserve ecosystem and WH site

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9th Steering Committee Meeting of UNESCO IWRM Guidelines in River Basin Level

- **AP region needs assessment:**
  - Make connection between the education and water industry needs
  - Training on models of future water conditions based on climate change
  - Data collection management for designing water resource infrastructure under an uncertain future

- **Discussions:**
  - Production of new volume of the guidelines on climate change
  - Customization of guidelines
  - Volumes on agriculture and urban water management

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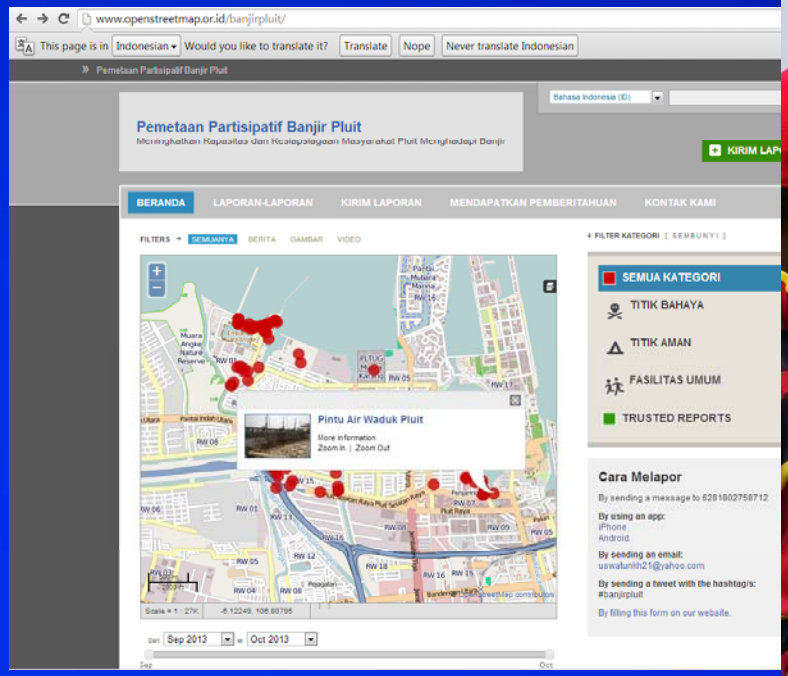
Participatory Point-of-Interest Mapping in Flood Management

- Focusing in Flood Prone Area in Jakarta (Pluit Area)
- September – December 2013
- Involving Community and Youth
- Using OpenStreetMap, Photovoice method and CrowdMap



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Review and Evaluation Meeting on IHP Activities supported by the Japanese Fund in Trust (FIT)

- An evaluation report on the activities implemented within the framework of the IHP Programme and supported by the Japanese FIT during the period 2012-2013, was presented by UNESCO Office, Jakarta, at the meeting held in UNESCO Office, Jakarta, from 10 – 11 July 2013. The report describes the activities carried out in the Asia Pacific Region within three main areas:

– the Regional Steering Committee (RSC) of IHP for Southeast Asia and the Pacific and
– the IHP Training Courses, annually organised by the Nagoya University in Japan.
– Development of Knowledge Platform for customizing IWRM guidelines for Extreme Events

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Publications

UNESCO Office Jakarta

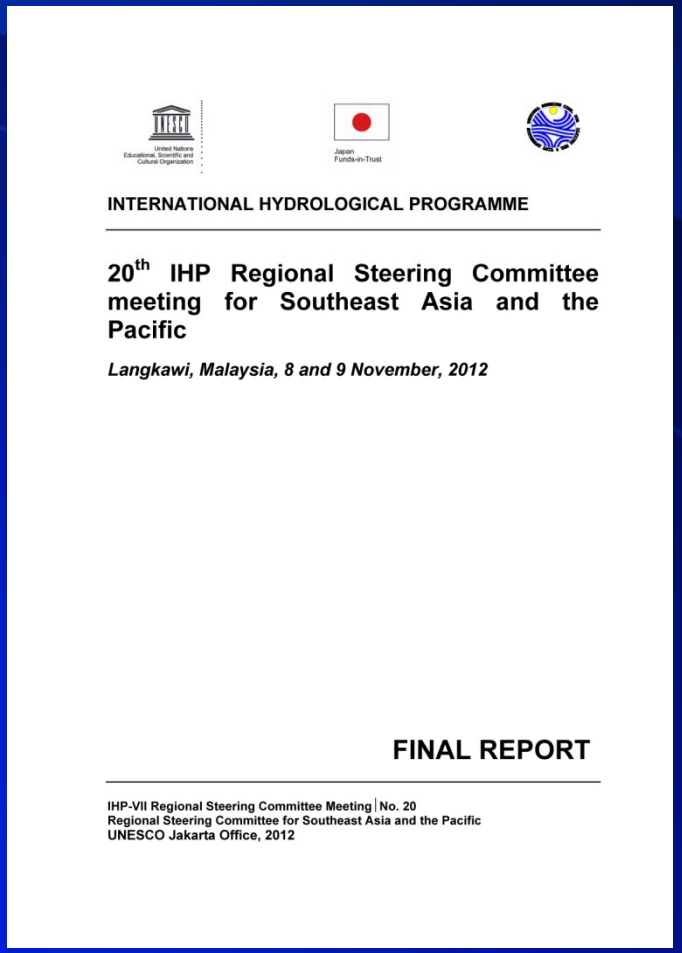
IHP VII Regional Steering Committee Meeting No.20

Title:

Final Report

20th IHP Regional Steering Committee meeting for Southeast Asia and Pacific

Available at UNESCO Jakarta website and RSC website



INTERNATIONAL HYDROLOGICAL PROGRAMME

20th IHP Regional Steering Committee meeting for Southeast Asia and the Pacific

Langkawi, Malaysia, 8 and 9 November, 2012

FINAL REPORT

IHP-VII Regional Steering Committee Meeting | No. 20
Regional Steering Committee for Southeast Asia and the Pacific
UNESCO Jakarta Office, 2012

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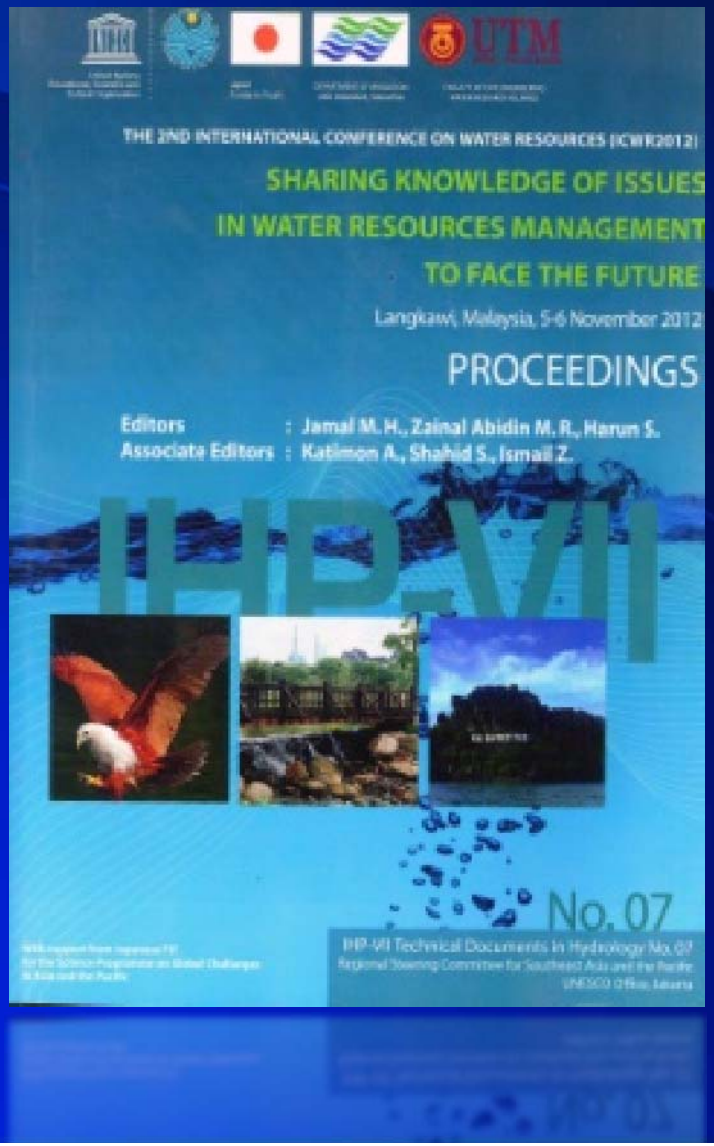
Title:

Proceedings of the 2nd International Conference on Water Resources (ICWR2012) "Sharing Knowledge of Issues in Water Resources Management to Face the Future", IHP-VII – Technical documents in Hydrology No. 7



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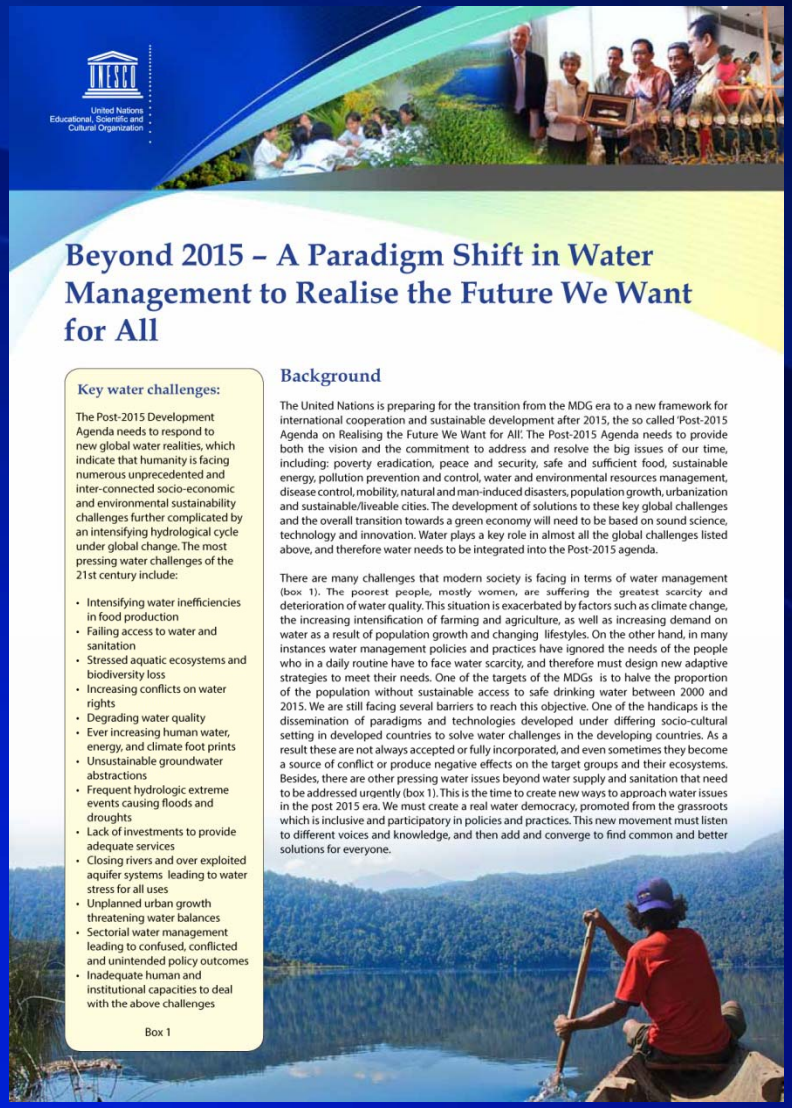
Publications

Brochure:

Beyond 2015 – A Paradigm Shift in Water Management to Realise the Future We Want for All, UNESCO Office, Jakarta, 2013



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Beyond 2015 – A Paradigm Shift in Water Management to Realise the Future We Want for All

Key water challenges:

The Post-2015 Development Agenda needs to respond to new global water realities, which indicate that humanity is facing numerous unprecedented and inter-connected socio-economic and environmental sustainability challenges further complicated by an intensifying hydrological cycle under global change. The most pressing water challenges of the 21st century include:

- Intensifying water inefficiencies in food production
- Failing access to water and sanitation
- Stressed aquatic ecosystems and biodiversity loss
- Increasing conflicts on water rights
- Degrading water quality
- Ever increasing human water, energy, and climate foot prints
- Unsustainable groundwater abstractions
- Frequent hydrologic extreme events causing floods and droughts
- Lack of investments to provide adequate services
- Closing rivers and over exploited aquifer systems leading to water stress for all uses
- Unplanned urban growth threatening water balances
- Sectorial water management leading to confused, conflicted and unintended policy outcomes
- Inadequate human and institutional capacities to deal with the above challenges

Box 1

Background

The United Nations is preparing for the transition from the MDG era to a new framework for international cooperation and sustainable development after 2015, the so called 'Post-2015 Agenda on Realising the Future We Want for All'. The Post-2015 Agenda needs to provide both the vision and the commitment to address and resolve the big issues of our time, including: poverty eradication, peace and security, safe and sufficient food, sustainable energy, pollution prevention and control, water and environmental resources management, disease control, mobility, natural and man-induced disasters, population growth, urbanization and sustainable/liveable cities. The development of solutions to these key global challenges and the overall transition towards a green economy will need to be based on sound science, technology and innovation. Water plays a key role in almost all the global challenges listed above, and therefore water needs to be integrated into the Post-2015 agenda.

There are many challenges that modern society is facing in terms of water management (box 1). The poorest people, mostly women, are suffering the greatest scarcity and deterioration of water quality. This situation is exacerbated by factors such as climate change, the increasing intensification of farming and agriculture, as well as increasing demand on water as a result of population growth and changing lifestyles. On the other hand, in many instances water management policies and practices have ignored the needs of the people who in a daily routine have to face water scarcity, and therefore must design new adaptive strategies to meet their needs. One of the targets of the MDGs is to halve the proportion of the population without sustainable access to safe drinking water between 2000 and 2015. We are still facing several barriers to reach this objective. One of the handicaps is the dissemination of paradigms and technologies developed under differing socio-cultural setting in developed countries to solve water challenges in the developing countries. As a result these are not always accepted or fully incorporated, and even sometimes they become a source of conflict or produce negative effects on the target groups and their ecosystems. Besides, there are other pressing water issues beyond water supply and sanitation that need to be addressed urgently (box 1). This is the time to create new ways to approach water issues in the post 2015 era. We must create a real water democracy, promoted from the grassroots which is inclusive and participatory in policies and practices. This new movement must listen to different voices and knowledge, and then add and converge to find common and better solutions for everyone.

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Thank you!!

ANNEX 4
REPORT ON RSC FUTURE PERSPECTIVES MAPPING

1. **Water Education using hydrological analysis tools**
   Action >> Kenichiro Kobayashi and Hidetka Chikamori

2. **Mapping of projects on to themes of IHP VIII and place it on the web**
   Action >> All countries to provide their mapping sheets to secretariat and to Yasuto Tachikawa

3. **MasterClass for Hydrological Analysis Education**
   Action >> Secretariat with Trevor Daniell

4. **For the World Water Forum contribution of RSC**
   - Position paper on adaptation to variability and uncertainty – case studies from member states, Trevor Daniell to circulate a request to member states (End of November 2013)
   - Map our contribution to IHP VIII against World Water Forum goals/themes (Secretariat)

5. **UNESCO HQ request for regions water related SDG. The secretariat will refine and expand using mapping matrix the following information.**
   Taking into account the themes and focal areas identified for IHP VIII, and considering the ongoing identification of Sustainable Development Goals (SDG) for the post-2015 global development agenda, the 21st meeting of the IHP Regional Steering Committee for Southeast Asia and the Pacific recommends that the following needs be reflected with priority in the SDG process:
   - To improve management of water-related extreme events and to adapt to global change, **strengthen operational flood and drought forecasting capabilities**
   - To ensure public understanding of the importance of water security for sustainable development, **develop comprehensive water education curricula and materials for primary and secondary schools**
   - To ensure the appropriate reflection of water security issues at all levels of decision-making, **strengthen water security governance and legal frameworks at local, national and regional levels**

6. For 23rd Session of RSC UNESCO secretariat will work with Myanmar IHP and RSC Chairperson and members to raise funds for the international conference and RSC meeting

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International Hydrological Programme

UN WATER World Water Day 2013 International Year of Water Cooperation

ANNEX 5

The Eighth Phase of the International Hydrological Programme (IHP-VIII, 2014-2021)

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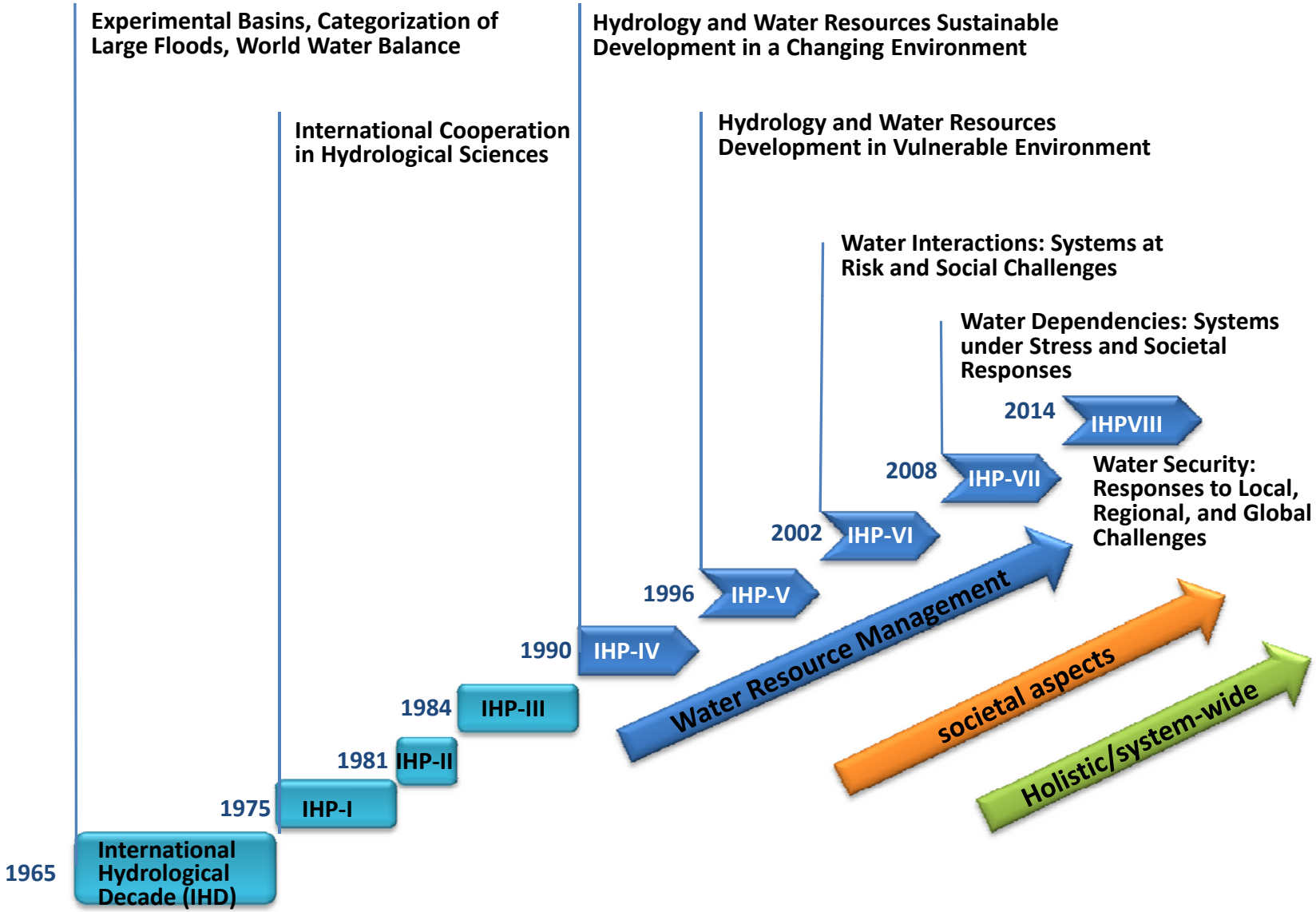
Evolution of IHP: From Hydrological Science to Integrated Science, Policy, and Society

UN Water World Water Day 2013 International Year of Water Cooperation



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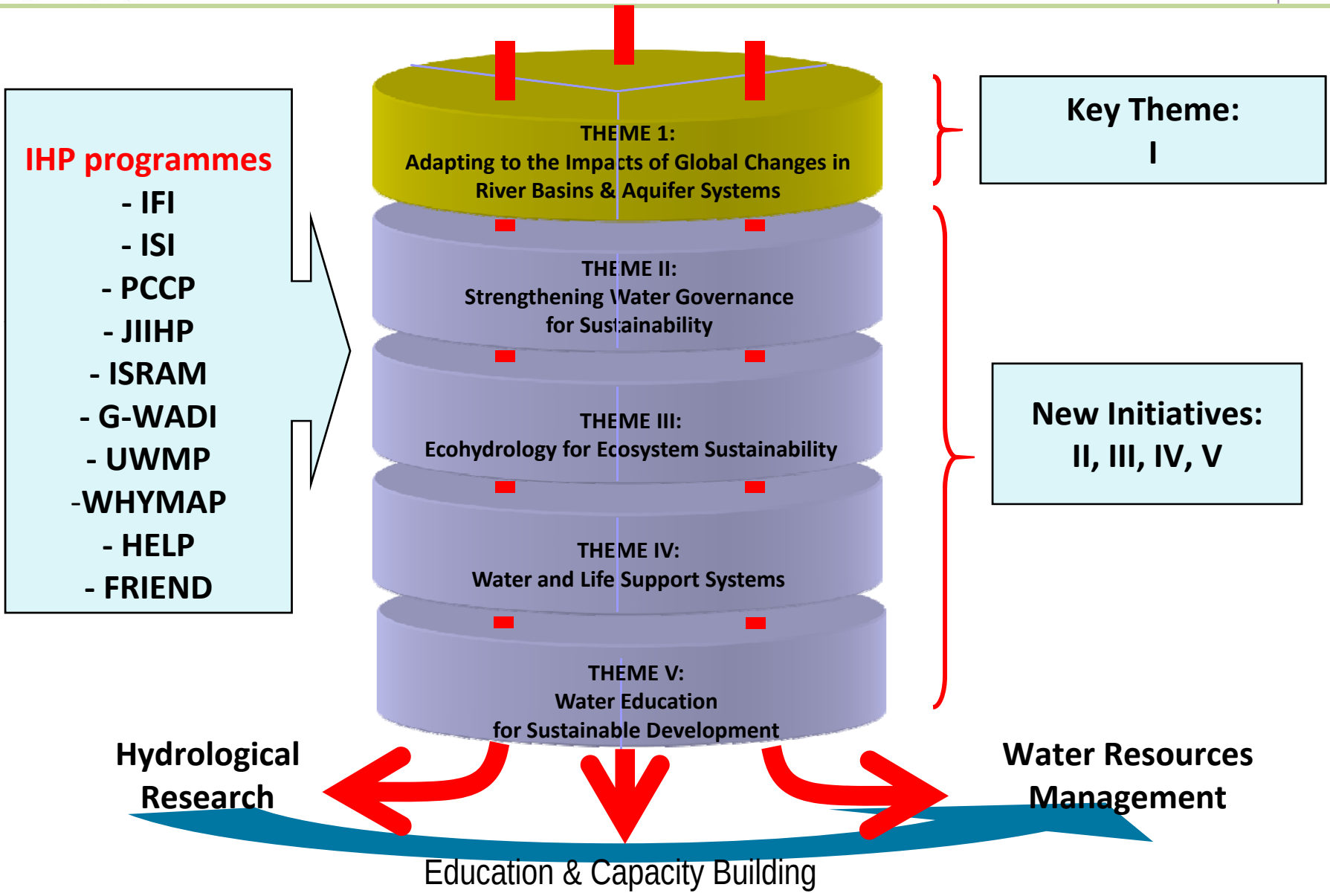
International Hydrological Programme

IHP-VII (2008-2013)

UN Water World Water Day 2013 International Year of Water Cooperation



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IHP-VIII 2014-2021

UN WATER World Water Day 2013 International Year of Water Cooperation

Water security:
Responses to local, regional, and global challenges

Water Education, Key for Water Security

1. Enhancing tertiary water education and professional capabilities in the water sector
2. Addressing vocational education and training of water technicians
3. Water education for children and youth
4. Promoting awareness of water issues through informal water education
5. Education for transboundary water cooperation and governance

Ecohydrology, Engineering Harmony for a Sustainable World

1. Hydrological dimension of a catchment – identification of potential threats and opportunities for a sustainable development
2. Shaping of the catchment ecological structure for ecosystem potential enhancement – biological productivity and biodiversity
3. Ecohydrology system solution and ecological engineering for the enhancement of water and ecosystem resilience and ecosystem services
4. Urban ecohydrology – stormwater purification and retention in the city landscape, potential for improvement of health and quality of life
5. Ecohydrological regulation for sustaining and restoring continental to coastal connectivity and ecosystem functioning

Water and Human Settlements of the Future

1. Game changing approaches and technologies
2. System wide changes for integrated management approaches
3. Institution and leadership for beneficiation and integration
4. Opportunities in emerging cities in developing countries
5. Integrated development in rural human settlement

Addressing Water Scarcity and Quality

1. Improving governance, planning, management, allocation, and efficient use of water resources
2. Dealing with present water scarcity and developing foresight to prevent undesirable trends
3. Promoting tools for stakeholders involvement and awareness, and conflict resolution
4. Addressing water quality and pollution issues within an IWRM framework – improving legal, policy, institutional, and human capacity
5. Promoting innovative tools for safety of water supplies and controlling pollution

Groundwater in a Changing Environment

1. Enhancing sustainable groundwater resources management
2. Addressing strategies for management of aquifers recharge
3. Adapting to the impacts of climate change on aquifer systems
4. Promoting groundwater quality protection
5. Promoting management of transboundary aquifers

Water-related Disasters and Hydrological Change

1. Risk Management as adaptation to global changes
2. Understanding coupled human and natural processes
3. Benefiting from global and local Earth observation systems
4. Addressing uncertainty and improving its communication
5. Improve scientific basis for hydrology and water sciences for preparation and response to extreme events

Global Change | **Governance** | **Human Dimension** | **Transboundary or Shared Waters** | **Integrated Water Ressource Management**

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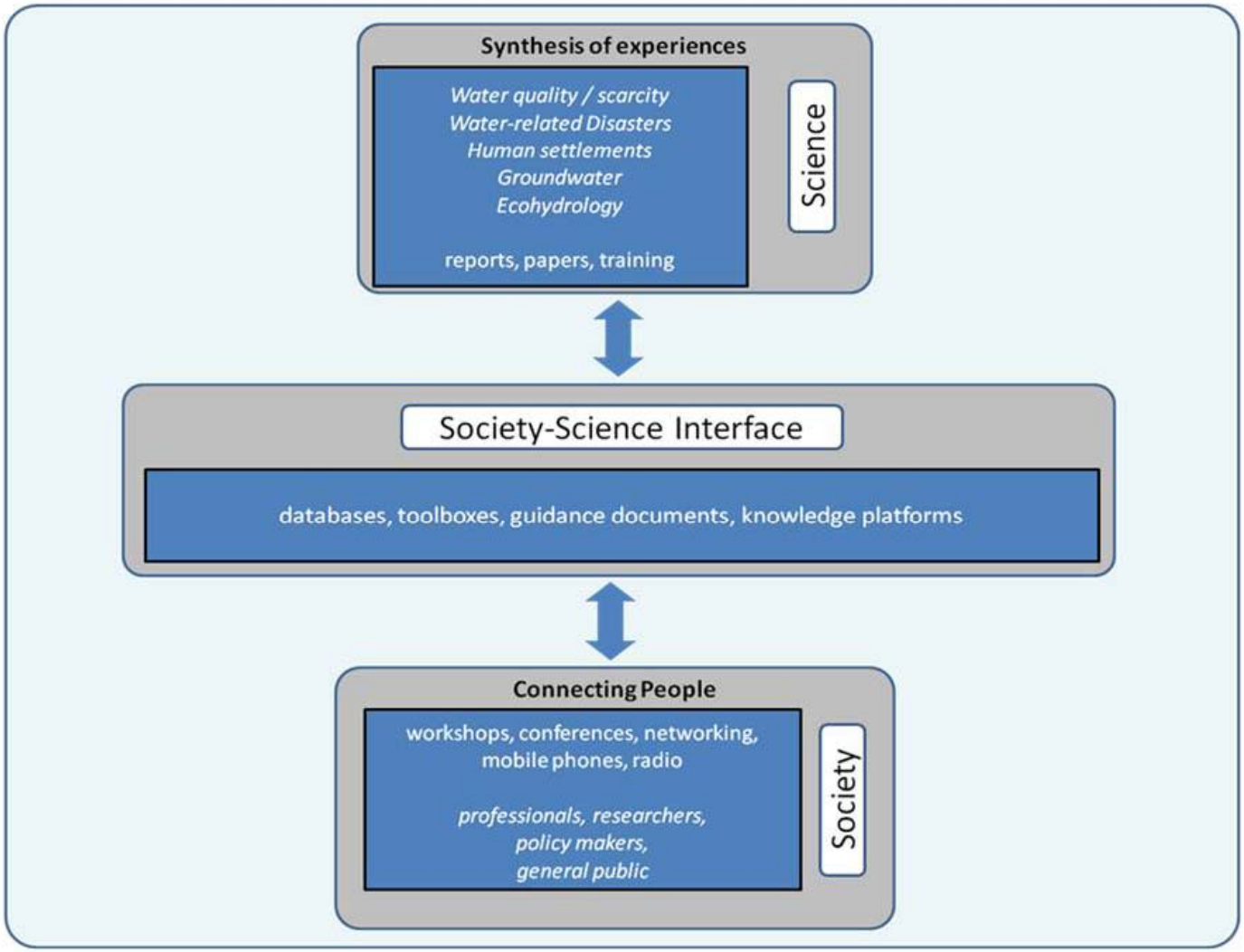
International Hydrological Programme

Putting science into action

UN WATER World Water Day 2013 International Year of Water Cooperation



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International Hydrological Programme

IHP-VIII 2014-2021

UN WATER World Water Day 2013 International Year of Water Cooperation

Water-related Disasters and Hydrological Change

1.1: Risk management as adaptation to global changes
1.2: Understanding coupled human and natural processes
1.3: Benefiting from remote sensing data and ground truth
1.4: Addressing uncertainty and improving its communication

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International Hydrological Programme

IHP-VIII 2014-2021

Groundwater in a changing environment

2.1 - Enhancing sustainable groundwater resources management
2.2 - Addressing strategies for management of aquifers recharge
2.3 - Adapting to the impacts of climate change on aquifer systems
2.4 – Promoting groundwater quality protection
2.5 - Promoting management of transboundary aquifers

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International Hydrological Programme

IHP-VIII 2014-2021

UN Water World Water Day 2013 International Year of Water Cooperation

Addressing Water Scarcity and Quality

3.1 - Improving planning, management, allocation, and efficient use of water resources

3.2 - Dealing with present water scarcity and developing foresight to prevent undesirable trends

3.3 - Promoting tools for stakeholders involvement and awareness, and conflict resolution

3.4 - Addressing water quality and pollution issues within an IWRM framework - improving legal, policy, institutional and human capacity

3.5 - Promoting innovative tools for safety of water supplies and controlling pollution

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IHP-VIII 2014-2021

UN WATER World Water Day 2013 International Year of Water Cooperation

Water and human settlements of the future

4.1- Game changing approaches and technologies
4.2 - System wide changes for integrated management approaches
4.3 - Institution and leadership for beneficiation and integration
4.4 -Opportunities in emerging cities in developing countries
4.5 – Integrated development in rural human settlement

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International Hydrological Programme

IHP-VIII 2014-2021

Ecohydrology, engineering harmony for a sustainable world

5.1 - Hydrological dimension of a catchment– identification of potential threats and opportunities for a sustainable development

5.2 - Shaping of the catchment ecological structure for ecosystem potential enhancement ─ biological productivity and biodiversity..

5.3 - Ecohydrology system solution and ecological engineering for the enhancement of water and ecosystem resilience and ecosystem services

5.4 - Urban Ecohydrology – storm water purification and retention in the city landscape, potential for improvement of health and quality of life.

5.5 - Ecohydrological regulation for sustaining and restoring continental to coastal connectivity and ecosystem functioning

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IHP-VIII 2014-2021

UN Water World Water Day 2013 International Year of Water Cooperation

Water education, key for water security

6.1 - Enhancing tertiary water education and professional capabilities in the water sector

6.2 - Addressing vocational education and training of water technicians

6.3 - Water education for children and youth

6.4 - Promoting awareness of water issues through informal water education

6.5 - Education for transboundary water cooperation

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International Hydrological Programme

IHP-VIII 2014-2021

UN Water World Water Day 2013 International Year of Water Cooperation

Cross-cutting programmes and initiatives

HELP: Hydrology for the Environment, Life, and Policy
FRIEND: Flow Regimes from International Experimental and Network Data
GRAPHIC: Groundwater Resources Assessment under the Pressures of Humanity and Climate Change
G-WADI: Global Network on Water and Development Information in Arid Lands
IDI: International Drought Initiative
IFI: International Flood Initiative
ISARM: Internationally Shared Aquifer Resources Management
ISI: International Sediment Initiative
JIIHP: UNESCO-IAEA Joint International Isotope Hydrology Programme
PC-CP: Water for Peace: From Potential Conflicts to Cooperation Potential
UWMP: Urban Water Management Programme
International Knowledge, Research, and Policy Initiative on Water Quality
WHYMAP: World Hydrogeological Map

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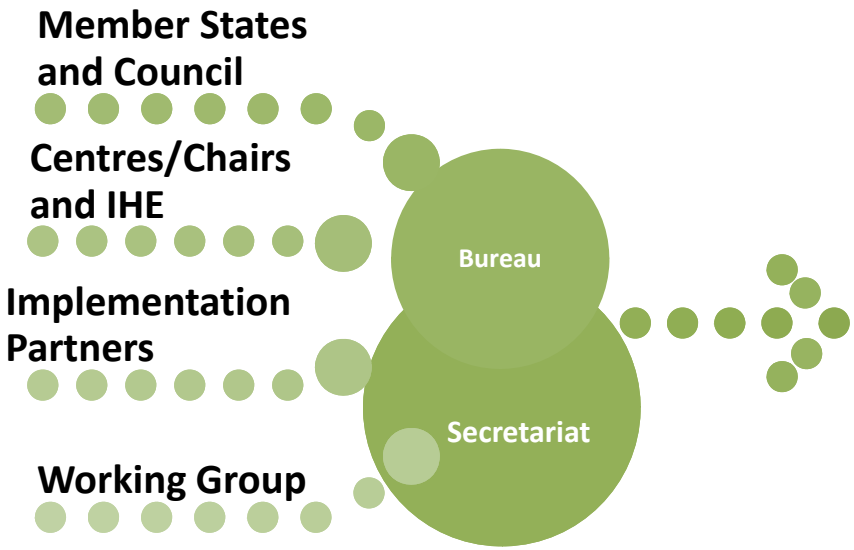
International Hydrological Programme

Detailed Consultation with Member States for implementation plan

UN WATER World Water Day 2013 International Year of Water Cooperation



December-2012
January- 2013

Development of Implementation Plan
Feb-April 2013

49th Bureau
May/June 2013

37 C/4
37 C/5

Approval of IHP-VIII
(37th Session of the General Conference)

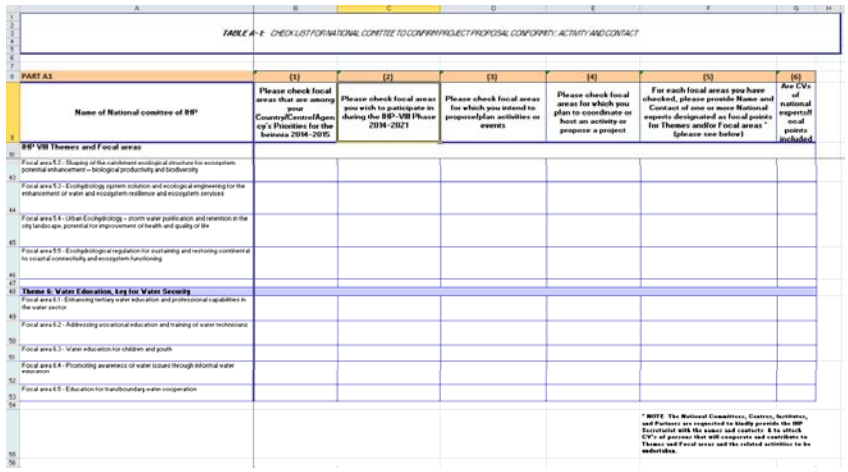


TABLE A-1: CHECK LIST FOR NATIONAL COMITEE TO CONFIRM PROJECT PROPOSAL CONFORMITY, ACTIVITY AND CONTACT

PART A1	(1)	(2)	(3)	(4)	(5)	(6)
Name of National comitee of IHP	Please check focal areas that are among your Country/Centre/Agency's Priorities for the biennia 2014-2015	Please check focal areas you wish to participate in during the IHP-VIII Phase 2014-2021	Please check focal areas for which you intend to propose/plan activities or events	Please check focal areas for which you plan to coordinate or host an activity or propose a project	For each focal areas you have checked, please provide Name and Contact of one or more National experts designated as focal points for Themes and/or Focal areas * (please see below)	Are CVs of national expert/all focal points included
IHP VIII Themes and Focal areas						
Focal area 6.2 - Shaping of the catchment ecological structure for ecosystem potential enhancement – biological productivity and biodiversity						
Focal area 5.3 - Ecohydrology system solution and ecological engineering for the enhancement of water and ecosystem resilience and ecosystem services						
Focal area 5.4 - Urban Ecohydrology – storm water purification and retention in the city landscape, potential for improvement of health and quality of life						
Focal area 5.5 - Ecohydrological regulation for sustaining and restoring continental to coastal connectivity and ecosystem functioning						
Theme 6. Water Education, Leg for Water Security						
Focal area 6.1 - Enhancing tertiary water education and professional capabilities in the water sector						
Focal area 6.2 - Addressing vocational education and training of water technicians						
Focal area 6.3 - Water education for children and youth						
Focal area 6.4 - Promoting awareness of water issues through informal water education						
Focal area 6.5 - Education for transboundary water cooperation						

* NOTE: The National Committees, Centres, Institutes, and Partners are requested to kindly provide the IHP Secretariat with the names and contacts & to attach CV's of persons that will cooperate and contribute to Themes and Focal areas and the related activities to be undertaken.

ANNEX 4
REPORT ON RSC FUTURE PERSPECTIVES MAPPING

1. **Water Education using hydrological analysis tools**
   Action >> Kenichiro Kobayashi and Hidetka Chikamori

2. **Mapping of projects on to themes of IHP VIII and place it on the web**
   Action >> All countries to provide their mapping sheets to secretariat and to Yasuto Tachikawa

3. **MasterClass for Hydrological Analysis Education**
   Action >> Secretariat with Trevor Daniell

4. **For the World Water Forum contribution of RSC**
   - Position paper on adaptation to variability and uncertainty – case studies from member states, Trevor Daniell to circulate a request to member states (End of November 2013)
   - Map our contribution to IHP VIII against World Water Forum goals/themes (Secretariat)

5. **UNESCO HQ request for regions water related SDG. The secretariat will refine and expand using mapping matrix the following information.**
   Taking into account the themes and focal areas identified for IHP VIII, and considering the ongoing identification of Sustainable Development Goals (SDG) for the post-2015 global development agenda, the 21st meeting of the IHP Regional Steering Committee for Southeast Asia and the Pacific recommends that the following needs be reflected with priority in the SDG process:
   - To improve management of water-related extreme events and to adapt to global change, **strengthen operational flood and drought forecasting capabilities**
   - To ensure public understanding of the importance of water security for sustainable development, **develop comprehensive water education curricula and materials for primary and secondary schools**
   - To ensure the appropriate reflection of water security issues at all levels of decision-making, **strengthen water security governance and legal frameworks at local, national and regional levels**

6. For 23rd Session of RSC UNESCO secretariat will work with Myanmar IHP and RSC Chairperson and members to raise funds for the international conference and RSC meeting

United Nations Educational, Scientific and Cultural Organization

International Hydrological Programme

UN WATER World Water Day 2013 International Year of Water Cooperation

ANNEX 5

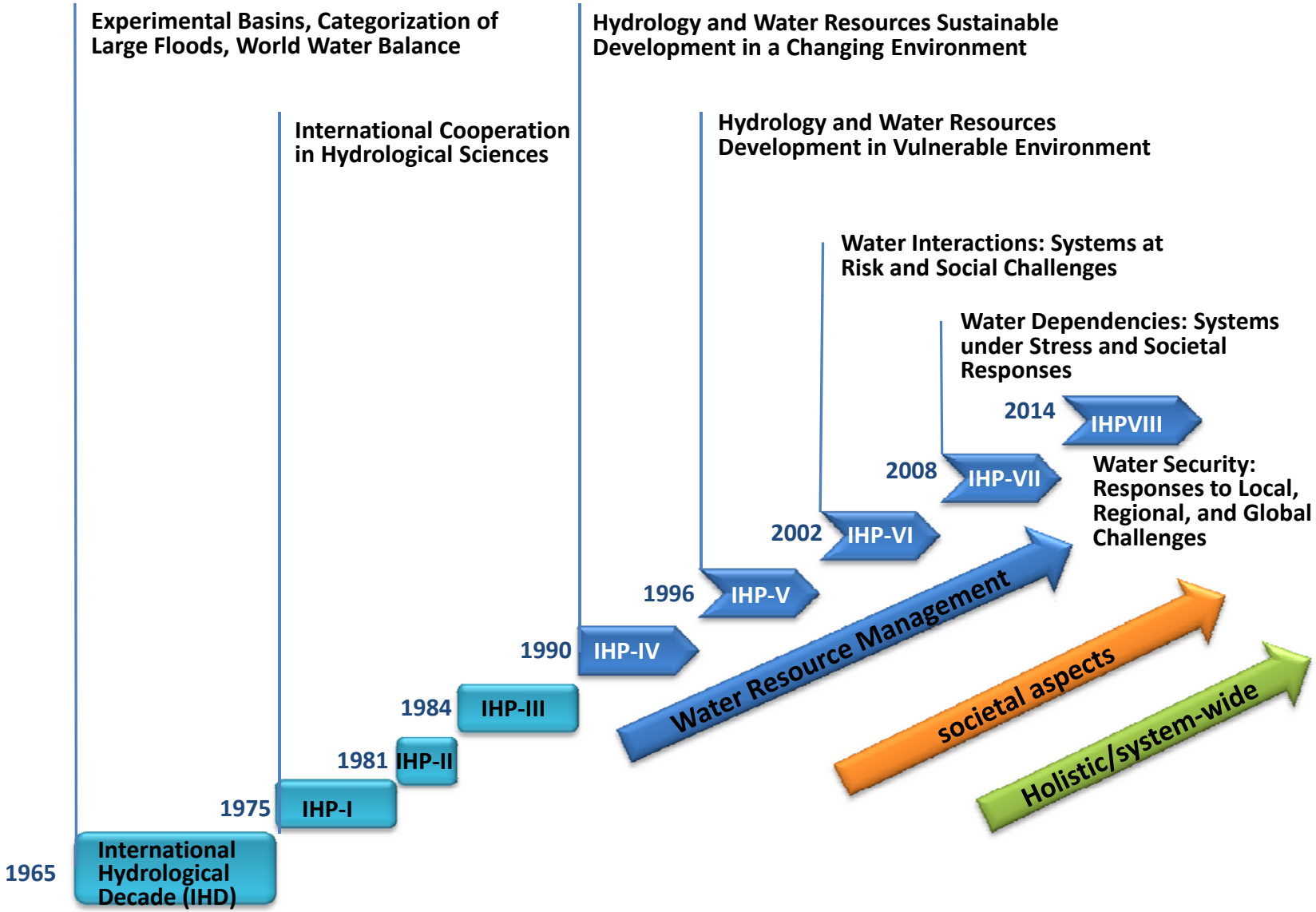
The Eighth Phase of the International Hydrological Programme (IHP-VIII, 2014-2021)

United Nations Educational, Scientific and Cultural Organization

International Hydrological Programme

Evolution of IHP: From Hydrological Science to Integrated Science, Policy, and Society

UN Water World Water Day 2013 International Year of Water Cooperation

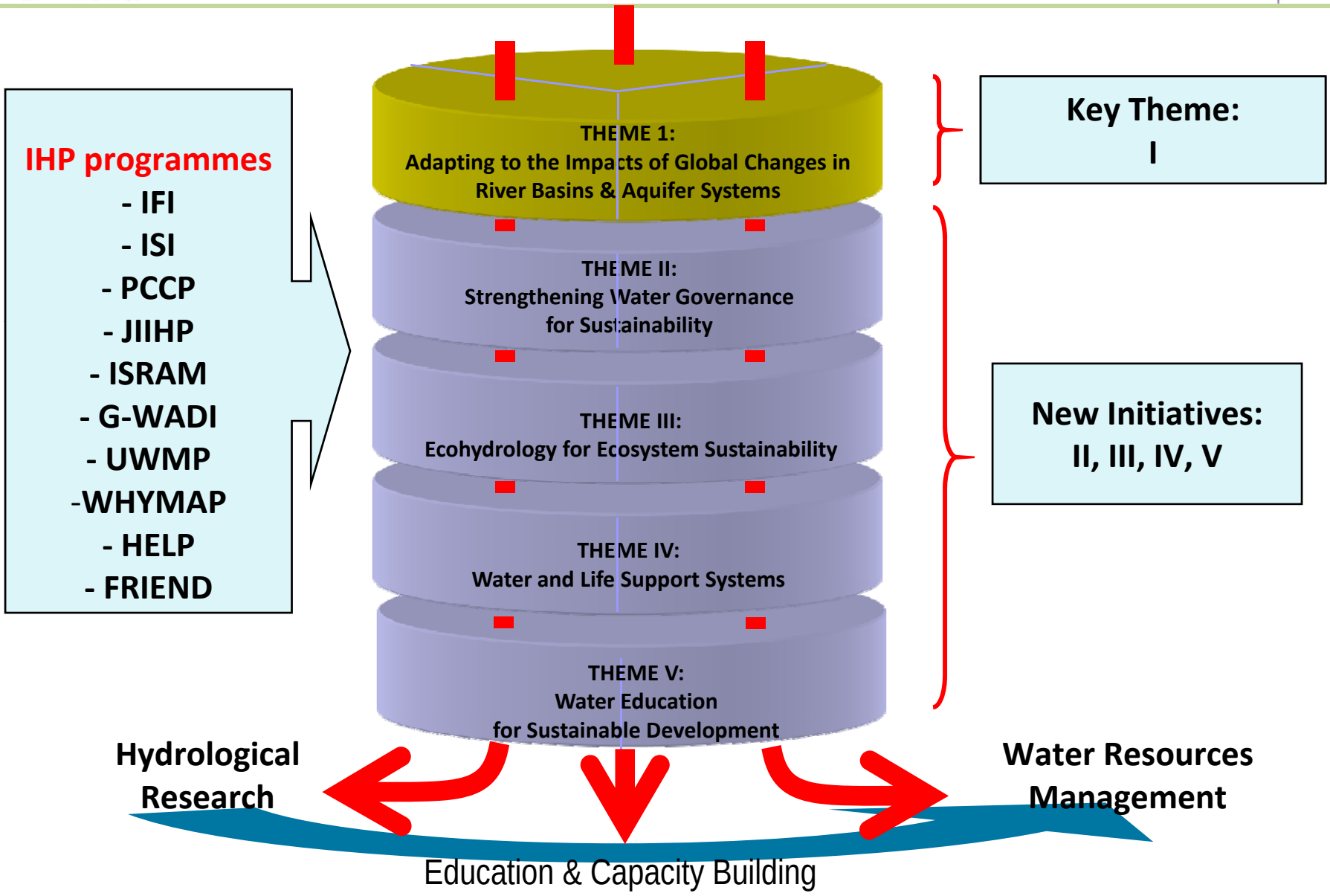


United Nations Educational, Scientific and Cultural Organization

International Hydrological Programme

IHP-VII (2008-2013)

