



International Hydrological Programme

20th session of the Intergovernmental Council
(Paris, 4 – 7 June 2012)

REPORTS OF UNESCO CATEGORY 2 WATER-RELATED CENTRES (2010-2012)

SUMMARY

The following reports of the UNESCO category 2 water-related centres cover the activities for the intersessional period between the 19th and the 20th sessions of the Intergovernmental Council of the IHP (June 2010 - May 2012).

The texts reproduced herewith stand exactly as submitted by the centres. The contents of the reports have not been modified and remain the sole responsibility of the respective centres.

Asia Pacific Centre for Ecohydrology (APCE) – UNESCO

REPORT 2011 – 2012

1. Introduction

APCE concerns with environmental/ ecological problems for sustainable provision of water as an environmental service and ecological component for all people. APCE activities are in line with the main mission of UNESCO in enhancing science, education and culture. In this context, APCE benefits people in general through environmental and ecological management by harnessing science and technology, education and culture.

In its activities, APCE commits to contribute in overcoming current and important issues of national, regional and global interests, such as poverty, climate change adaptation, and disaster risk reduction.

2. Activities

In achieving the objective of the APCE, we will do several activities as listed in Table 1 that also contains time and potential partners for each activity. These activities will benefit from results of past and current research activities conducted by Indonesian Institute of Science (LIPI) and their partners.

1. **Activity 1: Research on Sediment Deposition System on Saguling Reservoir, West Java (2011-2012)**

- In the first year of the project, we will focus on the selection of the demo-site location **demo-site location Saguling Reservoir**
- Saguling reservoir area is defined into several 1) restricted zone, 2) conservation zone, 3) fishing one, 4) aquaculture zone, and 5) Transportation zone.
- This activity will have an output of a report document, containing details of identified and defined ecological issues and problems in **demo-site location Saguling Reservoir, Indonesia.**

2. **Activity 2: National seminar & workshop**

National Seminar on Ecohydrology, held in Jakarta, 24 March 2011, with the theme: Integrating Ecohydrological Principles for Good Water Governance”

The topics discussed: a). Ecohydrology concepts and principles with its development, b). APCE and institutional programs, c). Ecohydrology applications in lake management, d). Concept educational and research necessity on ecohydrology, e). a national policy of water resource management, f). conservation of water resources, g). spatial planning in water resource management, h). sustainable water resource use. Keynote speakers were Prof. Dr. Maciej Zalewski, Director of International Institute of the Polish Academy of Science, European Regional Centre for ecohydrology under the auspices of UNESCO (ERCE) and Dr. Shahbaz Khan, Chief of Sustainable Water Resources Development & Management Section, UNESCO Division of Water Sciences, Paris, France.

3. **Activity 3: International (Regional) workshop**

International Workshop On New Ecohydrology Demonstration Site Projects “Ecohydrology For Managing Sustainable Water Futures” Jakarta, Indonesia, 21 – 23 March 2011. Organized by APCE, UNESCO Jakarta Office, IHP Indonesian National Committee.

Ecohydrology Programme (EHP) demonstration sites aimed to synthesize knowledge gaps for addressing issues related to critical water systems. The International workshop open by **Hery Harjono** LIPI Deputy Chairperson – and **Shahbaz Khan**, UNESCO HQ and **Giuseppe Arduino**, UNESCO Jakarta. The workshop was attended by EHP experts from Poland, Portugal, Germany, Philippines, Argentina, Cina, Australia, Ethiopia, Indonesia and focused on how better knowledge of the interrelationships between the hydrological cycle, livelihoods and ecosystems could be contributed to more cost-effective and environmental-friendly management. The existing projects

related to landscape processes, water issues in cities, rivers, floodplains, wetlands, reservoirs and coastal areas was discussed at the workshop.

The workshop bring together experiences of the following areas of interest in the demo sites:

- Relationships among ecological pattern and hydrological process;
- Disturbance and dynamics in natural and anthropogenic ecology and hydrology;
- Ecohydrological approaches to biodiversity conservation, environmental management, and ecological restoration;
- Integrating hydrology with ecological planning, design, and architecture, or reverse;
- Transdisciplinary studies of regional sustainability from scopes of ecohydrology, ecology, or both.

The activities included a discussion of the key aspects of the selected EH demo projects followed by the steering committee of the program which will elaborate on future plans.

4. Other activities

- a. Attend to IHP RSC in Kyoto – Japan, 27 – 28 October 2011
- b. Attend to World Delta Summit in Jakarta – Indonesia, 21 – 24 November 2011
- c. Attend to Korea International Symposium : "Addressing water quality challenges in Asia/Pacific", in Daejon, Korea, 7 – 9 December 2011
- d. APCE Meeting with Deputy of Earth Sciences – Indonesian Institute of Sciences, 22 December 2011 : "Renewal of the composition of the APCE organization committee"
- e. Participate in preparing the Indonesia National Committee IHP Response to The Draft Strategic Plan of The Eight Phase of IHP (IHP-VIII, 2014 – 2021), 26 January 2012
- f. APCE Meeting with Director General of High Education of National Education Ministry, 31 January 2012

- g. Attend to Indonesia National Committee of IHP in Jakarta, 19 January 2012
- h. Attend to Meeting of Indonesian Institute of Sciences and Indonesia National Committee for Unesco in Jakarta, 24 January 2012
- i. Site Visit to Pondok Pesantren Al-Amanah, Cililin – Bandung, in order to promote a Demo-site Saguling Reservoir, 27 January 2012
- j. Site Visit to Saguling Power Plant in order to promote a Demo-site Saguling Reservoir, 05 March 2012
- k. Study of sediment deposition system on saguling reservoir, west Java (2011)
- l. To Build the official secretary of APCE 1000 M² (APBNP 2012)
- m. Presented a paper entitled “Concept & Application Of Ecohydrology In Indonesian Inland Waters”, International Workshop on New Ecohydrology Demonstration Site Projects “Ecohydrology for Managing Sustainable Water Futures”, in Jakarta, Indonesia, 21 – 23 March 2011
- n. Presented a paper entitled “APCE in Indonesia” on National Symposium on Ecohydrology “Integrating Ecohydrological Principles for Good Water Governance” on 24 March 2011 in Jakarta, Indonesia
- o. International Training Program on Technology for Water Management, Belgium, December, 2011
- p. 21st IHP Nagoya Training Course in Asia and Pacific Region on Introduction to River Basin Environment Assessment under Climate Change. 8 November – 9 December 2011, Kyoto University, Japan
- q. Dr. Gadis Sri Haryani, Prof. J. Sopaheluwakan and H. Pawitan will present a paper entitled “Concept and Application of Ecohydrology in Indonesian Inland Waters
- r. Reformation of APCE organizational structure (2012). This is done in order to improve institutional performance including additional structural and personnel

5. Organization Structure

The new composition of the ASIA PACIFIC CENTRE FOR ECOHYDROLOGY (APCE) is :

Board of Directors :

1. Chairman of The Indonesian Institute of Sciences (IIS)
2. Vice-Chairman of The Indonesian Institute of Sciences
3. Secretary of The Indonesian Institute of Sciences
4. Director of The Unesco Jakarta Office
5. Chairman of Indonesia National Committee for Unesco
6. Deputy Chairman for Earth Sciences - Indonesian Institute of Sciences
7. Deputy Chairman for Natural Sciences - Indonesian Institute of Sciences
8. Deputy Chairman for Scientific Services - Indonesian Institute of Sciences
9. Director General of Water resources – Ministry of Public Works
10. Director of Research Centre for Limnology

Executive Director	: Prof. Dr. Hery Harjono	IIS
Executive Secretary	: Dr. Ignasius Dwi Atma Sutapa	IIS
	Yovita Lambang Isti	IIS
Research Division	: Prof. Dr. Hidayat Pawitan (Bogor Agriculture Institute)	
	Dr. Gadis Sri Haryani	IIS
Division of :		
Training and Workshop	: Drs. M. Fakhrudin	IIS
	Dr. Apip	IIS
Public Awareness	: Dr. Munasri	IIS
	Dr. Deny Hidayati	IIS
Information System	: Prof. Dr. Robert Delinom	IIS
	Dr. Luki Subehi	IIS

6. APCE activities in Progress :

1. MOU with Tsukuba University : Activities to promote collaborative scientific projects will be commenced by representatives from both parties, such as the project on studies of Lake Maninjau and other lakes or reservoirs potentially useful for downstream/pollutant-accumulating lake studies
2. MOU with NordCEE University of Southern Denmark : collaborative studies of the Malili Lakes
3. MOU with Toulouse University : Impact of anthropogenic activities on fish diversity in Citarum river, (experts exchange)
4. MOU with Katingan Subprovinve : Implementation of Peatwater Treatment Plant (IPAG60) as an alternative technology to provide clean water in peatland area.
5. MOU with Sopotulung Foundation : sustainable management of Toba lake (Hyacinth control with a biocontrol method)
6. MOU with Ministry of Education and Culture and Unesco Jakarta Office: International seminar, training and workshop of ecohydrology
7. Constructing of APCE secretariat building (April – December 2012)
8. APCE secretariat will be planned to be inaugurated by the President of Republic of Indonesia and the President of UNESCO in April 2013, one of the agenda of the APEC meeting in 2013

9. Received a visit from children's school and high school : learning relating to the management of sustainable water resources

7. Publications

- Ecohydrology Approach for Rehabilitation of Lake Limboto in Gorontalo, Indonesia (T Chrismadha, GS Haryani, M Fakhrudin, Lukman, I Ridwansyah, PE Hehanussa, Research Center for Limnology, Indonesian Institute of Sciences). Will be Published in Special Edition Journal on Ecohydrology.
- Proceedings of National Symposium on Ecohydrology “Integrating Ecohydrological Principles for Good Water Governance” on 24 March 2011 in Jakarta, Indonesia
- Ignasius Sutapa, Water Quality Assesment In Giam Siak Kecil – Bukit Batu Biosphere Reserve, Riau Province. Proceeding of International Workshop on “Sustainable Management of Bio-resources in Tropical Peat-swamp Forest” LIPI, Bogor/Cibinong, July 19th, 2011
- Ignasius Sutapa, Alternative Technology To Provide Clean Water In Peatland Area Of Gsk – Bb Biosphere Reserve - Riau Province. Proceeding of The 2nd International Workshop on South-South Cooperation for “Sustainable Development in the Three Major Tropical Humid Regions in the World”, Pekanbaru, Indonesia, 4-8 October 2011
- Ignasius Sutapa, *Bio-Village* Development Concept In Giam Siak Kecil Bukit Batu Biosphere Reserve, Riau Province: Development Of Peat Water Treatment Technology To Provide Clean Water Basic Needs. Proceeding of Korea International Symposium on “*Addressing Water Quality Challenges in Asia*”, jointly organized by UNESCO’s International Hydrological Programme and K-Water Institute. Daejeon, Republic of Korea, 07-09 December 2011.
- Reliana Lumban Toruan, 2012, Zooplankton emerging from fresh and saline wetlands, Journal of Ecohydrology and hydrobiology, Vol.12 no 1. 2012
- Tjandra Chrismada, Gadis Sr Haryani, M Fakhrudin, Lukman, I Ridwansyah, and P E Hehanussa. Ecohydrology approach for rehabilitation of lake Limboto in Gorontalo, Indonesia, Journal of Ecohydrology. 2011.
- Proceedings of National Seminar on Ecohydrology, 24 March 2011: Integrating Ecohydrological Principles for Good Water Governance”. This Proceedings contain 20 papers which consist of nine papers presented orally and 11 papers were presented in poster session. Those papers derived from various research institutions from both within and outside the country, universities, ministries and other institutions, who have been through the process of review by a team of editors.