UN Water World Water Day 2013 International Year of Water Cooperation



United Nations Educational, Scientific and Cultural Organization

International Hydrological Programme

IHP-VIII 2014-2021

UN WATER World Water Day 2013 International Year of Water Cooperation

Water security:
Responses to local, regional, and global challenges

Water Education, Key for Water Security

1. Enhancing tertiary water education and professional capabilities in the water sector
2. Addressing vocational education and training of water technicians
3. Water education for children and youth
4. Promoting awareness of water issues through informal water education
5. Education for transboundary water cooperation and governance

Ecohydrology, Engineering Harmony for a Sustainable World

1. Hydrological dimension of a catchment – identification of potential threats and opportunities for a sustainable development
2. Shaping of the catchment ecological structure for ecosystem potential enhancement – biological productivity and biodiversity
3. Ecohydrology system solution and ecological engineering for the enhancement of water and ecosystem resilience and ecosystem services
4. Urban ecohydrology – stormwater purification and retention in the city landscape, potential for improvement of health and quality of life
5. Ecohydrological regulation for sustaining and restoring continental to coastal connectivity and ecosystem functioning

Water and Human Settlements of the Future

1. Game changing approaches and technologies
2. System wide changes for integrated management approaches
3. Institution and leadership for beneficiation and integration
4. Opportunities in emerging cities in developing countries
5. Integrated development in rural human settlement

Addressing Water Scarcity and Quality

1. Improving governance, planning, management, allocation, and efficient use of water resources
2. Dealing with present water scarcity and developing foresight to prevent undesirable trends
3. Promoting tools for stakeholders involvement and awareness, and conflict resolution
4. Addressing water quality and pollution issues within an IWRM framework – improving legal, policy, institutional, and human capacity
5. Promoting innovative tools for safety of water supplies and controlling pollution

Groundwater in a Changing Environment

1. Enhancing sustainable groundwater resources management
2. Addressing strategies for management of aquifers recharge
3. Adapting to the impacts of climate change on aquifer systems
4. Promoting groundwater quality protection
5. Promoting management of transboundary aquifers

Water-related Disasters and Hydrological Change

1. Risk Management as adaptation to global changes
2. Understanding coupled human and natural processes
3. Benefiting from global and local Earth observation systems
4. Addressing uncertainty and improving its communication
5. Improve scientific basis for hydrology and water sciences for preparation and response to extreme events

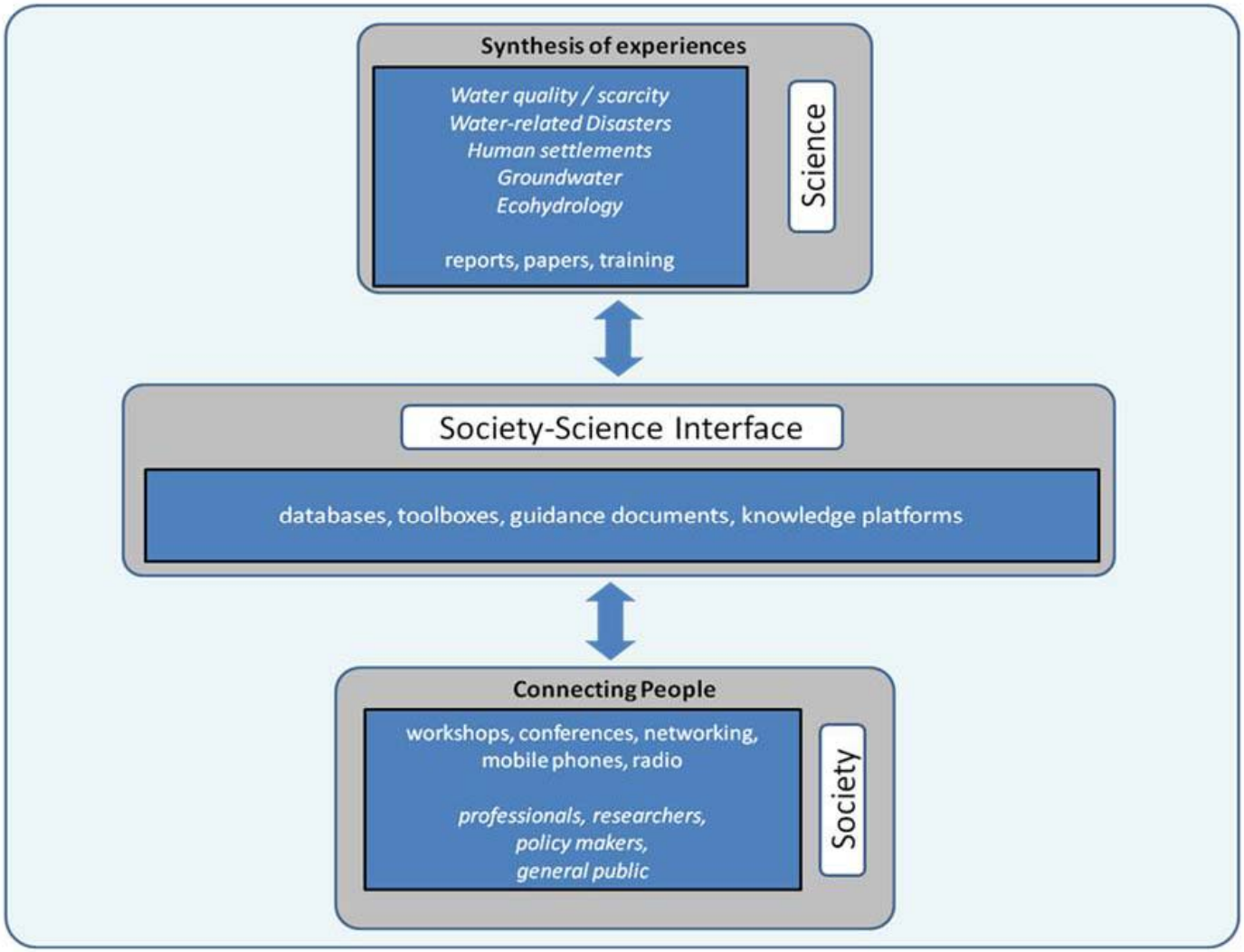
Global Change | **Governance** | **Human Dimension** | **Transboundary or Shared Waters** | **Integrated Water Ressource Management**

United Nations Educational, Scientific and Cultural Organization

International Hydrological Programme

Putting science into action

UN WATER World Water Day 2013 International Year of Water Cooperation



United Nations Educational, Scientific and Cultural Organization

International Hydrological Programme

IHP-VIII 2014-2021

UN WATER World Water Day 2013 International Year of Water Cooperation

Water-related Disasters and Hydrological Change

1.1: Risk management as adaptation to global changes
1.2: Understanding coupled human and natural processes
1.3: Benefiting from remote sensing data and ground truth
1.4: Addressing uncertainty and improving its communication

United Nations Educational, Scientific and Cultural Organization

International Hydrological Programme

IHP-VIII 2014-2021

Groundwater in a changing environment

2.1 - Enhancing sustainable groundwater resources management
2.2 - Addressing strategies for management of aquifers recharge
2.3 - Adapting to the impacts of climate change on aquifer systems
2.4 – Promoting groundwater quality protection
2.5 - Promoting management of transboundary aquifers

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International Hydrological Programme

IHP-VIII 2014-2021

UN Water World Water Day 2013 International Year of Water Cooperation

Addressing Water Scarcity and Quality

3.1 - Improving planning, management, allocation, and efficient use of water resources

3.2 - Dealing with present water scarcity and developing foresight to prevent undesirable trends

3.3 - Promoting tools for stakeholders involvement and awareness, and conflict resolution

3.4 - Addressing water quality and pollution issues within an IWRM framework - improving legal, policy, institutional and human capacity

3.5 - Promoting innovative tools for safety of water supplies and controlling pollution

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International Hydrological Programme

IHP-VIII 2014-2021

UN WATER World Water Day 2013 International Year of Water Cooperation

Water and human settlements of the future

4.1- Game changing approaches and technologies
4.2 - System wide changes for integrated management approaches
4.3 - Institution and leadership for beneficiation and integration
4.4 -Opportunities in emerging cities in developing countries
4.5 – Integrated development in rural human settlement

United Nations Educational, Scientific and Cultural Organization

International Hydrological Programme

IHP-VIII 2014-2021

Ecohydrology, engineering harmony for a sustainable world

5.1 - Hydrological dimension of a catchment– identification of potential threats and opportunities for a sustainable development

5.2 - Shaping of the catchment ecological structure for ecosystem potential enhancement ─ biological productivity and biodiversity..

5.3 - Ecohydrology system solution and ecological engineering for the enhancement of water and ecosystem resilience and ecosystem services

5.4 - Urban Ecohydrology – storm water purification and retention in the city landscape, potential for improvement of health and quality of life.

5.5 - Ecohydrological regulation for sustaining and restoring continental to coastal connectivity and ecosystem functioning

United Nations Educational, Scientific and Cultural Organization

International Hydrological Programme

IHP-VIII 2014-2021

UN Water World Water Day 2013 International Year of Water Cooperation

Water education, key for water security

6.1 - Enhancing tertiary water education and professional capabilities in the water sector

6.2 - Addressing vocational education and training of water technicians

6.3 - Water education for children and youth

6.4 - Promoting awareness of water issues through informal water education

6.5 - Education for transboundary water cooperation

United Nations Educational, Scientific and Cultural Organization

International Hydrological Programme

IHP-VIII 2014-2021

UN Water World Water Day 2013 International Year of Water Cooperation

Cross-cutting programmes and initiatives

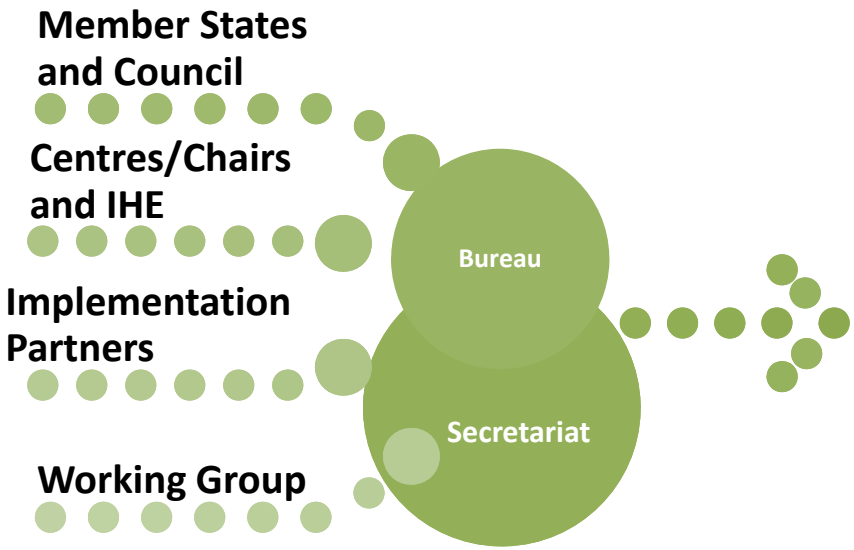
HELP: Hydrology for the Environment, Life, and Policy
FRIEND: Flow Regimes from International Experimental and Network Data
GRAPHIC: Groundwater Resources Assessment under the Pressures of Humanity and Climate Change
G-WADI: Global Network on Water and Development Information in Arid Lands
IDI: International Drought Initiative
IFI: International Flood Initiative
ISARM: Internationally Shared Aquifer Resources Management
ISI: International Sediment Initiative
JIIHP: UNESCO-IAEA Joint International Isotope Hydrology Programme
PC-CP: Water for Peace: From Potential Conflicts to Cooperation Potential
UWMP: Urban Water Management Programme
International Knowledge, Research, and Policy Initiative on Water Quality
WHYMAP: World Hydrogeological Map

United Nations Educational, Scientific and Cultural Organization

International Hydrological Programme

Detailed Consultation with Member States for implementation plan

UN WATER World Water Day 2013 International Year of Water Cooperation



December-2012
January- 2013

Development of Implementation Plan
Feb-April 2013

49th Bureau
May/June 2013

37 C/4
37 C/5

Approval of IHP-VIII
(37th Session of the General Conference)

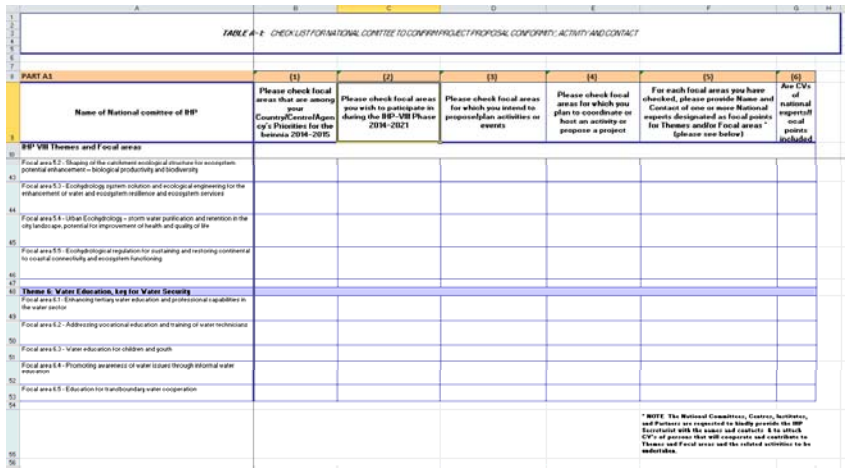


TABLE A-1: CHECK LIST FOR NATIONAL COMITEE TO CONFIRM PROJECT PROPOSAL CONFORMITY, ACTIVITY AND CONTACT

PART A1	(1)	(2)	(3)	(4)	(5)	(6)
Name of National comitee of IHP	Please check focal areas that are among your Country/Centre/Agency's Priorities for the biennia 2014-2015	Please check focal areas you wish to participate in during the IHP-VIII Phase 2014-2021	Please check focal areas for which you intend to propose/plan activities or events	Please check focal areas for which you plan to coordinate or host an activity or propose a project	For each focal areas you have checked, please provide Name and Contact of one or more National experts designated as focal points for Themes and/or Focal areas * (please see below)	Are CVs of national expert/all focal points included
IHP VIII Themes and Focal areas						
Focal area 6.2 - Shaping of the catchment ecological structure for ecosystem potential enhancement – biological productivity and biodiversity						
Focal area 5.3 - Ecohydrology system solution and ecological engineering for the enhancement of water and ecosystem resilience and ecosystem services						
Focal area 5.4 - Urban Ecohydrology – storm water purification and retention in the city landscape, potential for improvement of health and quality of life						
Focal area 5.5 - Ecohydrological regulation for sustaining and restoring continental to coastal connectivity and ecosystem functioning						
Theme 6. Water Education, Leg for Water Security						
Focal area 6.1 - Enhancing tertiary water education and professional capabilities in the water sector						
Focal area 6.2 - Addressing vocational education and training of water technicians						
Focal area 6.3 - Water education for children and youth						
Focal area 6.4 - Promoting awareness of water issues through informal water education						
Focal area 6.5 - Education for transboundary water cooperation						

* NOTE: The National Committees, Centres, Institutes, and Partners are requested to kindly provide the IHP Secretariat with the names and contacts & to attach CV's of persons that will cooperate and contribute to Themes and Focal areas and the related activities to be undertaken.

ANNEX 6

COUNTRY REPORTS

NATIONAL REPORT ON IHP RELATED ACTIVITIES
AUSTRALIA

1. ACTIVITIES UNDERTAKEN IN THE PERIOD June 2012 to October 2013

Australia waselectedto the IHP Intergovernmental Council in Nov 2011.

1.1 Meetings of the IHP National Committee

IHP activities in Australia are carried out under the guidance of the national UNESCO Science and Technology Network. In order to facilitate the implementation of UNESCO activities in Australia and the region, a national IHP Australian Network was established in 1995 and this network acts as the IHP National Committee for Australia. There are no formal meetings of the IHP Australian Network. Activities are conducted largely between the members by telecommunications (e-mail). The Australian National Commission (NATCOM) for UNESCO(www.dfat.gov.au/intorgs/unesco) has 12 members, two parliamentary representatives and four honorary members. Prof Ian White, and Mr Tony Falkland have represented the IHP National Network at these meetings.

1.1.1 Decisions regarding the composition of the IHP National Committee

The IHP Australian Network includes the following members. Summary details of all current members are listed below.Dr Dasarath Jayasuriyais the principal focus point for the National committee following the resignation of Mr Bruce Stewart who has taken up an appointment in the WMO.

Name	Expertise	Organization
Dasarath Jayasuriya	Flood and Seasonal Forecasting	Bureau of Meteorology
Tony Falkland	Island Hydrology	
Trevor Daniell	Urban, Low and High Flow Hydrology	University of Adelaide
Quentin Grafton	UNESCO Chair in Water Economics and Transboundary Water Governance	Australian National University
Peter Martin	Public Relations	CRC for Weed Management
Ian White	Hydrology/Water Quality	Australian National University
Jeff Camkin	Ecohydrology	University of Western Australia
	HELP Coordination	Centre for Excellence for Ecohydrology
Ian Cordery	Flood/Drought Hydrology	University of New South Wales
Peter Dillon	Groundwater	CSIRO Land and Water
Anne Jensen	Ecotones	Wetlands Care Australia
Ray Volker	Groundwater	University of Queensland

1.1.2 Status of IHP-VII activities

The IHP Australian Network brings together many of the key hydrological research groups within Australia. As such, Australia is able to contribute towards IHP activities through the research programs currently existing in Australia. For example, the eWater Cooperative

Research Centre (CRC) and other centres for research undertake activities which are closely aligned to the themes of IHP-VII. Figure 1 from the strategic plan for IHPVII shows the interaction of the various groups within the region as well as the elements of the plan. A description is provided below of some activities pertinent to IHP-VII. The Australian Bureau of Meteorology and CSIRO have also established a Water Information Research and Development Alliance (WIRADA) which undertakes research of direct relevance to the activities of the IHP.

Australia faces major challenges in ensuring sustainable water supply in the face of drying climate and rising demand for water. In response, the Australian Government's initiative, Water for the Future (http://ww.environment.gov.au/water/australia/index.html) is built on four key priorities of taking action on climate change; using water wisely, securing water supplies and supporting healthy rivers.

FIGURE 1
OVERVIEW OF THE RELATIONSHIPS BETWEEN THE CORE THEMES OF IHP-VII, AND THE CROSSCUTTING AND ASSOCIATED PROGRAMME COMPONENTS

THEME 1 Adapting to the impacts of global changes on river basins and aquifer systems

Focal Area I-1: Large-scale groundwater dependencies related to global change.

- The Great Australian Artesian basin and associated research activities.
- Frameworks for determining sustainable yield of aquifers

Focal Area I-2: Hydrological extremes in sensitive and stressed biomass and hydroclimatic zones e.g. small island developing states.

- Research activities involving the Pacific Island Countries

Focal Area I-3: Global change and feedback mechanisms of hydrological processes in stressed environments.

- The Murray Darling River Basin and GEWEX related research activities

Focal Area I-4: Changing global dynamics in aquatic environments: degrading ecosystems, especially those susceptible to sea level change, coastal sediment balance and pollutant accumulation.

- *Crosscutting Program Components – FRIEND and HELP*

Collaboration in the Asian Pacific FRIEND project by provision of data, hosting a node of the Internet based Water Archive, and assisting in research activities. HELP basins include the Lower Murrumbidgee catchment in the Murray Darling River Basin (coordinated by Awadesh Prasad, Murray Darling Basin Authority), Tully Basin (coordinated by Jim Williams, CSIRO), Lower Burdekin River Basin (coordinated by Keith Bristow, CSIRO), Fitzroy River basin (coordinated by Chris Carroll, Queensland Department of Environment Resources and Mines) and theOrd River Basin (coordinated by Jeff CamkinUniversity of Western Australia and Dick Pasfield). Overall coordination in Australia is through Prof. Jeff Camkin, University of Western Australia.

A subset of the hydrological data collected by the State and Territory water agencies and the Bureau of Meteorology is contributed to international data centres for use in global and regional studies. The eWater Cooperative Research Centre (http://www.ewatercrc.com.au/) hascontinued its research program that includes modelling hydroclimatic variability and impact on water resources and aquatic ecosystems and rare events and resilience in hydrological and ecological risk assessment and now offers a range of next generation products for Integrated catchment management, Complete River System management, Stormwater quality modelling, Urban water management and Ecological response management. This rapidly expanding product portfolio is the result of a partnership between the knowledge of leading scientists in the Australian water sector with the practical experience of frontline water managers from Government and Industry

The Indian Ocean Climate Initiative (IOCI) (http://www.ioci.org.au), a partnership of research organisations, is researching the impact of climate variability and climate change on the water resources of the southwest region of Australia. CSIRO (http://www.csiro.au/), Australia's national research organisation, has research programs addressing global and regional climate change, climate change impacts on natural resources including water and climate change adaptation strategies.

Australian National University (ANU) together with Ecowise Environmental have been researching vulnerability and adaptation to global change in small island countries and have contributed to AusAID's Pacific vulnerability and adaptation project. The ANU, Ecowise Environmental and the University of Adelaide have been investigating the vulnerability of water supply catchments in the Australian Capital Territory to global change.

The National Centre for Groundwater Research and Training (http://www.groundwater.com.au) has an extensive research program including research on groundwater/surface water interaction and is investigating how better to manage groundwater resources. CSIROis researching use of aquifer storage and recovery with urban stormwater and recycled water to sustain depleted groundwater resources (www.clw.csiro.au/research/urban/reuse). The ANU is researching artesian groundwater processes and modelling of groundwater changes in the lower Great

Artesian Basin and in south eastern Australia. ANU, with Ecowise Environmental, are investigating shallow groundwater recharge, socio-cultural aspects of groundwater management and impacts of climate variability in low coral islands as a follow up to a UNESCO-IHP initiated project.The Water Information Research and Development Alliance (WIRADA) brings together CSIRO's research and development expertise in water and information sciences and the Bureau of Meteorology's operational role in hydrological analysis and prediction.The Alliance has covered fields of data interoperability, hydrologic modelling, water accounting and water resource assessment. The Water data transfer standards project is defining and developing transfer standards and procedures for supply of specified data from water information providersand has contributed significantly to the development of an international data exchange standard named WaterML. Among the other significant contributions has been in improving the seasonal streamflow forecasting area using the Bayesian Joint Probability method which has been operationalised using the Bureau operational systems and now well accepted in the industry, One further development is the Australian Hydrological Geospatial Fabric which is a specialised Geographic Information System (GIS). This identifies the spatial relationships of important hydrological features such as rivers, lakes, reservoirs, dams, canals and catchments and makes working with geodata in a hydrological context much easier.

- *THEME 2 Strengthening water governance for sustainability*

Focal Area II-1: Culture, ethics and legislation for wise stewardship of water.

- Indigenous water knowledge and understanding
- Pacific Island countries culture and water issues
- A framework for integrating water policy for managed aquifer recharge into water resources management was developed and is being taken up by those states where the need is most pressing (http://www.nwc.gov.au/publications/waterlines/robust-policy-design-for-managed-aquifer-recharge)

Focal Area II-2: Good Governance, capacity development and stakeholder participation. Empowerment of human resources.

- CSIRO with NCGRT and IceWARM are providing training on MAR (management of aquifer recharge) including technical aspects, management policies and guidelines for health and environment protection
- Frameworks for determining sustainable yield of aquifers

CSIRO and SKM are each developing a thematic paper on groundwater governance for GEF-FAO (on groundwater recharge/discharge and aquifer equilibrium and on surface water-groundwater interaction, respectively)

- French-Australian Initiative on Water and Land Managementthrough the UNESCO Chair in Water Economics and Transboundary Water Governance at ANU conducted" Food and Water Security shaping Land-use Futures"12-14th June 2013 which has developed a continuing program of research on relevant issues in this focal area.

Focal Area II-3: Affordability, poverty alleviation and assured financing, for effective IWRM. Include 'water' in national PRSP'

- Implementation of IWRM in the Pacific Island Countries (assistance to SOPAC)
- Australian National Water Initiative

Focal Area II-4: Shared Water resources and conflict

- Water markets and water trading approaches
- International exchange of data

As a result of a National Water Initiative (NWI) agreed by Australian federal and state governments all Australian water agencies are required to develop comprehensive water management plans. The plans are being developed through a process of extensive stakeholder consultation and watershed modelling. The process being employed and the resultant plans provide a valuable resource for similar projects elsewhere in the world.
The WIRADA water resources assessment and water use accounting project is developing methods and technologies, to enable the Bureau to provide integrated surface and groundwater resource assessments, water accounts and water resource outlooks. The first 5 year agreement finishes in 2012 and will be reviewed for extension for a period of 3 more years

- *THEME 3 Ecohydrology for sustainability*

Focal Area III-1: Water as a landscape agent: erosive capacity, mobile solvent, habitat for aquatic biota - interdependencies and regulation in biogeochemical cycling.

- Developing policy and programs to support ecosystem enhancement through ecosystem service production
    - Australia has three UNESCO Ecohydrology Program Demonstration sites (Ord River, Western Sydney and water planning in Australia, with all three featured in the 2012 UNESCO document “Ecohydrology for Sustainability”.

Focal Area III-2: Complementing engineering solutions with ecological measures resulting in sustainable carrying capacity of ecosystems

- Developing policy and programs to support ecosystem enhancement through ecosystem service production
- National Approach to Biodiversity Decline
- Groundwater dependent ecosystems

Focal Area III-3: Urbanization pressures, sustainable cities, towns and villages; water and sanitation for mega cities

- Free exchange of information between the Australian Water Conservation Reuse Research Program and UNESCO

Focal Area III-4: Risk based environmental management (under uncertainty), especially climate change threats to ecosystem functions

- Biodiversity and climate change

The ANU and Ecowise Environmental have ongoing projects in conjunction with UNESCO-IHP investigating shallow groundwater recharge, water quality, impacts of land-use and extraction and socio-cultural aspects of groundwater management and impacts of drought in low coral islands. The ANU together with NSW Department of Primary Industry has been investigating estuary policy and management strategies to improve the health of estuaries. Research into hydrological process in and the sustainable management of wetlands is being undertaken in a number of universities and eWater Cooperative Research Centre and the ANU in conjunction with UNSW and the NSW Sugar Industry has been investigating the use of constructed wetlands to treat drainage from farm lands. The urban environment and water sensitive urban design are also areas of current research.The Bureau has been given a new responsibility under the *National Plan for Environmental Information*, which is the first step on a long-term commitment to reform Australia’s environmental information base and build this critical infrastructure for the future. It is initially a four-year program, and the first phase is a joint initiative between Commonwealth Department of Sustainability, Environment, Water, Population and Communities and the Bureau. The needs driving this initiative include looking at prioritising of investments in Natural Resource Management, identifying and predicting the impact of climate change, understanding environmental management decision impacts on the economy

and society, activation of markets for environmental goods and services, improvementof the quality and transparency of environmental assessments for major projects and driving more sustainable resource management.

- *THEME 4 Water and life support systems*

Focal Area IV-1: Methodologies for safeguards against water borne biotic and abiotic pollutants
Focal Area IV-2: Access to safe water, human health and integrated water resource management.

-
- An AusAID project has been approved to facilitate development of water quality guidance for managed aquifer in India. UNESCO Delhi office is assisting in project establishment.
- An IAH Commision on MAR project has commenced to produce a monograph on clogging in MAR and the international publication is being led by an Australian editorial team from AGT and CSIRO. This addresses an important constraint on the effectiveness of recharge enhancement.

Focal Area IV-3: Non-conventional water resources: brackish water use and waste water re-use.

- A major new research project on storing wetland treated stormwater in a brackish aquifer for recovering potable water. This will be an icon project with much on HACCP that will be transferable to developing countries.This now has partners in China, India and Singapore.
- Free exchange of information from Australian Water Conservation Reuse Research Program and UNESCO (http://www.clw.csiro.au/publications/awcrrp/)

Focal Area IV-4: Access to water for food security in environmentally stressed zones.

- Climate variability and change and water resources for agriculture

The National Land and Water Resources Audit (http://www.nlwra.gov.au/) and http://audit.ea.gov.au/ANRA/atlas_home.cfm) and the Water and the Economy study have produced a considerable body of data and information about the value, use, distribution and quality of water within Australia.
Research on property rights of water and the structure, operations and social and economic impacts of water trading markets continues to receive a lot of attention in Australia and is a potential resource for similar projects in other countries. The ANU, the French agency CIRAD and Ecowise Environmental has undertaken research on the use of multi agent systems and companion modelling to support negotiations and reduce conflict over groundwater use in low atolls.

- *THEME 5 Water education for sustainable development*

Each of the Cooperative Research Centres (CRC) is required to undertake an active program of training to ensure their research and technology are transferred into practise as soon as possible. The water related CRCs are:
eWater CRC (http://www.ewatercrc.com.au/)
CRC for Irrigation Futures (www.irrigationfutures.org.au/)

These CRCs are a partnership between universities and other research centres that also have educational and training programs. Some of the research centres are listed separately below.
National Centre for Groundwater Research and Training (http://www.groundwater.com.au)

The purpose of the centre is to provide research, education and specialist services for Australian and International land and water industries with the objective of improving the management of resources affected by groundwater processes.

Centre for Environmental Applied Hydrology (http://www.civag.unimelb.edu.au/ceah)

The Centre for Environmental Applied Hydrology is a research centre within the Departments of Civil and Environmental Engineering and Geography and Environmental Science at the University of Melbourne. Specific expertise covers all aspects of surface and groundwater hydrology, hydraulics and geomorphology.

Fenner School of Environment and Society, Australian National University (http://cres.anu.edu.au) conducts research and postgraduate training in spatial-temporal variability and characterisation of climate, integrated catchment management, groundwater modelling and hydrology, floods and droughts, coastal hydrology and land use, salinity, cultural and indigenous water issues, water and land policy and related socio-economic interactions, ecological economics.

The International Centre of Excellence in Water Resource Management (ICE WaRM) (http://www.icewarm.com.au/) is made up of a consortium of universities and has a strong focus on education and training. It promotes itself to international water resource management students to further their education in Australia and is also developing online courses for delivery in Australia and overseas.

International Water Centre (www.watercentre.org/) is a joint venture between University of Queensland, Griffith University, Monash University, University of Western Australia, International RiverFoundation, Moreton Bay and Catchments Partnership and the Queensland Government. The Centre aims to take Australia's expertise in whole of water cycle management to organizations in the rest of the Worldthrough Applied Research, Education and Training and Knowledge Services.

Professor David Waite, Director of the Centre for Water and Waste Technology & Dr Ashish Sharma, from School of Civil & Environmental Engineering at UNSW, are collaborating with Hohai University of Nanjing to develop joint research & Masters' level training programs in WATER MANAGEMENT through the Australia China Consortium for Water Research (ACCWR)

- The University of Western Australia has entered into a Memorandum of Understanding with the International Centre for Coastal Ecohydrology (under the auspices of UNESCO). Prof. Jeff Camkin, who coordinates HELP in Australia, has designed and delivered new components of the Erasmus Mundus MSc in Ecohydrology course in 2010, 2011, 2012. These courses have involved UNESCO HELP network participants from Australia, New Zealand, Malaysia, Philippines, France, Portugal, Spain, providing a bridge between UNESCO Ecohydrology and HELP programs and basins.
- *Crosscutting Program Components – FRIEND and HELP*

Collaboration in the Asian Pacific FRIEND project by provision of data, hosting a node of the Internet based Water Archive, and assisting in research activities. Australia currently has five UNESCO-IHP HELP basins (Ord, Murray Darling, Fitzroy (QLD), Burdekin and Tully. Further details are below.

1.2 Activities at a national level in the framework of the IHP

1.2.1 National/local scientific and technical meetings

- Practical Responses to Climate Change 2012, Water and Climate: Policy Implementation Challenges, 1 - 3 May 2012, National Convention Centre, Canberra, Website: www.climatechange2012.org
- The Irrigation Australia 2012 Conference & Trade Show took place in Adelaide, 24 – 29 June. This meeting incorporates theICID: 63rd IEC Meeting & 7th Asian Regional Conference

- 9th IWA Leading-Edge **Conference** on **Water** and Wastewater Technologies. 3 - 7 June 2012. Brisbane, **Australia**
- OZWATER'12 was held in Sydney 8-10 May, 2012 at the Sydney Convention and Exhibition Centre Darling Harbour.
- 14th Water Distribution Systems Analysis Conference, 24-27 September 2012 in Adelaide, South Australia. WDSA 2012 is produced as part of the annual conference series sponsored by the American Society of Civil Engineers (ASCE)
- 34th Hydrology and Water Resources Symposium (HWRS) in Sydney, Australia on 19 – 22 November 2012.
- OZWATER'13Perth7-9 May, 2013in Perth, Western Australia
- The 40th International Congress of the IAH hosted in Perth between 15 and 20 September, 2013. Themed 'Solving the Groundwater Challenges of the 21st Century
- Australian Stream Management Conference, "Managing-for-extremes"-Feb-6-8-2012, Canberra, ACT, http://australianriverrestorationcentre.com.au/australian-stream-management-conference-managing-for-extremes-feb-6-8-2012/

- **National Workshop on Monitoring and Evaluation (M&E) of Environmental Flows (National Water Commission)** On 10-11 December 2012, around 120 managers and academics from all states and territories participated in a two-day workshop at ANU, which was sponsored by the Commission. Four key actions emerged: development of agreed principles around data storage and management, development of best practice guidelines for the design and implementation of environmental flow M&E, communication of MERI benefits via value propositions, and development of a community of practice.

- A number of meetings of the National Committee on Water Engineering, Institution of Engineer's have been held during this period. Some of the key purposes of these meetings are to coordinate and organise hydrology and water resources symposia and conferences, to coordinate the ongoing revision to the national hydrological design guidelines Australian Rainfall and Runoff, prepare Position Papers on key hydrological issues and to manage the publication of Australian Journal of Water Resources. Position Papers are now all available on the Institution of Engineers, Australia web site: (http://www.eng.newcastle.edu.au/~ncwe/ncwePosPaper/ppHome.htm).

- FRENCH-AUSTRALIAN FORUM ON WATER AND LAND MANAGEMENT
  "Food and Water Security shaping Land-use Futures"12-14th June 2013 The Australian National University, Canberra, Australia
  This event is the second forum for the French-Australian Initiative on Water and Land Management and had participationfrom a number of IHP Committee members -Profs Quentin Grafton, Ian White and Trevor Daniell

1.2.2 Participation in IHP Steering Committees/Working Groups

CSIRO is the Australian research organisation linked to the Water and Development Information for Arid Lands – A Global Network (G-WADI) project set up by the IHP (www.gwadi.org/).

Mr Trevor Daniell was elected Chairman of the SE Asia and Pacific Regional Steering Committee in Kyoto in October 2011 and has attended RSC meetings in this capacity.

Prof. Jeff Camkin, University of Western Australia, was invited to the Steering Committee for the 2nd International HELP Symposium Building Knowledge Bridges for a Sustainable Water Future, Panama, November 2011.

1.2.3 Research/applied projects supported or sponsored

As a follow-up to the UNESCO/SOPAC research projects in Kiribati and Tonga, Professor Ian White, ANU is Project Manger of an ACIAR (Australian Centre for International Agricultural Research) sponsored project titled: Equitable Groundwater Management for the Development of Atolls and Small Islands. Its overall aim was to provide the basis for the sustainable use and equitable sharing of groundwater resources and their associated catchments between competing sectors, particularly agriculture, combining research on climate, groundwater, cropping and irrigation practices, economics, cultural traditions and social customs, and the aspirations and needs of stakeholders. The first phase of the project in Kiribati focussing on equitable groundwater use in North and South Tarawa was carried out in conjunction with the French agency CIRAD, the South Pacific Applied Geoscience Commission and government agencies in Kiribati and Tonga. This work used Multi Agent Systems and a companion modelling approach to develop Negotiation Support Systems to minimise conflicts over water resource development and use.

1. Kiribati Adaptation Programme Phase II
Development of National Water Resources Policy and National Implementation Plans
The Pacific small island nation of the Republic of Kiribati has water resource problems amongst the most challenging in the world: rapidly growing population; urbanisation; high infant death rates due to water borne-diseases; limited freshwater supplies; restricted resources and capacity; vulnerability to climate change and variability; seawater intrusion; unclear management and regulatory roles; and limited information on the quantity and quality of water resources. This project focussed on the development of the country's first National Water Resources Policy and 10-year Implementation Plan. Simple translocations of developed-world policy frameworks and "toolkits" to small island nations are unlikely to succeed because they ignore the local biophysical, socio-cultural, governance and resource context. Instead, analysis of past ministerial declarations, government decisions and community consultations as well as publicly-developed water resource priorities were used as a basis for developing policy. Many of the pressing national problems can be addressed through seven key policy objectives: improved understanding and monitoring of water resources and their use; increased access to safe and reliable water supplies and appropriate sanitation; achieving financially, socially and environmentally sustainable water resource management; increased community participation in water management and conservation; improved governance in water and sanitation sectors; providing training opportunities for and mentoring of staff in the sector; and decreasing unaccounted for water losses and improved cost recovery. These objectives were used as the framework for developing a 10-year National Water Resources Implementation Plan, The Cabinet of the Government of Kiribati endorsed both the National Policy and its Implementation Plan in January 2009.
Project support: The Kiribati Groundwater Hydrology Programme was initiated under UNESCO IHP V Theme 6, Humid Tropics Programme. It has been supported by UNESCO IHP, the Australian Centre for International Agricultural Research grant LW1/2001/050, by the European Union-SOPAC Pacific Water Governance Project, by AusAID, NZAid and the World Bank through the Kiribati Adaptation Programme Phase II and by Agence Francaise de Developpement (AFD), France.

2. Kiribati Adaptation Programme Phase II

Development of a 10-20 Year Water Master Plan for Tarawa.

The Water Master Plan for Tarawa is a direct response to the Government of Kiribati's National Water Resources Policy and its accompanying Implementation Plan. It focuses on the ability of groundwater sources, the traditional source of the majority of water used in Tarawa, the most populated atoll in the Republic and the location of the capital, to meet expected future demands. This focus is necessary because there are a number of knowledge gaps and difficult issues which need to be addressed by the government, its Ministries and agencies as well as the community. Demand for water in Tarawa is estimated over the next 10 to 20 years. Tarawa is an island in transition from largely subsistence, rural lifestyles, still largely followed in North Tarawa, to high-density, urban living in South Tarawa. Over the last 50 years, demographic and socio-economic factors have changed dramatically. This means that the traditional adaptation strategies developed over 4,000 years of subsistence in small islands are largely ineffective in coping with the demands of a modern urban society. The issues faced in groundwater management in Tarawa are already critical and future population growth will severely challenge the Government's ability to provide adequate supplies of safe, good quality water. Work in the Tarawa Water Master Plan has identified significant shortfalls in the ability of treated reticulated groundwater to meet the water needs of future populations in Tarawa. The potential for meeting some of the future water needs of Tarawa for the next 20 years through rainwater harvesting was examined. The large variability of rainfall in Tarawa, mostly driven by ENSO events plays a critical role. Major droughts occur on average about every 7 years and can last for two years. The predictions from climate change studies Global Circulation Models (GCMs) of changes in future rainfall and drought frequency due to climate change are problematic since the GCMs do not simulate ENSO events. It is assumed here that the future variability of rainfall in Tarawa over the next 20 years will be similar to that in Betio over the period 1947 to the end of 2008.

It was found that there is currently insufficient capacity in South Tarawa to meet the current water needs using piped, treated fresh groundwater from Bonriki and Buota water reserves and from domestic rainwater tanks. Future demand will be even greater than current demand and there is an urgent need, and one mandated by GoK in its National Water Resources Policy, to supply adequate quantities of safe freshwater to meet that demand.

The suggestions of previous studies in Tarawa have been reviewed. Desalination, bulk importation by ship, large constructed rainwater harvesting systems, recycling and a reclaimed island in the lagoon built to act as a source of fresh groundwater for the water supply system have all been critically examined. It is emphasised here that development of any other water source should only be considered once the existing leaks in the reticulation systems are dramatically reduced. There is no point in investing in extra water sources when losses from the reticulation system are 50%.

Project support: The Kiribati Groundwater Hydrology Programme was initiated under UNESCO IHP V Theme 6, Humid Tropics Programme. It has been supported by UNESCO IHP, the Australian Centre for International Agricultural Research grant LW1/2001/050, by the European Union-SOPAC Pacific Water Governance Project, by AusAID, NZAid and the World Bank through the Kiribati Adaptation Programme Phase II and by Agence Francaise de Developpement (AFD), France.

2. Groundwater Vulnerability, Tongatapu Kingdom of Tonga. This SOPAC/EU EDF8 project on the monitoring and assessment of the vulnerability of groundwater resources in Tonga's main island Tongatapuwas conducted by a team from the Ministry of Lands, Survey, Natural Resources and Environment, the Tonga Water Board and the Australian National University. Tongatapu is blessed with reliable rainfall and fertile soils but has groundwater of variable quality for drinking. There are increasing demands on, growing threats to, and public

concerns about its groundwater, which require wise management and use to ensure adequate supplies of safe freshwater for current and future generations, in accord with UN Millennium Goals and the Pacific Regional Action Plan on Sustainable Water Management.The team found that natural, human and institutional factors all add to the natural vulnerability of groundwater in Tongatapu. Strategies to decrease this vulnerability and protect Tongatapu's vital groundwater resource were presented. The main being the introduction of a Water Resources Bill to provide legal protection of groundwater sources and assign clear roles and responsibilities to government agencies and corporations.

3. Development of a National Water and Sanitation Policy Framework and Implementation Plan for the Republic of Nauru. This project is being conducted by ANU with support from the EU Pacific Integrated Water Resources Management National Planning Programme being run by the Secretariat of the Pacific Community's Applied Geoscience Division (SOPAC). Water supply and sanitation issues in Nauru are amongst the most complex and challenging in the world. This is due to frequent, severe droughts, which are closely related to sea surface temperature, increasing demand for freshwater, the impact of settlements and sewage on the safety of Nauru's very limited fresh groundwater, reliance on expensive, energy-intensive and aging desalination, limited water storages which are exhausted during droughts, less than ideal water distribution systems, absence of demand management, low rates of community participation limited resources and capacity to address the priority issues and future impacts of climate change. The Policy and its Implementation Plan addresses these challenges and are being developed through a whole-of-government and community-based-organisation Steering Committee under the Department of Commerce, Industry and Environment. The Policy whose theme is *Ebōk eiy itsimor, Ebōk eiy itsimor, Ebōk eiy gaganado, Rañga kō wam ebōk bwain tsimorum ñage me iyamwan*(Water is life, Water is precious, Care for water for your life for today and for the future) was endorsed by Cabinet of the Government of Nauru on 7 February 2012. The Implementation Plan is now being finalised.

1.2.4 Hydrology for Environment, Life and Policy (HELP)

Australia continues to contribute to the projects established under the HELP banner: the Lower Murrumbidgee catchment in the Murray Darling River Basin(coordinated by Awadesh Prasad, Murray Darling Basin Authority), Tully Basin (coordinated by Jim Williams, CSIRO), Lower Burdekin River Basin (coordinated by Keith Bristow, CSIRO), Fitzroy River basin (coordinated by Chris Carroll, Queensland Department of Environment Resources and Mines) and theOrd River Basin (coordinated by Jeff CamkinUniversity of Western Australia and Dick Pasfield). Overall coordination in Australia is through Prof. Jeff Camkin, University of Western Australia.

A meeting of HELP Australia and New Zealand Coordinators took place at RiverSympoium held in Perth in October 2010 in conjunction with a public seminar on HELP in Australia and the Pacific..

Prof. Jeff Camkin was an invited keynote presenter at the IHES/UNESCO Symposium Restoring Rivers for Future, South Korea (April 2011) and invited member of the Steering Committee for the UNESCO-IHP HELP 2nd International Symposium Building Knowledge Bridges for a Sustainable Water Future in Panama, November 2011.

The HELP Program, and HELP network participants from Australia and other countries, has featured in new modules developed for the Erasmus Mundus MSc in Ecohydrology delivered at the University of Algarve through a collaboration between the International Centre for Coastal Ecohydrology (under the auspices of UNESCO), the UWA and Technical University of Lisbon.

Ord River Help Basin activities include: successful nomination of the Ord River as a UNESCO Ecohydrology Program Demonstration Site in May 2010; a HELP workshop with Ord stakeholders in July 2010 to develop a HELP workplan; and joint papers and presentation with a comparable basin in Portugal (Guadiana) at conferences in Australia and Portugal (2010) and Korea (2011).

Fitzroy HELP Basinactivities include: The Paddock to Reef Integrated Monitoring, Modelling & Reporting Program focuses on diffuse water quality entering the Reef to track progress towards the Reef Plan targets.

Lower Burdekin HELP Basin activities included: The BWF is in the process of appointing an independent Chair and is reviewing its progress to date and confirming and updating future activities and directions.

Activity in the Murray Darling HELP Basin has focussed on the development of a Basin plan, the largest ever water reform in the Murray Darling Basin.

1.2.5 Collaboration with other national and international organizations and/or programmes

As President of the WMO Commission for Hydrology Network, Mr Bruce Stewart provided a link between the UNESCO IHP and WMO's Operational Hydrology Programme. Mr Tony Falkland and Prof Ian White are members of the Water Working Group of the Science, Technology and Resources Network of the South Pacific Applied Geoscience Commission. Prof Ian White is a member of the Asian Pacific Association of Hydrology and Water Resources.Mr Trevor Daniell is the past Chairman of the FIGCC.DrPeter Dillon chairs the IAH Commission on Managed Aquifer Recharge.University of Western Australia has entered into a Memorandum of Understanding with the International Centre for Coastal Ecohydrology (under the auspices of UNESCO). Prof. Jeff Camkin, who coordinates HELP in Australia, has designed and delivered new components of the Erasmus Mundus MSc in Ecohydrology course in 2010, 2011, 2012 and further work is being developed under the MoU.