8. Meetings hosted by the country

- Asia Pacific Centre for Ecohydrology, Indonesian National Committee for IHP-UNESCO, Indonesian Institute of Sciences, Indonesian National Committee of Indonesia conducted International Workshop on New Ecohydrology Demonstration Site Projects “Ecohydrology for Managing Sustainable Water Futures”, in Jakarta, Indonesia, 21 – 23 March 2011
- Asia Pacific Centre for Ecohydrology, Indonesian National Committee for IHP-UNESCO, Indonesian Institute of Sciences, Indonesian National Committee of Indonesia, organized National Symposium on Ecohydrology “Integrating Ecohydrological Principles for Good Water Governance” on 24 March 2011 in Jakarta, Indonesia

9. Participation in meetings abroad

- Dr. Gadis Sri Haryani, Dr. Ignasius D Sutapa, Dr. Tri Widiyanto, participated UNESCO IHP 19th RSC Meeting in Kyoto – Japan December 2011
- Prof. Peter Hehanussa and Dr. Gadis Sri Haryani, participated UNESCO IHP 18th RSC Meeting for Southeast Asia & The Pacific (SEAP) in Hanoi, Vietnam. in conjunction with a the Fifth APHW conference on Hydrological Regime and Water Resources Management in the Context of Climate Change (HWCC 2010) took place in Hanoi, Vietnam 8 – 12 November 2010.
- Dr. Gadis Sri Haryani, Dr. Ignasius D Sutapa, Dr. Tri Widiyanto attend to EXTREM Symposium in Kyoto Japan, December 2011
- Dr. Ignasius D.A. Sutapa attend to Korea International Symposium : “Addressing water quality challenges in Asia/Pacific”, in Daejon, Korea, 7 – 9 December 2011

Format for Reports by UNESCO's Water-related Centers on activities related to the IHP in the period June 2010 – May 2012

1. Basic information on the centre

Name of the Centre		Water Center for Arid and Semi-arid Zones in Latin-America and the Caribbean - CAZALAC
Name of Director		Guido Soto
Name and title of contact person (for cooperation)		Guido Soto
E-mail		gsoto@cazalac.org
Address		Benavente 980, La Serena, Chile
Website		www.cazalac.org
Location of centre		city/town _La Serena___ country Chile_
Geographic orientation *		global <input type="checkbox"/> regional <input checked="" type="checkbox"/>
Year of establishment		
Themes	Focal Areas ♦	groundwater urban water Xarid / semi-arid zones humid tropics Xdroughts and floods sediment transport and management water and environment Xecohydrology water law and policy transboundary river basins/ aquifers XIWRM Xglobal and climate change mathematical modeling social and cultural dimensions of water water education other: (please specify) _____
	Scope of Activities ♦	Xvocational training postgraduate education continuing education Xresearch Xinstitutional capacity-building advising/ consulting software development other: (please specify) _____
Support bodies ¹		General Water Board, Chile
Hosting organization ²		University of La Serena, Chile
Sources of financial support ³		Extrabudgetary fund UNESCO/Flanders; JRC-EU; Research funds of Chilean Gv
Existing networks and cooperation ⁴		UNCCD;
Governance		X director and governing board other: (please specify) _____ Link to election of board members to the IHP Intergovernmental Council (IGC) and hosting country IHP National Committee _____

* 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 center'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 center has with international organizations or programs, which are not already mentioned above

	Frequency of meetings: once every 1__year(s) Existence of UNESCO presence at meetings
Institutional affiliation of director	
Number of staff and types of staff	total number of staff (full-time, or equivalent) : _four_____ number of staff who are water experts: __three_and around five part time water experts_____ number of visiting scientists and postgraduate students: _four_____
Annual turnover budget in USD	500,000

2. Activities undertaken in the framework of IHP in the period June 2008 – May 2010

- 2.1 Educational activities (i.e., those with accreditation) that directly contributed to the IHP-VII (Appendix-1) and WWAP
Please include here those activities which led to the accreditation of degrees, or those held in formal school settings.
- 2.2 Research activities that directly contributed to the IHP-VII and activities by WWAP
Please include research/applied projects outputs such as publications that directly contributed to the IHP-VII and WWAP objectives

International Conference: Arid and Semi Arid Development Through Water Augmentation - ASADWA. (Valparaiso - Chile, December 2010). The main purpose of the conference was to provide an opportunity for the professionals and scientific investigators that work around the world to exchange experiences about topics related with the increase of water available in arid areas. In addition, the aim was to generate a useful result that allows stimulating the incorporation of new techniques and allows learning from mistakes and successes. The topics were: Harvesting of Rainwater, Capture of water from mist and dew, Refilling of Aquifers, Desalinization for rural development, Reuse of Water Resources and the Efficient Use of Water.

Organizing Committee: UNESCO CAZALAC Centre; Catholic University of Valparaiso (PUCV); UNESCO Chair of Eremology of the University of Ghent; UNESCO's International Hydrological Program (PHI/LAC).

International Scientific Committee: Dr. Donald Gabriels, President of the Committee. University of Ghent, Belgium; Dr. Soroosh Sorooshian Harvesting of Rainwater / Refilling of Aquifers. Center for Hydrometeorology and Remote Sensing, University of California at Irvine, USA; Dr. Roberto Pizarro Tapia, Harvesting of Rainwater. University of Talca, Chile; Dr. Koen Verbist, Harvesting of Rainwater. University of Ghent, Belgium; Guido Soto, Harvesting Mist. CAZALAC, Chile; Dr. José Luis Arumí, Refilling Aquifers. University of Concepción, Chile; MSc. Carlos Gutierrez, Refilling Aquifers. Mexican Water Technology Institute (IMTA), Mexico; Dr. Mike Edmunds, Refilling Aquifers. Oxford University, England; Dr. Manuel Cerda, Efficient Water Usage. Catholic University of Valparaiso, Chile; Dr. Dirk Raes, Efficient Water Usage. Catholic University of Leuven, Belgium. <http://www.cazalac.org/asadwa>

UNESCO/G-WADI-LAC Program.

The meeting was held in December 2010, with the purpose of creating and establishing the G-WADI network in the Latin American and Caribbean region. CAZALAC took on the Technical Secretariat of the ALC Region Network, which from the beginning included the participation of the representatives of Argentina, Bolivia, Brazil, Chile, Mexico and Peru. Participating Institutions: CAZALAC, Chile - Project Coordinator; UNESCO-PHI-LAC; University of Ghent, Belgium - Scientific Counterpart Government of Flanders; and AGRIMED, Chile - Scientific

Coordinator. During the meeting of the G-WADI-LAC program held in 2011, work continued with the conformation of the network and the preparation of an action plan for two-year period of 2011-2012.

EUROCLIMA Project of the European Commission for Latin America: CAZALAC has developed a coordination activity in Latin America, of the Water Balance axis through the "Variability and frequency properties of water balance components in Latin America" project. This activity has been developed with the European Commission's Joint Research Center (JRC).