1.2.6 National Plan for water security

As a result of 10 years of drought across a large portion of the country, in recognition that past management of water resources has not been effective, and that the recent National Water Initiative was not achieving sufficiently rapid progress in improving water management, the Australian government has embarked upon a National Water Security Plan. The plan has funding of A$10B, will run for 10 years and includes the following components.

- a nationwide investment in Australia's irrigation infrastructure to line and pipe major delivery channels;
- a nationwide programme to improve on-farm irrigation technology and metering;
- the sharing or water savings on a 50:50 basis between irrigators and the Commonwealth Government leading to greater water security and increased environmental flows;
- addressing once and for all water over-allocation in the Murray-Darling Basin;
- a new set of governance arrangements for the Murray-Darling Basin;
- a sustainable cap on surface and groundwater use in the Murray-Darling Basin;
- major engineering works at key sites in the Murray-Darling Basin such as the Barmah Choke and Menindee Lakes;

- expanding the role of the Bureau of Meteorology to provide the water information necessary for good decision making by governments and industry;
- a Taskforce to explore future land and water development in northern Australia; and
- completion of the restoration of the Great Artesian Basin.

The release of the National Plan for Water Security has resulted in the passing of the first Water Act. Previously water management was covered by legislation of the eight State and Territory governments.

1.3 Educational and training courses

The National Centre for Groundwater Research and Training (a joint venture between 9 research/educational institutions, government water management organizations and private consultants) organises a wide range of groundwater related training courses. Details of courses can be found at the web site http://www.groundwater.com.au/conf/content.asp. The centre has established strong links with institutions in the region, particularly in Indonesia, Malaysia, Thailand and China.

1.4 Publications

There are numerous Publications from various conferences and Journals.
Some of Particular interest are :
Australian Bureau of Meteorology and CSIRO, 2011. Climate Change in thePacific: Scientific Assessment and New Research. Volume 1: Regional Overview.Volume 2: Country Reports.http://www.cawcr.gov.au/projects/PCCSP/publications.html
Neto, S., Chicharo, L. and Camkin, J. 2011. Building synergies from the UNESCO-IHP HELP and Ecohydrology Programmes in the Guadiana river basin. UNESCO-IHP HELP International Symposium Building Knowledge Bridges for a Sustainable Water Future, Republic of Panama, 21-24 November 2011

Camkin, J. and Neto, S. 2011. New learning foundations for building water knowledge bridges. UNESCO-IHP HELP International Symposium Building Knowledge Bridges for a Sustainable Water Future, Republic of Panama, 21-24 November 2011

Camkin, J. 2011. Addressing changing hydrology, ecological condition and community attitudes to water at the Ord River, Western Australia. IHES - HELP Symposium Restoring and managing rivers for the future, Daegu City, Republic of Korea, April 2011

Recent publications of National Water Commission
http://nwc.gov.au/newsletter/dec2012
Water for Australia's Arid Zone – Summarises the main findings from investigations at five regional demonstration sites and outlines the process involved in developing the new thematic palaeovalley map of arid and semi-arid Western Australia, South Australia and the Northern Territory.
National-scale vulnerability assessment of seawater intrusion - Identifies several opportunities to progress and develop effective resource management and protection of Australia's coastal aquifers through additional monitoring, research, stakeholder education and communication.
Recognising the broader benefits of aquatic systems in water planning: an ecosystem services approach - Encourages a more comprehensive, systematic and transparent consideration of the multiple benefits of aquatic systems in water planning.

Three groundwater reports—the final publications in the Waterlines series—illustrated that given their value and criticality, our groundwater resources warrant greater investment in monitoring and management to support sustainable management:

- An assessment of groundwater management and monitoring costs in Australia - Assesses existing groundwater monitoring infrastructure in terms of age, technology, suitability of coverage, and baseline cost.
- Assessing the value of groundwater - Sets out to improve knowledge of the value of groundwater and to provide a tool to factor in economic considerations when making decisions about resourcing and managing a groundwater resource.
- Cost recovery for groundwater planning and management in Australia - Benchmarks current approaches to cost recovery for groundwater planning and management activities in Australia.

1.5 Participation in international scientific meetings

There have been numerous individuals participating in many meetings for IHP, APFRIEND, WMO, SOPAC, HELP.

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2.6 Other activities at a regional level

A project titled: Enhanced Application of Climate Predictions in Pacific Island Countries is currently in progress to meet the general goals of improving weather and climate services and products. The AusAID funded project is developing a climate prediction capacity in participating countries, and in particular, is providing a framework for incorporating climate prediction information into planning across a broad range of agencies and industries. The climate prediction system being provided under the project is based upon the seasonal climate prediction system of the Australian Bureau of Meteorology, which has successfully issued climate predictions for some years. (www.bom.gov.au/climate/pi-cpp/)

DrPeter Dillon of the CSIRO, Water Recycling and Diversified Supplies,Urban Water Theme, Water for a Healthy Country Flagship Program,CSIRO Land and Water, has been active in Managed Aquifer Recharge across the region and beyond.
www.clw.csiro.au/research/urban/reuse

2.6.1 Institutional relations/co-operation

No information available at this time.

2.6.2 Completed and ongoing scientific projects

Refer section 1.2.3 re ongoing Pacific Island projects.

3. Future Activities

2.1 Conference Activities in 2013-2014

- MODSIM2013 congress will be held in Adelaide, South Australia, from Sunday 1st to Friday 6th December 2013. The theme for this MODSIM2013 event will be *Adapting to Change: the multiple roles of modelling.*
- Water Sensitive Urban Design 2013 WSUD 2013 Key dates, 25–29 November 2013 and the 8th International Water Sensitive Urban Design Conference 2013 https://www.engineersaustralia.org.au/events/conferences
- 35th Hydrology and Water Resources Symposium 2014 (HWRS 2014)

Perth, Western Australia to be held 17-23 February 2014 at the Pan Pacific Hotel. Website: http://www.hwrs2014.com/

- 2013 Asia Pacific Water Industry Modelling Conference the premier event in Asia Pacific for infrastructure modelling and management. The conference will be held on 4 & 5th September, 2013 at the Sofitel Hotel in Brisbane, Australia. http://www.asiapacificwater.com/overview/

- *WASH 2014 - Water, Sanitation and Hygiene for Everyone, Everywhere* **24-28 March 2014, Brisbane, Australia** Web: **www.wash2014.com.au**
- NOM5 Down Under - 5th IWA Specialist Conference on Natural Organic Matter Research 1-4 October 2013, Pan Pacific Hotel, Perth, Western Australia Website: http://www.awa.asn.au/NOM2013/
- FENNER CONFERENCE FOR 2013 Shine Dome, the Australian Academy of Science, Canberra 10, 11 October 2013 "Population, Resources And Climate Change – Implications For Australia's Near Future"
- Stormwater 2014 - National Conference on Urban Water Management Hosted by the Stormwater Industry Association 13th - 17th October 2014, Hilton Adelaide, South Australia

2.2 Activities Planned for 2013-2014

- Transference of the outcomes of update of ARR to the International Community.
- Continuation of assistance to Pacific Island Projects.
- Continuation of involvement in Asian Pacific FRIEND and Global FRIEND 2014 Conference (Trevor Daniell is Chief editor of Proceedings).
- Continuation of involvement in HELP
- Participation in the IHP Intergovernmental Council of 2014

2.3 Activities envisaged in the long term

No information available at this time.

CHINA

National Report on IHP Related Activities

for

21st UNESCO IHP Regional Steering Committee (RSC) Meeting
for Southeast Asia and the Pacific (SEAP)

Contribution to IHP-VII (2008-2013)

30 September ~ 5 October, 2013
Gyeongju City, Gyeongbuk, Republic of Korea

Chinese National Committee for the IHP

This report is submitted to the 21st RSC meeting for the IHP at 30 Sept ~ 5 Oct, 2013
Gyeongju City, Gyeongbuk, Republic of Korea

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Contents

1. ACTIVITIES UNDERTAKEN IN THE PERIOD December 2012 – September 2013

1.1 Meetings of the Chinese National Committee for IHP

1.1.1 Decision regarding the composition of the Chinese National Committee

The current IHP national committee consists of **29** distinguished water experts who are active in hydrology and water resources work in China (see **Annex I**).

1.1.2 Status of IHP-VII activities

China national committee has arranged projects and activities in all themes and almost all focal points of IHP-VII through national committee members, focal points and working groups around the country. Some activities are provided in the following paragraphs.

(1) On 18 January 2013, the annual meeting of the Chinese national committee for IHP was hold in Beijing.

During the meeting, chairman, secretaries, and most committee member participated in the annual meeting. During the meeting, the secretary reviewed activities of the national committee during the past few years since the last annual meeting took place in Nanjing in 2011. The activities show high contribution to IHP-VII.

The meeting also listed the key issues to be solved and gained contributions from committee members for the implementation, including:

- How China regain the council member seat in UNESCO IHP competition
- How China national committee implement and contribute to the IHP VIII (2014-2019) themes;
- How to cope with the current situation of IHP in China, that likewise the general situation in UNESCO IHP, lack of budgets and lack of young people who wish to participate in the activities.

Focusing the raised questions, the members discussed and provided suggestions on how to solve those key issues. Particularly on the contribution to IHP VIII (2014-2019), most members pointed out that in fact the themes provided in IHP VIII are quite in line with their development goals, especially the plan each water sectors in China has developed in the 12^{th} 5-year plan. The members are in general positive to that hydrological work in China in general will contribute to the IHP VIII phase activities and objectives, the only question is how to share what we gain with others on world-wide platform, for which, all members agreed that becoming the council member will be encouraging for such a knowledge and technology sharing on a world-wild platform. Thus, on behalf the ministry, the bureau of international cooperation and technology and science promised to help on promoting the competition on the council membership on the coming new round competition.

Based on current financial management mechanism, the members pointed out that the activities have to be highly related to their work development needs, so to gain more initiative from the young engineers.

1.1.3 Decision regarding contribution to/participation in IHP-VII

During Nov 2012-Sep 2013, there were a couple of informal IHP national committee meetings or discussions. Through some focal points for certain projects, members of IHP and working groups desired to complete the on-going projects in their capacities. Meanwhile, the committee encourages IHP members to continue sharing knowledge and technology, and cooperate in various ways to promote hydrological development. Most activities are carried out among organizations of committee members.

1.2 Activities at national level in the framework of the IHP

1.2.1 National/local scientific and technical meetings

(1) National symposium on hydrology was held on December 10, 2012, in Nanjing. The symposium was organized by the bureau of hydrology of the ministry of water resources, IHP china national committee, national committee of IAHS and the national hydrological committee. The theme of the symposium is "new development of china hydrology on science and technology", focusing on theoretical research and applications on hydrology, monitoring on water resources and hydrology, hydro-meteorological forecasting for flood management and drought relief, water resources assessment and system development, assessment on hydro-ecology and hydro-environment, and quality management on hydrological work.

Participants of the symposium represent the highest level on hydrology in Chin, including the Vice minister of Liu Ning presented in the symposium and delivered keynote speech. Academia Mr. Liu Changming, Mr. Wang Guangqian, Mr. Wang Hao, Mr. Zhang Jianyun and other 7 national – level professionals also present the symposium with various topic work, in addition, more than 90 Chinese professionals participated in the symposium.

In the keynoted delivered by Vice Minister Liu Ning, emphasis has been given on the combination of regular daily management and emergency response shall due to the practical needs raised from the entire circle of hydrology phenomena, to ultimately improve the security

level of water resources utilization and exploration. After the opening ceremony, Vice Minister of Mr. Liu Ning attended the opening ceremony of the "base for flood control and emergency response (Chuzhou city)" and "State important laboratory for hydrological survey, Chuzhou base". Those base and laboratories will be providing infrastructure to facilitate university students' research.

(2) National Hydrology work video conference was held on 26 March 2013, in Beijing. This is an annual work meeting particularly in the field of hydrology. The vice minister of WMR - Mr. Liu Ning, Chairman of China IHP national committee also the director general of the bureau of hydrology of WMR, Mr. Deng Jian, and various committee members of the national IHP committee participated the video conference meeting. Officers of provincial water authorities, provincial bureau of hydrology and bureau of hydrology from each river basin commission took part in the video conference at their own office.

The meeting reviewed work achievements, problems and experiences learnt from the past, and discussed about the current situation and demands to hydrological work, and set up objectives for the hydrological work for the year of 2013.

According to Vice Minister Liu Ning, the achievement in 2012 was excellent, particularly on hydrological monitoring and forecasting, which has provided solid support to water resources management. Improvements have been made on the development of monitoring instruments and network for middle-small scaled rivers. The regulations on hydrology and management have gained new progress, and general investigations on rivers and lakes have been completed.

During the meeting, new challenges faced by hydrology are also identified, particularly on promoting social-needs and social-services on hydrology. For the work of 2013, the following objectives are given:

- Make all efforts to support flood management and drought relief by providing prompt and accurate flood monitoring and forecasting information;
- Promote organizational reforming of hydrology;
- Promote preparation for hydrological planning work;
- Continue construction of hydrological monitoring network for middle-small scaled rivers;
- Promote services from hydrology for management of water resources and urban hydrology;
- Improve capacity building.

(3) Meeting on promotion on state groundwater monitoring was held on 22 March, 2013, in Beijing. Organized by the bureau of planning and the bureau of hydrology, the meeting aim to promote groundwater monitoring work at a country wide level.

Directors from various river basins (mostly from north china) and water authorities of 11 provinces participated in the meeting. The meeting was chaired by Mr. Deng Jian, the director of the Bureau of hydrology, MWR and the chairman of IHP China national committee.

The meeting reported the reviewing and approving procedures of the feasibility study report on groundwater monitoring, for which, 4 conditions should have been made before the approval. The meeting discussed procedures of these conditions, and has reached agreement on how to promote such work.

Specific requirements have been given by both the director of bureau of hydrology and the director of the bureau of planning, of MWR, on timing, work contents etc., to facilitate obtaining approval from higher level to carry out groundwater monitoring at national wide.

(4) Workshop on early warning and information publication was during 21-22 Nov, 2012, in Taiyuan, Shanxi province. Organised by the bureau of hydrology, MWR, directors of hydrology bureaus of all 7 river basins and water authorities of 31 provinces attended the workshop.

The workshop introduced "standard of hydrological early warning system", "methodology of information publishing of early warning system", and demonstrated national platform of early warning system on hydrology. Participants studied and discussed about the standards, the methodology and the platform, and have reached mutual understanding that such work shall be promoted as quickly as possible.

According to Liu Xuefeng, the vice director of the bureau of hydrology, MWRC, to publish early warning is an important responsibility of hydrological authorities at all level, which is the urgent needs from flood control and drought relief work.

Comments and advices are invited to improve the current version of standard and methodology.

(5) Workshop on hydro-ecology monitoring in 31 May, 2013. To promote environmental protection and to improve monitoring technology on hydro-ecology, organized by the bureau of hydrology, a workshop on this particular topic was held. 60 representatives from the bureau of water resources, the bureau of hydrology, river basin commissions, provincial water authorizes participated in the workshop.

The workshop identified the importance of conducting monitoring on hydro-ecology particularly on algal bloom, which was firstly established in 2008 as a pilot project. It has been pointed by the director of bureau of hydrology, MWR, that, it is essential to conduct hydro-ecology measurement for sustainable development, therefore, we should improve supervision, organization, communication and exchange, increasing investment, and improve capacity building, so that to keep up with the social economic development in China.

(6)Workshop between the Bureau of Hydrology and Hehai University was held in on 22 July, 2012, in Wuhan. During the workshop, bureau of hydrology presents the students and professors from Hohai University the responsibility and organization structure of the bureau, and presents the technical development on monitoring, modeling and analysis on hydrology, also shared with the guests on how to advance career after school. Hohai University presents their education methods and how to promote creativity of students to face high competition and innovative demands from Industry. During the workshop, technologies on flood forecasting, hydrological computation, sedimentation and river bed erosion, climate change impact etc., are also presented and discussed. More than 40 people participated in the workshop.

The workshop has also resulted in a MOU signed by both sides signed on that the bureau of hydrology shall provide opportunity for students from Hohai University to have practices on various fields of hydrology work during their study in the university.

1.2.2 Participation IHP Steering Committees/Working Groups

(1) 2nd International Conference on Water Resources (ICWR2012) "Sharing Knowledge of Issues in Water Resources Management to Face the Future" In conjunction with the The 20th UNESCO-IHP Regional Steering Committee Meeting for Southeast Asia and the Pacific Contribution to IHP-VII (2008-2013), Langkawi, Malaysia, 5-9 November 2012.

Organized by national committee for IHP of Malaysia, representative from the Chinese IHP national committee participated in the workshop and RSC meeting. The 2nd International Conference on Water Resources (ICWR-2012) aims to bring together academics, scientists, practitioners from wide range of disciplines involved in water research, leading engineers, researchers from industry and research scholars from Universities to exchange and, share their experiences and research results about all aspects of sustainable water

resources management, and discuss practical challenges encountered and the solutions adopted. This conference also seeks to study and understand the existing water resources management strategies adopted in Malaysia, and sharing the information with those from other countries. There are 8 themes involved in the conference concerning sharing of water knowledge in various fields.

About 150 Professional from countries of AP region participated in the conferences and shared their knowledge and experiences on dealing with water issues from different perspective.

During the RSC meeting, country reports are presented, discussions have been carried out mainly focusing on how RSC activities contribute to IHP VIII objectives. Each participants and country described their activities, plans are been made to involve interested countries to participated in actions to contribute to IHP-VIII plan. It was resolved that all countries are encouraged to submit their plans to IHP Jakarta office before the next RSC meeting.

1.2.3 Research/applied projects supported or sponsored

The website of the Chinese National Committee for IHP has been supported by UNESCO Beijing office and has been updated regularly. It was updated regularly for distributing messages to the public. Official home page is http://www.chinaihp.org. Announcement of web-based training courses and international conferences information are shared with hydrologist at national-wide on this website.

1.2.4 Collaboration with other national and international organization and/or programs

(1) The 35th congress of the International Association for Hydro-Environment Engineering and Research was held during 9-12 September, 2013 in Chengdu, Sichuan province. The congress is jointly organized by China Institute of Water Resources and Hydropower research, Sicuan University, Thinghua university and Hongkong University. Hosted by the Ministry of Water Resources of China and the IAHR, the congress attracted more than 1,000 delegates from over 70 countries. Members of IHP china national committee have participated in the congress with various contributions.

The congress theme is "*The wise find pleasure in water: meandering through water science and engineering*", and the congress features around 130 technical sessions on topics such as hydro-engineering and social civilization, hydro-environment and hydro-ecology, river and ocean management, climatic change and disaster response. The Dujiangyan irrigation system, which was built in 256 BC, was recognized as a hydro-environment world heritage by the IAHR at the congress.

General Report: Achieving Harmony between People and Water for Sustainable Development, Dr. JIAO Yong, Vice Minister of Water Resources of P. R. China

General Report: Perspectives on International Cooperation for Water Security, Dr. Gretchen KALONJI, Assistant Director-General for Natural Sciences, UNESCO

(2) Scientific Assembly of the IAHS held during 20 – 28 July 2013, in Gothenburg, Sweden.

Delegations from IAHS china and IHP china participated in the symposium and workshops during the scientific assembly of IHAS in Gothenburg. In particular, representative from IHP china national committee, including the member of Mr. Ren Liliang (who is currently the vice president of IAHS), Prof. Xu Zhongxue, the vice chairman of ICWRS (committee member of IHP China national committee), Dr. Huang Y., the vice secretary of IHP china national committee (who is currently the secretary of international commission of surface water) took part in the bureau meeting of IAHS and contributed with suggestions and ideas for the future work of IAHS.

During the conference, quite a few Chinese professionals delivered presentations and shared experiences and discoveries from China perspective. In particular, Dr. Huang is nominated to act as the co-leader of target 3 (Science and practice) of the new plan for the New Scientific Decade of IAHS of 2013-2022, the so-called Panta Rhei, addressing changing hydrology for a changing society.

Panta Rhei includes three targets, namely, *Understanding*, *Estimation and prediction*, and, *Science in practice*. Each target is led by a Target Leader and a Target Co-Leader. Target Leaders are nominated for a biennium and their role is to assist the Panta Rhei Chair in overseeing the scientific activity that is carried out within Panta Rhei and to keep the links with the community. The tasks of the Target Leaders include the identification and preliminary

approval of Research Themes and Working Groups (the final approval is formalised by the IAHS Bureau), the organisation of Panta Rhei initiatives (scientific session at conferences, educational initiatives, summer schools etc.) and the synthesis of the activity that is carried out under each target.

(3) Wrap-up meeting for the Sino-Swiss cooperation on integrated flood risk assessment in Changjiang River was held on 23 April, 2013. Participated by the vice director of Federal Office of Environment of Switzerland, counselor of Swiss embassy in China, representative from Swiss Agency for Development & Cooperation (SDC), deputy chief engineer of the bureau of hydrology of MWR, vice director of the bureau of international cooperation on technology and science and project team members attended the wrap-up workshop.

The project started from April 2011. The major objectives are: to introduce models and methods on risk assessment on water management from Switzerland to China, namely the concepts and theory of the two tools of MINERVE (a forecasting model) and RISKPLAN (a risk assessment tool). A pilot study has been carried out in Hanjiang river (the largest tributary of Changjiang River), which may provide experience for future application on other areas of Changjiang River.

The meeting reviewed the final products and report of the project, recognized and agreed that the desired objectives have been achieved. In addition, both sides elaborated the opportunity on furthering cooperation on the field of climate change impact on water resources management in Changjiang River, which has gained higher attention from all sides, particularly the SDC who expressed their continuous support to further cooperation.

1.2.5 Other initiatives

NIL.

1.3 Education and training course

1.3.1 Contribution to IHP courses

NIL.

1.3.2 Organization of specific courses

(1) Special training course to support the hydrological development on Western China, 1 March ~ 8 June, 2013, Yangzhou University, China. The training course was jointly organized by the bureau of personnel and the bureau of hydrology.

Course participants on the opening ceremony

The objectives of the training course is to improve the capacity on hydrology and water resources on the technicians from western China, to learn about the advanced hydrological technology and application of new monitoring instruments/equipment, as well as management experiences on hydrology and hydrological stations.

The course is mainly composed of indoor teaching and field trips. Courses learnt during the training program include applied mathematics, hydrological statistics and uncertainty, hydraulics, IT, mechanism of runoff generation and hydrological forecasting, hydrological monitoring and data process, database technology, automatic Hydrometry, engineering hydrology and hydrological monitoring technology. The course also consists of several field trips to hydrological stations, hydrological office in cities of east China which represents the most advanced technology level in China.

(2) Training course on implementation of national regulation of groundwater monitoring and application of instruments was held on 2 September 2013, in Chengdu, China. The training course is jointly organized by the bureau of hydrology of MWR, and the quality inspection center of instruments of hydrological monitoring and geological engineering in Nanjing. About 70 participants from river basin commissions, provincial hydrological authorities and manufactories of groundwater monitoring instruments participated in the training course.

The course include "general technical conditions for the using of groundwater monitoring instruments (trial version)", "inspection methods on soil moisture monitoring instruments", "design and requirements on the 2nd phase of the decision support system of flood control and drought relief of the state". During the training, department of water resources monitoring and assessment participated the course and collected comments and advices on groundwater monitoring for improvements.

(3) Training course on satellite communication for hydrology was held during 16-19 April, 2013 in Suzhou city, Jiangsu province, China. The course was the second phase and organized by the bureau of hydrology, MWR. 70 technicians from river basin commissions, provincial water authorities etc. participated in the training course.

Operation of emergency response communication vechicle

Operation of portable satellite station

Aiming to facilitate data transferring from hydrological monitoring, the course is composed of indoor course learning, field trip and laboratory practices. The course provided a systematical data transferring technology using satellite and its application in hydrological monitoring work. The course also includes demonstration and practices on operation of emergency response communication vehicle, portable station of satellite information receiver, and stationary satellite information receiver. The participants also visited the satellite data process station in Wuxi water authority.

1.3.3 Participation in IHP courses

No participation to IHP Courses during Nov 2012 to Sept 2013 basically due to lack of financial support.

No observation of how many have actually participated in (or have received) the distance learning via web-courses. But the web-based distance learning notices received from UNESCO Jakarta office have been widely distributed through IHP China website and emails from IHP China secretariat.

1.4 Publication

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1.5 Participation in meetings abroad

(1) On 28-30 May 2013, Prof. Liu Heng, Vice Charirman of CHINA-IHP and Director General of ICSHP, attended "Vienna Energy Forum 2013" (VEF2013) in Austria, invited by UNIDO. This year's event brought together over 1,600 policy makers, country delegations, experts and representatives from the private sector and civil society from 116 countries, to discuss issues on sustainable energy for development. The debate was led by approximately 110 high level speakers. Organized one year after the Rio+20 Summit, the 3rd Vienna Energy Forum (VEF2013) focused on the energy dimensions of the Rio+20 outcomes and has provided a high level platform for a discussion focused on the following key issues and themes: sustainable energy for all vision, energy in post-2015 agenda, do we need a sustainable development goal for the energy sector, what are the drivers for new energy financing and so on.

The event first started in 2009 and held once every two years. It aims to build an international platform to lead the sustainable development of global energy, in order to provide communication opportunities for governments, international organizations, enterprises as well as the policy makers and energy experts to share the experience of energy development. During the closing ceremony, Kandeh K. Yumkella, UNIDO Director General, gave commendations to 18 organizations and individuals for their contribution to the global renewable energy development. Prof. Liu was one of them.

(2) During 19-23 May, 2013, Prof. Xue Zhongxue was invited to attend the international conference on Environment and Water Resources (EWRI2013) held in Cincinnati, USA.

The main theme of the conference is "Showcasing the Future", nearly 2000 professionals from different countries participated in the conference. During the conference, the Chinese American Water Resources Association organized "China Water Resources Panels", gathered professionals from mainland china, Hongkong, Taiwan, USA and Canada, invited 7 hydrologists from the above countries/regions, discussions have been carried out particularly on technical development and innovations, situation of water resources utilization and exploration, and issues appeared, in China.

During and after the conferences, delegation from China also visited laboratory of HyDROS in the university of Oklahoma, discussed further "Water issues in China: Challenge and opportunity" and learnt about meteorological technology from the "National Weather Center" which is situated in the university.

1.6 Other activities at a regional or international level

(1)UNDP-Aid Rehabilitation of 600kW Myongchon Hydropower Plant in DPRK Putin Operation in July 2013.

In July 2013, UNDP-Aid rehabilitation of 600kW Myongchon Hydropower Plant in Myongchon Cooperative Farm in DPRK was put in operation with technical support from International Center on Small Hydropower (ICSHP), which is a under the framework of Water and Energy of IHP-VII. The rehabilitation of Myongchon Hydropower Plant is a part of the Sustainable Rural Energy Development (SRED) Programme, which was formulated to strengthen the sustainable and efficient use of conventional energy in DPRK and improve accessibility of alternative energy sources for rural communities and households. The project aims to contribute to national policies and strategies to promote use of conventional energy and alternative energy sources through "pilot demonstration schemes" in specific regions and cooperative farms.

The project is designed to assist with the implementation of renewable and sustainable rural energy along sustainable development principles and practices. It directly addresses three key national priorities: (a) improved availability and utilization of energy (b) improved

environmental management; and (c) increased food availability at national and household level. The project approaches the problem of rural development and food security with energy as a means to provide sustainable livelihoods, health, water and sanitation, etc. for the rural households. In terms of entry points and institution all linkages, the project will use the farm co-operative for identification and provision of the suitable energy and technology mix that best meets those needs. The aim is to enhance productivity and simultaneous reduction in unit costs, while allowing improvement of rural livelihoods, reducing food and energy vulnerability.

ICSHP participates in the rehabilitation of Myongchon Hydropower Plant with services including equipment supply, super-vision of equipment installation, onsite testing, commissioning and training of local operators.

1.6.1 Institutional relations / co-operation / exchanges

No observations.

1.6.2 Completed and ongoing scientific projects

NIL.

2 FUTURE ACTIVITIES

2.1 Activities planned to until December 2013

For IHP China, the National Committee will:

- Continue paying high attention for regional (and international) cooperation under IHP framework and encourage cross-cutting cooperation with other international programme.
- Contribute to the implementation of IHP VIII strategic plan particularly on ecosystem of water circle and environment protection. Integrated river basin management remains important particularly on management of inter-basin water diversion project. Exchange might be possible to be made with other nations who are interested on such work.

2.2 Activities foreseen for 2013-2014

Projects related to IHP-VII themes will be continuously supported by the Ministry of Water Resources though IHP national Committee. IHP national committee will continue to encourage scientific and technical symposia and workshops. Meanwhile, initiatives for IHP-VIII themes will be encouraged by the National Committee. Cooperation among the Southeast Asia and the Pacific will be top priority. In summary, the activities will include (but not only) as below:

- Annual IHP national committee meeting to be held in spring 2014. The objective is to strengthen participation from members and cooperation between themencourage contributions to IHP VIII strategy plan. During the meeting, activities and issues regarding

IHP work at national level will be presented and discussed; initiative of participation & supporting IHP activities shall be proposed and discussed.

- Continue to implement collaborative researches project with IRTCES on erosion and sedimentation.
- Continue researching and collaboration on climate change impact on the hydrological cycle and water resources following the theme of IHP Phase VII, particularly at bilateral level on some case studies in upper Yangtze River under Sino-Swiss cooperation project.
- Encourage and initiate project following the new themes of IHP phase VIII focusing on water scarcity and environmental issues.
- Cooperate with regional IHP national committees to develop a development strategy on Small Hydropower.
- Implement rainfall monitoring network for small rivers for the purpose of early warning, to facilitate national planning on water resources management and flash flood (mudflow) early warning.
- Participate in national rural drinking water safety evaluation and planning, continue developing water quality protection technology.
- Providing training course for participates from developing countries on hydrological monitoring and flood forecasting technology, i.e. to train water engineers from Ecuador.
- Develop and promote integrated water resources management method specially on multiple reservoir operation and optimization.
- Other activities that will be organized at national/local (or basin-wide) levels by the committee members.

2.3 Activities envisaged for the long term

China IHP National Committee will continue contributions to IHP actives, especially, may host RSC meeting/workshops/conferences, or join co-team for regional and international cooperation. In the phase of IHP-VIII, working groups will be established for more cooperation activities. The committee will also promote and encourage young scientists to be actively involved in IHP work at national and international level.

Furthermore, it has to be noted that as UNESCO IHP China is a committee without **firm** management and organizational mechanism, it is difficult to gain driving forces to facilitate or promote HIP work. Thus, the secretariat will propose to the committee to promote IHP to gain more public attention and attract more participation from scientists and professionals from research institutions, in addition to the governmental organizations. In this regard, the most effective way is to establish some joint studies or research project so that people can cooperate under IHP framework / umbrella, which however require resources from either national level (which is rather difficult), or international funds (for which the possibility shall be discussed during the RSC meeting).

Annex I, Name list of the China national committee for UNESCO IHP

No.	Name	Position	Organization	Post in the organization
1	Deng Jian	Chairman	Bureau of Hydrology, Ministry of Water Resources (MWR)	Director
2	Liu ChangMing	Vice Chairman	Beijing Normal University	Academia
3	Liu ZhiGuang	Vice Chairman	Bureau of international cooperation and technology and Science, MWR	Deputy director
4	Jiang Jianjun	Vice Chairman	Bureau of geology and environment, Ministry of Land Natural Resources	Director
5	Liu Heng	Vice Chairman	Nanjing Hydraulic research institute of MWR	Deputy Director
6	Zhang Changkuan	Vice Chairman	Hohai University	Former chancellor
7	Wang Hao	Committee Member	China Institute of Water Resources and Hydropower Research	Department head, Academia
8	Wang Dianwu	Committee Member	Bureau of Hydrology of Liaoning province, MWR	Director
9	Hu HePing	Committee Member	Thinghua University	Vice chancellor
10	Guo Shenglian	Committee Member	Wuhan University	Deputy Provincial Governor
11	Wang Jun	Committee Member	Bureau of Hydrology, Changjiang Water Resources Commission, MWR	Director
12	Yang HanXia	Committee Member	Bureau of hydrology, Yellow River Commission, MWR	Director
13	Sheng Rong	Committee Member	China National commission for UNESCO	Department head
14	Lu Guihua	Committee Member	Water Authority of Jiansu province	Deputy director
15	Hu ChunHong	Committee Member	IRTCES under the auspices of UNESCO	Deputy director
16	Ni WeiXin	Committee Member	Nanjing Hydro-Automatic system research institute	Department head
17	Xia Jun	Committee Member	Department of Geology, China Institute of Water Resources and Hydropower Research	Director
18	Ren Liliang	Committee Member	Hehai University	Director
19	Yang ZhongShan	Committee Member	Hydrological center of Beijing city	Director
20	Ni GuangHeng	Committee Member	Thinhua university	Department head
21	Xu ZhongXue	Committee Member	Beijing Normal University	Deputy director
22	Cao ShengLei	Committee Member	Civil engineering department, ShanDong University	Director
23	Yu Zhijian	Committee Member	Bureau of Water diversion, Hubei province	Director
24	Tian TingShan	Committee Member	Chinese Institute of Geological Sciences Environmental Monitoring	Deputy director
25	Shi JianSheng	Committee Member	Department of Hydrology, Chinese Institute of Geology	Department head
26	Zhu Xiaoyuan	Secretary	Bureau of Hydrology, MWR	Department head
27	Jin Hai	Deputy Secretary	Bureau of international cooperation and technology and Science, MWR	Department head
28	Zou Ying	Deputy Secretary	Department of Hydrology, Nanjing Hydraulic research institute of MWR	Department head
29	Huang Yan	Deputy Secretary	Changjiang Institute of Survey, Planning, Design and Research	Deputy Chief Engineer

REPORT OF THE
INDONESIA NATIONALCOMMITTEE OF IHP

1. ACTIVITIES UNDERTAKEN IN THE PERIOD January – June 2013

1.1 Meetings of the IHP National Committee

The organizational structure of the Indonesian National Committee for IHP consist of a Chairman, a Vice Chairman, two Secretaries, and 23 members from vrious research institutes, universities and sectoral-Ministries.

Thecomposition of the National Committee is:

Chairman	: Dr. Iskandar Zulkarnain
Vice Chairman	: Ir. Bambang Hargono, M. Eng
Secretary I	: Dr. Tri Widiyanto
Secretary II	: Dr. Bogie Sudjatmiko
Members:	
1. Prof.Dr. H. Arief Rachman	: Executive Chair of National Commision for Unesco – Ministry of Education and Culture
2. Prof. Drs. Agus Subekti MSc, PhD	: Ministry of Education and Culture
3. Prof.Dr. Hery Harjono	: Indonesian Institute of Sciences (LIPI)
4. Prof. Dr. Hidayat Pawitan	: Bogor Agriculture Institute (IPB)
5. Ir. Dodid Murdohardono, MSc	: Ministry of Energy and Mineral Resources
6. Dr. Ir.William M. Putuhena M.Eng	: Ministry of Public Works
7. Prof. Dr. Sudarto Notosiswoyo	: Technology Institute of Bandung (ITB)
8. Drs. Endro Santoso, MSi	: BMKG
9. Drs. Arko Hananto Budiadi	: Ministry of Foreign Affairs
10. Dr. Titi Anggono	: Indonesian Institute of Sciences (LIPI)
11. Dr. Ir. M. Rahman Djuwansah	: Indonesian Institute of Sciences (LIPI)
12. Ir. Sudaryati Cahyaningsih	: Indonesian Institute of Sciences (LIPI)
13.Dr. Indreswari Guritno	: University of Indonesia (UI)
14.Dr. Istiqlal Amien	: Ministry of Agriculture
15. Dr. Budi Kartiwa	: Ministry of Agriculture
16. Ir. Imam Anshori, MT	: National Water Resources Council
17. Dr. Arie Setiadi Moerwanto, MSc	:Ministry of Public Works
18. Dr. Sutopo Purwo Nugroho	: National Bureau of Disaster Management (BNPB)
19. Dr. Gadis Sri Haryani	: Indonesian Institute of Sciences (LIPI)
20. Drs. Budi Suhardi, DEA	: BMKG
21. Dr. Armi Susandi	: National Climate Change Council (DNPI)
22. Dr. Saiful Anwar	: Ministry of Forestry
23. Dr. Ignasius D.A. Sutapa	: Indonesian Institute of Sciences (LIPI)

The committee hold bimonthly coordination meetings and in additional several technical meetings as needed for the planning and implementation of seminars and workshops organized under coordination of the committee. The committee routine meetings is attended by the Chairman of the Indonesian Committee for UNESCO and by Program Specialist of the UNESCO Jakarta Office. Members of the national committee through regular meetings distribute informations gathered during the meeting as well as report to the meeting hydrological and related activities in their organizations.

1.1.1 Status of IHP-VII activities

Theme 1. **Adapting to impacts of global changes on river basins and aquifer systems**

1. Global change and feedback mechanism of hydrological processes in stressed systems
2. Climate change impacts on hydrological cycle and consequence impact on water resources
    - Impacts of landuse and climate change on hydrologic regime on a watershed
    - Studies on water resources carrying capacity (WRCC)
3. Hydro hazards, hydrological extremes and water related disasters
4. Managing groundwater systems' response to global changes
5. Global change and climate variability in arid and semi arid region

Theme 2. **Strengthening water governance for sustainibility**

1. Cultural, societal and scienttific responses to the crisis in water governance
2. Capacity dev., for improved governance; enhanced legislation for wise stewardship of water resources
3. Governance strategies that enhance affordability and assure financing
4. Managing water as shared responsibility across geographical and social boundaries
5. Adressing the water energy nexus in basin wide water resources

Theme 3. **Ecohydrology for sustainibility**

1. Ecological measures to protect and remediate cacthment processes
2. Improving ecosystem quality and services by combining structural solutions with ecological biotech. : Research Center for Limnology-Indonesian Institute of Sciences (LIPI) conduct research on Ecohydrology application in Lake Limboto, Gorontalo Province
3. Risk based environmental management and accounting
4. Groundwater-dependent identification, inventory and assessment ecosystems : Research Center for Physic - Indonesian Institute of Sciences (LIPI) conduct research on Groundwater identification for community and economy in Serang, Province of Banten
5. Global change and climate variability in arid and semi arid region

Theme 4.**Water and life support system**

1. Protecting water quality for sustainable livelihoods and proverty alleviation
2. Augmenting scarce water resources, especially in small island developing states
3. Achieving sustainable urban water management
4. Achieving sustainable rural water management

Theme 5. **Water education for sustainable development**

1. Tertiery water education and professional development
    - Basic hydrological training for the water resources managers of the river area
    - DUWRMT formation in the Ministry of Public Works as a unit of knowledge dissemination and knowledge management on water resources including hydrology
    - Centre River Basin Organization Management (CRBOM) establishment as a center that will facilitate the implementation of experience in water resources management based on river basin carried out by the RBO (River Basin Organization)
    - Commemorating the world water day (Ministry of Public Works), Exhibition, National seminar (opened by the Minister of Public Works), discussions with awardees good water management (Mayor of Surabaya)., 22 Ministriesparticipated
    - Ministry of Environment: Management of rivers and lakes, giving awards to the Group Management of Maninjau lake and Lake Batur.
    - International Seminar on delta region held by the Coordinating Ministry for People's Welfare at the JCC, (The event attended by researchers from about 12 countries, opened by the Minister.

2. Vocational education and training of water technicians
3. Water education in school
4. Water education for communities, stakeholders and mass-media professional

1.1.2 Decisions regarding contribution to/participation in IHP-VII

1.2 Activities at national level in the framework of the IHP

- National Seminar of Limnology :Management of 15 Priority Lakesin Indonesia
- FGD evaluation and implementation of management programs15PriorityLakesinIndonesia June 2013

1.2.1 National/local scientific and technical meetings

- Hearingswiththe House of Representatives Commission VII, on the researchof 15priority Lakes in Indonesia
- Technical Meeting to constructGovernment Regulationof waterresources management in Indonesia
- Technical Meeting to constructGovernment Regulationof mangrove and wetland areas zonation
- Technical Meeting with the Ministry of Marine Affairs and Fisheries to identify the potential resources of15prioritylakesin Indonesia (Tri Widiyanto)
- Meeting with the Ministry of Educationand Culture, and Indonesia National Committee for Unesco

1.2.2 Participation in IHP Steering Committees/Working Groups

Annual meetings of the Regional Steering Committee for IHP in the Asia Pacific region are held in rotational base locations. Indonesia has always participated in these yearly meetings.

1.2.3 Research/applied projects supported or sponsored

RC for Limnology – Indonesian Institute of Sciences :

- Development of Saguling Reservoir Demo-site

RDC for Water Resources – Ministry of Public Works

- Flood forcasting and warning system
- Area reduction factor in West Jawa
- Rainfall runoff relationship for flood analysis
- Hydrological characteristics and the erosion rate as a function of land use change
- Balance and utilization of water resources strategy
- Balance and allocation of water in Indonesia
- Forecasts and drought control in the River watershed of PemaliComal
- Development of flood and drought risk map of the Java island
- Raw water supply technology development in East Java

1.2.4 Collaboration with other national and international organizations and/or programmes

- Biovillage development in Giam Siak Kecil – Bukit Batu Biosphere Reserve in collaborate with MAB – Unesco : Promoting Alternative Technology To Provide Clean Water In Peatland Area
- Development of Peat Water Treatment Technology To Provide Clean Water In Peatland Area in colaboration with Katingan Prefecture – in Central Kalimantan
- Committee member of the NationalCongress of Sciences especially in water field

1.2.5 Other initiatives

1.3 Educational and training courses

1.3.1 Contribution to IHP courses

1.3.2 Organization of specific courses

1.3.3 Participation in IHP courses

- 21st IHP Nagoya Training Course in Asia and Pacific Region on Introduction to River Basin Environment Assessment under Climate Change. @8 November – 9 December 2013, Kyoto University, Japan.
  This course focuses on three main objectives: (1) to acquire the latest knowledge on hydrology and environmental assessment under the influence of climate change on the scale of the catchment area in the Asia-Pacific, (2) use of simulation exercises catchment environmental assessment, (3)to discuss the possibility of implementing the environmental assessment of the catchment into several hydrologic and environmental management.

1.4 Cooperation with the UNESCO-IHE Institute for Water Education and/or international/regional water centres under the auspices of UNESCO

1.5 Publications

- UNESCO Free Flow : "Managing water : from local wisdom to modern sciences." 2013
- Ignasius Sutapa, IPAG60 : Alternative technology to provide clean water in peatland area." October 2013, Daegu, Korea

1.6 Participation in international scientific meetings
- Ignasius D.A. Sutapa attended to International Workshop on Integrated Lakes Basin Management in ILEC – Kyoto – Japan, March 2013
- Hidayat Pawitan attended to International Symposium on Integrated Lakes Basin Management in Kuala Lumpur – Malaysia, July 2013

1.7 Meetings hosted by the country
- Asia Pacific Centre for Ecohydrology, Indonesian National Committee for IHP-UNESCO, ICHARM, Indonesian Institute of Sciences, Indonesian National Committee of Indonesia conducted International Training on Integrated Flood Analysis System (IFAS), in Jakarta, Indonesia, 15 – 17 January 2013

1.7.1 Participation in meetings abroad
.
- Ignasius D.A. Sutapa attended to International Workshop on Integrated Lakes Basin Management in ILEC – Kyoto – Japan, March 2013
- Hidayat Pawitan attended to International Symposium on Integrated Lakes Basin Management in Kuala Lumpur – Malaysia, July 2013

1.8 Other activities at regional level

1.8.1 Institutional relations/cooperation

1.8.2 Completed and ongoing scientific projects

2. FUTURE ACTIVITIES

2.1 Activities planned until December 2013
- Participation in IHP-Training course
- Development of Saguling Demo-site

2.2 Activities foreseen for 2013-2014

- Asia Pacific Centre for Ecohydrology, Indonesian National Committee for IHP-UNESCO, Indonesian Institute of Sciences, Indonesian National Committee of Indonesia, will continue to conduct on goingresearch on EcohydrologyDemosite "Sediment Deposition System on Saguling Reservoir"
- Participation in IHP-RSC meeting Asian Pacific FRIEND
- Participation in IHP-Training course
- Conducting International seminar on Ecohydrology, in cooperation with the Ministry of Education and Culture of Indonesia
- Conducting regional training on ecohydrology, in cooperation with UNESCO Jakarta Office and KNIU
- Constructing the building of APCE Secretariat in Cibinong Sciences Centre Area

2.3 Activities envisaged in the long term

  - Participation in IHP-RSC activities and IHP Intergovernmental Council meetings.

NATIONAL REPORT ON IHP-RELATED ACTIVITIES

Japan

Various activities of UNESCO have been implemented under the support of the Japanese National Commission for UNESCO with financial contribution in the form of Fund-in-Trust (JFIT) for the Promotion of Science for the Sustainable Development. Japanese National Commission for UNESCO has discussed and made proposal on “Sustainability Science” which is a scientific concept as the integrated approach to build a truly sustainable society. At the occasion of 36th General Conference in November 2011, Japan has submitted a proposal on “Sustainability Science” to UNESCO. This concept contributes to the International Hydrological Programme (IHP) of UNESCO from the view of promoting sustainable development and sustainability science within the framework of UN Decade of Education for Sustainable Development 2005-2014 (DESD). Based on this concept, Japanese National Committee for IHP of UNESCO is expected to solve complex global challenges through following activities with a cross-cutting approach in collaboration with all the studies including social and human sciences, in addition to changing value. The following summary includes the activities of Japanese National Committee for IHP of UNESCO undertaken during October 2012 to August 2013.

3. ACTIVITIES UNDERTAKEN IN THE PERIOD JULY 2011 – AUGUST 2013

3.1 Meetings of the IHP National Committee

3.1.1 Decisions regarding the composition of the IHP National Committee

The composition of the Japanese IHP National Committee is as follows:

Members of the IHP National Committee as of August 2013.