Participating countries:

Environmental Flow Project of the Huasco Basin, Chile: This project is carried out by CAZALAC, with the collaboration of the International Union for the Conservation of Nature (IUCN) and is financed by the Regional Government of Atacama, Chile. The project is the first Chilean experience about the evaluation of environmental flow for the management of arid and semi-arid areas. Main products: Hydrological modeling of the basin (WEAP), incorporating the environmental demand of water in the most important points; social and economic evaluation of the water by the different production activities; participative dialogs with the actors of the basin; institutional strengthening (training professionals); and broadcasting.

From November 2011 up to August 2012, CAZALAC has started the activities of the "Sea water desalination through Inverse Osmosis and Photovoltaic Energy for the provision of drinking water in Isla Damas, Coquimbo Region" project. This initiative, is financed by Funds of the Regional Government of Coquimbo (Chile), the Belgian drinking water company, VMV (Vlammse Maatschappij voor Watervoorziening) and the National Forestry Corporation (CONAF). It has the objectives of dimensioning, designing, installing and evaluating an Inverse Osmosis System plant with Photovoltaic Energy that is energetically self-sustainable and that does not affect the environmental conditions in Isla Damas, located in the National Humboldt Penguin Reserve. Objective: propose technology innovation for Chile, combining the technology available for seawater desalinization and the use of photovoltaic energy for this. It is expected that this experience can be repeated in other areas of the country, under similar conditions. This being, the water requirement for human consumption on islands, remote places, without access to conventional sources of electrical energy.

2.3 Training activities that directly contributed to the IHP-VII and WWAP objectives

During the period, CAZALAC, through the researcher Jorge Nuñez, taught the following training courses:

Cooperation with EUROCLIMA-Water Project. During the Guayaquil EUROCLIMA-Water Workshop (Ecuador, October 2011). 18 participants from different countries in the Region were trained by professionals linked to CAZALAC about the use of open code analysis tools, for the processing of rainfall data in the entire Region. At least, data coming from 6,000 meteorological stations was analyzed during the event, which allowed generating a group of regional maps and statistical properties and rainfall frequency in the Region.

Course on the Analysis of Regional Drought Frequency based on L-moments (Robust estimation of the frequency of meteorological drought). III South American Meeting about the application of the eumetcast meteorological and environmental monitoring system. Maceio, Brazil, August 30th - September 2nd 2011.

Training Course of Regional Frequency Analysis based on L-moments.
Ispra, Italy. Course financed by the European Commission's Joint Research Centre through the EUROCLIMA-Water project. Ispra, Italy. 11-14 July 2011

International Course of Regional Frequency Analysis based on L-moments.
Course financed by the European's Commission's Joint Research Center through the EUROCLIMA-Drought project. Santiago, 4-5 April 2011

3. Collaboration and linkages

3.1 Participation in major international networks, programs, partnerships with other UN or other International Agencies, media and professional bodies

In 2011 CAZALAC is accepted as a member of the European Commission's Latin American Network of Knowledge Centers in the Management of Water Resources (RALCEA).

Research internship for two professionals from the Autonomous University of Baja California, Mexico (September 2010). The researchers participated in the presentation of the paper "Handling of Water Resources in Mexico: Baja California case" in the Water table institutions of the Huasco River Basin, Atacama Region, Chile, in the Seminar Program of the Geology, Mining, Metallurgy and SIGMMA Environment Investigation of the University of La Serena and in the workshop on "Training in L-Map Software", given by CAZALAC. Information about the research professionals: Dr. Jorge Ramirez Hernández; Lead Researcher, Science Group of the Land Engineering Institute of the Autonomous University of Baja California, Mexico and Engineer Michelle Hallack-Alegria, Associate Professor. Engineering and Technology Center of the Autonomous University of Baja California, Mexico.

Research internship of Dr. Teresa Torregrosa Marti of the Applied Economics Analysis Department of the Faculty of Economics of the University of Alicante, Spain (October 2010). During her stay, Dr. Torregrosa interviewed a series of researchers, authorities, professionals and technicians linked to the water management in the Elqui, Huasco and Limari basins. In addition, she presented her work in the University of La Serena's Seminar on Geology, Mining, Metallurgy and SIGMMA Environment Investigation.

In the framework of the Environmental Flow project of the Huasco Basin, Chile, research was carried out in the Center: Sandra Ledermüller, Geography student from the University of Cologne (German), specialist in the development of geographical information systems for the project, and Philipp Wagnitz, Postgraduate student in Natural Resource Management from the University of Applied Sciences of Cologne (Germany), who supported in the development of the valuing of environmental services in the Huasco basin

3.2 Participation in meetings related to the IHP and UNESCO (e.g., the UNESCO General Conference, the UNESCO Executive Board, the IHP Intergovernmental Council and/or other meetings organized by IHP)

3.3 Collaboration and networking with other UNESCO category 1 or 2 institutes/ centers

3.3.1 cross-appointment of directors of the category 1 or 2 institutes or centers on the governing board

3.3.2 exchange of information on activities such as training/educational materials, and funding opportunities

3.3.3 exchange of staff, most notably professionals and students

3.3.4 implementation of joint activities, such as workshops, conferences, training programs, joint projects, field visits, software and data sharing, knowledge exchange and publications

Exchange of hydrometeorological databases with the CEHICA Center (Dominican Republic and CIH - Itaipu, Brazil)

- 3.4 Relationships with the UNESCO field and regional office whose jurisdiction covers the country of location
- 3.5 Relationship with the UNESCO National Commission and the IHP National Committee in the country of location and with other organizations of other countries
Permanent participation in the monthly meeting of the Chilean IHP National Committee and direct collaboration with the institutions associated with the National Committee.
- 3.6 Relationship with other UNESCO-related networks, such as UNESCO Clubs, ASPnet, and UNESCO chairs

Meeting with Israel's President of Conaphi (July 2010). An active relationship has been kept through an Agreement held with the University of Ben Gurion. On this occasion, several possible ways of Israel collaborating, both in Chile as well as in other countries of the Region were included, such as:

- Raw sewage treatment systems for small communities and/or groups of houses
- Desalinization systems that work using solar energy
- Techniques for reusing water
- Refilling aquifers, Sustainable aquifer management (census of wells, water meters, training users, etc).