	Name	Position	E-mail
Chair *	TAKARA Kaoru	Prof., DPRI, Kyoto Univ.	takara.kaoru.7v@kyoto-u.ac.jp
*	UEMATSU Mitsuo	Director and Prof., CICAORI, Univ. of Tokyo.	uematsu@aori.u-tokyo.ac.jp
*	SUZUKI Kunio	President, Yokohama National Univ.	k-suzuki@ynu.ac.jp
	OKI Taikan	Prof., IIS, Univ. of Tokyo	taikan@iis.u-tokyo.ac.jp
	KAWAMURA Akira	Prof., Tokyo Metropolitan Univ.	kawamura@tmu.ac.jp
	KOIKE Toshio	Prof., Univ. of Tokyo	tkoike@hydra.t.u-tokyo.ac.jp
	SHIMIZU Yoshihisa	Prof., Kyoto Univ.	shimizu@biwa.eqc.kyoto-u.ac.jp
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Notes:
* Member of the Japanese National Commission for UNESCO;
CICAORI: Center for International Collaboration, Atmosphere and Ocean Research Institute;
DPRI: Disaster Prevention Research Institute, Kyoto University;
HyARC: Hydrospheric Atmospheric Research Center, Nagoya University;
ICHARM: The International Centre for Water Hazard and Risk Management (UNESCO Category II Centre);
IIS: Institute for Industrial Sciences, University of Tokyo;
RIHN: Research Institute for Humanity and Nature; and
WRRC: Water Resources Research Center.

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3.1.2 Status of IHP-VII activities

Various activities relating to IHP-VII (2008-2013) Themes have been implemented since 2008 as follows.

THEME 1: Adapting to the Impacts of Global Changes on River Basins and Aquifer Systems

FA 1.1 – Global changes and feedback mechanisms in hydrological processes in stressed systems

- Global water cycle assessment: IHP contribution to GEOSS [Univ. of Tokyo]

There are number of activities led by Prof. Koike (Univ. of Tokyo) and others as:

in Asia

- International Coordination Group (ICG) Meetings on the Global Earth Observation System of Systems (GEOSS) and Asian Water Cycle Initiative (AWCI) (GEOSS/AWCI/ICG)
  - 2nd GEOSS/AWCI/ICG Meeting, Tokyo, Japan, 16-17, April 2008
  - 3rd GEOSS/AWCI/ICG Meeting, Beijing, China, 6 November 2008
  - 4th GEOSS/AWCI/ICG Meeting, Kyoto, Japan, 6-7, February 2009
  - 5th GEOSS/AWCI/ICG Meeting, Tokyo, Japan, 15-18, December 2009
  - 6th GEOSS/AWCI/ICG Meeting, Bali, Indonesia, 13 March 2010
  - 7th GEOSS/AWCI/ICG Meeting, Tokyo, Japan, 5-6, October 2010
  - 8th GEOSS/AWCI/ICG Meeting, Seoul, South Korea, 6-8 October 2011

in Africa

- 1st African Water Cycle Symposium, Tunis, Tunisia, 6-8 January, 2009.
- 1st Task Team meeting in preparation of the Second GEOSS African Water Cycle Symposium, Geneva, Switzerland, 23-24 September 2009
- 2nd African Water Cycle Symposium, Addis Ababa, Ethiopia, 6-8 January, 2011.
- GEO-UNESCO Joint Workshop on Earth Observation and Capacity Development for IWRM at River Basins in Africa, Nairobi, Kenya, 12 - 14 January 2012.
- 3rd African Water Cycle Symposium, Libreville, Gabon, 27-29 February, 2012.

- Interaction between hydrological cycle and physical/biochemical oceanography by cooperation between IHP and IOC [JAMSTEC, Univ. of Tokyo, Kyoto Univ.]

- IHP-IOC sessions are organized at the meetings of Japan Geoscience Union (JpGU) at Makuhari Messe in May 2011 and in May 2012.

FA 1.2 – Climate change impacts on the hydrological cycle and consequent impact on water resources

- Climate change research focusing on impacts on water-related disaster risk using "Earth Simulator": MEXT Kakushin Project (2007-2012).
- The follow-on research project MEXT Sosei Project (2012-2016).

- Global Earth Observation System of Systems (GEOSS) and Asian Water Cycle Initiative (AWCI) [Koike]
  - GEOSS/AWCI training course for the Climate Change Assessment and Adaptation Study, Tokyo, Japan, 11-12 March 2011
  - 1st AWCI Climate Change Assessment and Adaptation (CCAA) study Workshop, Seoul, South Korea, 6 - 8 October, 2011

- GWSP-Asia: HydroChange 2008 Conference, Kyoto, Japan, 1-3 October 2008:
  HydroChange 2008 conference was held in Kyoto on October 1-3, 2008, and more than 180 papers were presented. The conference was organized by RIHN, GWSP, IAHS with co-sponsored by EOMF and IAHC. The conference results was published as a book "From headwaters to the ocean" from Taylor and Francis.
  http://www.chikyu.ac.jp/HC_2008/

- Groundwater research such as GRAPHIC.
  International symposium on "Groundwater as key for adaptation to changing climate and society" was held in Kyoto on November 14, 2010. The symposium was organized by RIHN, UNESCO-IHP-GRAPHIC, DPRI (Kyoto University), HyARC (Nagoya University), and MEXT, and more than one hundred people attended the symposium.
  http://www.chikyu.ac.jp/archive/topics/2010/e-topics_101114.html

- GWES (Groundwater in Emergency Situations).
  Great Eastern Japan Earthquake and Tsunami showed the importance of groundwater use in emergency situation during disasters.

- Collaboration with Mongolian UNESCO Chair on Groundwater.
  The monitoring system of the groundwater has been launched in Ulaanbaatar, capital city of Mongolia as one of the major activities of 2nd Phase activities of UNESCO Chair on Sustainable Management of Groundwater Resources in Mongolia.

- Climate change research under the MEXT KAKUSHIN program was intensively conducted from 2008 to 2012.

- Climate change research under the MEXT SOSEI program is intensively conducted from 2012 to 2017.

FA 1.3 – Hydro-hazards, hydrological extremes and water-related disasters

- A Global Center of Excellence (GCOE) Program at Kyoto University "Sustainability/Survivability Science for a Resilient Society Adaptable to Extreme Weather Conditions" adopted for 2009-2014.
  Interdisciplinary research and education at Ph.D. level is implemented at Kyoto University for extreme weather and water conditions [Takara, Tachikawa and others].

- A new task force on frequency analysis for non-stationary hydrological time series in ICHARM initiated since 2009
  Flood damage investigation of Thai flooding in 2011 was conducted in Thailand in cooperation with various Thai authorities.
  Intensive observation of radioactive materials and numerical modeling of the movement was intensively conducted at the river basins in Fukushima.

- Improving the predictability of hydrological extremes in ungaged or poorly gaged basins using new measurement technology and promoting the local use of satellite information for improved river basin management in partnership with GEOSS.
  The predictability of the largest recorded flood at the Kumano River basin in 2011 was examined to verify the performance of a hydrologic model for predictions of extreme events [Tachikawa].
  Space Application for Environment (SAFE), Asia-Pacific Regional Space Agency Forum (APRSA) [Koike]
  Demonstration projects:
  - Hong River, Viet Nam, 2008-2010
  - Sangker River, Cambodia, 2009-2012
  - Indus River, Pakistan, 2010-2012

- Case studies on human security and water-related disasters.

- Japan has experienced very severe water-related disasters in 2010-2012. Especially, the Great East Japan Earthquake and Tsunami (GEJET) damaged Japan very much, causing the tsunami disasters in wider coastal zones and its aftermath including radioactive contamination issues from nuclear power plants in Fukushima.

- Best practices on water risk management
  * ICHARM, as an ICFM5 Secretariat organized the 5th International Conference on Flood Management (ICFM5) in Tokyo from 27 to 29 September 2011.
  * ICHARM has started a UNESCO funded project “Strategic Strengthening of Flood Warning and Management Capacity of Pakistan” in response to the unprecedented Indus river flood disaster (2012-2013).
  * ICHARM had announced a flood inundation forecast of Chao-Phraya river basin to help local people in emergent operation(2011-).
  * Flood forecasting and management [ICHARM, PWRI, IFNet, JMA and universities] under the MEXT Kakushin Program from 2007 to 2012 and MEXT SOSEI Program from 2012 to 2017, changes of water-related disasters and water resources under global warming were investigated.

FA 1.4 – Managing groundwater systems’ response to global changes

- Groundwater resources assessment under the pressure of humanity and climate change (GRAPHIC) [Research Institute for Humanity and Nature (RIHN)]
  UNESCO-GRAPHIC organized several international activities including symposiums and training courses to evaluate the effects of climate change and human activities on groundwater resources. Many case studies are synthesized by books including “Groundwater System Responses to Changing Climate (eds.: Taniguchi and Holman)” and “Climate Change Effects on Groundwater Resources: A Global Synthesis of Findings and Recommendations (eds.: Treidel et al.)”, from Taylor and Francis.

FA 1.5 – Global change and climate variability in arid and semi-arid regions

- Hydrological and ecological impact assessment of long-term global warming on river basins in the world [Kyoto Univ.]
  DPRI initiated the Japan Egypt-Hydro Network (JF-HydroNet) with the coordination with three Egyptian Institutions under the umbrella of GCOE-ARS project at Kyoto Univ. for a joint research and education project on the water resources and environmental problems of the Nile Delta of Egypt [Prof. Tetsuya Sumi, WRRC, Kyoto Univ.].

THEME 2: Strengthening Water Governance for Sustainability

FA 2.1 – Cultural, Societal, and scientific responses to the crises in water governance

- Community-based integrated river basin management as a HELP follow-up [Univ. of Tokyo, Kyoto Univ.]
  To share the knowledge of hydrologic modeling techniques and enhance the understanding of hydrologic predictions, CommonMP (Common Modeling Platform for

water-material circulation analysis) was developed at the National Institute for Land and Infrastructure Management (NILIM). The hydrologic modeling software is a tool for construction of hydrologic models that anyone can download from the NILIM home page [Tachikawa et al.].

FA 2.2 – Capacity development for improved governance; enhanced legislation for wise stewardship of water resources*

- Research on "virtual water"
  Developed inventories of the virtual water/water footprint of industrial commodities [The University of Tokyo]
  Dispatched an expert for the ISO/TC207/SC5/WG8 Waterfootprint and supported developing the community draft [The University of Tokyo]

- Collaboration with IHP-LAC for Rio de La Plata Basin Workshops
  Preparatory Meeting for 6th International Workshop of Regional Approach of Development and Management of Reservoirs in La Plata River Basin [Dr. Yosuke Yamashiki, Kyoto Univ.]

- Relative impact evaluation in water resources dynamics and social systems with large development in river basins [Kyoto Univ.]

THEME 3: Ecohydrology for Sustainability

FA 3.1 – Ecological measures to protect and remediate catchments process

- Participation in ecohydrology research development

- Effect of forest devastation on water resources and environmental issues [Univ. of Tsukuba, Kyoto Univ., Kyushu Univ., Univ. of Tokyo, Tokyo Univ. of Agriculture and Technology]

- Ecohydrology symposia and sessions at AOGS meetings
  Ecohydrology session (JHW02: Interaction between fresh water and ecosystem in the coastal zone) was organized at IUGG2011 meeting on July 2, 2011 at Melbourne, Australia.

FA 3.4 – Groundwater-dependent ecosystems identification, inventory and assessment*

- Frontier of sustainable groundwater management systems based on groundwater flow process in arid/semi-arid region in cooperation with China and Mongolia [Univ. of Tsukuba, Hiroshima Univ., Kumamoto Univ.]

- A new CREST Project on the impact of the forest thinning on the groundwater recharge has been launched since 2010 [Univ. Tsukuba, Kyoto Univ., Univ. Tokyo, Kyushu Univ., …]

THEME 4: Water and Life Support Systems

FA 4.3 – Achieving sustainable urban water management

- Hydrogeological and sociological survey on development processes of East-Asian cities co-existing with floods [Kyoto Univ.]

- Human impacts on Urban subsurface environments were evaluated in seven Asian cities including Tokyo, Osaka, Seoul, Taipei, Bangkok, Jakarta and Manila by RIHN project (http://www.chikyu.ac.jp/USE/index-e.html) . The results were shown in a book edited by M. Taniguchi "Groundwater and Subsurface Environment – Human Impacts in Asian Coastal Cities – "from Springer, Mar. 2011.

- New CREST (Core Research for Evolutional Science and Technology) research projects supported by the JST (Japanese Science and Technology Agency) since 2009 for Innovative Technology and System for Sustainable Water Use

The JST adopted 17 projects: 7 in 2009, 6 in 2010 and 4 in 2011.

FA 4.4 – Achieving sustainable rural water management*

- Development of a new flood management method utilizing paddies into river management against global warming [National Institute for Rural Engineering (NIRE), Univ. of Tsukuba, Univ. of Tokyo]

THEME 5: Water Education for Sustainable Development

FA 5.1 – Tertiary water education and professional development

FA 5.2 – Vocational education and training of water technicians

FA 5.3 – Water education in schools

FA 5.4 – Water education for communities, stakeholders and mass-media professionals

- Nagoya University Training Courses: The 20th and 21st Training Courses have been conducted by Nagoya University and Kyoto University, respectively, with collaboration of Research Institute for Humanity and Nature (RIHN) , etc.

- ICHARM Training Programmes and a one-year Master Degree Program on water-related risk management in cooperation with the National Graduate Institute for Policy Studies (GRIPS) supported by JICA.

- ICHARM has been jointly conducting a three-year doctoral course, “Disaster Management”, with GRIPS since October 2010.

- Six short-term training courses have been conducted about Hazard Map, Early Warning System and Climate Change Adaptation, November 2010-May 2012.［ICHARM］

- Capacity building and education for observation experts for continuous monitoring of terrestrial environments in Asia [Univ. of Tsukuba]
  Workshops focusing on the training for the young scientists and engineers in the field of water and environment were held in July 2010 and 2011 in Tunisia, October 2010 and September 2011 in Mongolia in collaboration with UNESCO Chair Program on Groundwater in Mongolia and Environmental Diplomatic Leader Education Program, funded by MEXT.

Other regional and cross-cutting themes activities include:

(1) Catalogue of Rivers: The format of the Catalogue of Rivers for Southeast Asia and the Pacific, Vol. 6 was announced at the 15th Session of IHP Regional Steering Committee (RSC) for Southeast Asia and the Pacific (SEAP) in Manila, the Philippines, on 22-23 November 2007. Japanese contribution to Vo. 6 is the Yoshiigawa, of which draft was prepared by Dr. Hidetaka Chikamori, Okayama Univ. This volume contains seven rivers from seven countries with the inclusion of first time contributions from Korea (D.P.R.), Mongolia and Myanmar, and brings the total number of rivers catalogued in the region, including those in volumes I to VI, to 121. The information of previous five volumes locates at:
http://flood.dpri.kyoto-u.ac.jp/ihp_rsc/riverCatalogue/index.html

(2) Asian Pacific FRIEND: With the dissemination of information from the SEAP region it is hoped that there will be better understanding and co-operation on matters related to water resources within each country as well as regionally. Of particular importance was the establishment of the Asian Pacific FRIEND, a UNESCO-IHP regional collaborative project, and the Asian Pacific Water Archive (APWA) that archives and makes available hydrometeorological and related data for Asian Pacific FRIEND projects and other IHP related activities in the region. Japan has been contributing to Asian Pacific FRIEND since its first Technical Sub-Committee (TSC) meeting in Kuala Lumpur in May 1997.

(3) Hydrology for Environment, Life and Policy (HELP):
No activities during this period.

(4) Prediction in Ungauged Basins (PUB) by IAHS:

PUB-Japan members attended IAHS 90th anniversary PUB Symposium, Delft, the Netherlands, on 23-25 October 2012 [Takeuchi, Tani, Takara, Sayama, Hishinuma].

ICHARM Director Kuniyoshi Takeuchi was awarded "2012 IAHS International Hydrology Award" at this meeting.

(5) International Flood Initiative (IFI), International Sediment Initiative (ISI) and International Programme on Landslides (IPL):

- Contribution to IFI as secretariat

ICHARM has been serving as the secretariat of the International Flood Initiative (IFI), a joint initiative with international organizations such as UNESCO (IHP), WMO, UN/ISDR, UNU, IAHS and IAHR. ICHARM manages the IFI website (http://www.ifi-home.info/) and compiles inputs, materials and tools provided by member agencies, while also providing its own outputs. ICHARM made active contribution to the organization of the ICFM5, held in Tokyo in September 2011.

- ICHARM, as an ICFM5 Secretariat organized the 5th International Conference on Flood Management (ICFM5) in Tokyo from 27 to 29 September 2011. More than 450 participants from 41 different nations and region participated in the conference. More than 250 participants came from abroad and others came from Japan. The ICFM5 Secretariat received 417 abstracts covering all the announced topic areas. The ICFM5 international scientific committee reviewed all submitted abstracts for relevance to the ICFM5 objectives. In total, 256 presentations were delivered during the 3-day conference at various opportunities including plenary sessions, special sessions, oral parallel and poster sessions.

-During the 19th Session of RSC-SEAP on 24-28 October,2011 the organizer invited Professor Manfred Spreafico (UNiv. of Berne, Switzerland), the leader of ISI, and organized an ISI session on the first day of the IHP Symposium EXTREME2011.

3.2 Activities at national level in the framework of the IHP

3.2.1 National/local scientific and technical meetings

(1) The JFIT Annual Reviews and Evaluation Meetings on the Proposed Science Sector Activities of UNESCO Office Jakarta were held in the UNESCO Jakarta Office in May 2011 and May 2012. The status and progress of the UNESCO science programmes in the region were reported and evaluated. Jakarta Office explained the IHP-WINGA ASPAC (Water Interoperability Networks for Global Change Adaptation in Asia and Pacific Region) project, which includes four components: RSC activities, IHP Training Course, Flood Disaster Prevention and Mitigation Measures in ASPAC region, and Sustainable Water to Improve Tomorrow's Cities Health – Integrated Programme for Asia (SWITCH-*in-Asia*).

(2) IHP Training Course Task Forth Meetings were held several times in Tokyo and Uji (Prof. Uyeda, Prof. Nakamura, Prof. Takara, Prof. Kojiri and Dr. Takemon) and in Kyoto (Prof. Uyeda, Prof. Nakamura, Prof. Takara) to discuss the organization of the Training Courses, the plan for the 22nd Training Course, future direction, and the reviews.

(3) The 28th IHP National Committee meeting was held at MEXT on 7 May 2012 to discuss various issues relating to the 20th Session of IHP Intergovernmental Council (June 2012) and IHP-VIII (2014-2021).

3.2.2 Participation in IHP Steering Committees/Working Groups

Regional Steering Committee (RSC) for IHP in Southeast Asia and the Pacific (SEAP):

(1) The 20th RSC was held in Langkawi, Malaysia in conjunction with UNESCO-IHP and the 2nd International Conference on Water Resources (ICWR2012) "Sharing Knowledge of

Issues in Water Resources Management to Face the Future" *Langkawi, Malaysia, 5-9 November 2012*. The RSC Secretariat Assoc. Prof. Tachikawa was re-elected for 2012-2014. [Takara, Kawamura, Tachikawa, Kobayashi]

(2) The 21th RSC was held in Gyeongju, Republic of Korea in conjunction with UNESCO-IHP and the 2nd Nakdong River International Water Week/International Water Forum 2013 (Na-Ri IWW/IWF 2013), Geongju, Republic of Korea, 30 September - 4 October 2013. [Takara, Chikamori, Tachikawa, Kobayashi]

(3) The 1st Meeting of the Implementation Working Group UNESCO International Hydrological Programme (IHP), Dec. 10th – 12th, Koblenz [Tachikawa]

(4) IHP Eighth Phase (IHP-VIII) Task Force meeting at UNESCO Headquarters on 5-7 June 2011 [Oki].

(5) The 8th Steering Committee meeting of IWRM Guidelines at River Basin Level Initiative at UNESCO Headquaters on 7-11 December 2011.[Mr.Otsuki, a steering committee member]

3.2.3 Research/applied projects supported or sponsored

- MEXT Kakushin Program "Flood forecasting and management" 2007-2012, changes of water-related disasters and water resources under global warming [ICHARM, PWRI, IFNet, Kyoto Univ., Univ. Tokyo and others]

- MEXT Sosei Program "Climate Change Risk Information" 2012-2016, changes of water-related disasters and water resources under global warming [ICHARM, PWRI, IFNet, Kyoto Univ., Univ. Tokyo and others]

- Global COE Program "Sustainability/Survivability Science for a Resilient Society Adaptable to Extreme Weather Conditions" 2009-2014 sponsored by MEXT-JSPS [PL: Prof. Kaoru Takara]

- JSPS-Asian Core Program, " Research and Education Center for the Risk Based Asian Oriented Integrated Watershed Management," 2011-2015 [PI: Prof. Yoshihisa Shimizu].

- Program for Leading Graduate Schools "Inter-Graduate School Program for Sustainable Development and Survivable Societies" 2011-2018 sponsored by MEXT-JSPS [PC: Prof. Kaoru Takara]

- Grant-in-Aid for ODA UNESCO activities, 2013 sponsored by MEXT [Kyoto University]

3.2.4 Collaboration with other national and international organizations and/or programmes

The Japanese IHP National Committee has been closely collaborating with:

(1) Some committees in the Science Council of Japan (SCJ), including the Sub-Committee on IRDR (Integrated Research on Disaster Reduction) of ICSU (International Science Union).
(2) The national government and its branches relating to hydrology and water resources administration,
(3) Nagoya University and Kyoto University for IHP Training Courses and Graduate School and other universities and research institutes,
(4) The Japan Water Forum (JWF),
(5) World Meteorological Organization (WMO), and
(6) International NGOs/NPOs such as the International Association of Hydrological Sciences (IAHS), the International Water Resources Association (IWRA) and the International Consortium on Landslides (ICL).

3.2.5 Other initiatives

ICHARM: **I**nternational **C**entre for Water **Ha**zard and **R**isk **M**anagement under the auspices of UNESCO was established in Tsukuba, Japan in March 2006, after getting accreditation by the member states of UNESCO at the 33rd General Conference of UNESCO. Dr. Kuniyoshi Takeuchi, the former chairman of the Japanese National Committee for UNESCO-IHP, was assigned as the founding Director of ICHARM. In its inception, ICHARM has been playing core roles in research, training, and information networking activities on water-related disasters at global levels. The activities are expected to contribute in the prevention and reduction of water-related disasters, focusing on flood related disasters at the initial stage.

On 23 July, 2013, the Ambassador of Japan to UNESCO, H.E. Mr Isao Kiso and the Director-General of UNESCO, Irina Bokova, signed an agreement for the renewal of ICHARM at the UNESCO Headquarters in Paris. The agreement, which entered into force upon its signature, grants ICHARM the status of an international centre under the auspices of UNESCO (Category 2) for a second six-year term.

It is important to cooperate with existing UNESCO water Centers such as IHE in the Netherlands, IRTCES in China, HTC in Malaysia and RCUWM in Iran, etc. The outline of ICHARM is as follows.

1) Objectives: The objective of the Centre is to function as the world centre of excellence to provide and assist implementation of best practicable strategies to localities, nations, regions and the globe to manage the risk of water related disasters including flood, drought, landslide, debris flow, storm surge, tsunami and water contamination. The Centre conducts research, capacity building and information networking activities in an integrated manner for preventing and mitigating the impacts of water related disasters and thus to achieve sustainable and integrated river basin management.
2) Functions:
   (i) to promote scientific research and to undertake effective capacity-building activities at the institutional and professional levels;
   (ii) to create and reinforce networks for the exchange of scientific, technical and policy information among institutions and individuals;
   (iii) to develop and coordinate cooperative research activities, taking advantage particularly of the installed scientific and professional capacity of the IHP networks, WWAP, the IFI/P and relevant programmes of non-governmental organizations, international institutions and networks;
   (iv) to conduct international training courses for practitioners and researchers on the global level; and
   (v) to organize knowledge and information transfer activities including international symposia or workshops, and to engage in appropriate awareness-raising activities;
3) Structure: The center is established as a part of the Public Works Research Institute (PWRI) and operated under the responsibility of its Chief Executive, with the advice from the Advisory Board. See other information at: http://www.icharm.pwri.go.jp/html/about/index.html

The events related to the ICHARM are summarized as below:

(1) Visit of UNESCO Evaluation Team to ICHARM (13-14 January 2011)
(2) International workshop on Education for managing hydrological extremes and related geo-hazards,24-26 January 2011, Islamabad, Pakistan
(3) Meeting with UNESCO and Pakistan Governmental organization for the support of Pakistan flood disaster mitigation, 26-28 January 2011, Islamabad, Pakistan
(4) Discussion with UNESCO for finding mission to the flooded areas of Sri Lanka, 20-29 Jan. 2011
(5) “Local Emergency Operation Plan with Hazard Map” from 12 January to 16 February 2011
(6) “Capacity development for Adaptation to Climate change” from 8 February to 10 March 2011.
(7) Workshop on Developing Capacity for resilience to water-related disasters in Pakistan through Space Applications and Disaster Risk Management, 1-4 March 2011, Islamabad, Pakistan

(8) Organize stakeholder workshop in Dhaka and conduct community based disaster risk reduction activity, 9-24 March 2011, Solo, Indonesia.
(9) Training on floods and climate change for 20 engineers and governmental officials from Sri Lanka, 10-24 July 2011, Bangalore, India 12 July 2011, Islamabad, Pakistan
(10) Signing Ceremony of the project Strategic Strengthening of Flood Warning and Management Capacity of Pakistan.
(11) ADB-TA 7276-REG IFAS New Version Installation and Training Workshop with BBWS Solo and CRBOM engineers, 4-6 July 2011, Solo, Indonesia
(12) "Local Emergency Operation Plan with Hazard Map" The third and last phase were conducted for four weeks from 4 July to 2 August 2011 in Japan by ICHARM. Eleven people participated from Bhutan, Indonesia, Lao PDR, Myanmar, Pakistan, Sri Lanka, Tajikistan, and Bangladesh.
(13) The 2nd international MAHASRI /HyARC Workshop on Asian Monsoon and Water Cycle, 22-24 August 2011, Nha Trang, Vietnam
(14) Inception meeting for Strategic Strengthening of Flood Warning and Management Capacity in Pakistan, 17-19 August 2011, Bangkok, Thailand
(15) ADB Water Learning Week, 8-10 November 2011, Manila, Philippines
(16) Progress report with regard to ADB TA7276 Bangladesh Component, 16-19 November 2011, Dhaka, Bangladesh
(17) 2nd IFAS Training Workshop, 20-27 November 2011, Solo, Indonesia
(18) Sentinel-Asia Flood WG-IFAS Seminar 16-29 November 2011, India, and Myanmar
(19) Parallel Session for ADB Water Learning Week and field survey, 8-14 November 2011, Manila, Philippines and Bangkok, Thailand
(20) Field Survey for Chao Phraya flood, 24-29 November 2011, Thailand
(21) IFAS Workshop in Tehran, 6-9 February 2012, Tehran, Iran
(22) Field Survey and Discussion meeting with NDRI, 13-22 December 2011, Nepalgunj and Kathmandu, Nepal
(23) 8th Steering Committee meeting of IWRM Guidelines at River Basin Level Initiative, 7-11 December 2011, Paris, France
(24) International Training Workshop of Stakeholders Capacity Building in Flood Warning and Management, NUST, Islamabad, Pakistan,20-23 December 2011, Islamabad, Pakistan
(25) Field survey for the "Project on a Comprehensive Flood Management Plan for the Chao Phraya River Basin", 11-16 December 2011, Thailand
(26) Cooperation to JICA, "The Project for Building Disaster Resilient Societies In Central Region in Vietnam", 10-14 January 2012, Hanoi and Hue, Vietnam
(27) Knowledge sharing workshop on water-related disaster risk management, 11-25 January 2012, Kathmandu, Nepal
(28) 1st joint seminar of integrated water resources management for Chao Phraya River by strategic formulation committee for water resources management of the kingdom of Thailand, 14 January 2012, Thailand
(29) Making Implementation Partners Agreement for "Strategic strengthening Flood warning and management capacity of Pakistan" with UNESCO on 20 January, 2012
(30) Field survey for the JICA course "General Information on Capacity Development For Flood Risk Management with IFAS", 28 January to 4 February 2012, Kenya, Africa
(31) ADB-TA 7276-Reg. Workshop on Flood Vulnerability Assessment, 7-11 February 2012, Phnom Penh, Cambodia
(32) The 6th World Water Forum, 12 -17 March 2012, Marseille, France
(33) Assessment of flood and inundations under the effect of climate change in lower West Rapti River Basin in Nepal, March 5 2012, Kathmandu, Nepal
(34) ADB TA 7276-REG-Courtesy visit to the DGWR Ministry of Public Works and IFAS Follow up Training for Engineers, 2-6 March 2012, Jakarta, Indonesia
(35) ADB-GWP meeting on Integrated Flood and Water Resources Management, 15-16 April 2012, Manila, Philippines
(36) Workshop "Capacity Development for Integrated Flood Risk Management in Pakistan" as short term training course from 15-24 May 2012.
(37) Renew Partnership for ICHARM, on 23 July, 2013, the Ambassador of Japan to UNESCO, H.E. Mr Isao Kiso and the Director-General of UNESCO, Irina Bokova,

signed an agreement for the renewal of ICHARM at the UNESCO Headquarters in Paris. The agreement, which entered into force upon its signature, grants ICHARM the status of an international centre under the auspices of UNESCO (Category 2) for a second six-year term. For more

3.3 Educational and training courses

3.3.1 Contribution to IHP courses

UNESCO IHP Nagoya Training Courses (TC) have been held by Nagoya University since 1991 every year. Topics of the course were relevant to fit the IHP-VII themes: Water Resources for Sustainable Development, Hydrology and Water Resources under Vulnerable Environment, and Water Interactions (Systems at Risk and Social Challenges). The host or convener body is the Hydrospheric Atmospheric Research Center (HyARC), Nagoya University. After the 19th TC, the Disaster Prevention Research Institute (DPRI), Kyoto University joined as a convener body. After that, HyARC and DPRI took the convener role alternatively. This made the TC have wider scope including water resources and disaster prevention. About ten participants from East and Southeast Asian countries selected by UNESCO Jakarta Office took lectures and practices every year in the training course. The 20th was with a title of “Groundwater as a key for adaptation to changing climate and society” under a collaboration of the Research Institute for Humanity and Nature (RIHN), the 21st was with “Introduction to river basin environment assessment under climate change” organized by DPRI, the 22nd was with “Precipitation measurement from space and its applications” organized by HyARC, and the 23rd will be held at DPRI entitled with “Ecohydrology for River Basin Management under Climate Change”.

An important development of TC is information dissemination on website. The broadcasting of the lectures to universities in Asia via Internet was successfully performed with collaboration of EST (Engineering, Science, and Technology) programme. When the visiting participants and some graduate school students join the TC's, the number is limited as only 10-20. The lectures are now available via internet, and many participants at remote sites can join the TC's. The lectures are also opened to graduate school students in the host universities such as Nagoya University and Kyoto University. TC is a good opportunity for graduate school students, and conveners of TC encourage graduate students to join the TC's.

3.3.2 Organization of specific courses

ICHARM has been providing a training course on flood hazard mapping (5 weeks every year) since 2004. In November 2007, 16 trainees participated from 8 countries in Asia Pacific region.

ICHARM also has been conducting a one-year master’s program, “Water-related Disaster Management Course of Disaster Management Policy Program,” since 2007 in collaboration with JICA and the National Graduate Research Institute for Policy Studies (GRIPS). Seven students in the class of 2008 graduated on 16 September 2009 with a master’s degree in disaster management. The class of 2009 started the program on 6 October 2009 with 13 students. The new doctoral program in disaster management started its admission process in December 2009 in collaboration with GRIPS.

ICHARM organized a short-term training course with JICA as Capacity Development for Flood Risk Management (from 2012)

This training program was launched in FY2012 and designed to provide opportunity for meteorologists, river administrators and disaster management officers in flood-vulnerable developing countries to learn the use of the Integrated Flood Analysis System (IFAS), developed and upgraded by ICHARM. The other important purposes are to learn about disaster management and evacuation plans and flood response cases in Japan, and to develop an action plan for local flood management of flood-vulnerable areas in the participants’ countries. These training activities aim to enhance individual flood-coping capacities and eventually to contribute to flood damage mitigation in the countries.

as well as Master's Course Program "Water-related Disaster Management Course of Disaster Management Policy Program", and Doctor Course Program, "Disaster Management."

3.3.3 Participation in IHP courses
N/A

3.4 Cooperation with the UNESCO-IHE Institute for Water Education and/or international/regional water centres under the auspices of UNESCO

(1) Dr. Guangwei Huang (ICHARM) attended the course "Climate Change in Integrated Water Management" on 10 to 16 July 2011 as an exchange instructor under the agreement with UNESCO-IHE.
(2) Prof. Tomoharu Hori (Kyoto Univ.) is active as a member of IHE Steering Board.

3.5 Publications

(1) Lecture materials for the 20th IHP Training Course "Groundwater as a key for adaption to changing climate and society" via website "http://www.ihpnagoyaforum.org".
(2) The textbook for 21st IHP Training Course in 2011, "Introduction to river basin environment assessment under climate change", Nagoya University, Kyoto University and UNESCO.
(3) «IWRM Guidelines at River Basin Level» Part 1: Principles, UNESCO-IHP, WWAP and NARBO, 24 pp., ISBN: 978-92-3-104100-6.
(4) «IWRM Guidelines at River Basin Level» Part 2-1: The Guidelines for IWRM Coordination, UNESCO-IHP, WWAP and NARBO, 173 pp., ISBN: 978-92-3-104101-3.
(5) «IWRM Guidelines at River Basin Level» Part 2-2: The Guidelines for Flood Management, UNESCO-IHP, WWAP and NARBO, 76 pp., ISBN: 978-92-3-104102-0.
(6) «IWRM Guidelines at River Basin Level» Part 2-3: Invitation to IWRM for Irrigation Practitioners, UNESCO-IHP, WWAP and NARBO.
(7) Taniguchi, M. and Holman, I. "Groundwater system responses to changing climate", Taylor and Francis, 2010, 200pp
(8) Taniguchi, M. ed. "Groundwater and Subsurface Environments – Human Impacts in Asian Coastal Cities – ", Springer, 2011, 312pp
(9) Treidel, H., Martin-Bordes, J.L., Gurdak, J.J. eds.,"Climate Change Effects on Groundwater Resources: A Global Synthesis of Findings and Recommendations" , CRC Press Taylor and Francis Group., 2011, 414 pp.
(10) In Forms of Community Participation in Disaster Risk Management Practices Flood risk management culture and its role in changing natural and physical environments of lower West Rapti river basin in Nepal Gautam M. R., Osti R., Gautam D. R.,Inomata, H., Dhakal S. Osti R. and Miyake K. (Eds.), Nova Science Publishers, Inc.,New York 2011
(11) Forms of community participation in disaster risk management practices Rabindra Osti, Katsuhito Miyake NOVA Science Publisher Mar 2011
(12) Tsunamis Causes, Characteristics, Warnings and Protection Chapter 4 Application of Coastal Forest in Tsunami Disaster Mitigation Rabindra Osti, Dinar Istianto Neil Veitch and Gordon Jaffray (Eds.), Nova Science Publishers, Inc., New York 87-112 2010
(13) Planning and Design of Tsunami-mitigative Coastal Vegetation Belts Shigenobu Tanaka, Dinar Istiyanto, Daisuke Kuribayashi Technical Note of PWRI No.4177 Aug 2010
(14) Dynamics of hydrometeorological and environmental hazards, Environmental Hazards A. W. Jayawardena The Fluid Dynamics and Geophysics of Extreme Events, Lecture notes series, Institute for Mathematical Sciences National University of Singapore Vol. 21 229-267 2011
(15) Large-scale Flood Report Ali Chavoshian ICHARM Book Series ICHARM No. 1 1-207 Sep. 2011
(16) Forms of Community Participation in Disaster Risk Management Practices Rabindra Osti, Katsuhito Miyake Forms of Community Participation in Disaster Risk Management Practices NOVA science NY USA 1-170 Jun. 2011
(17) Groundwater Management in Mongolia "Bridging Disciplines and Sectors", 24th February 2011, University of Tsukuba, 19 pp.

(18) Proceedings of IHP Symposium on Extreme Events: “Meteorological, Hydrological and Tsunami Disasters: Social Adaptation and Future (EXTREME2011)”, Kyoto University Uji Campus, 24-26 October 2011.
(19) Special Issue: Predictions in Ungauged Basins –Japan Society of Hydrology and Water Resources, Y. Tachikawa, Y. Yamashiki, and M. Tsujimura (Eds), Hydrological Processes, vol. 26, Issue 6, John Wiley & Sons, March, 2012.

3.6 Participation in international scientific meetings

3.6.1 Meetings hosted by the country

(1) UNESCO Chair Workshop on International Strategy for Sustainable Groundwater Management: Transboundary Aquifers and Integrated Watershed Management was held at the University of Tsukuba, Japan on 24 February 2011.
(2) Special event entitled “International Forum on Mega-Water-Disaster”, which was held on the first day (27 September 2011) of ICFM5 at UNU. For this purpose, some high-level national and international officials were invited for the conference.
(3) The 5th International Conference on Flood Management (ICFM5) was held in Tokyo on 27-29 September 2011. Japan with more than 450 participants gathered from 41 different nations throughout the world.
(4) IHP Symposium on Extreme Events: “Meteorological, Hydrological and Tsunami Disasters: Social Adaptation and Future (EXTREME2011)” (24-28 October 2011) was held in conjunction with the 19th Regional Steering Committee Meeting for UNESCO-IHP for Southeast Asia and the Pacific in Kyoto, organized by Japanese National Committee for UNESCO-IHP; DPRI; Global COE Program “Sustainability/Survivability Science for a Resilient Society Adaptable to Extreme Weather Conditions” (GCOE-ARS); UNESCO Jakarta Office: 96 participants from 23 countries.
(5) UGG-IAHS Sub-Committee Meeting was held in Makuhari, Chiba, Japan on 23 May 2012 at the occasion of JpGU (Japan Geoscience Union) meetings on 20-25 May 2012 [Taniguchi, Takara, Tsujimura].
(6) JAPAN WATER 2012, an IAHS-IHP Joint National Workshop for Water Issues, MEXT, Tokyo, 15 October 2012 [Takara, Taniguchi, Tsujimura, Oki].
(7) ISRS2013 (The 12th International Symposium on River Sedimentation, Kyoto Japan, Sept. 2-5, 2013)
(8) IGU 2013 Kyoto Regional Conference, organized by IGU Commission Biogeography and Biodiversity, Kyoto International Conference Center, Kyoto, Japan, 4-9 August 2013.

3.6.2 Participation in meetings abroad

(1) IRDR Conference 2011 took place in Beijing, China, from October 31 to November 2, 2011. The conference was hosted by the Integrated Research on Disaster Risk International Programme Office (IRDR) and the China Association for Science and Technology. Prof. Takeuchi (ICHARM) served the session B1 “Improving the Quality of Decision-Making Practice—Japanese Earthquake” as a chairperson.
(2) The 6th World Water Forum « Time for Solution », Marseille, France, 12-17 March 2012 [Takara, Watanabe and others]
(3) The 20th Session of the IHP Intergovernmental Council at UNESCO Headquarters, 4-7 June 2012. [Takara, Tachikawa and others]
(4) ASLO summer meeting: Lake Biwa, 8-13 July 2012
(5) The International Workshop of the UNESCO Chair in Mongolia was held at Ulaanbaatar in July/August 2012.
(6) The 90th Anniversary meeting of IAHS and PUB final symposium was organized at TU Delft, the Netherlands, on 23-25 October 2012 [Takeuchi, Sayama (ICHARM), Takara, Tani (Kyoto Univ.)].
(7) The 6th International Conference on Water Resources and Environment Research (ICWRER), Koblenz, Germany, 3-7 June 2013.
(9) IAHS/IASPEI/IAPSO joint Assembly – Knowledge for the Future: Gothenburg, Sweden on 22-20 July, 2013

3.7 Other activities at regional level

3.7.1 Institutional relations/cooperation

N/A

3.7.2 Completed and ongoing scientific projects

N/A

4. FUTURE ACTIVITIES

4.1 Activities planned until December 2013

(1) The 23rd IHP Training Course with the theme “Ecohydrology for River Basin Management under Climate Change” will be held in Dec. 2-13, 2013 (see Annex I).

4.2 Activities foreseen for 2013 - 2014

(1) Groundwater-surface water interaction research in arid/semi-arid regions (Mongolia, Tunisia, China) in collaboration with Alliance for Research on North Africa and Japan-China Center on Hydrological Cycle Research, University of Tsukuba.

(2) The 21st Session of the IHP Regional Steering Committee (RSC) for Southeast Asia and the Pacific will be held in Rep. Korea in 2013.

(3) FRIEND-Water2014: 7th Global FRIEND-Water Conference, 24-28, February, 2014.

4.3 Activities envisaged in the long term

(1) Participation in IHP-VIII projects and RSC activities.

(2) Information dissemination through a web page of the National Committee.

(3) Activities relating to “Sustainability Science” that is a key promotion by the Japanese Commission for UNESCO

United Nations
Educational, Scientific and
Cultural Organization

Malaysia
COUNTRY REPORT

of the

NATIONAL COMMITTEE FOR
MALAYSIA INTERNATIONAL HYDROLOGICAL PROGRAMME

21st MEETING OF THE IHP REGIONAL STEERING COMMITTEE
FOR SOUTHEAST ASIA AND THE PACIFIC
GYEONGBUK, REPUBLIC OF KOREA
30 SEP - 5 OCT 2013

[ACTIVITIES UNDERTAKEN FOR THE PERIOD
NOVEMBER 2012 – SEPTEMBER 2013]

NATIONAL REPORT ON IHP RELATED ACTIVITIES

Report Format

Name of the Centre		UNESCO - International Hydrological Programmes Malaysia
Name of Chairman		Dato Ir. Hj. Ahmad HusainiSulaiman
Name of the Hon. Secretary		Dato Ir. Hj. Hanapi Mohamad Noor
Name and title of contact person (for cooperation)		Mr. Muhammad Al-Muzammil Chu Ahmad (Asst. Secretary)
E-mail		ihp@water.gov.my ; muzammil@water.gov.my
Address		Water Resource and Hydrology Division, Dept. of Irrigation and Drainage Malaysia, KM 7 JalanAmpang, 68000 Kuala Lumpur.
Website		http://h2o.water.gov.my/ihp/
Location of centre		city/town : Kuala Lumpur country : Malaysia
Geographic orientation *		global regional
Year of establishment		1975
Themes	**Focal Areas ♦**	☒ groundwater ☒ urban water ☒ arid / semi-arid zones ☒ humid tropics ☒ droughts and floods ☒ sediment transport and management ☒ water and environment ☒ ecohydrology ☒ water law and policy ☒ transboundary river basins/ aquifers ☒ IWRM ☒ global and climate change ☒ mathematical modelling ☒ social and cultural dimensions of water ☒ water education ☒ other: stormwater management, ☒ water hazard.
	Scope of Activities ♦	☐ vocational training ☐ postgraduate education ☐ continuing education ☒ research ☒ institutional capacity-building ☐ advising/ consulting ☐ software development ☐ other: (please specify) _____
Support bodies 1		The Government of Malaysia
Hosting organization 2		Department of Irrigation and Drainage Malaysia/ Ministry of Natural Resources and Environment
Sources of financial support 3		The Government of Malaysia/ UNESCO

Existing networks and cooperation 4	UNESCO/ICHARM/RCUWM/RSC for Southeast Asia and The Pasific/ Partner of the GWP/ IWA/ APAC Water-related Centre Category II/MyWP/Malaysian Stormwater Organization / AWGWRM
Governance	☒ director and governing board ☐ other: Frequency of meetings: twice every year(s) ☐ Existence of UNESCO presence at meetings (UNESCO Jakarta Office)
Institutional affiliation of director	IWA/IAHS/Partner of the GWP/Malaysia Nuclear Agency/MyWP/ Board of Engineers Malaysia
Number of staff and types of staff	total number of staff (full-time, or equivalent) : 10 persons number of staff who are water experts: 3 persons. number of visiting scientists and postgraduate students: 1 person.
Annual turnover budget in USD	Operational = USD 150,000.00 Programmes and Activities = USD 250,000.00

* check on appropriate box
♦ check all that apply
1 please specify bodies that cover the operational costs of the centre, and other essential costs such as salaries and utility bills, and that provide institutional support to ensure centre's sustainability
2 if different from support bodies
3 please specify sources of main budgetary and extrabudgetary funds to implement projects
4 please write international networks, consortiums or projects that the centre is part of, or any other close links that the centre has with international organizations or programmes, which are not already mentioned above

1. ACTIVITIES UNDERTAKEN IN THE PERIOD OF NOV 2012 – SEP 2013

1.1 Meetings of the IHP National Committee

Year 2012

- 2nd IHP Malaysia Trust Account Meeting – 21 Dec 2012 at DID Malaysia

Year 2013

- Series of meeting for Malaysia World Water Day celebration – from Jan- Mar 2013
- 1st IHP Malaysia Trust Account Meeting for 2013 – 21 Feb 2013
- 1st IHP Malaysia Executive Committee Meeting – 4 Jul 2013 at DID Malaysia

1.2 Activities at national level in the framework of the IHP

Year 2012

- 3rd IHP Malaysia Technical Talk – 21 Dec 2012 at DID Malaysia
  Presentationpapers :
  i. SewerageIndustry in Malaysia – Issues, Challenges and WayForward
  ii. DistributedHydrologyModellingusing Radar Rainfall data versus ConventionalLumped Model usingRain Gauge data – Case study of Sungai Johor Basin
- Seminar on Flood DisasterPreventionorganized by DID-UNITEN withJapanEmbassycooperation – 20 Nov 2012 at DID Malaysia. Presentationtitle : Latest Satellite Technology for Natural Disaster Mitigation.
- Malaysia UNESCO Day – 3-4 Nov 2012 at KLCC
- Learning for Change Workshop : Education for SustainableDevelopment in Malaysia organized by UKM Lestari – 4-6 Dec 2012 at UKM

Year 2013

- 1st National Water Watch Program for Young Leaders Camp for the SouthernRegion in Malacca – 21-23 May
- River Expedition Programme for the SecondarySchools – River for All. Organized by Universiti Sains Malaysia and UNESCO-IHP Malaysia – 19-20 May
- 1stIHP Malaysia Technical Talk – 23 Apr
  Presentation papers :
  i. SgKlang Towards WQ Class IIB - River Of Life (River Cleaning) by Mr. SanusiSulaiman (SYABAS)
  ii. River of Life by DatoHj. MohdAzmi Ismail (DID)

- 2nd IHP Malaysia Technical Talk – 18 Jun
  Presentation papers :
  i. River Sediment Management by Prof. Ismail Abustan (USM)
  ii. Lake Ecosystem And Changing Environment : A Case Of Bukit Merah Reservoir by Dr. ZatiSharip (NAHRIM)

- 1st IHP Malaysia Committee on Standardization of Hydrological Practices Meeting – 20 Jun
- 2nd National Water Watch Program for Young Leaders Camp for the East Region in Terengganu – 20-22 Aug
- 3rd IHP Malaysia Technical Talk – 19 Sep
  Presentation papers :
  i. Mapping the carbon landscape: technological and policy applications in tropical peatland catchments by Dr. Rory Padfield (MJIIT UTM)
  ii. Introduction on Water Footprint by Dr. ZainuraZainoon Noor (UTM)
- 3rd National Water Watch Program for Young Leaders Camp for the BorneoRegion in Sabah – 20-22 Sep

1.3 Educational and training courses

None

1.4 Cooperation with the UNESCO-IHE Institute for Water Education and/or international/regional water centres under the auspices of UNESCO

A number of Malaysian students are currently pursuing post-graduate studies at master's and PhD levels at this institute.