4. Communication

- 4.1 Communication and knowledge dissemination activities undertaken in the framework of IHP

Recent CAZALAC Publications

Arid Areas Atlas. Technical Document PHI-LAC N°25, "Atlas of Arid Areas of Latin America and the Caribbean", developed within the framework of the preparation project of the Arid, Semiarid and Sub-humid Dry Areas Atlas of Latin America and the Caribbean. Support of UNCCD to increase the print run.

CAZALAC-IWR Drought Atlas. Methodology Guidelines Publication for the Application of Regional Drought Frequency Analysis based on L-Moments and Application Results in Latin America. Technical Document PHI-LAC N°27.

CAMINAR Project. Technical Document PHI-LAC N°15, "Sustainable Mining in Arid Areas. Thematic Support of the CAMINAR Project".

CAMINAR Project. □ Technical Document PHI-LAC N° 17, "Water and Mining in Arid and Semi-Arid Basins, Guideline for Integral Management. CAMINAR Project".

- 4.2 Policy documents and advice

5. Update on Centre Operations

- 5.1 Membership of the Board of Governors between designated period
- 5.2 Key decisions made (minutes of meetings attached)

6. Evidence of the Centre's Impacts

- 6.1 Science Impacts (Major contributions to the science, technology, education, and regional and/or international cooperation in the field of water)
- 6.2 Knowledge Transfer Impacts (Major achievements in the dissemination of knowledge and technology transfer)

Through the European Commission's EUROCLIMA and RALCEA Project, CAZALAC has spread the Regional Frequency Analysis with L-moments, as a standard analysis tool for the execution of the Variability and frequency properties of the Water Balance component in Latin America project.

Distribution of several PHI technical documents, result of the projects developed by CAZALAC with standout specialists from Germany, Argentina, Belgium, Bolivia, Brazil, Colombia, Cuba, Chile, the United States, Mexico, Paraguay, Peru, the Dominican Republic, Uruguay and UNESCO, among others.

6.3 Policy Impacts (advice sought by government and other bodies and evidence of inputs into policy arena)

7. Future activities that will contribute directly to IHP and/or to WWAP

7.1 Operational Plan (attach if available)

7.2 Strategic Plan linked with IHP-VII (attach strategic plan if available)

8. Annexes

8.1 List of publications released by the centre (there can be overlap with those listed in 2.3 above)

Arid Areas Atlas. Technical Document PHI-LAC N°25, "Atlas of Arid Areas of Latin America and the Caribbean", developed within the framework of the preparation project of the Arid, Semiarid and Sub-humid Dry Areas Atlas of Latin America and the Caribbean. Support of UNCCD to increase the print run.

CAZALAC-IWR Drought Atlas. Methodology Guidelines Publication for the Application of Regional Drought Frequency Analysis based on L-Moments and Application Results in Latin America. Technical Document PHI-LAC N°27.

CAMINAR Project. Technical Document PHI-LAC N°15, "Sustainable Mining in Arid Areas. Thematic Support of the CAMINAR Project".

CAMINAR Project. □ Technical Document PHI-LAC N° 17, "Water and Mining in Arid and Semi-Arid Basins, Guideline for Integral Management. CAMINAR Project".

8.2 List of training courses conducted (these can be overlapped with those listed in 2.1 above)

Cooperation with the EUROCLIMA-Water Project. During the Guayaquil EUROCLIMA-Water Workshop (Ecuador, October 2011), no fewer than 18 participants from different countries in the Region, were trained by professionals linked to CAZALAC about the use of open code analysis tools, for the processing of rainfall data in all the Region. At least, data coming from 6,000 meteorological stations was analyzed during the event, which allowed a group of regional maps and statistical properties and rainfall frequency in the Region to be generated.

Course on the Analysis of Regional Drought Frequency based on L-moments (Robust estimation of the frequency of meteorological drought) III South American Meeting about the application of the eumetcast meteorological and environmental monitoring system. Maceio, Brazil, August 30th - September 2nd 2011.

Training Course of Regional Frequency Analysis based on L-moments. Ispra, Italy. Course financed by the European Commission's Joint Research Centre through the EUROCLIMA-Water project. Ispra, Italy. 11-14 July 2011

International Course of Regional Frequency Analysis based on L-moments. Course financed by the European's Commission's Joint Research Center through the EUROCLIMA-Drought project. Santiago, 4-5 April 2011

Appendix-1

Overview of the Core Program Themes of the Seventh Phase of the IHP (2008-2013) WATER DEPENDENCIES: SYSTEMS UNDER STRESS AND SOCIETAL RESPONSES

Theme 1: ADAPTING TO THE IMPACTS OF GLOBAL CHANGES ON RIVER BASINS AND AQUIFER SYSTEMS

Focal area 1.1 - Global changes and feedback mechanisms of hydrological processes in stressed systems

Focal area 1.2 - Climate change impacts on the hydrological cycle and consequent impact on water resources

Focal area 1.3 - Hydro-hazards, hydrological extremes and water-related disasters

Focal area 1.4 - Managing groundwater systems' response to global changes

Focal area 1.5 - Global change and climate variability in arid and semi-arid regions

Theme 2: STRENGTHENING WATER GOVERNANCE FOR SUSTAINABILITY

Focal area 2.1 - Cultural, societal and scientific responses to the crises in water governance

Focal area 2.2 - Capacity development for improved governance; enhanced legislation for wise stewardship of water resources

Focal area 2.3 - Governance strategies that enhance affordability and assure financing

Focal area 2.4 - Managing water as a shared responsibility across geographical & social boundaries

Focal area 2.5 - Addressing the water-energy nexus in basin-wide water resources

Theme 3: ECOHYDROLOGY FOR SUSTAINABILITY

Focal area 3.1 - Ecological measures to protect and remediate catchments process

Focal area 3.2 - Improving ecosystem quality and services by combining structural solutions with ecological biotechnologies

Focal area 3.3 - Risk-based environmental management and accounting

Focal area 3.4 - Groundwater-dependent ecosystems identification, inventory and assessment

Theme 4: WATER AND LIFE SUPPORT SYSTEMS

Focal area 4.1 - Protecting water quality for sustainable livelihoods and poverty alleviation

Focal area 4.2 - Augmenting scarce water resources especially in SIDS

Focal area 4.3 - Achieving sustainable urban water management

Focal area 4.4 - Achieving sustainable rural water management

Theme 5: WATER EDUCATION FOR SUSTAINABLE DEVELOPMENT

Focal area 5.1: Tertiary water education and professional development

Focal area 5.2: Vocational education and training of water technicians

Focal area 5.3: Water education in schools

Focal area 5.4: Water education for communities, stakeholders and mass-media professionals

Format for Reports by UNESCO's Water-related Centres on activities related to the IHP in the period June 2010 – May 2012

1. Basic information on the centre

Name of the Centre		European Regional Center for Ecohydrology under the auspices of UNESCO - the International Institute of the Polish Academy of Sciences
Name of Director		Maciej Zalewski
Name and title of contact person (for cooperation)		Iwona Wagner Joanna Włodarczyk
E-mail		erce@erce.unesco.lodz.pl ;
Address		3 Tylna Str., 90-364 Lodz, Poland Phone: +48 42 681-70-07 Fax: +48 42 681-30-69
Website		www.erce.unesco.lodz.pl
Location of centre		city/town: Lodz, country: Poland
Geographic orientation *		<input type="checkbox"/> global <input checked="" type="checkbox"/> regional
Year of establishment		2006
Themes	Focal Areas ♦	<input checked="" type="checkbox"/> groundwater <input checked="" type="checkbox"/> urban water <input type="checkbox"/> arid / semi-arid zones <input type="checkbox"/> humid tropics <input type="checkbox"/> droughts and floods <input type="checkbox"/> sediment transport and management <input checked="" type="checkbox"/> water and environment <input checked="" type="checkbox"/> ecohydrology <input type="checkbox"/> water law and policy <input type="checkbox"/> transboundary river basins/ aquifers <input checked="" type="checkbox"/> IWRM <input checked="" type="checkbox"/> global and climate change <input checked="" type="checkbox"/> mathematical modelling <input checked="" type="checkbox"/> social and cultural dimensions of water <input checked="" type="checkbox"/> water education <input checked="" type="checkbox"/> other: ecohydrological biotechnologies
	Scope of Activities ♦	<input type="checkbox"/> vocational training <input checked="" type="checkbox"/> postgraduate education <input checked="" type="checkbox"/> continuing education <input checked="" type="checkbox"/> research <input checked="" type="checkbox"/> institutional capacity-building <input checked="" type="checkbox"/> advising/ consulting <input type="checkbox"/> software development <input type="checkbox"/> other: (please specify)
Support bodies ¹		Government of Republic of Poland
Hosting organization ²		Polish Academy of Sciences
Sources of financial support ³		<ul style="list-style-type: none"> - Ministry of Science and Higher Education Projects - Ministry of Foreign Affairs Projects - Framework Programme (6 & 7 FP) - Life+ Projects - UNESCO Activity-Financing Contracts - Consulting
Existing networks and cooperation ⁴		International Networks:

* 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

- ALTER Net (A Long Term Biodiversity, Ecosystem and Awareness Research Network) Network of Excellence, 6th FP EU
- AlterNet2
- LTER Europe (A Long Term Ecological Research Network)
- ILTER (International Long Term Ecological Research)
- Ebone: European Biodiversity Observation Network - Member of advisory committee

International Programmes:

- UNESCO IHP – member of the Special Task Force for IHP-VIII, Maciej Zalewski
- UNESCO IHP Ecohydrology Programme - member of the Scientific Steering Committee, Iwona Wagner
- UNESCO-IHP Demosites, Iwona Wagner
- UNEP GEMS Water Programme, Maciej Zalewski, Iwona Wagner
- European Commission Joint Programming Initiative "Water Challenges for a Changing World" – Maciej Zalewski polish representative
- InterAcademy Water Programme (IAP) – coordination IAP in Europe, Maciej Zalewski

International organizations:

- SIL - International Society of Limnology – Maciej Zalewski Chairman of the working group on Ecohydrology
- ESFRI – European Strategy Forum on Research Infrastructures - Maciej Zalewski polish representative, member of the Task Group on Environment

International Projects:

- Water, Ecosystem Services and Society - establishing the Collaboration between European Academies of Science under the IAP Water Programme and European Long-Term Ecosystem Research Network. IAP Water Programme.
- Hydroacoustic estimation of fish abundance in shallow lakes using horizontal beaming. Within Agreement between Polish Academy of Sciences and Hungarian Academy of Sciences.
- EU Life + ENVEUROPE: Environmental quality and pressures assessment across Europe: the LTER network as an integrated and shared system for ecosystem monitoring.
- EU Life + EKOROB: Ecotones for reducing diffusion pollution.
- EU FP7 EXPEER: Distributed Infrastructure for EXPERimentation in Ecosystem Research.
- Towards Engineering Harmony Between Water, Ecosystem and Society. Strengthening the Collaboration between European Academies of Sciences in the IAP Water Programme".
- Mechanisms and Early Warning Techniques of Algal Blooms including Cyanobacteria in the Tributaries of the Three Gorges Reservoir in China.
- EU Life + EH-REK: Ecohydrologic rehabilitation

	<p>of Arturowek recreational reservoirs (in Lodz) as a model approach to rehabilitation of urban reservoirs.</p> <ul style="list-style-type: none"> - EU Life + GPPinfoNET: The Green Public Procurement Information Network. - Standardization of hydroacoustic methods for assessment of ecological quality of aquatic ecosystems. Within Agreement between Polish Academy of Sciences and Czech Academy of Sciences. - Ecohydrology - a transdisciplinary science for integrated water resources and sustainable development in Ethiopia. Co-operation with Ministry of Water Resources of Ethiopia. Project financed by the Ministry for Foreign Affairs Republic of Poland. - EU FP6 FORMAN - Forest Management and the Water Cycle. - EU FP6 SWITCH: Sustainable Water Management Improves Tomorrow's Cities Health.
Governance	<p><input checked="" type="checkbox"/> director and governing board <input type="checkbox"/> other: (please specify) _____</p> <p>Link to election of board members to the IHP Intergovernmental Council (IGC) and hosting country IHP National Committee _____</p> <p>Frequency of meetings: once every 2 year(s) <input checked="" type="checkbox"/> Existence of UNESCO presence at meetings</p>
Institutional affiliation of director	European Regional Center for Ecohydrology under the auspices of UNESCO - the International Institute of the Polish Academy of Sciences
Number of staff and types of staff	<p>total number of staff (full-time, or equivalent) : 14</p> <p>number of staff who are water experts: 8</p> <p>number of visiting scientists and postgraduate students: 8</p>
Annual turnover budget in USD	0.8 mil USD