1.5 Publications

- Guide to Hydrological Practices on Estimation of Design Flood Discharges in Malaysia (expected to be published by Dec 2013).

1.6 Participation in international scientific meetings

Participation at the Consulting Partners Meeting & World Water Week in Stockholm, Sweden from 30 Aug until 5 Sep 2013by Y. Bhg. Dato' Ir Haji Hanapi bin Mohamad Noor, the Hon. Secretary of IHP Malaysia.

1.7 Otheractivitiesatregionallevel

- Sustainability Science Workshop : A science basedapproach to realize the future wewant for all atIstanaHotel Kuala Lumpur. Organized by UKM Lestari and UNESCO-IHP Malaysia – 4-5 May 2013
- River Clean-upCampaign in conjunctionwith World Water Day Celebrationat River Tekala Selangor. Organized by UKM Lestari and Canon Marketing Malaysia – 19 May 2013
- Ecosystem Management for Lakes and WetlandsPutrajaya 2013 in Putrajaya - 5-6 Feb 2013

2. FUTURE ACTIVITIES

2.1 Activitiesplanned until December 2013

- PutrajayaExploraceCarnival - 28-29 Sep 2013 | Putrajaya
- Malaysia UNESCO Day 2013 - 3-6 Oct 2013 | Malacca
- Participation at the 21st RSC Meeting - 30 Sep- 5 Oct 2013 | Republic of Korea
- National Water Watch Program for Young Leaders (Higher Education)- 28-30 Oct 2013 | Kedah, Malaysia
- National Water Watch Program for Young Leaders (NorthRegion)- 12-14 Nov 2013 | Banding Lake, Perak
- Educational Trip to Ministry of the Environment and Water Resources Singapore - Dec 2013
- Best ThesisAward on Water Resources for Malaysianhigher Education Students - Dec 2013
- 4th IHP Malaysia Technical Talk for 2013 - Nov 2013
- 2nd IHP Malaysia Executive Committee Meeting – Dec 2013

2.2 Activitiesforeseen for 2014/2015

Committee onStandardization of Hydrological Practices

Studies proposed under IHP Malaysia Committee on Standardization of Hydrological Practices:

- Guidelines to Estimation of Environmental Flow in Malaysian Rivers
- Guidelines to Estimation of Sedimentation
- Guidelines in Monitoring of Water Quality in Lakes and Reservoir

Committee on Research

Researches to beaccomplishedunder IHP Malaysia Committee ofResearch:

- Construction Up Scaling of MSMA Stormwater Management Eco hydrology at Basin Level (Langat River)
- Decision Support System (DSS) for MSMA Stromwater Management Ecohydrology (SME) at HTCKL and Upscaling at Langat River
- Artificial Bio-Macropore for Enhancing Soil Infiltrability for Urban Catchment at HTCKL and Langat River basin
- Rural River Rejuvenation Project at Jenderam River, Sepang
- Study of performance Gross pollutant trap (GPT) Trapping Devices versus Life Cycle Cost and Gross Pollutant Management Strategies Knowledge Portal Case Study Putrajaya

Committee on Education, Training and Public Information

- World Water Day 2014 celebration in March 2014 (Malacca)
- National Water Watch Program for Young Leadersfor Northern, Southern, Eastern and Borneoregions (Mar, Jun, Sep &Dec)
- IHP Malaysia TechnicalTalks (everyquarterly)
- Water Footprint Course for ASEAN Countries in Kuala Lumpur (17-20 Mar 2014)

- 13th International Conference on Urban Drainage 2014 atBorneo Convention Center, Kuching, Sarawak (7-12 Sep 2014).

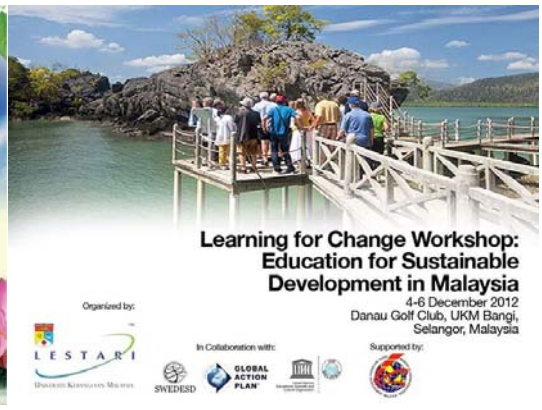
2.3 Activities envisaged in the long term

- Malaysia National Committee for IHP will promote activities to the public, coordinate participations at national level to augment people's awareness through, educations and trainings on hazards caused by global warming, as well as hazards caused by geological events, These include sea level rise, flood and drought hazard, debris control, tsunamis, water and food security, and access to save water. Areas of priorities are mega cities and coastal.
- Participation in IHP-VII projects and RSC activities.
- Information dissemination through a web page of the National Committee.
- Participation in IHP-RSC activities and IHP Intergovernmental Council meetings.
- Malaysia IHP commitment to IHP Phase VIII (2014-2019)
- Scientific Researches by Malaysia IHP Standing Committee

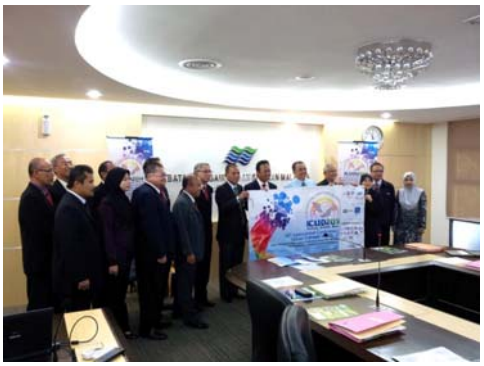
Picture Attachments:

National Water Watch Program for Young Leaders Camp

Seminars and Workshops



Soft launch of the ICUD 2014 in Sarawak



Malaysia UNESCO Day 2012

20th RSC Meeting 2012 - Langkawi

River Clean-up Campaign– 19 May 2013 (newspaperarticles)


KEMBARA SISWA VARSITI

Eko-relawan UKM bersih Sungai Tekala

60 peserta


Komuniti

Canon Terapkan Konsep Bersukan Sambil Menjaga Alam Sekitar

Canon Opto (M) Sdn Bhd, Canon Marketing (M) Sdn Bhd, Institut Alam Sekitar dan Pembangunan (LESTARI) UKM, Jabatan Perhutanan Selangor (JHNS), Majlis Perbandaran Kajang (MPKj) dan IHP- Malaysia menyertai program pembersihan Sungai Tekala , Hulu Langat Selangor pada Ahad baru-baru ini.

INFO 314.84 Kilogram sampah berjaya dikutip hasil daripada program ini

Implementation IHP in Mongolia
Main activities and outputs in 2012 – 2013

I. Main activities and outputs in 2013:

In national level:

- Organized and participated numbers of meetings related to "Ecosystem Based Adaptation to Maintain Water Security in Critical Water Catchments in Mongolia" in 2013. The project implementation is ongoing by Ministry of Environment and Green Development, Government of Mongolia, financed by Adaptation fund.
- Developed IRBM plans in particular 2 River basins supported by Ministry of Environment and Green Development of Mongolia and IHP Committee.
- Organization of World Water day of 2013 under The International Year on Water Cooperation topic within water related sectors and hydrological and meteorological services of Mongolia including distribution of awareness materials, organization of news briefing, lecturing at Universities and schools etc.
- Organization of national conference on "Regional climate change and desertification" jointly with IMHE in the Dund gobi province, Mongolia, 3-8, August, 2013 (more than 160 participants from all regional centers, some Mongolian Universities, Emergency Agency, International projects, NGOs)
- Participation in the project on Climate Change Vulnerability and Risk Assessment in the Altai mountains/Great Lakes Depression and estimate the catchment surface and groundwater use balance in Kharhiraa and Turgen River basin of the Ecosystem Based Adaptation to Maintaining Water Security in Critical Water Catchments in Mongolia" MON/08/301 Project, June-September, 2013
- Trained 25 senior engineers in water sector, January 2013, in Research and Training Center in IWRM, UST, Ulaanbaatar, Mongolia.

A. Regional and International activities:

- Participation in International Conference on Environment and Sustainable development in the Mongolian Plateau, 20-22 August, 2013, Ulan-ude, Russia with support of Russian Academy of Sciences, Mongolian Academy of Sciences and some universities from China, Japan and Germany (3 participants nominated from Mongolian National Committee).

- Participation in the workshop on "Integrated natural resources Management in Baikal lake basin" co-organized by UNESCO Chair in Sustainable Groundwater Management established in 2007 at the University of Tsukuba, Ibaraki, Japan and the Institute of Geo-ecology, Mongolian Academy of Sciences, in May, 2013, Ulaanbaatar, Mongolia

- Long-term Water balance experimental study in the Selbe river basin jointly organized by Mongolian (G. Davaa, Institute of Meteorology and Hydrology) and Japanese (Prof. I. Kaihotsu, Hiroshima University) IHP committees, since 2000 till present continued to this date, 2012-2013.

- Improvement of capacity building in Water sector of Mongolia is ongoing process and 5 students have been trained in various foreign Universities in Netherland, France, Japan, and China and etc., including the 22-nd IHP Training Course on "Precipitation Measurement from Space and its Applications", Nagoya, Japan from 18 November to 1 December 2012.

- Development of project proposal on Prediction and evaluation of influences by precipitation change on the multi scale to meteorological, hydrological and vegetational environments in Mongolia to JICA and JST in cooperation of Institute of meteorology, hydrology and environment, Mongolia and several Universities and Organizations, Japan.

- Members of the National Committee actively participated in the "Developing Harmonized water quality monitoring program for the Baikal Basin in Mongolia and accomplishing the

initial Pollution Hotspot analyses" project (Project: 00078317, Integrated Natural Resource Management in the Baikal Basin Transboundary Ecosystem) implementing following assignments: Assignment I. Develop Joint Russian-Mongolian Harmonized water quality monitoring program for the Baikal Basin and Assignment II. Accomplishing the pollution hotspot analyses (from June, 2012-March, 2013)

B. Presented and prepared papers:

1. G.Davaa, D.Oyunbaatar, S.Tomor ochir, Wim Van der, B.Miyagmarjav, 2012, Surface water assessment, Proceeding of baseline research studies for development of IWRM planning, Volume 1, pp. 15-28 Ulaanbaatar
2. G.Davaa, D.Oyunbaatar, T.Otgonbat, Aspect optimization of Envionmental flow and permissible widrwal rate from rivers, Research proceedings of IMHE, No.33, Ulaanbaatar, 2013, pp.115-132
3. Dambaravjaa Oyunbaatar, Gombo Davaa, Purevjav Gomboluudev, Dashzeveg Batkhuu, Byamba-ochir Monkhbat: 2013, Development of Mongolian Hydrometeorological monitoring network and its future, Report of the Joint research Cruise in the Amur river, Edited by Amur-Okhotsk Consortium, Published by Institute of Water and Ecology (Russia, Khaborovsk), Institute of Low temperature Science, Hokkaido University (Japan), Reseacr Institute for Humanity and Nature, Mitsui & Co.Ltd. Environment Fund (Japan), 2012, pp. 21-29
4. Ichirow Kaihotsu, Keiji Imaoka, Hideyuki Fujii, Dambaravjaa Oyunbaatar, Tsutomu Yamanaka, Kazuaki Shiraishi, Toshio Koike, 2013: First evaluation of SMOS L2 soil moisture products using in situ observation data of MAVEX on the Mongolian Plateau in 2010 and 2011, Hydrological Research Letters, Japan Society of Hydrology and Water Resources. Published omline in J-STAGE, pp.30-35

Regional climate change and desertification

C. **Forthcoming activities:**

- Organize seminar involving governmental, non-governmental and donor organizations and agencies to Share the information for open-discussion and to disseminate the outcomes water related projects and activities to the public and make a link
- Implement project to improve "water education" to raise the public awareness

National Committee for IHP, Mongolia

Address: C.P.O.Box-1650, Ulaanbaatar-13, Mongolia, tel/fax 976-11-323519, email: b_green@mongol.net and watersect@yahoo.com

NATIONAL REPORT ON IHP RELATED ACTIVITIES

MYANMAR

1. ACTIVITIES UNDERTAKEN IN THE PERIOD November 2012 - September 2013

1.1 Meeting of the IHP National Committee

1.1.1 Decision regarding the composition of the IHP National Committee

The Myanmar National Committee for IHP (MNC-IHP) has been organized on 24 March 2003 comprising a Chairman, a Vice Chairman, a Secretary and (17) members from 8 Ministries and 2 City Development Committees. The present composition of MNC-IHP is as follow;

Chairman: Minister for Transport

Vice Chairman: Deputy Minister for Transport

Secretary: Director General of Department of Meteorology and Hydrology

Members: Representatives from departments and committees concerned are as follows;

1. Deputy Minister for the Ministry of Science and Technology
2. Deputy Minister for the Ministry of Agriculture and Irrigation
3. Director General of the Directorate of Water Resources and Improvement of River System
4. Professor of Civil Engineering Department, Yangon Institute of Technology
5. Professor of Civil Engineering Department, Mandalay Institute of Technology
6. Director General of the Irrigation Department
7. Director General of the Water Resources Utilization Department
8. Director General of the Department of Forestry
9. Secretary of National Commission for Environmental Affairs
10. Director General of the Department of Progress of Border Areas and National Races
11. Director General of the Department of Hydroelectric Power
12. Director General of the Department of Health
13. Professor of Department of Mathematics, Yangon University
14. Mayor of Yangon City Development Committee
15. Head of Department of Engineering (Water & Sanitation), Yangon City Development Committee
16. Mayor of Mandalay City Development Committee

17. Head of Department of Engineering (Water & Sanitation), Mandalay City Development Committee

Under MNC-IHP, the (5) Working Committees (WC) were organized according to the (5) Themes of IHP-VI. Each working committees consists of (10) members from the members of departments and committees. The MNC-IHP normally held one session each for the National Committee (NC) and Working Committee (WC) during 2008-2013. Activities related to the themes of IHP-VII are implemented by the members of the working committees. The WC prepared the (30) research papers and shared the knowledge and experiences to the other national committee members during 2008-2013. The session could not be hold during 2008 to 2013. But the MNC-IHP will try to implement the water related activities in line with the themes of IHP.

1.1.2 Status of IHP-VII Activities

- Monitoring Water Quality of Rivers in Myanmar
- Monitoring the changes of Water resources in Myanmar
- Monitoring the low flow characteristics
- Assessment of the climate change impact on the flood events
- Developing the flood hazard map in order to reduce loss of lives and properties due to flood disaster
- Implementing the hydrological disaster risk management activities by using GIS and Remote Sensing Technologies

1.2 Activities at National Level in the framework of the IHP

1.2.1 National/local scientific and technical meetings

1.2.2 Participation in IHP steering committees/working groups

Participants from DMH attended the UNESCO-IHP 13th , 14th ,15th ,17th , 18th , 19th and 20th Regional Steering Committee Meetings for Southeast Asia and Pacific during 2005 to 2012.

1.2.3 Research / applied projects supported or sponsored

1.2.4 Collaboration with other national and international organizations and / or programmes

Myanmar is the member country of EANET (Acid Deposition Monitoring Network in East Asia) since 2005. So Myanmar collaborate with EANET's activities.

Myanmar is collaborating with ADPC and RIMES(Regional Integrated Multi-Hazard Warning System for Africa and Asia) in Hydrometeorology, Seismology and Climate Change sectors.

1.2.5 Other Initiatives

1.3 Educational and Training Courses

1.3.1 Contribution to IHP courses

- Training on Hydrological Grate I was held on December, 2012 at Mandalay, Myanmar. Also Hydrological Grate II was held on January, 2013 at Yangon, Myanmar.

1.3.2 Organization of specific courses

1.3.3 Participation in IHP courses

1.4 Publication

1.5 Participation in International Scientific Meeting

1.5.1 Meeting hosted by the country

- Monsoon Forum was held on 3 May 2013 at Nay Pyi Taw, Myanmar. This meeting was organized by FAO and DMH. It was as part of the project ' Reducing risk of tsunamis, storm surges, large waves and other natural hazards in low elevation costal zones' supported by UNESCAP and technical assistance from WMO and RIMES.
- Training on Forecast Interpretation, Translation, Communication and Application on 11-13 September, 2013 at NayPyiTaw, Myanmar. This training was organized by RIMES.
- The Scientific Advisory Committee(SAC) of Acid Deposition Monitoring Network in East Asia(EANET) held its session in (SAL 2012) from 22 to 24 November 2012 by Secretariat and the Network Center(NC) for the EANET.
- The Intergovernmental Meeting on the Acid Deposition Monitoring Network in East Asia(EANET) held its Fourteenth Session (IG 14) in Yangon, Myanmar on 26-27 November, 2012.This Session was organized by Secretariat and the Network Center(NC) for the EANET.

1.5.2 Participation in meetings abroad

The Secretary of MNC-IHP is a Permanent Representative of WMO and so she has contact and coordinate with WMO's activities.

- The Kick-off Workshop of the Mini-Project, Thailand, 10 – 29, September, 2012.
- Symposium on Hydro-Meteorological Networks, Cambodia, 18 – 21, September, 2012.
- Final Seminar for Flood Forecasting and Warning System for Dam Operation, Philippine, 10 – 18, October, 2012.
- 20th Regional Steering Committee Meeting for Southeast Asia and the Pacific- UNESCO IHP, Malaysia, 5 – 11, September, 2012.
- Workshop of the Mini-Project, Thailand, 3 – 21, December, 2012.
- WMO Regional Seminar of Strategic Capacity Development of National Meteorological and Hydrological Services in Regional Association II (Asia) and The Fifth Session of RA II, Qatar, 11 – 12, December,2012.
- Senior Technical Manager Meeting(STM 14), Japan, 26-28 August, 2013.

- KOICA-JICA Joint Capacity Development Program II, Land Slide and Slope Hazards Prevention, Republic of Korea, 22, September, 2013 to 12, October, 2013.
- River Basin Commissions and other Joint Bodies for Trans boundary Water Cooperation; Legal and Institutional Aspects, Switzerland, 23-24, September, 2013.
- Thirteenth Session of the Scientific Advisory Committee (SAC 13), People Republic of China, 25-27 September, 2013.

1.6 Other activities at regional level

1.6.1 Institutional relation / cooperation

1.6.2 Completed and ongoing scientific projects

2. FUTURE ACTIVITES

2.1 Activities planned until / December 2013

2.2 Activities foreseen for 2014-2015

- The MNC-IHP will try to implement the water related activities in line with the themes of IHP
- IHP national committee will continue to encourage scientific and technical symposia and workshops
- The members of MNC-IHP will attend the 20th Regional Steering Committee for Southeast Asia and the Pacific.
- The members of MNC-IHP will participate in the international and national activities of IHP.
- Hydrological Division will upgrade the flood early warning system and flood monitoring system.
- Remote Sensing and GIS Division will produce the flood risk maps and flood assessment maps in order to reduce the loss of life and properties.

NATIONAL REPORT OF NEW ZEALAND

Activities undertaken in the period November 2012– October 2013

1.1 Meetings of the IHP National Committee

1.1.1 Composition of the IHP National Committee

Mr Jamieson continues as Chair of the IHP Committee. M S Srinivasan (National Institute of Water and Atmospheric Research) is now Secretary of the IHP Committee and member of the UNESCO-New Zealand Science sub-commission. UNESCO New Zealand is undergoing a protracted review process and the future role, composition and membership of any future structure remains uncertain.

1.1.2 Status of IHP-VII activities

The following projects continue to be funded through the Ministry of Innovation, Business, Industry and Employment (MBIE), which replaced the Science and Innovation (MSI) in a further restructuring of science administration and funding:

WG 1.1 Information on New Zealand's Freshwaters: Water Resources Database;

WG 2.7 Land Use Intensification: Sustainable Management of Water Quality and Quantity
The water quality component is combined with agricultural research. During the reporting period the effort was focused more clearly on effects of increased irrigation development. Adaptive management will be required as the results of water science activities will not be available within the development timetable proposed by the government.
Water quantity is part of a "Waterscape" project quantifying water availability in New Zealand.

WG 2.8 Reducing the Impacts of Weather Related Hazards – funding continues, see section 1.6.2. (Refer IHP-V Technical Documents in Hydrology No.2 UNESCO Jakarta Office 1999 for details).

WG 1.1 "Information on New Zealand's Freshwaters: Climate and Water Resources Archives" is a national programme of climate and hydrometric data collection. The data produced from this programme are of increasing importance to guide decision-making on development (especially proposed hydropower and expanded irrigation) and to contribute to the assessment of effects of human related activities on rivers and lakes. In addition there is wide interest in the effects of climate change on water resources and consequent effects on hydropower and agriculture.

As reported in previous years, the implementing agency (National Institute of Water and Atmospheric Research - NIWA) implemented a policy of "free" data access for most users from 1 July 2007.

1.3 Contribution to participation in IHP-VII

Components of the New Zealand hydrological research programme have had good alignment with IHP-VII themes ("Continuity with change"). The bulk of hydrological research in New Zealand continues to be funded through the MBIE. As in the past, projects must continue to demonstrate that results will address national needs, and alignment with IHP themes is possible only to the extent that these themes are relevant to resource management requirements in New Zealand. Additional sources of support (e.g. WMO, internal support from NIWA and other institutes) are important to maintain links with colleagues in the Asia-Pacific region.

Preparations for IHP-VIII (2014-19) continue to be followed with interest to determine whether the interests of New Zealand and the Asia-Pacific Region have been taken into account.

The final version of IHP-VIII Strategic Plan indicates a close fit with NZ priorities in:
Theme 1 - Water related disasters and hydrological change
Theme 2 - Groundwater in a changing environment
Theme 3 - Addressing water scarcity and quality
Theme 5 - Ecohydrology

A specific alignment is with the Chapter 6 topic of "Putting science into action" where the following two major initiatives covered elsewhere in this report apply:

- Canterbury Water Management Strategy (CWMS)
- Land and Water Forum (LAWF)

1.2 Activities at national level in the framework of the IHP

1.2.1 National/local scientific and technical meetings

Scientific and technical meetings are generally held within the context of professional societies (particularly the New Zealand Hydrological Society) and resource management affairs (e.g. workshops to brief groups established to guide government decisions on future land and water use).

1.2.2 Participation in IHP Steering Committees Working Groups

The Chair is a member of New Zealand's UNESCO Science Sub-Commission where he is able to promote hydrological matters at a national level.

Mr Jamieson and Mr Srinivasan attended the 20th RSC meeting held in Langkawi, Malaysia and attended the 18th Technical Sub-Committee meeting associated with the 20th RSC meeting.

1.2.3 Research/applied projects supported or sponsored

None directly sponsored by IHP.

1.2.4 Collaboration with other national and international organizations and/or programmes

Land and Water Forum (LAWF) and Canterbury Water Management Strategy (CWMS)

IHP activities under IHP-VI& IHP-VII and capabilities related to these activities have been used extensively to inform water management in New Zealand. This will continue under the proposed IHP-VIII programme. An important aspect of this work is the integration of biophysical and social sciences in the pursuit of local and UNESCO goals.

Central government has actively intervened where it was not satisfied with progress made by local government. In particular central government has continued support for a process known as the "*Canterbury Water Management Study"* (CWMS), which is seeking to balance development needs against environmental values. The CWMS aligns with the description of "Adaptive Integrated Water Resources Management (AIWRM) included in IHP-VIII as The Chair of the NZ IHP Committee has been in a leading role with the Infrastructure project associated with this initiative from 31/10/2011. A current focus is to seek to use wider IWRM experience in any project review, drawing on expertise at institutions such as the Australian National University (ANU) which has personnel with wide international expertise in this area.

Republic of Korea Water Resources Association (KWRA) – collaborative research strategy with New Zealand Hydrological Society (NZHS)

The KWRA and NZHS have had a Memorandum of Understanding (MOU) in place since 2007. There have been regular exchanges between the organisations. The importance of the relationship has been recognised by the NZ Ministry of Foreign Affairs and Trade (MFAT).

Links with other International and Regional organisations

The Chair of the National Committee is in regular contact with Charles Pearson, the Regional Hydrological Advisor to the President of the WMO Region V (Asia Pacific). Contact is also maintained directly and indirectly with SOPAC's Suva based Water & Sanitation Unit, through its role of representing the SW Pacific Island states on water related issues.

SOPAC – Pacific HYCOS project
Follow up activities are carried out by NIWA is the context of other projects. The goals of the HYCOS project to enable local water hydrology personnel to build useable records are being pursued in this manner. A key part of the approach taken is for hydrologists to take responsibility wherever possible to integrate the efforts of NIWA, AusAid, The Bureau of Meteorology (Australia) and NZAID and to align these with the interests of Pacific based personnel.

1.3 Educational and training courses

1.3.1 Contribution to IHP courses

None.

1.3.2 Organisation of specific courses

Courses and workshops run in New Zealand generally meet national needs. NIWA is the primary provider. In addition courses are run in specific Pacific countries to meet their particular needs. Recent examples include:
- Fiji
- Samoa
- Solomon Islands
- Tonga
- Cook Islands

At present a New Zealand Qualifications Authority (NZQA) approved framework is being finalised for hydrology training. This will allow a refreshed range of courses to be offered by NIWA.

National Institute of Water and Atmospheric Research (NIWA) Courses / workshops

Over the course of a year NIWA provides many courses for regional government agencies and their own staff. These cover topics from general hydrological training to courses on specific topics of wide interest.

1.3.3 Participation in IHP courses
See 1.3.1.

1.4 Publications

Contributions to IHP publications have been principally through the Regional Steering Committee and the Asia-Pacific FRIEND. Other publications related to IHP activities include:

Regular climate and water bulletins

The National Climate Centre (NCC) publishes monthly New Zealand climate outlooks through web publications and media releases.

The "Island Climate Update" monthly bulletin

The National Climate Centre (NCC) This NZAID funded bulletin provides an overview of the present climate in tropical South Pacific Islands and a forward outlook, and continues to be published, and circulated widely throughout the South Pacific. (http://www.niwa.co.nz/our-science/climate/publications/all/icu).

The ICU, produced by NIWA's NCC in collaboration with SOPAC, is a multi-national project with important contributions from the meteorological services of countries around the region. The bulletin provides El Nino/Southern Oscillation and seasonal rainfall forecasts, discusses climate developments each month, and provides a tropical rainfall outlook for the next three months and tropical cyclone outlooks during the cyclone season. It also includes an editorial on some topical aspect of relevance and interest to end-users.

"Freshwater Update" bulletin

The National Centre for Freshwater has changed publication of the bulletin entitled "Freshwater Resources Update" back to a quarterly basis (http://www.niwa.co.nz/our-science/freshwater). This publication summarizes national freshwater conditions, and focuses on a number of topical issues confronting New Zealand scientists and water management.

Access to climate and water resources information

The NIWA real time environmental data site EDENZ (**E**nvironmental **D**ata **E**xplorer **N**ew **Z**ealand) is available to the public on the web (http://edenz.niwa.co.nz/).

EDENZ provides visitors with near real-time access to Ministry of Business, Innovation and Employment (MBIE) funded data that are collected from the NIWA nationwide network of monitoring stations, installed as a component of the Nationally Significant Database programme. Data on this site are automatically transferred using a national telemetry network and are un-audited.

Data from this network is then audited and added to the Climate and Water Resources Databases. These are classified as "nationally significant databases" by MBIE. The data include air temperature, barometric pressure, wind direction, rainfall, lake and river water levels, river flows and sediment loads, and river water quality variables The goal of these databases, and the EDENZ system, is to provide comprehensive and accessible data as a basis for improved knowledge on New Zealand's climate and freshwater resources.

A key aspect of the archiving programme is application of stringent quality control procedures ensuring national consistency and providing assurance that data can be confidently used for scientific and planning purposes.

An additional system deployed by NIWA for enabling access to the results of modeling based on data is: http://wrenz.niwa.co.nz. This website enables access to model results including catchment sediment yield, rainfall and runoff, river water quality, flood frequency and suitability for kayaking. It also allows an initial assessment of hydropower potential for all streams in New Zealand.

1.5 Participation in international scientific meetings

1.5.1 Meetings hosted by the country

New Zealand Hydrological Society Annual Symposium

The annual conference of the NZHS was held in Nelson, New Zealand from the 27-30 November 2012. The conference theme "Water: know your limits" reflects the stress surrounding water allocation and water quality. A delegation from the Korea Water Resources Association (KWRA) attended continuing the important collaborative relationship between the KWRA and NZHS.

1.5.2 Participation in meetings abroad

Mr Jamieson and Mr Srinivasan represented New Zealand at the 20th RSC meeting held in Langkawi, Malaysia in November 2012.

New Zealand Hydrologists participated in a range of international conferences related to IHP themes.

1.6 Other activities at regional level

1.6.1 Institutional relations/co-operation

There is considerable contact between New Zealand and other UNESCO Member Countries in the Asia-Pacific region, principally through overseas development assistance and consulting. For example, the Tideda hydrological database management system has been or is being installed in various agencies in Australia, Cambodia, Indonesia, Malaysia, Vietnam, Cook Islands, Fiji, Samoa, Solomon Islands, Papua New Guinea, Vietnam and Vanuatu. This is being augmented by an expanded range of work around the use of climate data and information around the Pacific which includes development and deployment of a new database system with participation of the Bureau of Meteorology (BOM), Australia. Many such contacts have been enabled via the IHP, even though subsequent work has been in the context of bi-lateral arrangements and Pacific regional projects and entities (e.g. SOPAC).

1.6.2 Completed and ongoing scientific projects

The Reducing Impacts of Weather Related Hazards programme (WG2.8) is continuing with additional support gained for its ongoing operations. The programme concentrates on forecasting of extreme weather, floods and landslides.

The programme on "Reducing impacts of climate change on the urban and built environment" has developed a "toolbox" of procedures that show practitioner different options for tackling climate change issues they are faced with. A particularly useful example is that of urban water supplies.

NIWA is working hard to maintain hydrology staffing in four groups (Hydrological Processes, Applied Hydrology, Freshwater Ecology, and Sediment) based in Christchurch. While NIWA has expanded hydrology related capability and capacity, government led approaches to emerging national scale hydrology issues including surface/groundwater interaction, water allocation and water quality and efficient use of hydropower resources continue to change and evolve creating ongoing new challenges in how science results are actually applied.

2. Future Activities

2.1 Activities foreseen until December 2013

New Zealand Hydrological Society Annual Symposium

The Joint Conference for the New Zealand Hydrological Society and the Meteorological Society of New Zealand will be held between 19 and 22 November 2013 in Palmerston North, New Zealand'. The conference theme is Water and Weather: Solutions for health, wealth and environment.

21st Regional Steering Committee Meeting

Unfortunately New Zealand attendance at the 21st RSC meeting in Gyeongju, Republic of Korea Malaysia from 30 September to 5 October 2013 and associated meetings was not possible due to an acute medical situation.

2.2 Activities planned for 2013

Scientific activities planned at the national level are, as explained in Section 1.1.3, within the context of the research programme funded by MBIE. A significant proportion of this activity will be in areas that are included within the IHP, but are not explicitly implemented as a component of the IHP. Implementation of science programmes (CWMS, LAWF) will be a strong focus in 2013.

Future activities are expected to depend very much on decisions reached by the Regional Steering Committee, and we are committed to participate in its deliberations, with the intention of being involved in future scientific work at the regional level.

NIWA Courses

A range of training courses will be offered by NIWA. For a full list of courses refer to the NIWA web site (www.niwa.co.nz). These courses are also open to overseas participants.

2.3 Activities envisaged in the long term

Continuation of the:

- Upgraded research programme on extreme rainfall and flood design
- NZAID funded Pacific Hydrological Training Programmes as required;
- NZAID funded monthly “Island Climate Update” publication with stronger links to end users.
- Regular New Zealand “Climate Update” and “Climate Outlook” (web) publications.
- Regular “Freshwater Update” (web) publication
- Canterbury Water Management Strategy (CWMS)

NATIONAL REPORT ON IHP RELATED ACTIVITIES

THAILAND

Contents

1. Activities undertaken in the period of November 2012 – October 2013

Meeting of the IHP National Committee

Decision regarding the composition of the IHP National Committee

The present composition of THC-IHP consists of 18 members as follows:

Chairman:	Mr. Nitat Poowatanakul, Director General of Water Resources
Vice Chairmen:	Deputy Director General of Water Resources
	Deputy Director General of Royal Irrigation
Secretary:	Director, Bureau of Research, Development and Hydrology, Department of Water Resources
Members:	Representatives from concerning agencies and experts are as follows: 1. National Park, Wildlife and Plant Conservation Department 2. Department of Groundwater Resources 3. Royal Irrigation Department

4. Meteorological Department
5. Marine Department
6. Hydrographic Department
7. National Research Council of Thailand
8. Bureau of Royal Rainmaking and Agricultural Aviation
9. Secretarial of the Thai National Commission for UNESCO
10. Electricity Generating Authority of Thailand
11. The Thailand Research Fund
12. Thai Hydrologist Assembly
13. Mr. Veeraphol Taesombat
14. Director of Research and Hydrology Development Division, Department of Water Resources

The mailing address are as follow :

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Status of IHP-VII activities

The activities related to IHP-VII was undertaken, ongoing and will be implemented such as the enhancement of Radar network and the Meteorological Satellite Data Receiving Station, improvement of storm surge forecasting, flood forecasting and warning system, implement of integrated water resources management in overall river basin focused on public participation.

Decisions regarding contribution to/participation in IHP-VII

During November 2012 – October 2013, there was no Thailand National Committee –IHP meeting or discussion. However, the committee still encourages IHP members to continue sharing knowledge and technology, and cooperate in various ways to promote hydrological improvement and water resources criteria.

Activities at national level in the framework of the IHP

National/local scientific and technical meetings

Thai representatives attended in various meetings particularly on hydrology, meteorology, flood forecasting and warning system, water resources and environmental management.

Participation in IHP Steering Committees/Working Groups

Representatives from TNC – IHP and the Department of Water Resources participated in the 20th RSC-IHP Meeting for the IHP in Southeast Asia and the Pacific and the International Conference on Sharing Knowledge of Issues in Water Resources Management to Face the Future, 5-9 November 2012 in Langkawi, Malaysia,

Research/applied projects supported or sponsored

Research project approved by National Research Council of Thailand and funded by Thai government for fiscal year (B.E.2556) are as following:

- Feasibility and frequency of flood and land slide from climate change and global warming. (Case study : Northern Thailand)
- Enhancing capabilities of community to cope with water related disaster. (Case study : Chi river basin)
- Awareness of local community to impact of climate change and adaptation
- Climate change and impact on water resources management of community. (Multiple case study : tributaries of Mun river basin)

- Water resources management of Chi river basin community.
- Water resources management of Klong Tha Lat sub-basin with WEAP mathematical model.
- Study of any flood response with participation of Ban Klong Wa community. (Kor Hong municipality, Hat Yai district, Songkhla province)
- The effect of climate change on community based water management: the case study of the sub watershed area of Mun River, 1 October 2012-30 September 2014.
- The conservation planning on small canel and the way of life of people Ampawa district, Samutsongkarm province, June 2013- June 2014.

Collaboration with other national and international organizations and/or programmes
- Cooperate with Ministry of Natural Resources and Environment (MNRE) and other concerned agencies such as UNESCAP to organize a meeting /events/exhibitions on the occasion of the World Water Day in March 2013.

- Cooperate with JICA for project implementation on Comprehensive Flood Management Plan for the Chao Phraya River Basin during July 2012 – September 2013. The project is already completed with successful by the end of September.

- Trilateral Cooperation; Lao PDR, Thailand and German Agency for International Cooperation: GIZ on Nam Xong Sub-River Basin Management, Vangveieng District, Vientiane Province, Lao PDR.

- Collaborate with German Agency for International Cooperation: GIZ under the support by German Federal Ministry of Environment, Nature Conservation and Nuclear Safety (BMU) to contribute the project on Improved Flood and Drought Prevention through Ecosystem-Based Adaptation in Watershed.

Other initiatives

- The Department of Water Resources initiates and cooperate the guideline on Conjunctive Water Management with the Department of Groundwater Resources, Thailand under the consultations of Natural Heritage Institute (NHI), the United States of America.

Educational and training courses

Contribution to IHP courses

None

Organization of specific courses

- National Training on Operation and Maintenance of ADCP and GPS equipment on 29-30 July 2013, Nong Khai, Thailand
- Training Programme on the sediment grain size analysis on 5-6 August 2013, Chiang Saen Hydrological Centre, Chiang Rai, Thailand
- National Training on Operation and Maintenance of Early Warning System in the High Risky Areas of Flash Flood and Landslide between 9-10 May 2013, with total 1,054 stations, cover with 3,074 villages. The course to increase understanding and skills for Public Relations and hear comments from the public and representatives of the early warning system for flood risk areas - landslide prone areas in the foothills and plains for 2013

Participation in IHP courses

- Thai representative attended the training course on Precipitation Measurement from Space and its Applications, 18 November-1 December 2012, Nagoya, Japan.
- Thai representative attended the International Workshop on Remote Sensing and eco-hydrology in arid regions under the Asian Water and Development Information for Arid Lands-A Global Network – UNESCO IHP (Asian G-WADI/IHP), 16-20 September 2013, People's Republic of China.

- Thai representative attended the Urban Water Security Learning Week organized by Asia-Pacific Center for Water Security, Tsinghua University, in September 2013, People's Republic of China.

Publications
There are numerous Publications from various conferences.

Participation in international scientific meeting

Meetings hosted by the country

- Thailand by Ministry of Natural Resources and Environment hosted the 12th ASEAN Ministerial Meeting on the Environment in September 2013.
- Royal Thai Government hosted the 2nd Asia-Pacific Water Summit and exhibitions, 14-20 May 2012, Chiang Mai, Thailand.
- Thailand by the Department of Water Resources hosted the ASEAN Water Dialogue Conference 2013: AWDC 2013, 25-27 September 2013, Bangkok, Thailand.

Participation in meetings abroad

Representatives from Thailand participated in

- World Water Week 2013, 1-6 September 2013, SIWI, Stockholm, Sweden.
- 13th ASEAN Working Group on Water Resources Management, 24-26 June 2013, Darussalam, Brunei.

Other activities at regional level

Institutional relations /co-operation

- TNC-IHP has remained coordination closely and contacts with UNESCO Jakarta Office.

1.6.2 Completed and ongoing scientific projects

- Completed project

The Mekong-HYCOS is an MRC project funded by Agence Française de Développement (AFD) and Fonds Français pour l'Environnement Mondial (FFEM). The Mekong-HYCOS Mekong-HYCOS project operated by the Information and Knowledge Management Programme (IKMP). Since 2006, it has upgraded existing hydro-meteorological stations in Cambodia, Lao PDR, Thailand, Viet Nam and China with state of-the-art equipment and tools as well as operating systems to meet the standards of the World Meteorological Organization, the project's partner. The project also installed new posts in the countries.

Currently, there are 49 stations throughout the region, 17 on the mainstream, 30 on the tributaries and 2 tidal stations in the Mekong Delta. These stations share raw data on rainfall and water levels through the MRC's data sharing platform. Moreover, the MRC's Flood Management and Mitigation Programme and national flood forecasting agencies use the data for their flood modelling and trigger flood warnings if waters reach critical levels. Near real-time flood forecasting information is also available on the MRC's website: http://www.mrcmekong.org.

- Implementation of Joint-Discharge and Sediment Transport and Bedload Measurements on Mekong River of Thailand.

-Nam Pong project A series of training for national modellers under IWRM principles

-Lam Ta Kong project A series of on the job training/workshop for capacity building for the application of ArcSWAT

- Flow model calibration and data preparation for sedimentation model held on Jul 10-12, 2013
- The LTK sedimentation model calibration to be held on Aug 21-23, 2013

FUTURE ACTIVITIES

Activities planned until December 2014

Thai representatives will participate in the 23rd IHP Training Course on Ecohydrology for River Basin Management under Climate Change, 2-13 December 2013 in Kyoto, Japan.

Activities foreseen for 2013-2014

- Continuation of Collaboration with RSC for Asia and Pacific
- Continuation of involvement in *Asian-Pacific FRIEND*
- Enhancing activities contributed to IHP-VII
- Enhancing activities in Flood and Drought Management
- Continuation of promotion on Integrated Water Resources Management
- Expansion of an Integrated Water Resources Management implementation to the rest of the country
- Promotion on Capacity Building on Water Resources Management for River Basin Committee
- Participate in the international forum/conference on water resources management.

Activities envisaged in the long term

- Enhancing activities contributed to IHP-VII
- Enhancing activities in Flood and Drought Management
- Highlight on Integrated Water Resources Management in 25 river basins
- Continuation of raising public awareness and education in water resources management
- Continuation of raising public awareness in efficient water resources management
- Continuation of raising public participation for better water resources management

VIET NAM NATIONAL COMMITTEE FOR THE IHP
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NATIONAL REPORT ON IHP RELATED ACTIVITIES

I. ACTIVITIES UNDERTAKEN IN THE PERIOD NOVEMBER 2012 - OCTOBER 2013

1.1 Meetings in the IHP National Committee

1.1.1 Decisions regarding the composition of the IHP National Committee

The Committee has remained unchanged during the period under review, with the Chairman being Prof. Dr. Tran Thuc, Director of Vietnam Institute of Meteorology Hydrology and Environment (IMHEN) - Ministry of Natural Resources and Environment (MONRE).

Assoc.Prof. Dr. Hoang Minh Tuyen, secretary of IHP National Committee.

The current IHP National Committee consists of 6 water experts working in hydrology and water resources in Viet Nam. Experts from Institutes, Departments and Committees concerned are as follows:

1. Vietnam Institute of Meteorology Hydrology and Environment
2. Department of Water Resources Management.
3. National Hydro-Meteorological Service
4. Ha Noi University for Natural Resources and Environment
5. Ha Noi Water Resources University
6. Center for Water Resources Planning and Investigation

1.1.2 Status of IHP-VII activities

Viet Nam national committee has arranged projects and activities in all themes and almost all focal points of IHP-VII through national committee members, focal points and working groups around the country.
Prepare for the participation/contribution to HP-VIIII activities.
Disseminate themes of the UNESCO IHP Eighth Phase of IHP (2014-2021).

1.1.3 Decision regarding contribution to/participation in IHP-VII

1.2 Activities at a national level in the framework of the IHP

1.2.1 National/local scientific and technical meetings

1. On 4/03/2013, IMHEN organized the vocational program for Hydro-meteorological sector for high school students.

2. IMHEN and Viet Nam IHP organized the meeting and dialogue with the Press on: "CLIMATE CHANGE AND SEA LEVEL RISE SCENARIOS UPDATE DETAILS FOR VIETNAM IN 2012 AND NATIONAL ACTION PLAN ON CLIMATE CHANGE DURING PERIOD 2012-2020" on April 17, 2013.

3. Cooperation with Water Resources Department (WRD) in meetings on water resources issues of Viet Nam such as: Water resources Maps of Viet Nam, Water Allocation... ect.

4. Collaboration with Ha Noi University for Natural Resources and Environment to upgrade subjects in Hydrology and Integrated water resources management for education programme

1.2.2 Participation in IHP Steering Committees/Working groups

The members of the Vietnam National Committee for the IHP have attended and participated actively in all of the annual meetings of the Regional Steering Committee.

1.2.3 Research/applied projects supported or sponsored

- *Development of Operation rules n for reservoir system on Red, Ba, Thu Bon, Sesan, Srepok rivers*, Projects funded by MONRE.
- *Study on flash flood in Central Highlands an Central Area of VietNam***,** Research Project funded by MONRE
- *Updated Climate change Scenario for Vietnam in 2013-2015*, Project funded by the Government, 2013.

1.2.4 Collaboration with other national and international organizations

- From 17-18 April 2013, IMHEN and Viet Nam IHP organized the training workshop "Strengthening the capacity to cope with climate change and groundwater models SEAWAT" in the framework of the project "Development and implementation adaptation measures to climate change in coastal areas of Vietnam". The project was funded by the Finnish Ministry of Foreign Affairs;

- On June 27, 2013, in Ho Chi Minh City, Institute of Meteorology, Hydrology and Environment (IMHEN) in collaboration with the Korea Institute of Ocean Science and Technology (KIOST) organized the second seminar on "Responding to oil spills". The Workshop focus on the developing 3D models for oil spill forecast; oil spill forecasting technology; analysis of the impacts of wind to prevent oil spills; marine ecosystems Vietnam.

1.2.5 Other initiatives

1.3 Education and training courses

1.3.1 Contribution to IHP courses

1.3.2 Organization of specific courses

None.

1.3.3 Participation in IHP courses

1.4 Publications

1. **Technical Guidance for Integrating Climate Change into Development Plans.** Vietnam Publishing House of Natural Resources, Environment and Cartography 2013
2. **Viet Nam Water Resources and Management**, Publishing House for Natural science and Technology.

1.5 Participation in international scientific meetings

None.

1.6 Other activities at a regional level

1.6.1 Institutional relations/co-operation

Continue developing Vietnam-Korea Environment Center for Research and Training (Viet Nam-KOICA). From 04 to 10 September, 2013. the Center conducted the training course on Improve the writing scientific reports skill and developing project proposal for young researchers.

1.6.2 Completed and ongoing scientific projects

Nil

II. FUTURE ACTIVITIES

2.1 Activities planned for 2013-2014

Participate in the Study on the Impacts of Mainstream Hydropower on the Mekong River

Participate in the compilation and promulgation of the guidelines of the Water Resources Law

Develop operation rules for reservoir systems on major river basins

Continue to improve warning and forecasting flood in central of Vietnam

Develop IDF for Meteorology stations in Viet Nam

Adjust warning level at Hydrology stations.

2.2 Activities envisaged in the long term

Enhance activities contributed to IHP-VIII

Water for sustainable cities; Water-related disasters management;
Promoting and applying new technology and approach in Integrated Water Resources management;
Assessment of impact of climate change on water resources and hydrological extreme events; Adaptation measures to Climate change;

Monitoring and assessment of water trans-boundary;
Developing River Basin Organization (RBO);
Modernization of Hydro-Met Service;
Transfer technology and training course in Hydrology and WR.