2. **Activities undertaken in the framework of IHP in the period June 2010 – May 2012**

2.1 Educational activities (i.e., those with accreditation) that directly contributed to the IHP-VII (Appendix-1) and WWAP *Please include here those activities which led to accreditation of degrees, or those held in formal school settings.*

Researchers from European Regional Center for Ecohydrology run lectures for the University of Lodz students on the basis of Cooperation Agreement between ERCE and University of Lodz in a field of Ecohydrology. Lectures on:

- Ecohydrology
- Urban Ecohydrology
- Applied Ecology
- Ecology Basis
- Environmental Monitoring
- Ecotoxicology
- Integrated Water Resources Management
- Ecological Biotechnologies
- Environmental Modelling & Statistics
- Environmental/Landscape Planning
- Phytotechnologies & Phytoremediation
- Wetlands & Land – Water Ecotones

ECOHYD

ERASMUS MUNDUS Master Course on Ecohydrology (ECOHYD) with ICCE UNESCO/Algarve University, UNESCO-IHE Delft, Lodz University & Kiel University.

On the basis of cooperation with Department of Applied Ecology UL, ERCE participated in research of the following master thesis in 2010-2011:

- Elaboration of geotextile, biodegradable filters for recultivation of phosphorus pollution.
- Dynamics of nutrients allocation – ground waters versus vegetation of the Pilica river floodplain.
- Application of geofibres for intensification of denitrification process in order to reduce nitrogen pollutions.
- Eutrophication symptoms analysis in Sulejow reservoir.
- The estimation of the influence of character of ecotone zone of the Pilica river tributaries on the water quality on the basis of teledetection methods and GIS technologies.
- Drivers and pressures of city water resources -developing risk-based decision support system for implementation of ecohydrological approach.
- The water quality evaluation of the "Arturowek" reservoirs and the Bzura river for their ecohydrological recultivation.
- Impact of small impoundments on ecological processes in small lowland rivers.
- Green areas in the city space structure as a key factor for inhabitants' health.
- The influence of the Pilica river valley's management on water quality in the river.
- Lagoon exploitation as a chance for increasing the sledge utilization as fertilizer.
- Recognition of nutrients transport dynamics along the Pilica river and identification of point source pollutions in its catchment for elaboration of a strategy against eutrophication and degradation of water resources.
- Evaluation of groundwater quality in Sulejow reservoir direct catchment and capabilities of its improvement by use of riparian ecotones.
- Exploiting the potential of the Sokołówka's valley for improving environmental quality and people-friendly space creatures.
- Elaboration of geotextile, biodegradable filters for removal of nitrogen and phosphorus pollution from water ecosystems.
- Analysis of the Bzura River and Arturowek reservoirs water quality threats for ecohydrological rehabilitation.
- Urban gardens in the Lodz Blue-Green Network – a model of the influence of social and economic behavior of residents on the land use and its impact on environment quality.

2.2 Research activities that directly contributed to the IHP-VII and activities by WWAP

Please include research/applied projects outputs such as publications that directly contributed to the IHP-VII and WWAP objectives

Research projects:

- "Towards Engineering Harmony Between Water, Ecosystem and Society. Strengthening the Collaboration between European Academies of Sciences in the IAP Water Programme". IAP 3240226102/010/013.
- EU Life+ ENVEUROPE: Environmental quality and pressures assessment across Europe: the LTER network as an integrated and shared system for ecosystem monitoring. LIFE08 ENV/IT/000399.

- Ecohydrology - a transdisciplinary science for integrated water resources and sustainable development in Ethiopia. Co-operation with Ministry of Water Resources of Ethiopia. Project financed by the Ministry for Foreign Affairs.
- EU FP7 EXPEER: Distributed Infrastructure for EXPERimentation in Ecosystem Research. FP7-INFRASTRUCTURES-2010-1.
- EU Life+ GPPinfoNET (LIFE07 INF/IT/000410) action "Creation of regional networks for GPP in European regions".
- ALTER-Net: A Long-Term Biodiversity, Ecosystem and Awareness Research Network. (Network of Excellence, 6th FP EU)
- EU Life+ EKOROB: Ecotones for reducing diffusion pollution. LIFE08 ENV/PL/000519.
- EU Life+ EH-REK: Ecohydrologic rehabilitation of Arturowek recreational reservoirs (in Lodz) as a model approach to rehabilitation of urban reservoirs. LIFE08 ENV/PL/000517.
- "Analysis of point sources pollution of nutrients, dioxins and dioxin-like compounds in the Pilica River catchment and draw up of reclamation methods". N305 365738. Project financed by the Ministry of Sciences.
- Blue-Green Network in Lodz Concept. Project financed by the City Lodz Office.
- EU FP6 SWITCH: Sustainable Water Management Improves Tomorrow's Cities Health. Co-operation with Lodz University.

List of publications attached in annex 8.1.

2.3 Training activities that directly contributed to the IHP-VII and WWAP objectives

6-months scholarships in ERCE for Africa:

ERCE participates in UNESCO/Poland Co-Sponsored Fellowships for 2010, 2011 and 2012 in Ecohydrology – The New Approach and Methods for Integrated River Basin Management. In the framework of this exchange programme it provides 6 months scholarships for water professionals and decision makers:

- In 2010 ERCE hosted Mrs Genzebe Kebede from Ministry of Water Resources in Ethiopia.
- In 2011 ERCE hosted two fellows: Mrs Madjiki Adjia Ghislaine, a student from Department of Plant Biology University of Yaounde, Cameroon and Mrs Susan Kumwenda, from Malawi.
- In 2012 ERCE hosts Mr Sani Dauda Ahmed from National Water Resources Institute in Kaduna, Nigeria

International Advanced Study Course on Ecohydrology:

Advanced Study Course: "Ecohydrology & Biotechnology for Sustainable Integrated Water Resources Management in HELP and Ecohydrology Basins" – 13-20 September 2010 in Lodz, Poland

Information and educational meeting within EKOROB Project:

Educational Meetings to raise ecological awareness of local communities in the field of causes and effects of the pollution from agricultural areas, and methods of its reduction. Presentation of ecotonic zone activity, including the use of denitrification wall as a solution for sustainable prevention of pollution influx coming with groundwater from intensively used land.