ANNEX 7

CATEGORY 2 CENTRES UNDER THE AUSPICES OF UNESCO

ASIA PACIFIC CENTRE FOR ECOHYDROLOGY
APCE – UNESCO CATEGORY II CENTRE

Research Centre for Limnology Campus
Cibinong Sciences Centre – Jl. Raya Bogor Km 46
Cibinong – Bogor – West Java - INDONESIA
Tel.: 021-8757071 Email : ignasdas@yahoo.co.id

BACK GROUND

- The Asia Pacific Centre for Ecohydrology (APCE) is a category II centre of the United Nations Educational, Scientific and Cultural Organization (UNESCO). It focuses on ecological approaches to water resources management, to provide sustainable water for the people by harnessing science and technology, education and culture. APCE is committed to contributing towards overcoming current and important issues of national, regional and global interest, such as poverty, climate change adaptation and disaster risk reduction.

Organization Structure

Executive Director

Executive Secretary

Research Division

Training & Workshop

Information System

Public Awareness

APCE DIRECTIVE

- **VISION**
  - To be an Internationally Reputed Asia Pacific Center in Urban and Rural Ecohydrology by 2021
- **MISSION**
  - Develop understanding and practices of ecohydrology through research, training and knowledge exchanges, information systems and public awareness.
- **VALUES**
  - Wisdom
  - Integrity
  - Harmony

STRATEGIC GOAL

1. To promote local resources base ecohydrological research
2. To strengthen local capacity to adopt ecohydrological concept and approach
3. To provide easy access to local resources based ecohydrological information and knowledge
4. To enhance public awareness of local resources based ecohydrological practices

RECENT ACTIVITIES

IFAS TRAINING COURSE

- A technical course was organized based on the frame- work of the Flood Forecasting and Warning System which was conducted in 10 countries (Australia, Cambodia, China, Indonesia, Lao People's Democratic Republic, Malaysia, the Philippines, the Republic of Korea, Thailand and Vietnam). This Integrated Flood Analysis System (IFAS) course was realized in collaboration with the International Centre for Water Hazard and Risk Management, the UNESCO Jakarta Office and LIPI.

Demo Site for Community-Based Water Management

- The objective of the demo site for ecohydrology development is to act as a field station for the implementation of ecohydrology concepts in the field. The demo site ecohydrology campaign is expected to be significant in socializing the sustainable management of water resources in accordance with the concept of ecohydrology. It will also serve as a natural laboratory for the future development of ecohydrology, especially as a tropical Indonesian concern. Ecohydrology demo site development in Indonesia will be directed to a location demo site representing the concept of sustainable water resources management in several different groups, namely an ecohydrology demo site for the community-based management of water resources.

Cultural Landscape and Subak System in Bali

- Subak is the name of the water management (irigation) system for paddy fields on Bali island, Indonesia, developed more than 1,000 year ago. Over that time, this traditional ecologically sustainable irrigation system has constantly adjusted to changing situations. The result is an intricate system which is strongly interlinked with Bali's natural, social, cultural and religious environment.

IPAG60: Alternative Technology for Clean Water in Peatland Areas

- The majority of areas in Riau Province and Central Kalimantan Province have land with peat surface water, which characteristically has: • low pH levels (2-4), making it highly acidic • high levels of organic matter • high levels of iron and manganese • yellow or dark brown colour.
- Peat water treatment technology that has been established in previous studies (2009-2011), by Ignasius D.A. Sutapa and team enables peat areas to have peat water treatment facilities for the drinking water supply. A lot of territory in some areas in Indonesia – especially Sumatra and Kalimantan – have clean water source issues. Implementation of this technology in the wider area is necessary to support the increase in water services in the region.

Flooding events in Indonesia

IFAS course activities

Discussing with Islamic Leaders community

Artificial constructed wetland

Rice Field in Jatiluwih world heritage site

Subak system : Pura, paddy field and water

IPAG 60 : from peatwater to clean water

Clean water produced by local people with IPAG60

HUMID TROPICS CENTRE KUALA LUMPUR

The Regional Humid Tropics Hydrology and Water Resources Centre for Southeast Asia and The Pacific

UNESCO-IHP

21st Regional Steering Committee Meeting for Southeast Asia and the Pacific, Gyeongju, Republic of Korea 3 & 4 October 2012

DIRECTOR'S REPORT

THE REGIONAL HUMID TROPICS HYDROLOGY AND WATER RESOURCES CENTRE FOR SOUTHEAST ASIA AND THE PACIFIC

(HTC KUALA LUMPUR)

FOREWORD

The Humid Tropics Centre Kuala Lumpur was inspired by increasing awareness of the importance of hydrology and water resources management in humid tropics region. It has become the prominent issue to the world organization.

The Regional Humid Tropics Hydrology and Water Resources Centre for Southeast Asia and the Pacific (HTC) is one of the UNESCO's Category II water centres. The HTC started operation in early 1997. An agreement between UNESCO and the Government of Malaysia was signed on 28 October 1999. The HTC aims to act as a catalyst in carrying out local, regional and international collaboration, consultation and partnership in water management. More specifically, the objectives of the HTC are:

- To promote a conducive atmosphere for collaboration through technology and information exchange, education and science.
- To increase scientific and technological knowledge about the hydrological cycle.
- To promote and increase scientific and technological knowledge about urban stormwater management, ecohydrology, humid tropics and water education

The focal areas of HTC since 2009 are: Integrated Water Resources Management (IWRM), Urban Stormwater Management, Ecohydrology, River Waste Water Management, Humid Tropics and Water Education. The scope of activities includes applied research, services/advising/consulting, innovation product development, education and software development.

HTC has been involved in the cross-cutting APFRIEND River Catalogue and some of the information can be access through http://htc.ebox.com.my or http://htckl.org.my/apfriend. The Centre contributed to the SWITCH-in-Asia Urban Water Management through the construction of a demonstration integrated MSMA Stormwater Management Ecohydrology (SME) project at HTC and will continue to carry out the R&D&C for the benefits of UNESCO-IHP Strategic Plans. The SME demonstration project was officiated by H.E. Irina Bokova, the Director General of UNESCO on 21st May 2013.

Hopefully in the years to come, some of the component of the project can be successfully implemented through the Upscaling SME project at Langat river basin in Malaysia, in collaboration with one of the university that involve in UNESCO-HELP River Basin programme. The main target together with the implementation of other environmental projects at the river basin is to improve from the present stage E-Evolving to the next level stage O-Operating.

We wish very much to continue in the collaboration and networking and offer our services as a regional water centre under the auspices of UNESCO.

With Best Wishes,

Dr. Mohamed Roseli bin Zainal Abidin
Director
Humid Tropics Centre, Kuala Lumpur
Malaysia

INTRODUCTION

This report highlights events and activities that had taken place since the 20th Regional Steering Committee Meeting for South East Asia and the Pacific UNESCO IHP held in Langkawi, Malaysia from 08th – 09th November, 2012 and throughout the year 2013 (till 30th September 2013). This report also highlights future programmes and activities for the year 2014-2015 planned by the Centre. The report is categorized as follows;

1. Chapter 1: Activities Implemented and Participated at International and Regional Level.
2. Chapter 2: Activities Implemented and Participated at National Level.
3. Chapter 3: Quality Management System and Water Education Programme.
4. Chapter 4: Future Programme for 2014 - 2015.
5. Chapter 5: AP Friend Water Archive.
6. Chapter 6: Finance in 2012- 2013.
7. Chapter 7: Staffing in 2013.
8. Chapter 8: Publications in 2012/2013.
9. Chapter 9: Concluding Remarks.

Letter from the Director General UNESCO

CHAPTER 1

ACTIVITIES IMPLEMENTED AND PARTICIPATED AT INTERNATIONAL AND REGIONAL LEVEL

1.1. Seminar/Workshop/Training

Attended the Asia-Pacific Climate Change Adaptation Forum 2013 from 18th - 20th March 2013 in Incheon, Republic of Korea. The forum was attended by Madam Rohani binti Ahmad (Deputy Director). This forum was organized by Korea Environment Institute (KEI) in association with Korea Adaptation Center for Climate Change & United Nations Environment Programme with theme "Mainstreaming Adaptation into Development.

Attended the Executive Development Programme (for young officers, Grade 41 – 44), from 6th – 20th April 2013 at Central Official Training Institute (COTI), Republic of Korea, The forum was attended by Ms Devi Peechmani (Assistant Director).

Attended the Sustainability Science Workshop: *A Science Based Approach to Realise the Future We Want For All* on 4th -5th April 2013 at Istana Hotel, Kuala Lumpur, Malaysia. This workshop organized by UNESCO Jakarta in collaboration with LESTARI, UKM and ISTIC was attended by Dr. Mohamed Roseli bin Zainal Abidin (Director).

1.2. Meeting

Attended the 20th Regional Steering Committee (RSC) Meeting for South East Asia and the Pacific UNESCO-IHP held in Langkawi from 08th – 09th November, 2012. As Malaysia was the host for the RSC Meeting, the IHP Malaysia and HTCKL organized the Meeting.

1.3. Conference and Technical Visit

The 2nd International Conference on Water Resources (ICWR2012) in Conjunction with 20th UNESCO-IHP Regional Steering Committee Meeting for Southeast Asia and the Pacific was held at the Bayview Hotel Langkawi, Malaysia from 5th - 6th November 2012. The theme for the conference is *"Sharing Knowledge of Issues in Water Resources Management to Face the Future"*. HTCKL together with University Technology Malaysia (UTM) organized the Conference. Other collaborators includes such as UNESCO Jakarta, Department of Irrigation and Drainage, IHP Malaysia, Malaysian National Commission for UNESCO (SKUM), Ministry

of Natural Resources & Environment (NRE), UNITEN, UKM, IUKL, Langkawi Development Authority (LADA), IAHR-AIRH UTM and others successfully organized the conference.

In conjunction, technical visit was conducted by HTCKL on 7th November 2012. Place of visit includes Langkawi Geopark, Craft and Crystal Complex, Mahsuri's Tomb, Under Water World and others.

1.4 Visits to HTCKL by H.E Madam Irina Bokova, Director General UNESCO

Her Excellency Madam Irina Bokova, Director General UNESCO had visited HTCKL on 21st May 2013. She had officially launched the UNESCO-SWITCH in Asia: MSMA Stormwater Management Ecohydrology at HTCKL by releasing fish into the constructed wetland & signing of plaque.

CHAPTER 2

ACTIVITIES IMPLEMENTED AND PARTICIPATED AT NATIONAL LEVEL

2.1 Malaysia World Water Day 2013

This programme was cancelled upon Malaysia Election's Day. However, in conjunction of this programme, HTCKL together with Malaysia IHP conducted the MIHP-UNESCO best thesis award, an award to the best student's thesis at undergraduate, post graduate and doctorate level in the field of hydrology and water resources. The objective was to promote Hydrology and Water Resources subjects at university level in Malaysia.

2.2 Research Activities

HTC carry out its R&D activities according to its first two functions under Article II (i.e. (a) to coordinate the implementation of cooperative hydrological and water resources research projects and activities, and (b) to network with IHP National Committees and other similar centres for exchange of scientific and technical information on research results) and the UNESCO-IHP cross-cutting programmes of SWITCH-in-Asia: Urban Water Management; as well as UNESCO-HELP River Basin (Langat River).

The R&D carried out is also in conjunction with UNESCO IHP-VII STRATEGIC PLAN (2008-2013); Water Dependencies Systems under Stress and Societal Responses for the themes and focal areas of Themes 1, 3, 4 and 5. The main focuses are in stormwater management, ecohydrology, river management, waste water management and water education.

Most of the R&D are being carried out through collaboration and networking with local universities and under the R&D committee of Malaysian National IHP.

The R&D carried out is as follows:

2.2(a) MSMA Stormwater Management Ecohydrology at HTCKL (SWITCH-in-Asia: Urban Water Management):

- Monitoring programme (measurement of water quantity, water quality, present of heavy metals, hydrological performance analysis for all MSMA-SME components, modelling runoff and pollutants loads) completed in Dec 2012.

- The outcome of the project is as shown in table below;

NO	SME COMPONENTS	MONITORING OUTCOME
1	Porous Pavement	Control at source in reducing peak runoff during storm events
	a. Turf Pavement	Reduction in surface run-off 93.5% -100%
	b. Interlocking pavement	Reduction in surface run-off 59.5% -100%
2	Green Roof	Reduction in peak discharge up to 30% compared to impervious roof & reduction in temperature by 1.5ºC.
3	Bioretention System	Enhancement in infiltration rate from 62.15mm/hr – 337.48mm/hr compared to min infiltration rate 13mm/hr as per MSMA Manual.
4	Rainwater Harvesting	Improving in water quality value from class III or Class IV to at least min Class II & max Class I WQI. No present of heavy metal.
5	Constructed Wetland	
6	Greywater reuse System	

Hydrological analysis for interlocking pavement

Event	Event length (min)	Total rainfall (mm)	Observed Total Runoff Volume (m^3)	Inflow Volume (m^3)	Reduction (%)
17/6/2012	42	10.8	0.514	3.024	83.0
24/6/2012	7	2.0	0	0.560	100.0
26/6/2012	30	5.6	0.056	1.568	96.4
2/7/2012	82	11.6	0.352	3.248	89.2
3/7/2012	135	1.2	0	0.336	100.0
4/7/2012	112	5.8	0.112	1.624	93.1
5/7/2012	33	7.2	0.019	2.016	99.1
6/7/2012	104	29.6	1.623	8.288	80.4
8/7/2012	103	23.4	1.268	6.552	80.6
9/7/2012	251	15.0	1.699	4.200	59.5
11/7/2012	102	3.6	0.031	1.008	96.9
16/7/2012	66	42.6	1.867	11.928	84.3
17/7/2012	121	10.0	0.337	2.800	88.0
19/7/2012	187	9.4	0.331	2.632	87.4
20/7/2012	144	26.2	1.452	7.336	80.2
22/7/2012	71	3.2	0.124	0.896	86.2

Interlocking pavement in HTC could achieve 59.5% (lowest) to 100% (highest) of total volume reduction from rainfall volume.

Hydrological analysis for turf pavement

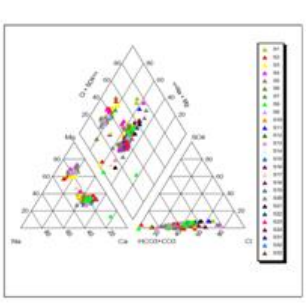
Event	Event length (min)	Total rainfall (mm)	Observed Total Runoff Volume (m^3)	Inflow Volume (m^3)	Reduction (%)
17/6/2012	42	10.8	0	3.024	100.0
24/6/2012	7	2.0	0	0.560	100.0
26/6/2012	30	5.6	0	1.568	100.0
2/7/2012	82	11.6	0	3.248	100.0
3/7/2012	135	1.2	0	0.336	100.0
4/7/2012	112	5.8	0	1.624	100.0
5/7/2012	33	7.2	0	2.016	100.0
6/7/2012	104	29.6	0.474	8.288	94.3
8/7/2012	103	23.4	0.337	6.552	94.9
9/7/2012	251	15.0	0.001	4.200	100.0
11/7/2012	102	3.6	0.019	1.008	98.1
16/7/2012	66	42.6	0.777	11.928	93.5
17/7/2012	121	10.0	0	2.800	100.0
19/7/2012	187	9.4	0	2.632	100.0
20/7/2012	144	26.2	0.252	7.336	96.6
22/7/2012	71	3.2	0	0.896	100.0

Turf pavement in HTC could achieve 93.5% (lowest) to 100% (highest) of total volume reduction from rainfall volume.

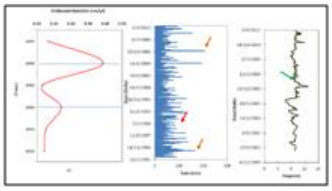
2.2(b) Agricultural Non-Point Source Pollution and Impact on Reservoir (Sembrong Dam) Sedimentation and Water Quality (Phase IHP-VII: Theme 1) – Collection of site data is ongoing. The target outcome is as follows;

- Characterize different types of water and the alteration processes in water body.
- Relationship of sedimentation rate, rainfall events and water stage.

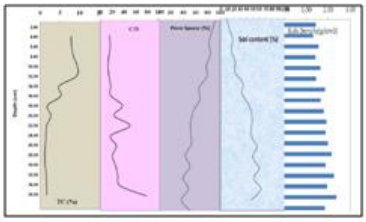
- Physical properties of lake about current condition of depositional system.



Piper Diagram of water samples: characterize different types of water and the alteration processes in water body

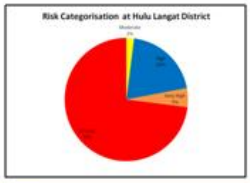


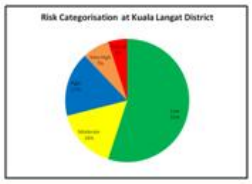
The relationship of sedimentation rate, rainfall events and water stage at Sembrong Reservoir



Physical properties of lake can imply the properly about current condition of depositional system

2.2(c) Erosion Risk Categorization Potential at Langat River (part of UNESCO-HELP River Basin (Langat River) – completed. Erosion risk potential in Langat River has been categorized as shown in figure below;





The river bank erosion more critical at the districts of Hulu Langat and Sepang whereas Kuala Langat district experienced less river bank erosion.

This is particularly due to the fast flowing water at the upper stream compared to the downstream and most of soil composition at Hulu Langat and Sepang districts have sand and silt based.

Soil Erodibility → Upstream of the Langat River: Critical
Middle stream: Critical and High
Lower Stream: High Moderate

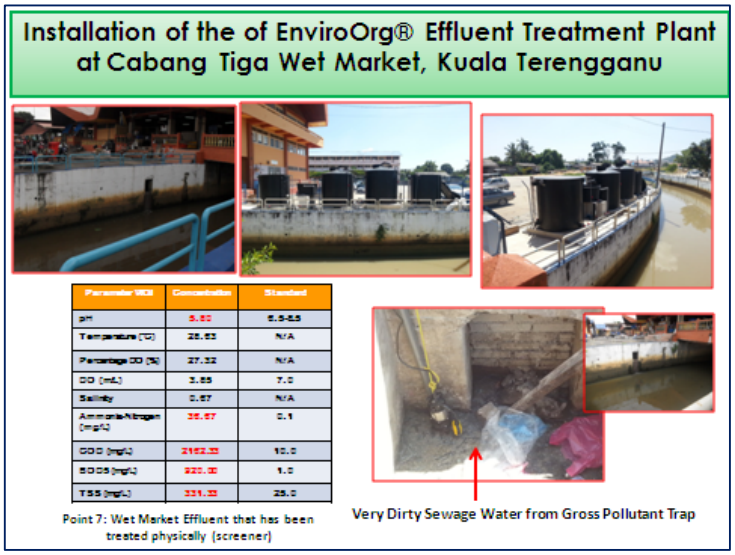
Seksyen 5, Bandar Baru Bangi @Hulu Langat

2.2(d) Monitoring Rainwater Harvesting System (RWHS) Effectiveness in Perhentian Island (Phase IHP-VII: Theme 1)-completed.

2.2(e) Remediation of Pollution from Large Point Sources for Hiliran River (Phase IHP-VII: Theme 3 & 4) – Monitoring programme in progress.

- The construction of the EnviroTex® Effluent Bio-Treatment Plant for Azo-Dye Waste Water Treatment at Source completed in 2012. Early result in removal the azo-dye has been obtained as shown in figure below;
- The construction of the EnviroOrg® Effluent Bio-Treatment Plant for wet market Waste Water Treatment at Source completed in 2013 as shown in the figure below:

Installation of EnviroTex® Effluent Bio-Treatment for Azo-Dye Waste Water Treatment at Source



Installation of EnviroOrg® Effluent Bio-Treatment for Waste Water Treatment at Source

2.2(f) Construction of a Large Scale Solar Still System for Treatment of Sanitary Wastewater at Perhentian Island (Phase IHP-VII: Theme 3 & 4) – Monitoring programme in progress.

- The construction/installation of Solar Still System for treatment of Sewage (+sanitary) water completed in June 2013.

Installation of the Step Solar Still System for Waste Water Treatment at Source or Modified for Sea Water Desalination for Portable Water Use

2.2(g) Urban Eco-Hydrology for Resilient Environment (UCOREN) – Working Group 2: Component Ecohydrology (Phase IHP-VII: Theme 3). On-going.

2.2(h) Upscaling of Stormwater Management Ecohydrology at Langat River Basin (UNESCO - HELP River Basin).

- To analyze the Watershed Sustainability Index (WSI) which include gathering, describing and assessing relevant socio-economic data, and with objective to conduct detail public participatory and urban social learning activities for WSI (on-going).
- Detailed design of the proposed rehabilitation works to improve the water quality, quantity and riverbank rehabilitation in developed areas (on-going).

LANDSCAPE MASTER PLAN FOR THE UPSCALING SME AT LANGAT RIVER BASIN

Notes: Once the R&D projects and programmes completed, the output will be either or combinations in the form of technical reports, technical guidelines, papers, proceedings, posters, innovation products and demonstration projects.

2.3 Seminar/Courses/Training Workshop

- Four (4) Seminars/Workshop conducted in 2012 & one (1) seminar conducted in 2013 through networking and collaboration with various universities as shown in table below;

No.	Seminar/Workshop/ Lecture	Place & Date
1.	Workshop on Water Quality Analysis	Primula Hotel, Kuala Terengganu, 14th & 15th May 2012
2.	Seminar on Geospatial Related Disaster and Problems: Issues, Challenges and Prevention	Avillion Admiral Cove, Port Dickson, Negeri Sembilan, 4th & 5th June 2012
3.	Seminar on Integrated Urban Water Management Using MSMA Stormwater Management Ecohydrology as part of SWITCH Program: From Theory until Implementation	Heritage Hotel, Cameron Highlands, Pahang, 2nd & 3rd July 2012
4.	International Conference on Water Resources (ICWR2012)	Bayview Hotel, Langkawi, 5-6 Nov. 2012
5.	Seminar on Geospatial Disaster and UNESCO-HELP BASIN: Water Co-Operation, Security and Geohazards	Cititel Midvalley City, Kuala Lumpur, 17-18 June 2013

- Participants: government officers, consultants (private), lecturers, university students, NGOs', MIHP members.

CHAPTER 3

QUALITY MANAGEMENT SYSTEM AND WATER EDUCATION PROGRAMME

Since HTC Kuala Lumpur was awarded the MS ISO 9001:2008 quality management certification, continual improvement has always being carried out. The UNESCO SWITCH-in-Asia Urban Water Management: MSMA Stormwater Management Eco-hydrology project in HTC compound is used as the quality management system. The external surveillance auditing for 2013 has been carried on 19th September 2013.

List of some of the Water Education Programmes carried out are as follows:

Water Education: Lecture and Talk Given

No.	Lecture and Talk	Place & Date
1.	Lecture on IWRM to officers from National Audit Dept. During River of Life Seminar	Delivered on 9th Nov. 2012 at Awana Hotel, Genting Highlands
2.	Lecture on Integrated Catchment Management to officers from National Audit Dept	Delivered on 12th Mac 2013 at Akademi Audit Negara (AAN), Nilai, Negeri Sembilan
3.	Technical Talk on HTCKL Goes Green In support of Malaysian Government 'Goes Green' programme and Storm Water Management Ecohydrology Project to Officers from DID Kelantan, DID Negeri Sembilan, DID Penang and DID Hilir Perak	Delivered on 27th Mac 2013, 20th June 2013 and 25th June 2013 at HTCKL (4 no. technical talk)
4.	Technical Talk on Storm Water Management Ecohydrology Project to lectures and students from two(2) universities	Delivered on 2nd April 2013, and 17th April 2013 at HTCKL
5	Technical Talk Stormwater Management Ecohydrology Related to Works Carried out by HTCKL and Flood Management Making Space for Water to officers from Flood Management Division, DID Malaysia	Delivered on 19th August 2013 at HTCKL

Water Education: University Students R&D

No.	Name of Students	Title of Research	Candidate
1.	Ms Nur Asmaliza binti Mohd. Nor	Performance Evaluation of Constructed Wetland as Stormwater Improvement: Case Study at HTCKL	PhD candidate
2.	Mr Kok Kah Hoong	Evaluation of Green Roof as an Option of Green Technology for Urban Stormwater Quantity and Quality Control	Completed Master Degree July 2013
3.	Ms Amirah Hanim binti Mohd. Fuad	Monitoring Program of MSMA Stormwater Management Ecohydrology Project at HTCKL	Completed Master Degree 2013

4.	Ms Nur Fadzilla binti Usop	Sensitivity Analysis on the Estimation of Evapotranspiration Model, Penchala River Basin (working group: Urban Ecohydrology)	Graduated July 2012 with M.Sc
5.	Mr. Mohd. Khairul Idlan bin Muhammad	Ecohydrological Modeling of Water Discharge and Pollutant Loads in Penchala River (working group: Urban Ecohydrology)	PhD candidate
6.	Ms Asma Nabila binti Abd Kader	Effectiveness of Green Roof in Controlling Rate of Surface Water and Water Quality at HTCKL	Bachelor Degree completed in 2013
7.	Ms Naimah binti Yusoff	Erosion Risk Potential Categorization Along Langat River	Completed Master Degree 2013
8.	Ms Nor Bakhiah binti Ibrahim	Historical Sediment Geochemistry and Hydrochemistry of Sembrong Reservoir	PhD candidate

Water Education: Papers in 2012

No.	Title of Paper	Place & Date
1.	Transformation and Innovation through R&D in Stormwater Management Ecohydrology	DID Senior Management Conference, Renaissance Hotel, Kota Bharu, Kelantan, 10-12 September 2012.
2.	Coastal Development Issues and Impacts of Climate Change on Coastal Resources	National Conference On Extreme Weather And Climate Change: Understanding Science And R&D Capacity Needs, Auditorium, Malaysian Meteorological Department, 8-9 October 2012.
3.	Evaluation of Permeable Pavement under Tropical Climate: A Case Study at Humid Tropics Centre (HTC)	International Conference on Water Resources (ICWR2012), Bayview Hotel, Langkawi, 5 – 6 November 2012.
4.	Sustainability of Hydropower Reservoir as Flood Mitigation Measure: Lesson Learned from Ringlet Reservoir, Cameron Highlands, Malaysia	International Conference on Water Resources (ICWR2012), Bayview Hotel, Langkawi, 5 – 6 November 2012.
5.	The Relationship of Localized Rainfall Versus Urban Heat Island (Uhi) Parameters And Air Pollution	International Conference on Water Resources (ICWR2012), Bayview Hotel, Langkawi, 5 – 6 November 2012.
6.	Performance of Constructed Wetland Under Tropical Climate: A Case Study Humid Tropics Centre Constructed Wetland	International Conference on Water Resources (ICWR2012), Bayview Hotel, Langkawi, 5 – 6 November 2012.
7.	Preliminary Results of Stratification Study in Sembrong Reservoir, Peninsular Malaysia	International Conference on Water Resources (ICWR2012), Bayview Hotel, Langkawi, 5 – 6 November 2012.

Water Education: Papers in 2013

No.	Title of Paper
1.	River Bank Erosion Risk Potential With Regards to Soil Erodibility.
2.	Soil Erosion Risk Potential with Regards to Rainfall Erosivity Along Langat River Basin
3.	Comparison of Methods for Estimating Evapotranspiration In A Tropical Urban Catchment: Case Study of Penchala River
4.	Evaluation of Green Roof as Green Technology for Urban Stormwater Quantity and Quality Controls

Water Education: Others

UNITEN Students 'Portable Desalination of Sea Water System Innovation Product' Competition held at UNITEN campus. Director of HTC became the head jury of the competition.

CHAPTER 4

FUTURE PROGRAMME 2014-2015

4.1 The future activities planned or to be participated as shown in the table below;

NO	PROGRAMME /ACTIVITIES	2014-2015
1	21st Intergovernmental Council (IGC) UNESCO – IHP Paris - Member	2014 - Paris, Date to be confirmed.
2	International Conference on Peri-Urban Landscapes: Water, Food and Environmental Security	July 2014, Sydney, Australia. Director HTCKL to deliver Keynote Address.
3	13th International Conference on Urban Drainage (13th ICUD 2014) – Secretariat (technical and publication)	8 -11 Sept 2014, Borneo Convention Centre Kuching, Malaysia
4.	Water Management Component Workshop on Comparative Studies of Applying Ecohydrology and IWRM in Asia and Africa through UNESCO Category 2 Water Centres in Asia and Africa; to be hosted by HTCKL	Sept. 2014, Borneo Convention Centre Kuching, Malaysia. Collaboration with Asia Pacific Center for Ecohydrology (APCE), Capital National University (CNU) Beijing China, Regional Centre for Integrated River Basin Management (RC-IRBM) Kaduna Nigeria, Malaysia National Commission for UNESCO, Malaysian IHP National Committee and local partners of HTC.

NO	PROGRAMME /ACTIVITIES	2014-2015
5	Upscaling Water Security to Meet Local, Regional and Global Challenges: (1) Research Component: Demonstration sites of ecohydrology biotechnologies in Langat River and Putrajaya Lakes. (2) Education Component: HELP and Ecohydrology scoping.	2014 – 2015. Same as no. 4 above. Under Extra-budgetary programme, Malaysian-Funds-in-Trust, and UNESCO RB.
6	Construction Upscaling of MSMA Stormwater Management Ecohydrology at Basin Level (Langat River)	2014-2015: Under the Cross-cutting UNESCO-SWITCH : Urban Stormwater Management and UNESCO-HELP Basin: Construction of some components of the SME (Bioretention system, constructed wetpond, porous pavement, drainage system, community centre, landscaping works, riverbank stabilization works and others at the identified river corridor of Langat River.
7	Decision Support System (DSS) for MSMA Stormwater Management Ecohydrology (SME) at HTCKL and Upscaling MSMA-SME Langat River Basin	2014-2015: Development and using DSS software tool in planning, design, construction and monitoring the successful implementation of MSMA-SME at HTCKL as well as planning, R&D Watershed Sustainability Index, and the design of the Upscaling MSMA-SME at Langat River.
8	Artificial Bio-Macropore for Enhancing Soil Infiltrability for Urban catchment at HTCKL and Langat River Basin	2014-2015: Study on using the technique of artificial bio-microphore hole to increase the soil-water infiltration rate and reduce surface runoff during heavy rain.
9	Rural River Rejuvenation (R3) Project at Jenderam River, Sepang	2014-2015: A small demonstration project through Applied Research to enhance aquatic life in rural river and the use of bio-filter techniques in increasing the river water quality so that the river can be use for recreational activities.
10	Study on Performance of Gross Pollutant Trap (GPT) Trapping Devices versus Life Cycle Cost and Gross Pollutant Management Strategies Knowledge Portal Case Study Putrajaya	2014-2015: Study by HTC indicated that there are GPTs in market can only trap gross pollutant loading but not necessarily increase the wastewater quality that being discharge back to river. This study is to give background to the problems caused by gross pollutants followed by a review of methods for reducing gross pollutants from reaching receiving waters, to monitor loads of gross pollutant generated from different type of land use during storm events, to collect performance data for selected device used to remove gross pollutant from within the urban drainage network. The result of this study will be incorporated into an innovative decision-support system (DSS) that enable to assist engineers, local authorities to choose the most suitable GPTs to be installed according to specific site characteristic.

NO	PROGRAMME / ACTIVITIES	2014-2015
11	Monitoring Performance of Demonstration Wastewater Treatment Plants at Hiliran River and Perhentian Island, Terengganu	2014-2015: Monitoring the performance of EnviroTex® water pollution from the release of azo-dye, performance of biotechnology EnviroOrg® plant for processing wastewater from wet market and the performance of solar still system in treating waste water.
12	Development of Innovation Product, Intellectual Property for Stormwater Management	2014-2015: Such as Enviro-Drain from light-foam concrete, the environment friendly riverbank erosion structure, structure for treatment of water pollution in river and others.
13	Journal of Water Resources Management JPS Vol. 3 and Vol. 4 and Other Technical Report Publication	2014 & 2015
14	Malaysia-New Zealand Environmental Cooperation : Forecasting Erosion Induce Landslide at Cameron Highland & Langat HELP Basin	2015
15	A Novel Approach to Reuse Alum Sludge in Pottery Manufacturing and Building Material Using Silica and Thermal Curing	2015
16	Stormwater Management Ecohydrology (SME), Integrated River Basin Management (IRBM), Integrated Water Resources Management and Integrated Catchment Management (ICM) such as twinning programme between Langat HELP Basin and Citarum River, Indonesia.	2015
17	To be part of the proposed Regional Centre of expertise (RCE) Langat Basin led by LESTARI,UKM under the framework of United Nation University with the of promoting Education of Sustainable Development (ESD), via the spirit of togetherness and sustainable collegiality and friendship.	2015

- Funding/ Collaborator of the planned activities above either Government of Malaysia or UNESCO through UNESCO Jakarta.

4.2 Operational Plan

HTCKL will continue to perform and carry out its obligation under Article 2 of the Agreement related to;

- ✓ Coordinating the implementation of cooperative hydrological and water resources research projects and activities;
- ✓ Networking with IHP National Committees and other similar centre for exchange of scientific and technical information on research results;

- ✓ Organizing training courses, seminars, workshops and meetings for knowledge and technology transfer;
- ✓ Producing related hydrological and water resources publications and media for distributions.

4.3 Strategic Plan linked with IHP-VIII (Water Security: Responses to Local, Regional and Global Challenges)

- ➢ HTCKL Focus Area on R&D based on UNESCO IHP VIII Themes (2014 – 2021) :
  HTCKL will continue to contribute in stormwater management, ecohydrology, river basin management, waste water management through its R&D programmes and through the three cross-cutting programmes i.e. UNESCO SWITCH (Sustainable Water Management Improves Tomorrow's Cities Health)-in-Asia: Urban Water Management; APFRIEND (Asia Pacific Flow Regimes from International Experimental and Network Data) and UNESCO-HELP (Hydrology for the Environment, Life and Policy) the Langat River Basin.

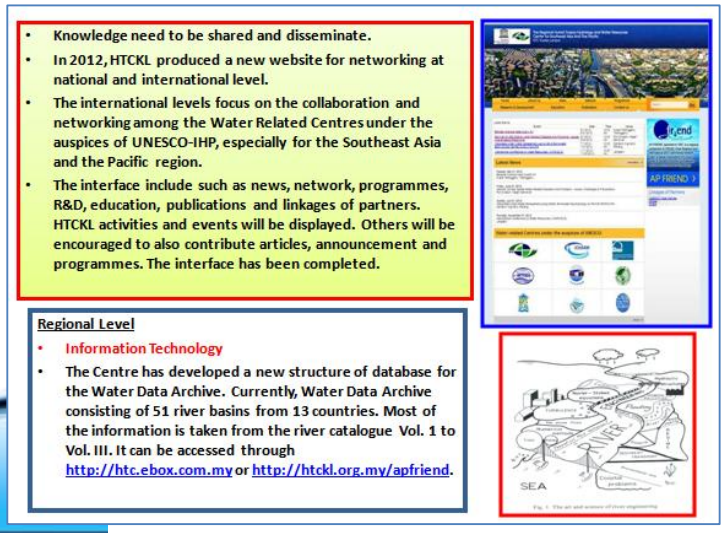
- ➢ The scope of activities includes applied research, advising/consulting, continuing education and software development.

CHAPTER 5

AP FRIEND WATER ARCHIVE

Water Data Archive

The Centre has developed a new structure of database for the Water Data Archive. Currently, Water Data Archive consisting of 51 river basins from 13 countries. Most of the information is taken from the river catalogue Vol. 1 to Vol. IV. It can be accessed through www.htckl.org.my



CHAPTER 6

FINANCE

6.1 Operation and Maintenance

The annual operating budget for the year 2012 and 2013 is shown in the table below.

No.	Component	Amount (USD $)		Contributing Agency
		2012	2013	
1.	Operation and Maintenance			
	• Trust Account	26,450	27,660	Government of Malaysia
	• Operating allocation			Government of Malaysia
	➢ Current	35,940	67,190	
	➢ One Off	34,380	-	
	➢ Others	31,250	-	
	Subtotal	**128,020**	**94,850**	
2.	Emolument			
	• Staff salary	198,260	233,250	Government of Malaysia
	Subtotal	**198,260**	**233,250**	
3	Sponsorship			
	• For ICWR 2012 & 20th RSC Meeting, Langkawi	10,000		UNESCO Jakarta
	• for Seminar on Geospatial Disaster and UNESCO-Help Basin		8,600	Malaysia National Commission for UNESCO
			5,000	UNESCO Jakarta
	Subtotal	**10,000**	**13,600**	
	TOTAL	**336,280**	**341,700**	

6.2 Development

Development Fund for 2012 and 2013 are as follows:

No.	Component	Amount (USD $)		Contributing Agency
		2012	2013	
1.	Research and Development	937,500	-	Government of Malaysia (DID)
		4,940	12,720	Government of Malaysia (Ministry of Education)
	Subtotal	**942,440**	**12,720**	
2.	Upgrading HTCKL building	471,010	119,380	Government of Malaysia (DID)
	TOTAL	**1,413,450**	**139,100**	

CHAPTER 7

STAFFING IN 2013

7.1 Outgoing

- Mrs.Hezrin Hazlinda bt Hashim the former Assistant Director of HTC Kuala Lumpur has been transferred to DID Selangor state on 31st December 2012.
- Mr. Mohd. Fadly bin Mohd. Zain the former Assistant Engineer of HTC Kuala Lumpur has been transferred to DID Training Centre in state of Kelantan on 31st December 2012.
- Mrs Rohani bt Ahmad the former Deputy Director of HTC Kuala Lumpur has been transferred to Flood Management Division DID Malaysia on 16th August 2013

7.2 Incoming

- Mrs. Sandra Anak Ligong, Assistant Director had reported her duty in HTC Kuala Lumpur on 02nd January 2013 (replacing Mrs.Hezrin Hazlinda bt Hashim).
- Mrs. Farah Hafiza bt Zulkipli, Assistant Engineer had reported her duty in HTC Kuala Lumpur on 22nd January 2013(replacing Mr. Mohd. Fadly bin Mohd. Zain).

Note: HTC Kuala Lumpur Organization Chart is as shown in Figure 1

CHAPTER 8

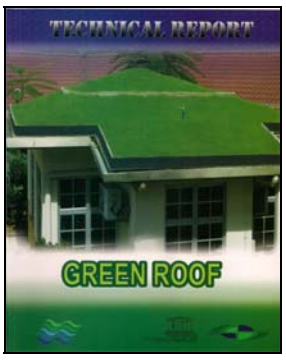
PUBLICATIONS

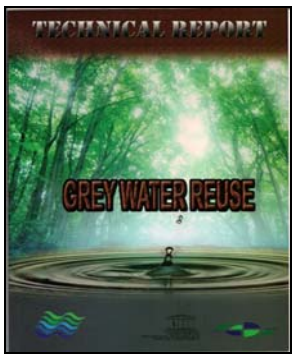
8.1 Recent Publications by HTC are as listed below:

- Humid Tropics Centre Kuala Lumpur 10-year Report (1999 – 2009).
- Proceedings of International Training Workshop on Flash Flood Risk Assessment and Mitigation Strategies, 10 – 13 August 2009, DICODE Kuala Lumpur, Malaysia.
- Technical Guidelines: MSMA Stormwater Management Ecohydrology at Humid Tropics Centre
- Proceedings Integrated and Multidisiplinary Research on Flood Hazard Assessment in Johor, 3 – 6 July 2011, Permaisuri Hotel, MITC Ayer Keroh, Malacca, Malaysia

8.2 Publications by HTC in 2012/2013 are as listed below:

- Journal of Water Resource Management, Vol. 1, No. 1, December 2012.
- Technical Report: Greywater Reuse, 2012
- Technical Report: Green Roof, 2012
- Proceedings The 2nd International Conference on Water Resources (ICWR2012): Sharing Knowledge of Issues in Water Resources Management to Face the Future, IHP-VII Technical Documents in Hydrology N0. 07, 2012.





8.3 To be publish by HTC in 2013 are as listed below:

- Journal of Water Resource Management, Vol. 2, No. 1, December 2013.
- Technical Report: Porous Pavement, 2013 (in mock-up form because no fund for printing)
- Technical Report: Constructed Wetland, 2013 (in mock-up form because no fund for printing)
- Proceedings Seminar on Geospatial Disaster and UNESCO-HELP Basin: Water Co-Operation, Security and Geohazards (fund from UNESCO Jakarta)

CHAPTER 9

CONCLUDING REMARKS

This report gives a brief account about activities carried out by the Centre during the reporting period. HTC Kuala Lumpur has been in existence and in operational for the past 10 years since October 1999 under the agreement between the Government of Malaysia and the United Nations Education, Scientific and Cultural Organization (UNESCO) and is expected to continue to be the UNESCO Water Centre i.e. The Regional Humid Tropics Hydrology and Water Resources for Southeast Asia and the Pacific.

HTC Kuala Lumpur plays a major role in conducting research in the field of hydrology and water resources and in contribution within framework of International Hydrological Programme (IHP) activities. The centre also provides research under the established Malaysian Hydrological Programme (MIHP) and in the lead of conducting a number of multidisciplinary collaborative researches in national and regional level.

Besides the research activities, HTC Kuala Lumpur also plays a very active role in the area of capacity building to increase scientific and technological knowledge about hydrological cycle, thus increasing the capacity to better manage and develop the water resources in a holistic manner.

Another major role of HTC Kuala Lumpur is to promote the conducive atmosphere for collaboration among countries in the regions of Southeast Asia and the Pacific through technology and information exchange, education and science.

ORGANIZATION CHART 2013

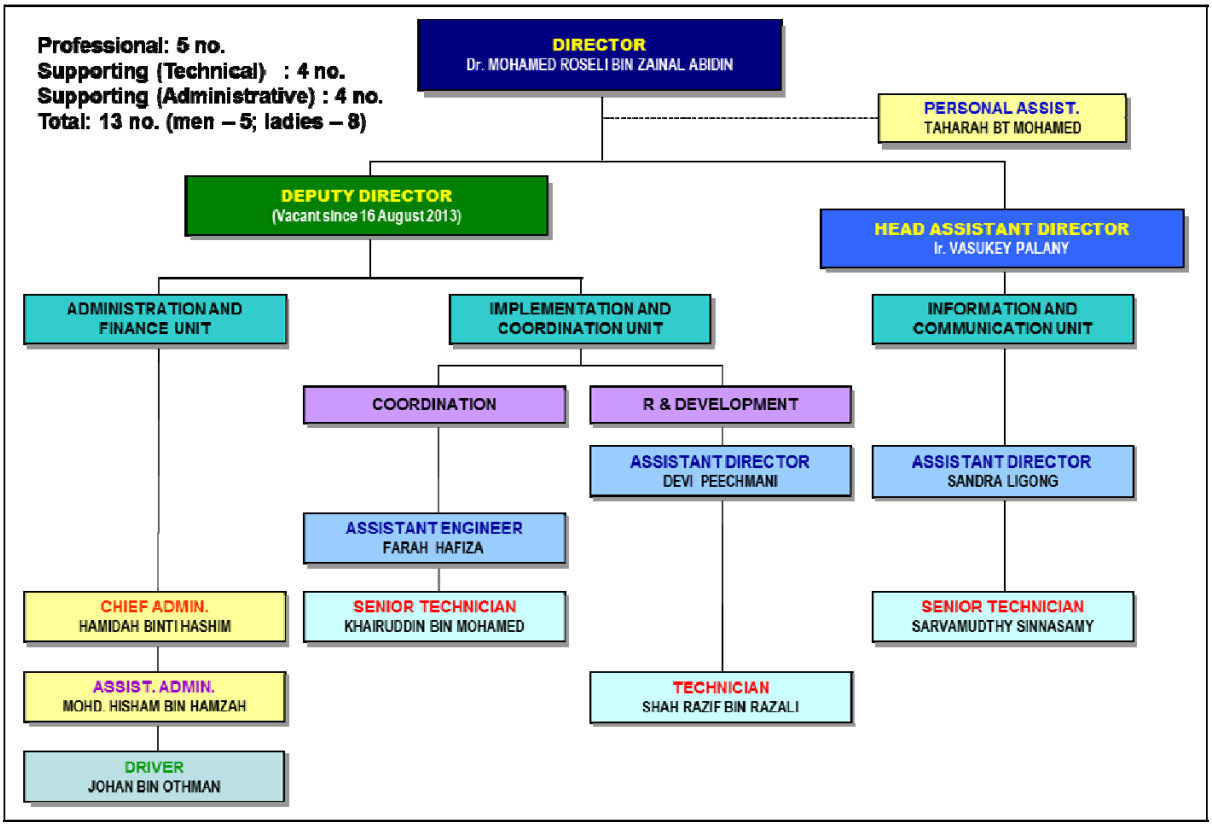
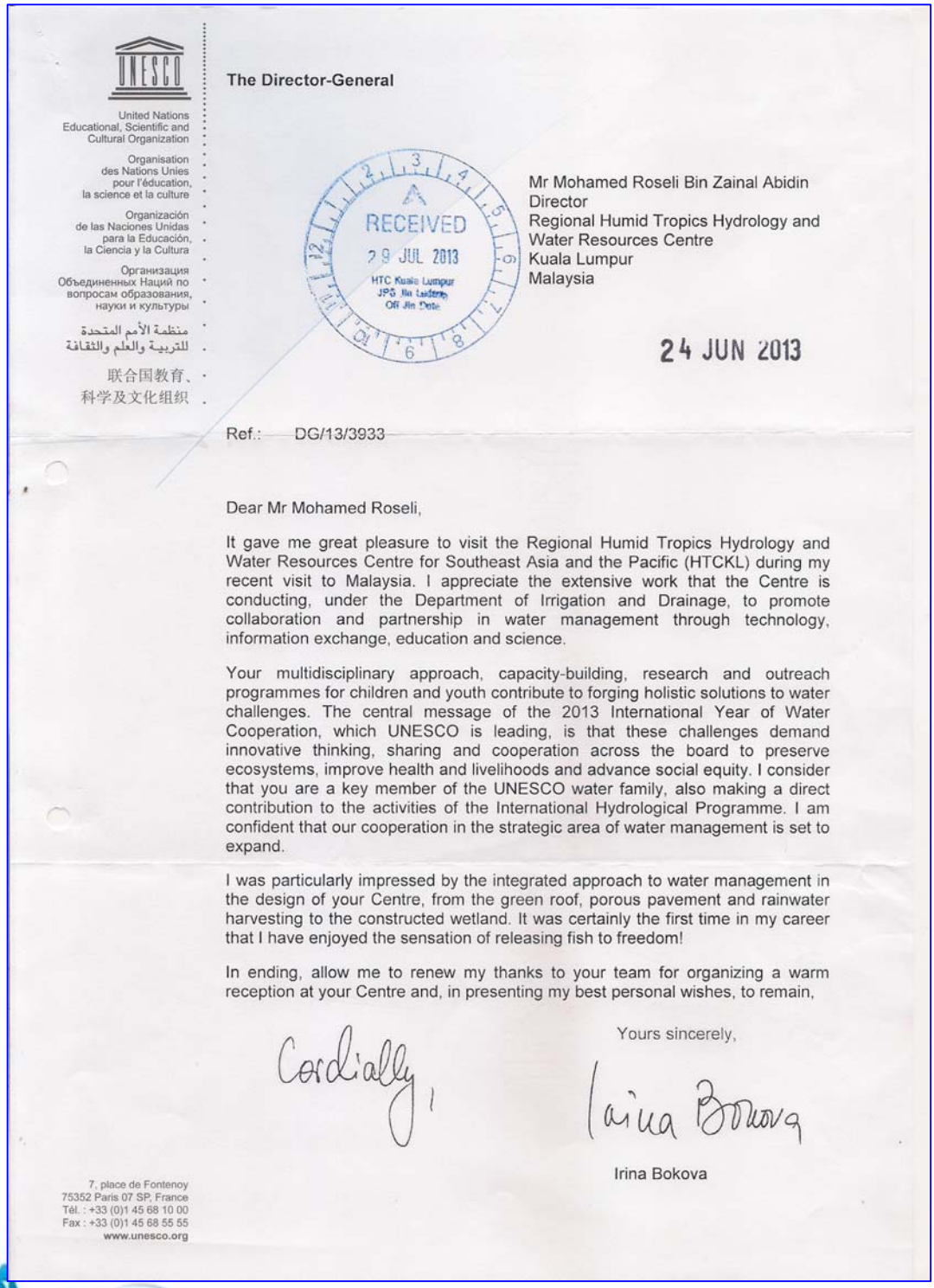


Figure 1: Organizational Chart of HTC

Letter from H.E. the Director General of UNESCO to HTC dated 24th Jun 2013



United Nations Educational, Scientific and Cultural Organization

Organisation des Nations Unies pour l'éducation, la science et la culture

Organización de las Naciones Unidas para la Educación, la Ciencia y la Cultura

Организация Объединенных Наций по вопросам образования, науки и культуры

منظمة الأمم المتحدة للتربية والعلم والثقافة

联合国教育、科学及文化组织

The Director-General

RECEIVED
29 JUL 2013
HTC Kuala Lumpur
JPG file Ladang
Off file Date

Mr Mohamed Roseli Bin Zainal Abidin
Director
Regional Humid Tropics Hydrology and Water Resources Centre
Kuala Lumpur
Malaysia

24 JUN 2013

Ref.: DG/13/3933

Dear Mr Mohamed Roseli,

It gave me great pleasure to visit the Regional Humid Tropics Hydrology and Water Resources Centre for Southeast Asia and the Pacific (HTCKL) during my recent visit to Malaysia. I appreciate the extensive work that the Centre is conducting, under the Department of Irrigation and Drainage, to promote collaboration and partnership in water management through technology, information exchange, education and science.

Your multidisciplinary approach, capacity-building, research and outreach programmes for children and youth contribute to forging holistic solutions to water challenges. The central message of the 2013 International Year of Water Cooperation, which UNESCO is leading, is that these challenges demand innovative thinking, sharing and cooperation across the board to preserve ecosystems, improve health and livelihoods and advance social equity. I consider that you are a key member of the UNESCO water family, also making a direct contribution to the activities of the International Hydrological Programme. I am confident that our cooperation in the strategic area of water management is set to expand.

I was particularly impressed by the integrated approach to water management in the design of your Centre, from the green roof, porous pavement and rainwater harvesting to the constructed wetland. It was certainly the first time in my career that I have enjoyed the sensation of releasing fish to freedom!

In ending, allow me to renew my thanks to your team for organizing a warm reception at your Centre and, in presenting my best personal wishes, to remain,

Yours sincerely,

Cordially,

Irina Bokova

Irina Bokova

7, place de Fontenoy
75352 Paris 07 SP, France
Tél. : +33 (0)1 45 68 10 00
Fax : +33 (0)1 45 68 55 55
www.unesco.org

HTC's Green Roof

ANNEX 8

PROPOSALS

Proposal for making catalogues of hydrologic analysis as the follow up of river catalogues for Southeast Asia and the Pacific

We propose to make Catalogues of Hydrologic Analysis to understand the river and hydrology of the Southeast Asia and the Pacific.

The catalogues will be made based on the information as follows:

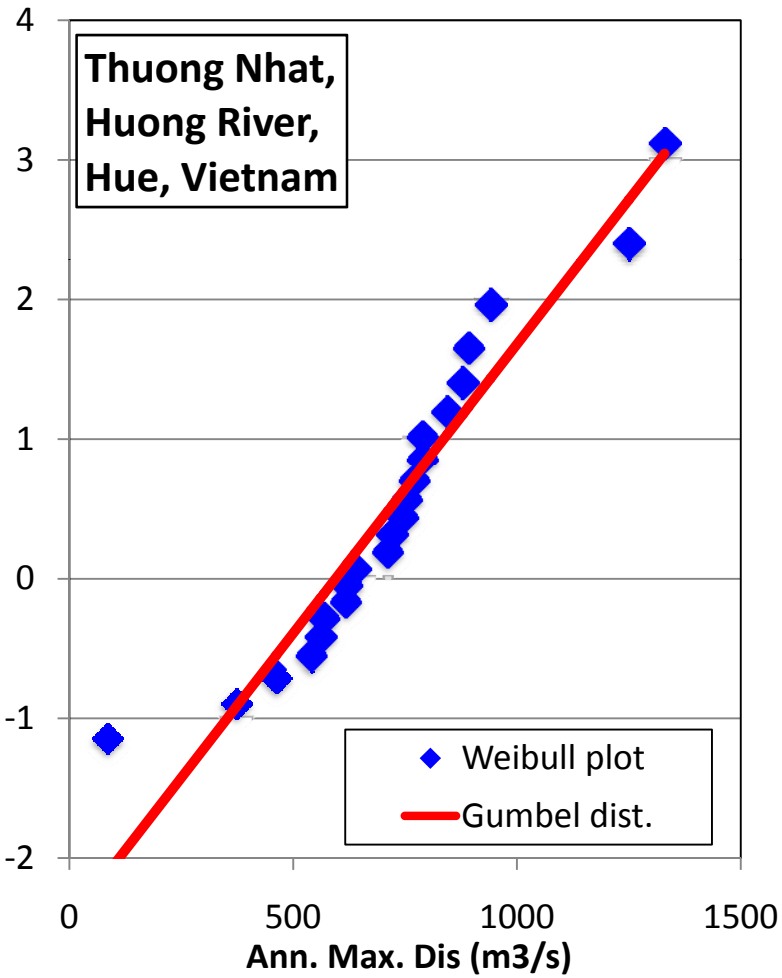
■Hydrologic frequency analysis (e.g. analysis of the annual maximum daily rainfall)
■Rainfall-runoff analysis（e.g. summary of rainfall-runoff model applications on a river catchment)
■Estimation of evapotranspirations（e.g. using Penman, Thornthwaite, Hamon method at a point of a river catchment)
■…

It is favourable to do the analysis of the rivers contained in the river catalogues. The data, analysis method and explanations will be written in the new catalogues.

Each member country brings the examples every year. Then it will be published in the IHP website as “Catalogues of Hydrologic Analysis for Southeast Asia and the Pacific”. The printed edition is also considered.

Example of frequency analysis of discharge

- Huong River in Hue, Vietnam -



Gumbel probability paper

4.5 An

At Thuong

Year									
1981									
1982									
1983									
1984									
1985									
1986									
1987									
1988									
1989									
1990	9.18	745	5	3.17	2001	10.21	568	8	3.46
1991	11.26	84.0	8	2.20	2002	10.6	561	7; 8	2.33

1), 2) Discharge rated according to manual observation of water level.

Applying Gumbel distribution to annual maximum discharge

Return Period	Quantile (m^3/s)
10	1138.23
20	1312.12
50	1537.21
100	1705.88

HUMID TROPICS CENTRE KUALA LUMPUR

The Regional Humid Tropics Hydrology and Water Resources Centre for Southeast Asia and The Pacific

UNESCO-IHP
Promoting Stormwater Management Ecohydrology

SYNTHESIS PAPER

PROPOSAL IN CONTRIBUTING URBAN WATER MANAGEMENT THROUGH THE IMPLEMENTATION OF INTEGRATED STORMWATER MANAGEMENT ECOHYDROLOGY AS PART OF UNESCO SWITCH PROGRAMME AND IHP-VIII STRATEGIC PLAN

PROPOSAL IN CONTRIBUTING URBAN WATER MANAGEMENT THROUGH THE IMPLEMENTATION OF INTEGRATED STORMWATER MANAGEMENT ECOHYDROLOGY AS PART OF UNESCO SWITCH PROGRAMME AND IHP-VIII STRATEGIC PLAN

by

Humid Tropics Centre, Kuala Lumpur

1.0 PROPOSAL

The Humid Tropics Centre, Kuala Lumpur (HTCKL) would like to propose, the member countries of UNESCO-IHP South-East Asia and the Pacific region to contribute/engaged in **INTEGRATED STORMWATER MANAGEMENT ECOHYDROLOGY** as part of UNESCO SWITCH programme and IHP-VIII Strategic Plan (2014 – 2021).

The reporting format could be set and decided similar to Water Data Achieve under the AP FRIEND programme which consist of several volumes or to follow the IWRM Guidelines at River Basin through the Key for Success and Good Examples or any other format deem relevant. The projects/programmes could be reported based on the components, entire project area and/or a river basin, R&D carried out, water education and others.

This could be one of our region contributions under the Regional Steering Committee (RSC) for UNESCO-IHP in supporting the UNESCO SWITCH-in-Asia Urban Water Management, as well as several Themes under the IHP-VIII Strategic Plan – Water Security: Responses to local, regional and global challenges.

HTCKL is willing to take the lead in this programme.

2.0 BACKGROUND

Since the year 2010, more than half of the world's population lives in cities with large segment in an increasing number of megacities. Urban water problems are growing more complex and acute all over the globe. The developing world is faced with uncontrolled expansion of large cities confronting extreme conditions: a dense population further exacerbated by high rates of rural migration, large income disparities, and explosive growth of peri-urban areas. Widespread mismanagement of water resources, growing competition for the use of freshwater, degraded sources, sometimes by pollutants of unpredictable effects, only heighten the depth of these problems.

Cities in the develop world also face critical challenges, including deteriorating infrastructure, a degrading environment and an inability to confront extreme events successfully. Improving

freshwater management to provide better access to safe drinking water and basic sanitation, as called for by the Millennium Development Goals, particularly in urban areas in developing countries, now command a greater sense of urgency and is seen as a precondition for health. These demands can only be addressed properly through a concerted effort which involves scientific, social and institutional approaches.

Global changes have resulted not only in the degradation of the physical environment but also in considerable modification of landscape processes, including water through its ecosystems. In turn, this result in increasing risk, deterioration of the environment, a reduction of biological diversity and the ecosystem's ability to provide goods and services.

For the ecological measures to protect and remediate catchment processes the activities to be carried out could include: managing erosion, sediment, landslides, and mudflow by ecological measures; minimizing mobile solvent, nutrient and pollutant transport by ecological measures; managing interdependencies between the water cycle and terrestrial/aquatic biota for restoring biogeochemical cycling and biological diversity; bio-remediation and phyto-technologies for water bodies and landscape rehabilitation; enhancing water retention in the landscape and developing **ecohydrological** methods for flood and drought mitigation; and sustainable landscape development and land use planning.

Existing solutions in water management are based largely on a technical approach which often does not consider the functioning of ecosystems. This over-engineering of the environment raises management costs and in many cases does not ensure sufficient ecological quality and services. Efforts to develop soft engineering technologies to complement hard engineering solutions need to be strengthened.

These should be based not only on the wider application of ecological biotechnologies, but should also emphasize the potential in harmonizing traditional uses of hydro-technical infrastructure such as dam, water supply, harvesting/reducing of the risk of flash floods with ecosystem needs and services such as improving connectivity between rivers and floodplains. The activities should aim in the elaboration of transdisiplinary, cost-effective approaches to water management at the catchment scale, reducing existing environmental risks and providing economic and social benefits based on ecosystem goods and services.

For the improving ecosystem quality and services by combining structural solutions with ecological biotechnologies, the activities to be carried out could include: combining structural solutions with ecological biotechnologies for risk management such as for floods and drought, water quality decrease, biodiversity decline; improving knowledge of the use of hydrological processes-biota interaction to enhance the efficiency of ecosystem biotechnologies that is the soft engineering to complement structural solutions.

3.0 OBJECTIVES

Stormwater Management involved managing the quantity and quality of the stormwater. While the Integrated Water Management (IWM) has the potential to improve runoff quality, reduce the risk and impact of flooding and deliver an additional water resource to augment potable supply.

IWM offers several techniques including stormwater harvest (to reduce the amount of water that can cause flooding), infiltration (to restore the natural recharge of groundwater), bioretention to store and treat runoff and release it at a controlled rate to reduce impact on streams and wetland treatments to store and control runoff rates and provide habitat in urban areas.

Ecohydrology is an interdisciplinary field studying the interactions between water and ecosystems. These interactions may take place within water bodies, such as rivers and lakes, or on land, in forests, deserts, and other terrestrial ecosystems

The ecohydrology for sustainability is focused on an integrated understanding of biological and hydrological processes in order to create a scientific basis for a societal acceptable, cost-effective and systemic approach to the sustainable management of freshwater resources.

a) General Objectives:

Develop a more appropriate management strategies and best practices and mitigation measures to counter negative effects of urbanization with the application of stormwater management eco-hydrology (SME).

b) Specific Objectives:

- Be aware of the principles and benefits of SME and have a good understanding of the different technologies and their most appropriate applications.
- Have an appreciation of critical success factors for achieving water sensitive developments.
- Be aware of successful water sensitive urban design projects according to urban stormwater management manual, guidelines and global standards.
- Know how to apply urban stormwater management manual, guidelines and global standards at a range of scales and development types.
- **Improve water quality** to meet “best practice” stormwater quality performance objectives set by some standards for several water quality parameters such as TSS, TP, TN and reduction of typical urban annual load.
- **Reduce peak flows and flood risk** through SME components e.g. bio-retention, porous pavement, constructed wetlands etc.
- **Minimize the use of mains (potable) water, minimize the sewage discharges** and **maximize water reuse**.
- Provide **visual and potential recreational** benefits.

4.0 EXAMPLE OF SME PROJECT

4.1 SME at HTCKL

Rapid urbanization and development in Malaysia endow with the negative impacts on water quality environment issues. Furthermore, the tropical climate in Malaysia with heavy rainfall in short duration also contributed in increasing of stormwater runoff.

Hence, Humid Tropics Centre Kuala Lumpur has initiated the Research and Development on Application of Water Sensitive Urban Drainage Design for Integrated Stormwater Management Ecohydrology at Humid Tropics Centre compound to be the pilot and demonstration project as initiative to the earlier problem.

What the SME aims to achieve?

- Consideration of water issues and infrastructure from the earliest stages of project planning.

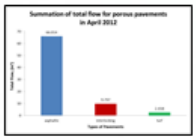
- Support the Stormwater Management Manual of Malaysia (MSMA) as an integration of urban water streams (stormwater, water supply and wastewater).
- Demand side (use reduction) and supply side (supply enhancement) measures.
- Highlight importance of synergies that can be gained by this approach.
- Building Green, Low Impact Development and Sustainability.

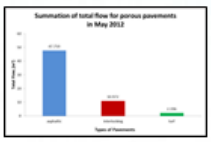
The main objective of this study is to perform a monitoring program for developed Stormwater Ecohydrology project at Humid Tropics Centre Kuala Lumpur. The primary objective is to document MSMA SME performance for storm events and identify any design issues or malfunction that should be made to existing and future MSMA SME to improve MSMA SME performance. In order to achieve this, the Study carried out the following tasks:

1) To measure water quantity, water quality and hydrology performance analysis for each of MSMA SME components,
2) To develop a basic parameters and conceptual description of processes for modeling runoff and pollutant loads for local climate,
3) To propose an appropriate strategies and best practice management and mitigation measures to counter negative effects of urbanization with the application of various MSMA SME concepts.
4) To develop performance MSMA SME baseline database to assist in developing local climate-based decision support system in future.

The MSMA SME project consists of six (6) integrated component: porous pavement; greywater reused system; rainwater harvesting system; bioretention; green roof; and constructed wetpond. The construction of the project completed in October 2010. Landscaping works and installation of instrumentations/equipments for monitoring the performance were carried out in 2011. Some improvement works to the project were carried out in 2012. Monitoring of the performances started in April 2012 and completed with report in December 2012.

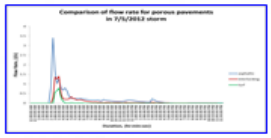
Examples of the Hydrological Performance of porous pavement for asphalt, interlocking blocks and turf pavements





Summation of total flow for different types of pavement

The study has shown that Turf pavement has the highest percentage of peak runoff reduction (relative to asphalt) ranges between 70 to 90 percent with 15 – 30 minutes lag time. The Interlocking pavement gives percentage of peak discharge reduction which ranges between 50 to 80 percent with 15 minutes lag time.



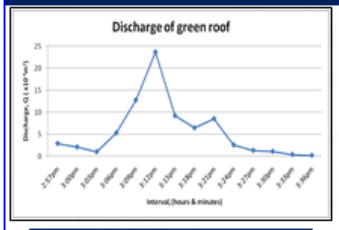
Comparison of flow rate for different types of pavement

It shows the important of adopting Stormwater Management Control at

MONITORING PARAMETERS FOR EACH MSMA SME DESIGN COMPONENTS – POROUS PAVEMENT SYSTEM

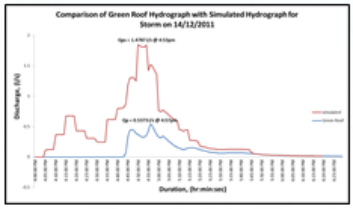
QUANTITY	QUALITY
Runoff Volume Reduction	Physical: pH Temperature Total Suspended Solid (TSS) Conductivity Oil and Grease Conductivity
Peak Flow Reduction	Chemical: Biochemical Oxygen Demand (BOD_5) Chemical Oxygen Demand (COD) Dissolved Oxygen (DO) Total Phosphate Ammoniacal Nitrogen or Total Nitrogen Total Kjeldahl Nitrogen (TKN)
Runoff frequency reduction	Heavy Metals: Lead (Pb) Zinc (Zn) Copper (Cu)

Examples of the Hydrological Performance of green roof for a storm event



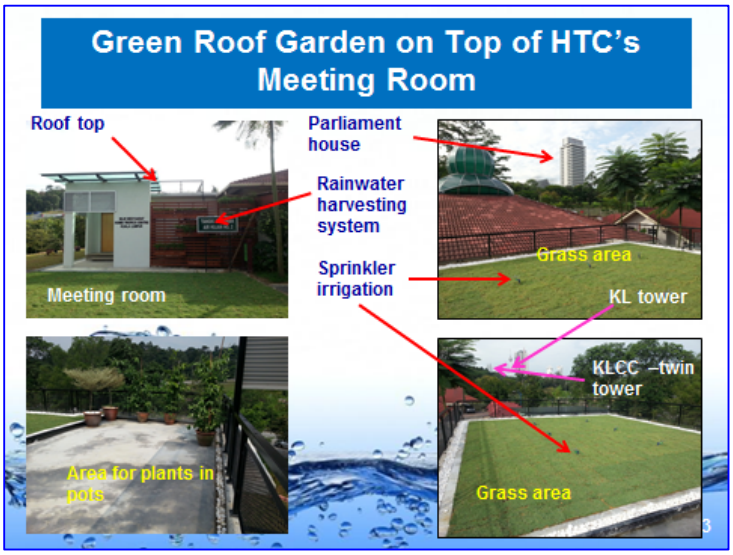
Hydrological performance of green roof

The study on the hydrological performance of green roof for a storm event shows that the peak discharge produced from green roof is 0.0024 m3/s while peak discharge estimated (rational method) for impervious roof is 0.0034 m3/s. There is 30% of reduction.



Hydrological performance of green roof for comparison of hydrograph

The Figure shows a peak runoff reduction of 64% for comparison of green roof hydrograph with simulated hydrograph for a storm event.



4.2 **UPSCALING SME AT LANGAT RIVER BASIN**

There is a need to conduct a study and construct project for **"Upscaling of MSMA Ecohydrology at Catchment Level in Sungai Langat"** as a continuation from the pilot project at a bigger catchment scale and with different challenges in terms of stormwater quantity and quality behavior. This project is also an initiative towards improving the current level of Langat River Basin from an "*Evolving*" to an "*Operational*" River Basin under the framework of UNESCO-IHP HELP Network.

HELP (Hydrology for Environment, Life and Policy) is a **cross cutting and transdisciplinary initiative** of the UNESCO led by the International Hydrological Programme (IHP) with objectives to deliver **social, economic and environmental benefits** to stakeholders through sustainable and appropriate use of water by directing hydrological science towards improved integrated catchment management basins and also implementation of research in collaboration between scientists, managers and stakeholders.

a) Project Background

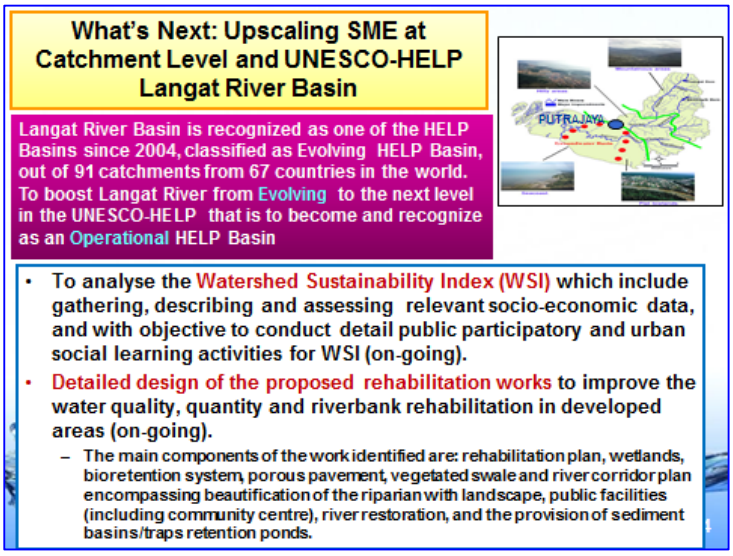
- The Langat River Basin is a unique and special basin in Malaysia because it lies within three different administrations of Selangor State, Negeri Sembilan State and the Putrajaya Federal Territory.
- It is situated approximately 27 km to the south of Kuala Lumpur (the capital city of Malaysia).
- The catchment of the Langat River is about 2350 sq. km and the length of 200 km and its flows out of Klang Valley and ends to the Straits of Melaka.

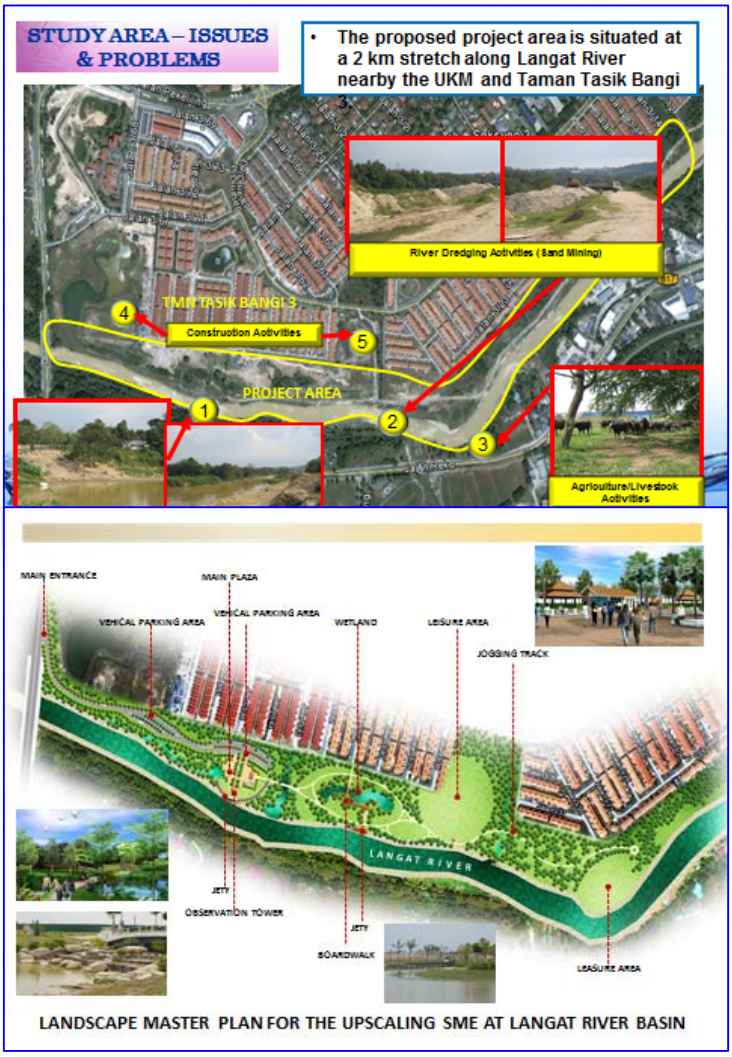
- It has few tributaries and out of them the main tributaries are Semenyih River, Lui River and Beranang River.
- There are two reservoirs which is at the upstream of the Langat and Semenyih Rivers which purpose are to supplying water to the treatment plants situated downstream of the catchment.

b) Project Component

The main components of the work identified for the "Upscaling of MSMA SME at Catchment Level in Sungai Langat are mainly:

- To apply spatial and social dimensions on eco hydrology of the selected Langat River reach for stormwater management, natural ecosystems health and quality of life.
- To rehabilitate the riparian zone of the selected Langat River to improve recreational, tourism value, and strengthen the river basin management to ensure long-term sustainable development and pollution control.





5.0 PROGRAMME JUSTIFICATION

Stormwater Management and Ecohydrology is one of the topics deliberated during the SWITCH-in-Asia Regional Partnership Workshop which was held at the Grand Kemang Hotel, Jakarta, Indonesia from 8 to 10 December 2009. The workshop aimed to discuss and identify potential project sites in Asia and the Pacific region and possible themes to be developed, as well as to establish an initial regional partnership and learning alliance for sustainable urban water management.

The opportunities for research are different in different countries across the region; however, there is sufficient evidence to start a regional initiative which can bring together research

excellence and stakeholder participation through demonstration of best practices. It is evident that the advanced research on urban water management already exists in some countries; however, integration of reduce, reuse and recycling of water is often not well-linked with the ecological management of water supply and disposal of sewage.

The acronym SWITCH stands for Sustainable Water Management Improves Tomorrow's Cities' Health. The SWITCH-in-Asia Initiative provides an integrated and innovative concept towards the development of sustainable water management in urban areas. It is a visionary flagship programme of UNESCO that addresses un-sustainability of current water management practices in cities, and sets the scene for the development of solutions for 'Water in the City of the Future'.

The workshop recommended sharing of good experiences within the region by setting up country level SWITCH initiatives. The best practices should be circulated to build learning alliances. UNESCO and partners can help improve the research capability as well community's capacity through its existing networks with the Member States in the region and through research policy advice.

Following this workshop, the SWITCH-in-Asia programme will be implemented in two phases. The phase I (2010-2013) will emphasize on setting up innovation, development, demonstration, awareness raising and capacity building projects in selected countries through national workshop with potential partners. The phase II (2013-2016) will be mainly focused on replication and **up-scaling** of best practices in the other cities of Asia.

So, HTC would like to recommend the urban stormwater management ecohydrology to be the project adopted and reported by the region.

The Strategic Plan of the Eighth Phase of IHP (IHP-VIII, 2014-2021) - WATER SECURITY: RESPONSES TO LOCAL, REGIONAL, AND GLOBAL CHALLENGES focuses on six knowledge areas translated into six themes as shown in Figure below:

Refering to Theme 5: Ecohydrology, Engineering Harmony For A Sustainable World, in both agricultural landscape and urban space, ecohydrological biotechnologies (based on “dual regulation”) have to be developed in order to increase water availability, food/bioenergy productivity, reduce diffuse pollutant emission, enhance biodiversity and serve human health and quality of life by development system approach toward regulation the complexity of interactions between the water cycle, ecosystems and societies.

The concept emerges as an ecohydrological response based on the assumption that under intensive global changes it is not enough to protect ecosystems against increasing human population, energy and matter consumption and increasing climate instability. It is necessary to regulate the “novel (human modified) ecosystem” structure and processes (life support systems) aimed at increasing the “carrying capacity” (water quality, restoration of biodiversity, ecosystem services for society, resilience of river ecosystem).

Under the Urban Ecohydrology context – storm water purification and retention in the city landscape, potential for improvement of health and quality of life, the urban populations cause large demands on life-support resources and services, including water, which are one of the major causes of the world’s water crisis. The dynamic spatial expansion of cities is characterized by highly diverse patches of urban development and “novel ecosystems” impacts sustainability of cities. Therefore, the quality of life and human health are top priorities for the sustainable city development, thus the need for a new paradigm of holistic city management. In terms of the water cycle, one of the major impacts is the runoff management. But in urban areas, a change in the perception of storm water management can be accomplished through the application BMPs and, more recently, ecohydrological biotechnologies for water purification and retention. Consideration for the enhancement of purified storm water retention in “green areas” in the city spatial planning results as a friendly “blue-green city landscape” with reduced energy consumption, pollutants transfer and accumulation as well as improved human health, aesthetic and cultural values.

There is a need to identify and promote good practices for the reduction of urban storm water hydro-peaking by development of systems for infiltration, purification and retention of storm water; develop guidelines for sustainable urban planning, **based on combination of water sensitive urban design and ecohydrological biotechnologies** for improving the quality of life and economics of urban systems and adaptation for global climate variations; develop and strengthen frameworks and improve methodologies for cooperation in multi-

stakeholder platforms and public participation for demand driven research and efficient application of the recent achievement of ecohydrology for IUWM.

The expected results from these projects will contribute to HYD 37/C5 on responses to local, regional and global water security challenges strengthening linked with IHP VIII.

DRROSELI-HTCKL/PROMOTING AND IMPLEMENTING SME/26092013/

HUMID TROPICS CENTRE KUALA LUMPUR

The Regional Humid Tropics Hydrology and Water Resources Centre for Southeast Asia and The Pacific

UNESCO-IHP

SYNTHESIS PAPER

PROPOSAL FOR PROMOTING AND IMPLEMENTING GEOSPATIAL WATER RELATED DISASTER MANAGEMENT PROGRAMMES AS PART OF UNESCO IHP-VIII STRATEGIC PLAN

PROPOSAL FOR PROMOTING AND IMPLEMENTING GEOSPATIAL WATER RELATED DISASTER MANAGEMENT PROGRAMMES AS PART OF UNESCO IHP-VIII STRATEGIC PLAN

by

Humid Tropics Centre, Kuala Lumpur

1.0 PROPOSAL

The Humid Tropics Centre, Kuala Lumpur (HTCKL) would like to propose, the member countries of UNESCO-IHP South-East Asia and the Pacific region to contribute/engaged in **GEOSPATIAL DISASTER MANAGEMENT PROGRAMMES** as part of UNESCO IHP-VIII Strategic Plan (2014 – 2021).

The reporting format could be set and decided similar to Water Data Achieve under the AP FRIEND programme which consist of several volumes or to follow the IWRM Guidelines at River Basin through the Key for Success and Good Examples, or any other format deem relevant. The projects/programmes could be reported based on subject matter, R&D, projects, policy, management of the disaster, events and remedial measure taken, electronic information system and others.

This could be one of our regional contributions under the several Themes in the IHP-VIII Strategic Plan – Water Security: Responses to local, regional and global challenges.

HTCKL is willing to take the lead in this programme.

2.0 BACKGROUND

Geospatial technology refers to equipment used in visualization, measurement, and analysis of earth's features, typically involving such systems as GPS (Global Positioning Systems), GIS (Geographical Information Systems), and RS (remote sensing). Its use is well-known and widespread in the military and in homeland security, but its influence is pervasive

everywhere, even in areas with a lower public profile, such as land use, flood plain mapping and environmental protection. Geospatial technologies play a significant role in disaster management cycle. The recent large-scale earthquake and tsunami events have demonstrated their uses in post-disaster emergency responses. Remote sensing provides synoptic and detailed data required for emergency and post-disaster responses. It is the unique source of timely data captured in hard-hit and inaccessible areas after a disaster. To respond to a large-scale disaster, the International Charter on Space and Major Disasters shall be activated whereby more space sensors were rescheduled to capture the disaster area, and hence, data availability is not a critical question these days. Data interpretation for mapping damage areas was a slow process when relying on visual interpretation.

Numerous research and development on automated interpretation has not yet produced a reliable solution, visual interpretation is still needed for damage assessment. It has much been improved with the developed web-based geospatial collaborative platform which allows numerous interpreters around the world acquiring the data and submitting their allocated works. The process is speeded up drastically and introduced a new term/approach, crowd-sourcing damage assessment. The critical issue of crowd-sourcing data analysis is data quality control and it remains an issue needs to be solved. Geospatial tools and services, including mobile and web-based solutions, have extensively deployed in emergency responses and relief efforts. For instance, mobile mapping solutions ease the work of inspectors and rescuers on the ground. The geospatial web-based platforms have been used for dispatched management and planning, community participatory mapping and reporting. The crowd-sourcing damage assessment platform as mentioned above could take granted of those timely information contributed by the communities on the ground providing a verification mechanism exists to maintain the quality. Experiences from latest large-scale disasters infer that there exists the gap between the demands from disaster management practitioners and what geospatial analysts produce. Therefore, it is vital to provide training on spatial thinking skills to the disaster management practitioners and set up a communication channel to geospatial researchers and analysts.

Basically these management practitioners are based with the understanding of theoretically and technically skill in order to make a complete circle of handling this disaster. All over the world, countries have their own techniques and proposal that have been proposed to make sure this kind of disaster can be solved or at least the impact can be minimized.

3.0 OBJECTIVES

Water Related Disaster is a situation that would repeat an incident that occurs in a sudden manner, complex in nature, resulting in the loss of lives, damages to property or the environment as well as affecting the daily activities of local community. It would create major obstacles to achieving human security and sustainable socio-economic development. Globally, more than 3,000 water-related disasters have been reported and also records high mortality of up to 290,000 people which involved more than 1.5 billion people, and losses of more than U.S. $422 billion over the period 2000-2011. Such natural disaster for example flood, storm, drought, beach erosion and landslides are hard to prevent, but mitigation measures can be done to reduce the impact of disaster. Hydrological disasters are a violent, sudden and destructive change either in quality of earth's water or in distribution or movement of water on land below the surface or in atmosphere.

The factors that have led to improvements in this disaster is related to the water in which it is deemed to have disturbing natural systems management, social pressures such as climate variability, the lack of an appropriate system of organization, management overhaul inappropriate land and increasing population in the area placement of high-risk (especially for the poor).

b) General Objectives:

Generally, it is an effort to further enhance the level of intellectual and professional development activities where there will be sharing of knowledge, experience, skills in various fields related to Geospatial engineering and water related disaster management and discuss the practical challenges encountered and the solutions adopted

a) Specific Objectives:

- To discuss issues, challenges and prevention of geospatial disasters.
- To disseminate current information on methods used in the prevention of geospatial related disasters.
- To provide a platform for knowledge sharing on geospatial related disasters among industry players, academicians, government and private sectors.

The suggested topics can cover areas such as: The Use of Geospatial Technology in Managing Geohazard, Water Related Disaster Management (eg. tsunami, typhoon, earthquake, drought); Dam Hazard Sustainable Development; Stormwater Management and Floods; Geotechnical Challenges in Construction; Use of Geospatial Information for Rescue Operation; River Bank Erosion and Landslide; Slope Stability; Early Warning System, Risk Mapping, Climate Change Vulnerability and Adaptation, Land Planning and other areas of interest.

4.0 EXAMPLES

With this in mind, HTCKL working together with Infrastructure University of Kuala Lumpur had an initiative to conduct two seminars on geospatial disaster as follows:

4.1 SEMINAR 1 (2012)

SEMINAR ON GEOSPATIAL DISASTERS: Issues, Challenges, Preventions on 4th and 5th June 2012

The topic and the outcome of each topic are as follow:

1) MSMA Stormwater Management Ecohydrology : Towards Preventing Disasters

The definition of flashfloods: “A sudden local flood of great volume and short duration”. In a natural setting, intense rain, soils that are low permeability or are in high saturated state, impervious ground surfaces, steep slopes that facilitate rapid runoff and flood wave movement and possibly anchor convection are all conducive of this disastrous event called flash flood.

As the country rapidly urbanized and rainfall very intense in a short duration, the management of urban water can be very challenging. The upcoming Stormwater Management Eco-hydrology (SME) concept is the best practice that provide for holistic approach to the management of urban water cycling including stormwater, water supply and wastewater into sustainable urban design. The SME approaches improve the water quality entering the urban rivers from urban regions; minimize use of portable water, minimize the sewage discharges, maximize water reuse and reduce peak flows and flood risk through MSMA components like bio-retention, porous pavement as well as constructed wetland. SME is a combination of engineering, biotechnology and environmental management. On the other hand, SME provide visual and potential recreational benefits in local communities.

SME components are now being integrated into the design of urban development projects and likely it’s achieving the desired environmental outcomes which lessen water related disasters. This approach also creates high quality public realm for the benefit of both residents and visitors to the city.

2) Flood Disasters in Malaysia - Why It Happened and What are the Solutions?

Floods are natural disasters that have been affecting human lives since beginning of time. In Malaysia the earliest recorded major flood was back in 1926. Other major floods occurred in 1949 and 1971. Over the years, flood events keep continuing and the occurrence seems to increase. It is most probably attributed to the progressive change in land use as the country developed while the drainage system remains inadequate with only little upgrading. As for the year 2000, the reported flood affected or flood prone areas in Malaysia are about

29,000 km^2 or about 9% of total land mass of Malaysia while the number of people affected was close to 5 million. Typically, floods occur when flows in rivers and drainage channels overtop the banks and inundate the surrounding areas or flood plains. Generally in Malaysia there are 3 types of flooding which are: flooding due river bank overflow, high tides and flash floods. The basic cause of river basin flooding is heavy rainfall. In low-lying areas near the sea, the flood may become more severe or it may take a longer time to subside when coincide with high tide. Flood events will becomes a disaster when it has impact on human settlement and activities which resulting in loss of lives, agricultural and property damage, business losses, inconveniences, as well as stress and emotional to the affected population.

In this will discuss positive impacts of traditional flood management measures against traditional flood management. Integrated flood management calls for a paradigm shift from the traditional, fragmented and localized approach, and encourages to the use of the resources of a river basin as a whole. Total flood protection is unrealistic and unwise. The ultimate goal of flood loss prevention is the improvement of the quality of life by reducing the impact of flooding and flood liability on individuals, private and public losses. In order to achieve that goal, each community needs to agree upon its level of acceptable risk of flooding, which is described by the chance (probability of occurrence) that a flood will occur in any given year. The first step in assessing flood hazard is estimating the probable future runoff rates and associated characteristics (depths of water, velocities, etc.). Hazard mapping reveals the areas that are particularly susceptible to floods. Information is needed both in spatial and temporal terms and includes location, frequency of occurrence, duration and severity. When this information becomes available it is possible to develop contours which indicate the severity of risk. A flood risk map has several direct economic effects, since it causes revision of all planning maps for the area. On the negative side, it may lower property value in the flood prone areas and may stop development but on the positive side, the map initiates the construction of flood loss prevention structures, alerts prospective land and property owners, as well as provides new developing ideas to the local planning authorities.

3) Safety Inspection For Water Supply Dams in Malaysia

Safety Inspection for Water Supply Dams in Malaysia are planned and carried out periodically by the Department of Water Supply, the Ministry of Energy, Green Technology and Water, Malaysia (KeTTHA). It is an important programme to ensure that water supply dams in Malaysia are in a very good state in terms of operation and maintenance. These inspections are performed visually by a team of experts and involves all components of the dams including Upstream Slope, Downstream Slope, Draw-Off Tower and Reservoir Rim. All inspection activities are based on standard checklist and any other defects discovered such as any traces of small cracks found on the walls of Draw-Off Tower, the plants growing wild in the Downstream Slope drainage system and valve damage will be recorded and included in the preparation of the report. Further to the findings during the inspection, a report will be produced and will be submitted to the owner and operator of the Water Supply Dam with recommendations to remedy the defect.

4) Climate Change & Water Supply

The earth could be the only planet in the entire universe that has lives thriving on it and the reason may be, because we are blessed with abundance water. The available water resources we have is depleting due to ever increasing water demand from surging population, rapid urbanization, reckless irrigation and waste pollution. In years to come, these threatening factors will be compounded by climatic change. Climate change will have affect on our weather and changes in weather pattern will lead to variability in water supply and demand. With climate change that will affect the availability, quantity and quality of our water resources, there is a need for us to manage the ever increasing water demand. We need to change our lifestyle, being more prudent on how we use water, going for crops and industries which will consumes less water, be more protective of our environment and not to pollute it. In the short term and medium term we may have to construct infrastructures to adapt/response to climatic change but in the long term we need to be more efficient in water management by going for more efficient water appliances, treatment technologies, water saving devices, use of recycled water, low NRW etc.

5) Strengthening Tsunami Warning and Public Awareness

The Malaysian National Tsunami Early Warning System (MNTEWS) was established at Malaysian Meteorological Department (MMD) in the year 2005 as a reaction of the 2004 tsunami event when 68 lives were lost in Malaysia. The system provides early warnings on tsunamis generated in the Indian Ocean, Andaman Sea, South China Sea, Sulu Sea, Sulawesi Sea and Pacific Ocean that will affect Malaysia.

The set-up of the MNTEWS consists of three main components that provides real-time monitoring, alert seismic and tsunami activity that is the Data and Information Collection Component; the Processing and analysis Component; and the Information and Warning Dissemination Component. In strengthening the MNTEWS, the number of seismic stations had increased from 17 to 29, tide gauge stations from 6 to 17, coastal camera stations from 4 to 18 and tsunami siren stations from 13 to 23.

The pre-computed tsunami database contains scenario earthquakes covering the most active subduction zones. The threat levels of warning, alert and watch issued by MNTEWS are based on wave amplitude and arrival times of tsunami at the pre-determined coastal points.

The modes of dissemination advisory or warning and other information are sorted out into dispatching short messages (SMS) to mobile phones, sending facsimile to relevant disaster management agencies, transmitting relevant information to mass media via broadcasting system, public announcement system such as sirens and alarms, and automated updating of the earthquake advisory or warning into web pages. To warn the public and to ensure public safety, warnings of imminent danger will also disseminate via Fixed Line alert System (FLAS).

The effectiveness of a Tsunami Early Warning System for Malaysia is evaluated in terms of the detection earthquakes, tsunami forecast decision and the dissemination of tsunami warning information. To ensure efficient dissemination of earthquake information and

tsunami warnings, the time of issuing has been reduced from 15 minutes to 10 minutes from the time of the earthquake event.

For the national tsunami early warning system to be effective, risk knowledge, education and community preparedness are considered the important part of disaster management and crucial to the success of an effective warning system. Forty two (42) public awareness campaigns and six (6) tsunami drills have been carried out at selected high risk areas from the year 2007 to 2011.

6) Earthquake Resistant : Design Issues for Construction Industries in Malaysia

Malaysia is located in a stable Sunda Shelf with low to moderate seismic activity level. However, it is surrounded by Indonesia and Philippine, which are close to active seismic faults. It is bordered to the west by the seismically active inter-plate boundary (subduction zone) between the Indo-Australian and Eurasian Plate and to the east of Sabah by the inter-plate boundary (subduction zone) between the Eurasian and Philippines Plate. Major earthquakes originating from these zones have been felt in Malaysia.

In recent years, Malaysia is more aware to the seismic effect on their structures such as buildings and bridges because the tremors were repeatedly felt over the centuries from the earthquake events around Malaysia (SAASEE, 1985). This phenomenon has created concerns to the construction industries especially in Peninsular Malaysia which felt tremors occasionally from some of the large earthquakes originating from the intersection areas of Eurasian plate and Indo-Australian plate near Sumatra, and some of the moderate to large earthquakes originating from the Great Sumatran fault. On the other hand, East Malaysia has experienced small to moderate earthquakes from local origin and tremors originating from the southern part of the intersection area of Eurasian and Philippines plates as listed by Surat (2001) and Rosaidi (2001).

Therefore, the issue on whether to implement Earthquake Resistant Design (EQRD) for our structures becomes critically important. Consequently, seismic hazard assessment play a

major role in identifying the potential risk of an earthquake both in relation to existing facilities as well as in the planning and location of new structures. The consideration is a part of the EQRD criteria to tackle accurate safety issues against earthquake hazards, which considers geological and seismological conditions, attenuation of earthquake wave propagation in base rock, specific acceleration time histories, and local soil conditions.

Seismic design criteria for infrastructure such as bridges depend on the design life and probability of exceedence specified in the design codes. The decisions were based on philosophical background of the structural design and also the importance of the structures. Eurocode 8 specifies a 10% to 19% probability of exceedence in 50 to 100 years design life, which provides design return periods of 250 to 1000 years. An example of design return period of 500 years for seismic hazards is provided in terms of ground acceleration contours, design response spectra, surface ground accelerations and surface response spectra. Minimum ground acceleration value of 0.02g is located at the east coast of Peninsular of Malaysia and the maximum is that at the east coast of Sabah (0.12g). The ground acceleration however amplifies as it travels through the soil layers up to the surface level. The amplification factor can reach up to 3. Design response spectra at the bedrock and the surface also show slight different trend as the surface spectra expand to the longer period range (0.2 seconds to 1.0 second). This phenomenon indicates that the ground acceleration becomes higher as it reaches to the surface and affects mostly medium span bridges.

7) Effect of Typhoon Tragedy in Gunung Pulai

The tragedy that struck Kg. Sri Gunung Pulai on the night of 27th December 2001 caused the loss of five lives and trail of destruction to properties and infrastructures. The villagers whose houses were located at the foothill of the mountain were washed away by the mud, log and rock slide. The forces of nature that combined to cause the tragic event were rainfall and strong wind. Four days of rainfall (220mm) and wind of up to 170 km/h triggers the event. The continuous rainfall has softened the soil, and the strong wind (typhoon Vamei) causes the trees to be uprooted. The uprooted tree exposed the rocks and top soil for erosion. Not only the rock and soil were transported by the surface runoff, but also the

timbers were washed off to the downstream area. The washed off materials blocked the existing river and created a natural dam at a location along the river. The generated surface runoff that accumulated at the upstream of the dam continues to build up until it burst the dam. The large volume of flow to the downstream area not only transports mud and soil but also rocks and timbers. At the foot of the hill, villagers houses that are located near the river were completely washed away by the flood flow. These strings of natural events lead to the catastrophic event. However, human interventions may also play a role in the land slide. The construction of road leading to the top of the hill may weaken the structure of the soil as most of the uprooted trees were located along the road.

8) Dam Failure and Impact Assessments Towards Dam Safety & Disaster Prevention

Dam has been known as a key player in sustaining people's lives. Dams are constructed for many reasons such as for irrigation and water supply, power generation, navigation and diversion, flood mitigation and other needs. Despite their many beneficial uses and value, dams also present risks to property and life due to their potential to fail and cause catastrophic flooding. There have been around 200 notable dam failures worldwide in the 20th century. The high level of energy being stored in reservoir water body will certainly pose detrimental impacts to the surrounding community if it is released suddenly through a dam break event. The amount of water escaped in such event is exceedingly larger than all previous flood events and response time is significantly shorter than that of normal runoff-flood event. The impacts due to dam failure are often catastrophic lead to losses lives, as well as in social, economic and environmental values of such downstream area. To mitigate these risks, dam owners and regulators carefully analyze and inspect dams to identify potential failure modes and protect against them. Since no program for preventing failure can ever be certain, and because the potential for loadings exceeding design limits can never be eliminated, another essential part of risk mitigation is simulating potential failures and planning for them.

Therefore, a dam break study is necessary for carrying out the dam safety study and preparation of emergency response plans for existing and future dams. The purpose of the

dam break study is to provide possible flood inundation information and risk assessment at downstream of the dam in the event of a dam failure. This will include flood inundation mapping and damage assessment on affected properties, houses, infrastructures, utilities and the likely loss of life. The dam break disaster prevention can be accomplished through emergency management which begins with hazard identification and planning for disaster mitigation but encompasses other activities as risk analysis, risk response and recovery. Therefore, an emergency management system with capacity to: i) forecast critical situations; ii) warn the population as well as the authorities; and iii) support the civil protection system to deal with an emergency, is a most helpful tool to minimize the impact of dam break disaster.

9) Water Related Geohazard : Forensic Investigation

The epoch after the last Ice Age, about 18,000 years ago, when the ice cover began to retreat, is known as the postglacial period, while the Holocene, also known as Recent, covers approximately the last 10,000 years of this period. Throughout this time, both high and low sea level changes occurred on a global scale. In Malaysia, low sea levels created land bridges which facilitated the migration of animals and humans between the Malay Peninsula and Borneo, while high sea levels inundated much of the lowlands of the Peninsular west coast.

Their participation is harder to convince to stop environmental pollution because we, as an already very developed country, have already done what they are trying to do, which is to grow and develop. The rate of growth is extremely rapid. With the Kyoto Protocol some more developed countries are helping the developing countries develop but in more sustainable ways. Some 1.1 billion people in developing countries have inadequate access to water, and 2.6 billion people lack basic sanitation. In developing countries some 2.5 billion people are forced to rely on biomass—fuel wood, charcoal and animal dung—to meet their energy needs for cooking. In sub-Saharan Africa, over 80 percent of the population depends on traditional biomass for cooking, as do over half of the populations of India and China.

10) Civil Defense Department, *Akademi Latihan Pertahanan Awam* (ALPHA) Malaysia

Geospatial information is critical to effective, collaborative decision making during emergency management situations, however conventional GIS are not suited for multi user access and high-level abstract queries.

The mechanism to support large scale rescue operations with multimedia communication and information services are discussed. The task of planning and controlling large scale rescue operations requires flexible and robust tools which help the rescue forces to do their search and rescue work with maximum efficiency. Resource planning tools and carfographic information about the operation site are essential to fulfill the complex task of operation management. Identifying of features and interdependencies of various tools taking into account innovative feedback and interaction mechanism.

11) River Bank Erosion Risk Potential

A fast flowing river erodes its banks more seriously than it does a slow moving one. With higher velocity and discharge, there are increases in the river bank erosion risk potential and its sediment carrying capacity. Rainfall impact to a river will significantly force it to overflow the bank. Rainfall erosivity, river bank textural composition and the flowing water has been the prime governing factors in causing erosion. By determining the rainfall erosivity and soil erodibility potential along the river bank, the risk of river bank failure at any location along the river can be made known. Thus, this valuable information would certainly enable the concerned government and private authorities to plan, design and construct the most suitable preventive measures in arresting river bank erosion.

4.2 SEMINAR 2 (2013)

SEMINAR on GEOSPATIAL DISASTER and UNESCO-HELP BASIN: WATER CO-OPERATION, SECURITY and GEOHAZARDS on 17th and 18th June 2013

The outcomes of some of the topics presented are as follow:

1. Dam Failure and Impact Assessments Towards Intelligent Dam Safety & Disaster Prevention.

Dams provide vital socioeconomic and environmental services for the nation. Dams are constructed for many reasons such as for irrigation and water supply, power generation, navigation and diversion, flood mitigation and other needs. Despite their many beneficial uses and value, dams also present risks to property and life due to their potential to fail and cause catastrophic flooding. The high level of energy being stored in reservoir water body will certainly pose detrimental impacts to the surrounding community if it is released suddenly through a dam break event. The amount of water escaped in such event is exceedingly larger than all previous flood events and response time is significantly shorter than that of normal runoff-flood event. The impacts due to dam failure are often catastrophic lead to losses lives, as well as in social, economic and environmental values of such downstream area. To mitigate these risks, dam owners and regulators carefully analyze and inspect dams to identify potential failure modes and protect against them. Dam failure may be caused due to extreme rainfall, earthquake or unforeseen and unrecognized system such as piping failures or equipment malfunctions. Since no program for preventing failure can ever be certain, and because the potential for loadings exceeding design limits can never be eliminated, another essential part of risk mitigation is simulating potential failures and planning for them. Therefore, a dam break study is necessary for carrying out the dam safety study and preparation of emergency response plans for existing and future dams. The purpose of the dam break study is to provide possible flood inundation information and risk assessment at downstream of the dam in the event of a dam failure. This will include flood inundation mapping and damage assessment on affected properties, houses, infrastructures, utilities and the likely loss of life. The dam break disaster prevention can be accomplished through emergency management which begins with hazard identification and planning for disaster mitigation but encompasses other activities as risk analysis, risk response and recovery.

The INSPIRE as intelligent Dam Safety is developed to address emergency situations which demand fast, decision making and effective multi-agency collaboration due to dam break event. The fundamental role of Intelligent Dam Safety is to provide an integrated system that may be used by dam operators as an interactive emergency response plan to mitigate the risk of dam failure. The decision support tools aimed to support the decision processes regarding dam safety event. Communication is crucial, but often difficult under immense time pressure, in extremely complex and often very dangerous settings. The fundamental role of INSPIRE is to provide an integrated system that may be used by dam operators as an interactive emergency response plan to mitigate the risk of dam failure. The decision support tools aimed to support early warning decision processes to detect and provides notification of a dam failure event with adequate warning time to allow for safe evacuation of the downstream community at risk. The Intelligent Dam Safety would be a powerful tool for the decision makers, as it can help to save time and enhance the effectiveness of decisions, which means that the emergency management would be more efficient and more lives will be saved in a dam break event. Therefore, an emergency management system with capacity to: i) forecast critical situations; ii) warn the population as well as the authorities; and iii) support the civil protection system to deal with an emergency, is a most helpful tool to minimize the impact of dam break disaster.

2) MSMA Stormwater Management EcoHydrology (MSMA SME) For Switch UNESCO Project : Issues, Challenges and Way Forward

Rapid urbanization and development in Malaysia endow with the negative impacts on water quality environment issues. Furthermore, the tropical climate in Malaysia with heavy rainfall in short duration also contributed in increasing of stormwater runoff. The paved road, parking lot and impervious surfaces does not allow water to infiltrate through them thus increase the surface runoff which will eventually goes to the river. This surface runoff will transport all the pollutants, debris and sediment with them. Hence, the Research and Development on Application of Water Sensitive Urban Drainage Design for Integrated Stormwater Management at Local Scale in Kuala Lumpur will be an elucidation as initiative to the earlier problem.

The objective of this study is to develop a more appropriate stormwater management strategies and best practices and mitigation measures to counter negative effects of urbanization with the application of various MSMA urban drainage design. Six (6) MSMA SME components were designed and constructed at the study area which consists of green roof, porous pavement, bioretention, rainwater tank, greywater system and constructed wetland system. The concept of MSMA SME is the integration of all the urban water cycle managements which comprises of water harvesting (rainwater tank and on-site detention system), water reuse (greywater reuse system) and water treatment (bioretention, wetland and green roof) with the compliments of Malaysian Urban Stormwater Management Manual (MSMA).

Qualitative and quantitative monitoring were carried out for all MSMA SME components which also covered water quantity (hydrological and hydraulic) and water quality analysis to gain a better understanding of MSMA SME and its performance. The water quantity and quality modelling for the MSMA SME components were also being executed using XP-SWMM and MUSIC software in order to study its behaviour. Based on the water quality results obtained from MUSIC modelling, the percentage reduction of pollutants after MSMA SME components being implemented given the Total Suspended Solids, Total Nitrogen and Total Phosphorus are 76.5%, 60.4 % and 84.2% respectively. The stormwater quantity modelling using XPSWMM presented 80% of runoff reduction approximately. The water qualities were proven to improve tremendously after the treatment process of MSMA SME components. The output of this study will be used as a guide to further enhance and proficiently implement the integrated stormwater management concept in Malaysia as well as support the Urban Stormwater Management Manual (MSMA) and SWITCH UNESCO Program.

3) Geospatial Analysis of Ecosystems : Issues and Challenges from the Langat HELP River Basin in Malaysia

Studies on the physical ecosystem of river basins have a long history in Malaysia. From the perspective of physical geography or environmental science, research procedures and methodology can be considered established. The same goes for the social environment.

Whether it is from the humanities or social science, various disciplines already have strong groundings. However, when attempts are made to integrate these basic research within the context of the Hydrology, Environment, Life and Policy (HELP) initiative which requires policy development and design creation, several incompatibilities are apparent which requires an explicit geo-spatial component. However, the geo-spatial analysis of ecosystems, such as that of a river basin, is not an easy undertaking - especially for the trans-disciplinary approach required by the HELP initiative. There are many reasons why geo spatial studies of such areas often remain sectorial in nature rather than integrated. One of the main reasons is the requirement of integrating the intricate components that make up the natural system is often too demanding to be achieved. Furthermore, considering that a team of researchers is a must in such a venture, the tool used to merge and synthesize the different information sections to create a whole must also be up to the task. While the management of a river basin is dependent upon the approach and the objectives set, the geo-spatial analysis must also be able to emulate the spatial relationship structure that make up the regional system. The paper presents several issues and challenges in developing such an analysis for the Langat River Basin in Malaysia.

4) Construction of SMART – Geological Challenges

The City of Kuala Lumpur, which is located at the confluence of the Klang River and the Gombak River has been subjected to major floods since 1926. After the largest recorded flood in 1971, Department of Irrigation and Drainage Malaysia (DID) has undertaken various projects to alleviate flooding in the city center. Towards the end of 20th century, the city center has frequently experienced flash flood caused by rainfall of very high intensity. The conventional means to alleviate flooding are no longer effective, so we need a radical approach, by using a combination of holding ponds and a flood bypass tunnel to divert flow from entering city center.

This gave birth to the idea of implementing the Stormwater Management And Road Tunnel or SMART as it is commonly called. SMART is a unique and innovative project designed to transfer the excess floodwaters away from the city center and also to provide another traffic

dispersal scheme to ease the traffic congestion at the Sungai Besi Airfield, Kuala Lumpur. It is the first project of its kind in the world to incorporate a twin deck traffic component into a 3km stretch of the 9.7 km long storm water tunnel. It is a flood relief and road tunnel facility in a single structure.

The management and construction of SMART has been a great challenge for the local engineers as it runs below congested roads, near sensitive structures and through varied geological ground conditions. The tunnel is founded on bedrock of karstic limestone with high ground water table and with varying depths of loose alluvium soils on top. The limestone profile is highly irregular and filled with cavities which can cause a rapid drawdown of water table and trigger sinkhole accidents when exposed during excavation. Inevitably, the geological condition has posed various construction challenges and much thought and planning was channeled towards the selection of a construction method that would have minimal negative impact on the geological condition of the soil. Hence, the slurry shield Tunnel Boring Machine was opted for so as to overcome problems of groundwater drawdown which has been identified as the root cause of incidences of sinkhole appearance. This paper describes the distinctiveness of SMART project and the construction challenges faced on this innovative, fast track project.

5) River Bank Erosion Risk Potential With Regards to Soil Erodibility

River bank failures are common scenario in Malaysia especially during heavy rainy seasons. One of the significant factors causing river bank erosion is the textural composition along the river banks which can be presented by the degree or level of soil erodibility. Sieve analysis and hydrometer tests were conducted for all soil samples collected along the river bank and the "ROM" scale (after the name of researcher **RO**slan and **M**azidah) is used to determine the degree of soil erodibility namely low, moderate, high, very high and critical along the river bank based on the percentage composition of sand, silt and clay. By determining the soil erodibility level, the risk of river bank failure at any location along the river bank can be made known. Thus, this valuable information would certainly enable the

concerned government and private authorities to plan,design and construct the most suitable preventive measures in arresting river bank erosion.

6) Stormwater Management Ecohydrology and Flood Management: Making Space For Water and Control at Source

Many of the impacts on natural hazards on socio-economic development occur through water. Water related hazards account for 90% of all natural hazards and their frequency and intensity is generally rising.

Water management plays a central role in reducing risks of natural disaster such as through Integrated Water Resources Management (IWRM). Complex climate and hydrology mean efficient Water Resources Management is vital. There are river basins facing the mounting challenges of flood, water scarcity, pollution and environmental degradation.

Stormwater Management involved managing the quantity and quality of the stormwater. While the Integrated Water Management (IWM) has the potential to improve runoff quality, reduce the risk and impact of flooding and deliver an additional water resource to augment potable supply. Examples of the Hydrological Performance of porous pavement for asphalt, interlocking blocks and turf pavements, one of the six components in Integrated Stormwater Management Ecohydrology Project at HTCKL has shown that Turf pavement has the highest percentage of peak runoff reduction (relative to asphalt) ranges between 70 to 90 percent with 15 – 30 minutes lag time. The Interlocking pavement gives percentage of peak discharge reduction which ranges between 50 to 80 percent with 15 minutes lag time.

Another example on the hydrological performance of green roof for a storm event shows that the peak discharge produced from green roof is 0.0024 m3/s while peak discharge estimated (rational method) for impervious roof is 0.0034 m3/s. There is 30% of reduction. A peak runoff reduction of 64% was also obtained for comparison of green roof hydrograph with simulated hydrograph for a storm event. These examples have shown the important of adopting Stormwater Management Control at Source in reducing peak runoff during storm events.

Flood Management Making Space for Water can be carried out through programmes such as river restoration works, river corridor/river riparian/floodplain management, retarding basin, storage pond (inline, offline), washland, river cutoff, meandering channels, river compound channel (two stage channel: main channel & floodplain), attenuation of the hydrograph (the different between peak inflow with peak outflow) and many other non-structural measures.

Some concept, research results on understanding natural river behaviour, water level and storage effect, storage and peak outflow, combining narrow and wide channels in flood mitigation works, attenuation of flow through inline storage and conveyance in floodplain management to reduce peak outflow discharge, and examples of making space for water in flood management projects are addressed.

7) Slope Stability

In Malaysia, due to rapid economic growth, limited availability of flat land has driven the developers to start their development projects on slopes, hilly and highland areas. Due to different setting of the topography, normal procedures had often failed to ensure each development on slope is safe and sustainable. With increasing numbers of reported cases involving natural and man-made induced slope failure, a hazard and risk map will become an important tool for addressing potential and severity of failures and also as guidelines for future development plans.

8) Malaysian Civil Defense Force : Role & Functions (Disaster Management) Civil Defence in Malaysia

The introduction of Civil Defence to this country goes back to the colonial era during outbreak of Second World War. Under the Emergency Regulations Enactment, 1939, the passive Defence Measures Regulations and the Civil Defence (compulsory Duties) Regulations were promulgated in 1941 for the primary purpose of creating an effective Civil Defence system in the country. Services such as Air Raid Wardens, Medical Auxillary and Auxillary Fire Services were formed in all major towns to cope with war situations.

In the year 1948 our country declared Emergency and the country was preparing to contain the menace. Among the various measures taken, 'Civil Defence' was one of them and legislation for CD was made vide Civil Defence Ordinance 1951. A year later the Federal Department of Civil Defence was formed to implement some of the Civil Defence measures. The CD system followed the United Kingdom pattern of Civil Defence which was an updated version of passive defence.

'Civil Defence' is defined in the Civil Defence Act 1951 as 'Any measures not amounting to actual combat for affording defences against any form of hostile attack or for depriving any form of hostile attack of the whole or part of its effect, whether the measure are taken before, at or after the time of attack'.

The Government decided that the Civil Defence be regarded as a permanent and integral part of the Defence structure of the country as mentioned in the Federal Constitution (Ninth Schedule).

Tasks of Civil Defence

Civil Defence is part of our national defence. Proceeding from this principle, the Federal Constitution and the Federal Laws have created the basis for the implementation of civil defence. As well as being a balanced component within the framework of national defence, its tasks are as follows:

- Civil Defence shall increase the country's capability of resistance against attacks and attempted extortion by foreign powers and contribute, by its degree of credibility, to the safeguarding of our independence and to the integrality of our territory, even without total war.

- In the state of armed neutrality and above all in case of war, the civil defence must in collaboration with the army and economical measures for times of war, civil defence

shall enable as many inhabitants as possible intact survival in case of an armed conflict, and thereby create the precondition for survival and reconstruction of the whole country.

- The civil defence, in collaboration with the existing civil administration and the army, should be in a position to provide help in peacetime catastrophes.

The Civil Defence Conception

Civil Defence measures enabling the Malaysian population to survive and live on, and basing on the knowledge that prevention is more effective than cure, shall

- be independent of the scenario in any emergencies
- know the right action to do rather waiting for aid or further assistant
- Take into consideration that the rescuer or medical personnel can't afford to be at your side in a split second by any means.

Concerning the independent of the scenario in any emergencies, this means:

All citizens of Malaysia could handle themselves and their respective community assistance by implementing the knowledge and skills provided by Malaysia Civil Defence Force or other respective agencies when facing through emergencies or disasters without depending to the aid or further assistance.

By offering every inhabitant of Malaysian a sufficient knowledge and training, we can cope with the insecurity resulting from not knowing where the emergencies and disaster has been taken into account by preventive measure before the event get trouble.

5.0 PROGRAMME JUSTIFICATION

The new phase of IHP follows the Millennium Development Goals (MDGs) era and envisions new challenges to be set in Rio+20. During its eighth phase, IHP aims to improve water security in response to local, regional, and global challenges. For our purpose, water security is defined as the capacity of a population to safeguard access to adequate quantities of water of acceptable quality for sustaining human and ecosystem health on a watershed basis, and to ensure efficient protection of life and property against water related hazards - floods, landslides, land subsidence,) and droughts.

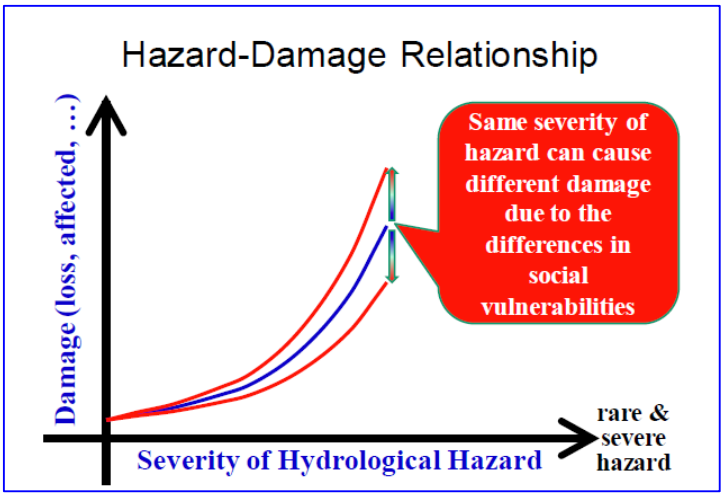
The Strategic Plan of the Eighth Phase of IHP (IHP-VIII, 2014-2021) - WATER SECURITY: RESPONSES TO LOCAL, REGIONAL, AND GLOBAL CHALLENGES focuses on six knowledge areas translated into six themes as shown in Figure below:

Promoting and implementing Geospatial Water Related Disaster Management Programmes Is Referred to Theme 1: **WATER-RELATED DISASTERS AND HYDROLOGICAL CHANGE.**

The number of human losses and economic damages linked to human practices has been exacerbated by water-related extreme events. Water-related risks may further increase for a number of reasons. On the one hand, the probability of extreme events with high impacts to society is expected to increase because of human activities (e.g. deforestation, river training, reservoir storage and release, and embankment) and/or as a result of climate

variability and change. On the other hand, increasing population and economic growth lead to intensive urbanization, often in flood prone areas. Poor water governance coupled with lack of adequate emergency management institutions and infrastructures reduce society's capacity to cope with extreme events and therefore increase the risk to life and property. Thus, risk management should be improved.

There is a need to establish methodologies to assess risk, considering the hydro-climatological and social conditions of the area of concern. Integrating pilot case studies on hazard-damage relationships on local/regional scales and developing hazard-damage relationships are essential to providing risk management tools for water managers and policy makers.



Relationship between the damage caused by hydrological extremes and the severity of the event

The expected results from these projects will contribute to HYD 37/C5 on responses to local, regional and global water security challenges strengthening linked with IHP VIII.

So, HTC would like to recommend the GEOSPATIAL WATER RELATED DISASTER MANAGEMENT PROGRAMMES to be the project adopted and reported by the region.

ANNEX 9

MAPPING IHP VIII

Mapping of RSC Future Projects against IHP VIII

"WATER SECURITY: RESPONSES TO LOCAL, REGIONAL,

AND GLOBAL CHALLENGES"

(2014 – 2021)

COUNTRY: ____AUSTRALIA_____

List of Themes and Focal Areas under IHP VIII

Theme 1: Water-Related Disasters and Hydrological Change
Focal Area 1.1: Risk management as adaptation to global changes
Focal Area 1.2: Understanding coupled human and natural processes
Focal Area 1.3: Benefiting from global and local Earth observation systems
Focal Area 1.4: Addressing uncertainty and improving its communication
Focal Area 1.5: Improve scientific basis for hydrology and water sciences for preparation and response to extreme hydrological events

Theme 2: Groundwater in a changing environment
Focal Area 2.1: Enhancing sustainable groundwater resources management
Focal Area 2.2: Addressing strategies for management of aquifers recharge
Focal Area 2.3: Adapting to the impacts of climate change on aquifer systems
Focal Area 2.4: Promoting groundwater quality protection
Focal Area 2.5: Promoting management of transboundary aquifers

Theme 3: Addressing Water Scarcity and Quality
Focal Area 3.1: Improving governance, planning, management, allocation, and efficient use of water resources
Focal Area 3.2: Dealing with present water scarcity and developing foresight to prevent undesirable trends
Focal Area 3.3: Promoting tools for stakeholders involvement and awareness and conflict resolution
Focal Area 3.4: Addressing water quality and pollution issues within an IWRM framework - improving legal, policy, institutional, and human capacity
Focal Area 3.5: Promoting innovative tools for safety of water supplies and controlling pollution

Theme 4: Water and human settlements of the future
Focal Area 4.1: Game changing approaches and technologies
Focal Area 4.2: System wide changes for integrated management approaches
Focal Area 4.3: Institution and leadership for beneficiation and integration
Focal Area 4.4: Opportunities in emerging cities in developing countries
Focal Area 4.5: Integrated development in rural human settlement

Theme 5: Ecohydrology, engineering harmony for a sustainable world
Focal Area 5.1: Hydrological dimension of a catchment – identification of potential threats and opportunities for a sustainable development
Focal Area 5.2: Shaping of the catchment ecological structure for ecosystem potential enhancement – biological productivity and biodiversity
Focal Area 5.3: Ecohydrology system solution and ecological engineering for the enhancement of water and ecosystem resilience and ecosystem services
Focal Area 5.4: Urban Ecohydrology – storm water purification and retention in the city landscape, potential for improvement of health and quality of life
Focal Area 5.5: Ecohydrological regulation for sustaining and restoring continental to coastal connectivity and ecosystem functioning

Theme 6: Water Education, key for Water Security
Focal Area 6.1 - Enhancing tertiary water education and professional capabilities in the water sector
Focal Area 6.2 - Addressing vocational education and training of water technicians
Focal Area 6.3 – Water education for children and youth
Focal Area 6.4 – Promoting awareness of water issues through informal water education
Focal Area 6.5 – Education for transboundary water cooperation and governance

List of Projects and Timeline

1. **Project Title:Operational Forecasting and effective information dissemination**
   Description:
   Timeline:
   Contribution to IHP VIII:Theme x Focal Area x.x 1.1, 1.3, 1.4, 1.5

2. **Project Title:Development of forecasting droughts for better water resources management**
   Description:
   Timeline:
   Contribution to IHP VIII:Theme x Focal Area x.x 3.2, 1.1, 1.5

3. **Project Title:Water Education Tools and Hydrological Analysis Techniquesusing COR Data**
   Description:
   Timeline:
   Contribution to IHP VIII:Theme x Focal Area x.x6.1, 6.2
4. **Project Title:**
   Description:
   Timeline:
   Contribution to IHP VIII: Theme x Focal Area x.x

5. **Project Title:Tools for stakeholder Involvement in the Pacific Islands and Region**
   Description:
   Timeline:2014-2018
   Contribution to IHP VIII: Theme x Focal Area x.x 3.3

(You may add or reduce the numbers according to your needs)

List of Projects and Timeline (IHP Japan)

1. **Project Title:** Climate change research focusing on impacts on water-related disaster risk using "Earth Simulator": MEXT SOSEI Project
   Description: Climate change impacts on the hydrological cycle and consequent impact on water resources (Kyoto University, University of Tokyo, ICHARM, other universities and institutes)
   Timeline: 2012-2016
   Contribution to IHP VIII: Theme x Focal Area 1.1, 1.3

2. **Project Title:** Global Earth Observation System of Systems (GEOSS) and Asian Water Cycle Initiative in Asian and Africa
   Description: Global water cycle assessment in Asia and Africa (University of Tokyo)
   Timeline: 2012-2016
   Contribution to IHP VIII: Theme x Focal Area 1.3

3. **Project Title:** Sustainability/Survivability Science for a Resilient Society Adaptable to Extreme Weather Conditions
   Description: Interdisciplinary research and education at Ph.D. level is implemented for extreme weather and water conditions (Kyoto University)
   Timeline: 2012-2016
   Contribution to IHP VIII: Theme x Focal Area 1.5,

4. **Project Title:** Groundwater as key for adaptation to changing climate and society
   Description: Groundwater as key for adaptation to changing climate and society (RIHN)
   Timeline: 2013-2018
   Contribution to IHP VIII: Theme x Focal Area 2.1

5. **Project Title:** UNESCO IHP Training Courses (TC)
   Description: Water resources for sustainable development, hydrology and water resources under vulnerable Environment, and water interactions (Nagoya University and Kyoto University)
   Timeline: 2013-2021
   Contribution to IHP VIII: Theme x Focal Area 6.1

6. **Project Title:** Future of catalogue of rivers
   Description: Catalogue of Hydrologic Analysis for Southeast Asia and the Pacific (IHP RSC SEAP) This will discuss at the RSC.
   Timeline: 2013-2021
   Contribution to IHP VIII: Theme x Focal Area 6.1

(You may add or reduce the numbers according to your needs)

Mapping of RSC Future Projects against IHP VIII

"WATER SECURITY: RESPONSES TO LOCAL, REGIONAL,

AND GLOBAL CHALLENGES"

(2014 – 2021)

COUNTRY: _Mongolia_

List of Themes and Focal Areas under IHP VIII

Theme 1: Water-Related Disasters and Hydrological Change
Focal Area 1.1: Risk management as adaptation to global changes
Focal Area 1.2: Understanding coupled human and natural processes
Focal Area 1.3: Benefiting from global and local Earth observation systems
Focal Area 1.4: Addressing uncertainty and improving its communication
Focal Area 1.5: Improve scientific basis for hydrology and water sciences for preparation and response to extreme hydrological events

Theme 2: Groundwater in a changing environment
Focal Area 2.1: Enhancing sustainable groundwater resources management
Focal Area 2.2: Addressing strategies for management of aquifers recharge
Focal Area 2.3: Adapting to the impacts of climate change on aquifer systems
Focal Area 2.4: Promoting groundwater quality protection
Focal Area 2.5: Promoting management of transboundary aquifers

Theme 3: Addressing Water Scarcity and Quality
Focal Area 3.1: Improving governance, planning, management, allocation, and efficient use of water resources
Focal Area 3.2: Dealing with present water scarcity and developing foresight to prevent undesirable trends
Focal Area 3.3: Promoting tools for stakeholders involvement and awareness and conflict resolution
Focal Area 3.4: Addressing water quality and pollution issues within an IWRM framework - improving legal, policy, institutional, and human capacity
Focal Area 3.5: Promoting innovative tools for safety of water supplies and controlling pollution

Theme 4: Water and human settlements of the future
Focal Area 4.1: Game changing approaches and technologies
Focal Area 4.2: System wide changes for integrated management approaches
Focal Area 4.3: Institution and leadership for beneficiation and integration
Focal Area 4.4: Opportunities in emerging cities in developing countries
Focal Area 4.5: Integrated development in rural human settlement

Theme 5: Ecohydrology, engineering harmony for a sustainable world
Focal Area 5.1: Hydrological dimension of a catchment – identification of potential threats and opportunities for a sustainable development
Focal Area 5.2: Shaping of the catchment ecological structure for ecosystem potential enhancement ─ biological productivity and biodiversity
Focal Area 5.3: Ecohydrology system solution and ecological engineering for the enhancement of water and ecosystem resilience and ecosystem services
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Focal Area 6.1 - Enhancing tertiary water education and professional capabilities in the water sector
Focal Area 6.2 - Addressing vocational education and training of water technicians
Focal Area 6.3 – Water education for children and youth
Focal Area 6.4 – Promoting awareness of water issues through informal water education
Focal Area 6.5 – Education for transboundary water cooperation and governance

List of Projects and Timeline

1. Project Title: *Operational meteorological and hydrological forecasting and effective information dissemination and use for water resource management*

Description: *Observation data on precipitation, lake and glacier dynamics and other water and energy balance variables will be improved through benefiting from global and local Earth observation system of systems. Short range rainfall, solid precipitation and runoff forecast, climate and hydrology models will be developed. Drought yearly warning will be enhanced through seasonal forecasting improvement.*

Timeline: *2014-2017*

Contribution to IHP VIII: *Theme 1, Focal Area 1.3 and 1.5*

2. Project Title: *Improving groundwater monitoring with application of GEOSS to enhance ground water resource management*

Description: *Observation data on precipitation and groundwater will be improved through benefiting from global "Grace" and local Earth observation systems.*

Timeline: *2015-2019*

Contribution to IHP VIII: *Theme 2, Focal Area 2.1 and 2.2*

3. Project Title: *Enhancing water education using demonstration of hydrological analysis*

Description: Demonstration result and illustration of hydrological analysis

Timeline: *2016-2020*

Contribution to IHP VIII: *Theme 6, Focal Area 6.1-6.3*

(You may add or reduce the numbers according to your needs)

Philippines IHP – prepared by Leonardo Q. Liongson
Proposed IHP VIII – themed Projects:

1. **Project Title: AP-HELP**
   Description: Asia Pacific HELP as a multi-country partnership addressing and applying solutions in the issues of water security, governance, water law and policy, etc.
   Timeline: 5 years
   Contribution to IHP VIII: Themes 3, 4, 5, and 6.

2. **CAP-LGU-WSM**
   Description: capacity-building of local governments in water security management (national government-LGU partnership).
   Timeline: 5 years
   Contribution to IHP VIII: Theme 3,4,5,6.

3. **Top-Down Water Education (TD-WE)**
   Description: technical assistance from the tertiary and vocational levels of water expertise in order to promote and develop water education in the levels of children, youth and informal education sectors. (academe-NGO-LGU partnership).
   Timeline: 5 years
   Contribution to IHP VIII: Theme 6.

4. **Multiple Source Drought Management Using Sustainable Local Technology (MSDM)**
   Description: promotion and development of water-saving devices and practices in agriculture (irrigation and aquaculture), rural water supply and sanitation, sourced from groundwater (springs, wells) and surface water sources (rainfall, rivers, lakes).
   Timeline: 5 years
   Contribution to IHP VIII: Themes 2, 3, 6.

Mapping of RSC Future Projects against IHP VIII

"WATER SECURITY: RESPONSES TO LOCAL, REGIONAL,

AND GLOBAL CHALLENGES"

(2014 – 2021)

COUNTRY: THAILAND

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Focal Area 1.1: Risk management as adaptation to global changes
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Focal Area 6.4 – Promoting awareness of water issues through informal water education
Focal Area 6.5 – Education for transboundary water cooperation and governance

List of Projects and Timeline

1. **Project Title:**
   Description: Formulation of Integrated Plan on Water Resources Management for river Basin
   and Provincial Water Security
   Timeline: 2015-2018
   Contribution to IHP VIII: Theme III Focal Area 3.1 Improving governance, planning, management, allocation, and efficient use of water resources

2. **Project Title:**
   Description: Improved Management of Extreme Event through Ecosystem-based Adaptation in
   Watersheds
   Timeline: 2013-2016
   Contribution to IHP VIII: Theme 5 Focal Area 5.3 Ecohydrology system solution and ecological
   engineering for the enhancement of water and ecosystem resilience
   and ecosystem services

3. **Project Title:**
   Description: Promotion and Strengthening for Personal on Water Resources Management in Wetland.
   Timeline: 2015-2018
   Contribution to IHP VIII: Theme 6 Focal Area 6.1 - Enhancing tertiary water education and
   professional capabilities in the water sector

Mapping of RSC Future Projects against IHP VIII

"WATER SECURITY: RESPONSES TO LOCAL, REGIONAL,

AND GLOBAL CHALLENGES"

(2014 – 2021)

COUNTRY: VIETNAM

List of Themes and Focal Areas under IHP VIII

Theme 1: Water-Related Disasters and Hydrological Change
Focal Area 1.1: Risk management as adaptation to global changes
Focal Area 1.2: Understanding coupled human and natural processes
Focal Area 1.3: Benefiting from global and local Earth observation systems
Focal Area 1.4: Addressing uncertainty and improving its communication
Focal Area 1.5: Improve scientific basis for hydrology and water sciences for preparation and response to extreme hydrological events

Theme 2: Groundwater in a changing environment
Focal Area 2.1: Enhancing sustainable groundwater resources management
Focal Area 2.2: Addressing strategies for management of aquifers recharge
Focal Area 2.3: Adapting to the impacts of climate change on aquifer systems
Focal Area 2.4: Promoting groundwater quality protection
Focal Area 2.5: Promoting management of transboundary aquifers

Theme 3: Addressing Water Scarcity and Quality
Focal Area 3.1: Improving governance, planning, management, allocation, and efficient use of water resources
Focal Area 3.2: Dealing with present water scarcity and developing foresight to prevent undesirable trends
Focal Area 3.3: Promoting tools for stakeholders involvement and awareness and conflict resolution
Focal Area 3.4: Addressing water quality and pollution issues within an IWRM framework - improving legal, policy, institutional, and human capacity
Focal Area 3.5: Promoting innovative tools for safety of water supplies and controlling pollution

Theme 4: Water and human settlements of the future
Focal Area 4.1: Game changing approaches and technologies
Focal Area 4.2: System wide changes for integrated management approaches
Focal Area 4.3: Institution and leadership for beneficiation and integration
Focal Area 4.4: Opportunities in emerging cities in developing countries
Focal Area 4.5: Integrated development in rural human settlement

Theme 5: Ecohydrology, engineering harmony for a sustainable world
Focal Area 5.1: Hydrological dimension of a catchment – identification of potential threats and opportunities for a sustainable development
Focal Area 5.2: Shaping of the catchment ecological structure for ecosystem potential enhancement – biological productivity and biodiversity
Focal Area 5.3: Ecohydrology system solution and ecological engineering for the enhancement of water and ecosystem resilience and ecosystem services
Focal Area 5.4: Urban Ecohydrology – storm water purification and retention in the city landscape, potential for improvement of health and quality of life
Focal Area 5.5: Ecohydrological regulation for sustaining and restoring continental to coastal connectivity and ecosystem functioning

Theme 6: Water Education, key for Water Security
Focal Area 6.1 - Enhancing tertiary water education and professional capabilities in the water sector
Focal Area 6.2 - Addressing vocational education and training of water technicians
Focal Area 6.3 – Water education for children and youth
Focal Area 6.4 – Promoting awareness of water issues through informal water education
Focal Area 6.5 – Education for transboundary water cooperation and governance

List of Projects and Timeline

1. **Project Title:**
   Description: Extreme Events in hydrology
   Timeline: 2017-2018
   Contribution to IHP VIII: Theme I Focal Area 1.1 Risk management as adaptation to global changes

2. **Project Title:**
   Description: Developing operation rule for reservoir system on Ba river basin in dry season.
   Timeline: 2015-2016
   Contribution to IHP VIII: Theme 3 Focal Area 3.1- Improving governance, planning, management, allocation, and efficient use of water resources

3. **Project Title:**
   Description: Transboundary water issues of Vietnam
   Timeline: 2017-2021
   Contribution to IHP VIII: Theme 6 Focal Area 6.5- Education for transboundary water cooperation and governance

ANNEX 10

ABSTRACTS FROM SUBMITTED PAPERS

1. **The Canterbury Water Management Strategy (CWMS) Integrated Water Resource Management in Action**

Dennis Jamieson, MS Srinivasan

The Canterbury Water Management Strategy (CWMS) is a process to improve water management in the Canterbury Region of New Zealand, which has both abundant water and challenges with water management. The CWMS is a result of collaboration between Ngāi Tahu[i] (Maori tribe or iwi), communities and councils across the region and includes the full spectrum of water interests. The CWMS has a vision: "To enable present and future generations to gain the greatest social, economic, recreational and cultural benefits from water resources within an environmentally sustainable framework". It is achieving this by addressing ten targets, which cover values identified in the establishment stage of the strategy.

The CWMS approach was developed in relative isolation from international Integrated Water Resources Management (IWRM) precedents. In essence this paper is beginning the process of greater integration of CWMS with IWRM international work. This is significant given the recognition to IWRM and associated adaptive management components identified in the Eighth Phase of the International Hydrological Programme (IHP-VIII), 2014-2019.

The CWMS, and hence the approach included in IHP-VIII is also consistent with good infrastructure practice being promoted by the NZ Treasury. It addresses the observations made by Treasury officials from New Zealand, The United Kingdom and elsewhere that often the "wrong things are done the right way". In practice the CWMS is assisting in identifying the "right things" that can meet multiple objectives at minimum environmental and economic cost In fact the expectation is that economic and environmental gains will both be substantial.

A key feature of the CWMS process is the identification of information needs. The structured approach emerging allows prioritisation of effort in science and enable cases to be made for funding support. CWMS targets have timelines extending to 2040 which is in contrast to traditional short term science funding which rarely extends beyond five years. The recognition that this is a "science informed" process in which both Social and Biophysical sciences are important is consistent with two themes of UNESCO New Zealand.

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[i] See www.ngaitahu.iwi.nz

2. **Variation and changes of glaciers in Mongolia**

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The paper summarizes results of analysis, obtained from hydrological, glaciological and meteorological observations, conducted on glaciers at Tavanbogd, Tsambagarav and other glacier Mts. in Mongolia, in 2003-2011. Climate in high mountain area became warmer, annual average temperature has increased by 1.0-1.3°C and average temperature in JJA period has increased even higher by 1.7-1.8 °C in 1940-2011.

Glaciers affected by climate changes were retreating and shrinking; glacier area has been decreasing since 1940th till 1990 by 12.3%, in the period of 1990-2000 by 9.8%, in the period of 2000-2010 by 11.7% and totally has decreased by 27.8 in last 70 years.

Glacier massifs and glaciers were classified by their areas. Using glacier thickness data collected at selected glaciers in Mongolia, here has been obtained glacier area (A) and volume (V) relationship for Mongolian glaciers that is $V=0.0410 \cdot A^{1.220}$. The strong relationship enables to estimate ice and water resources in Mongolian glaciers. Total glacier ice reserves were estimated as 21.57 cub. km, with average thichness of 31.3 m and accordingly glacier water resource is 19.4 cubic km in Mongolia, in 2000.

Cumulative balance of ice of the Potanin glacier is 29.44-33.72 m at the altitude of 2977-2998 m, 13.05-19.24 m at the altitude as 3339-3366 m in 2004-2011. While the balance totals 10.94 m at the altitude of 3607 m and 5.35 m at the altitude of 3814 m of the Tsambagarav ice cap in the period of 2005-2011. Strong altudinal (H, m) dependency of the annual average balance (M, cm of ice) in 2005-2011 expressed as: $M = 28.5 \cdot 10^{24} H^{-6.55}$ enables to make regional estimation of ablation rates in ungauged glaciers.

Degree day factor for the Tsambagarav ice cap ranges 0.44-0.65 cm of ice /^{o}C·day on average and 0-1.22 cm of ice/^{o}C·day in JJA, 2010, 2011. Collected data enable to simulate river flow draining from glacierised mountains with SMR (Snow melting runoff) model.

Futhermore, hydrological model combined with glacier and climate models needs to predict future complex of changes and enables to make better water and natural resources management.

3. IWRM AND SUSTAINABLE ECOSYSTEM MANAGEMENT APPROACHES: SOME INITIATIVES AND PERSPECTIVES FROM THE LANGAT HELP RIVER BASIN IN MALAYSIA

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Integrated Water Resources Management (IWRM) and Sustainable Ecosystem Management are two important approaches that need to be applied in the management of water and natural resources. These approaches have been adopted in managing water resources and river basin in Langat River Basin, Malaysia. The Langat River Basin in Malaysia is a transboundary river basin and is one of Evolving UNESCO-IHP HELP Basin since 2004. The basin is small but has inherited many problems of a large river basin. This is because the river plays an important role in conservation, agriculture and potable water supply but is facing threat from rapid development in the industry sectors and urbanization in the basin. This is why the components of IWRM and Sustainable Ecosystem Management needed to be implemented as practical approaches toward sustainable water resources and river basin management. These will help to resolve the problems occurred in this basin. This paper highlights some initiatives and perspectives in managing water resources in this basin, as well as describes the current development and existing commitments towards achieving sustainability of water resources and river basin. The implementation of IWRM and Sustainable Ecosystem Management need to be

enhanced and further strengthened in order to sustain the water resources and ecosystem management in this basin.

Keywords: IWRM, sustainable ecosystem; management, water resources, river basin, integrated, Langat, Malaysia.

4. IPAG60 : ALTERNATIVE TECHNOLOGY TO PROVIDE CLEAN WATER IN PEATLAND AREA

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The majority of areas in Riau Province and Midle Kalimantan Province have the land with peat surface water. The characteristics of the peat water are: low pH levels (2-4) that is highly acidic; high levels of organic; high levels of iron and manganese; yellow or dark brown. This kind of surface water is basically not suitable as raw water for drinking water. Compared with other surface water that is fresh water, the water from the turf needs to be processed specifically by adding stages in the process. In order to improve the efficiency of water treatment plant, it would require a review of potential issues that may arise in every phase of water treatment process. Meanwhile the first phase of this research activity aims to conduct field observations in order to determine the mounting location of IPAG and to learn about the readiness and willingness of local communities to adopt appropriate technologies that will be implemented. Peat water treatment technology that has been established in previous studies (2009-2011) allows the peat areas have peat water treatment facility for drinking water supply. The implementation and testing of the water treatment facility is limited in the area of Katingan Distric, Central Kalimantan province and Bengkalis Distric – Riau Province, meanwhile, a lot of territory in some areas in Indonesia, especially Sumatra and Kalimantan, which has a clean water source issues. Implementation of this technology in the wider area is necessary to support the increase in water services in the region. The quality of peat water and clean water(treated by IPAG) was assessed using STORET methods. STORET analysis results indicate that the IPAG can improve peat water quality (class C) intoclean waterquality (class A).

Key words : peat water, IPAG60, water quality, clean water

5. Analysis on the Flood Years of the Stations along Upper Ayeyarwady

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The flood is a natural disaster that the people of Myanmar have been facing usually. The upper Myanmar has been doing observation, data processing, forecasting, annual maintenance for the Ayeyarwady and Chindwin, the two main channels since 1964. As A eyarwady is a main channel, the people from the towns and villages along the river have been suffering from the effect of plain flood. Whenever the flood occurs, the various damages happen more or less. In this paper, we try to know the nature of the flood of the Upper Ayeyarwady.

In analyzing the data, 40 years hydrological observation data, actual monthly rainfall and normal monthly rainfall of the stations along the Upper Ayeyarwaddy are used.

6. THE VALUE OF MEKONG HYDROLOGICAL CYCLE OBSERVING SYSTEM PROJECT

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In cooperation with the World Meteorological Organization (WMO), MRC has been established a near-real time hydro-meteorological network, name as the MRC hydro-meteorological network.
The work includes on managing and coordinating all technical, administrative and financial activities to ensure the effective implementation of the Mekong-HYCOS project in full compliance with all applicable donors funding agreements from Finland and French through French Development Agency (AFD) and the Fonds Francais pour l'Environment Mondial (FFEM),with technical support by the World Meteorological Organization (WMO) and within WMO's framework of WHYCOS Projects. The main objective of the MRC hydro-meteorological network is to establish an efficient, reliable and timely hydro-meteorological data collection and transmission system. This will also strengthen relevant national and regional capacities. The information is shared between MRCS's four member countries, Cambodia, Lao PDR, Thailand and Viet Nam. The Project is also cooperation with China by sharing hydro-meteorological data from 2 stations upstream of the Mekong River at Jing Hong and Man An. The hydro-meteorological network is a basin wide hydro meteorological information system, spatially covering both mainstream and main tributaries of the Mekong River. The system is integrated into the existing MRCS monitoring system, and will also improve the national hydrological networks and river monitoring/forecasting capacities.

The 49 network stations provide near-real time data water level and rainfall in 15 min time-step over the mainstream and main tributaries of the Mekong River, Online charts from the stations are available at : http://monitoring.mrcmekong.org/ and http://portal.mrcmekong.org/

Keywords: Hydrological Cycle Observing System, hydro-meteorological data, Water level, Rainfall, WHYCOS, Mekong-HYCOS, Information system

7. SOME ISUSSES ON TRANSBOUNDARY WATER RESOURCES OF VIETNAM

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Up to now, there are about 263 international rivers in the world. In Viet Nam, there are about 206 contiguous and successive rivers and streams, including 124 successive water courses, 82 contiguous watercourses with a total length of 1100 km. In recent years, the exploitation and use of water resources of the Mekong and Red River on the territory of China and other

countries in the lower Mekong basin has affected on water resources of the Red and Mekong River in Viet Nam. These issues require the research, assessment and monitoring to proactively respond to these adverse effects on the sustainable development of socio-economic of Viet Nam.

Keywords: International Rivers, trans-boundary water resources