- Workshop with EKOROB in Barkowice, 6 August 2011
- Workshop with EKOROB in Zarzecin, 20 August 2011

3. Collaboration and linkages

3.1 Participation in major international networks, programmes, partnerships with other UN or other International Agencies, media and professional bodies

UNESCO IHP

- Iwona Wagner – member of the Scientific Steering Committee of the UNESCO IHP Ecohydrology Programme;
- Maciej Zalewski – member of the Special Task Force for IHP-VIII

Other International Programmes:

- UNEP GEMS Water Programme
- European Commission Joint Programming Initiative “Water Challenges for a Changing World” – Maciej Zalewski polish representative
- InterAcademy Water Programme (IAP) – coordination IAP in Europe, Maciej Zalewski

International Networks:

- ALTER Net (A Long Term Biodiversity, Ecosystem and Awareness Research Network) Network of Excellence, 6th FP EU.
- AlterNet2 Consortium.
- ILTER (International Long Term Ecological Research).
- LTER Europe (A Long Term Ecological Research Network) – dr Kinga Krauze vice-chair of LTER.
- EBONE: European Biodiversity Observation Network – dr Kinga Krauze member of advisory committee.

3.2 Participation in meetings related to the IHP and UNESCO (e.g., the UNESCO General Conference, the UNESCO Executive Board, the IHP Intergovernmental Council and/or other meetings organized by IHP)

- IHP-VIII Task Force meeting 5-7 June 2011, Paris, France
- International Workshop on UNESCO new Ecohydrology Demonstration Site Projects. 19-25 March 2011, Jakarta, Indonesia
- UNESCO-IHP Expert Meeting on "Groundwater Dependent Ecosystems". 5-6 July 2011, Madrid, Spain
- XXXVIII IAH Congress on “GROUNDWATER QUALITY SUSTAINABILITY”, Joint IAH-UNESCO session “Interactions of Surface and Groundwater”, 12-17 September 2010, Kraków, Poland
- 19th Intergovernmental Council IHP, 5-8 July 2010, Paris, France
- Kovacs Colloquium 2010 - Hydrocomplexity: New Tools for Solving Wicked Water Problems. UNESCO, 2-3 June 2011, Paris, France

3.3 Collaboration and networking with other UNESCO category 1 or 2 institutes / centres

3.3.1 cross-appointment of directors of the category 1 or 2 institutes or centres on the governing board

Prof. Maciej Zalewski - member of ICCE (Portugal) Governing Board

3.3.2 exchange of information on activities such as training/educational materials, and funding opportunities

Common publication with Prof. Michael McClain from UNESCO-IHE “Training hydrologists to be ecohydrologists and play a leading role in environmental problem solving” by M. E. McClain, L. Chicharo, N. Fohrer, M. Gaviño, W. Windhorst, M. Zalewski. Special Issue of HESS - Hydrology Education in a Changing World (in press)

3.3.3 exchange of staff, most notably professionals and students

Lectures of Prof. Luis Chicharo from International Center for Coastal Ecohydrology within Erasmu Mundus ECOHYD M.Sc. in Ecohydrology programme

Lecture of Prof. Hidayat Pawitan from Asia-Pacific Center for Ecohydrology within Erasmu Mundus ECOHYD M.Sc. in Ecohydrology programme

- 3.3.4 implementation of joint activities, such as workshops, conferences, training programmes, joint projects, field visits, software and data sharing, knowledge exchange and publications

ECOHYD

ERASMUS MUNDUS Master Course on Ecohydrology (ECOHYD) with ICCE UNESCO/Algarve University, UNESCO-IHE Delft, Lodz University & Kiel University.

Knowledge exchange with:

- International Center for Coastal Ecohydrology & Algarve University, Portugal,
- UNESCO-IHE Institute for Water Education in Delft, the Netherlands,
- Asia-Pacific Center for Ecohydrology, Indonesia,
- US Corps of Engineers, USA,
- Wien University, Austria,
- Leibniz-Institut für Gewässerökologie und Binnenfischerei, Germany,
- German Christian-Albrechts-Universität zu Kiel, Germany,
- UFZ, Germany,
- Faculty of Urban Construction and Environmental Engineering, Chongqing University, China, - (joint agreement on Joint Research Center on Ecohydrology)
- Ministry for Water Resources of Ethiopia,
- YEHA Natural Resources Management Institute for Eastern Africa, Ethiopia,
- Integrated Biofarm Enterprise, Ethiopia,
- Tours University, France, (Ecohydrology & cultural heritage)
- CEMAGREF, Hydrology-Hydraulics Research Unit, France,
- Leicester University, UK,
- University of la Plata, Argentina,
- Laboratory of Aquatic Ecotoxicology, University of Eastern Finland,
- UBA (EEA), Austria,

- 3.4 Relationships with the UNESCO field and regional office whose jurisdiction covers the country of location

none

- 3.5 Relationship with the UNESCO National Commission and the IHP National Committee in the country of location and with other organizations of other countries

Cooperation with UNESCO National Commission within the framework of UNESCO/Poland Co-Sponsored Fellowships in Ecohydrology – The New Approach and Methods for Integrated River Basin Management.

- 3.6 Relationship with other UNESCO-related networks, such as UNESCO Clubs, ASPnet, and UNESCO chairs

none

4. Communication

- 4.1 Communication and knowledge dissemination activities undertaken in the framework of IHP

Meetings/conferences/courses organized & co-organized by ERCE:

- II National Workshop on Ecotoxicology "Practical use of bioindication systems to evaluate the toxicity of the environment and chemicals", 19-20 April 2012, Konstantynów Łódzki, Poland, ERCE as a co-organizer
- The 2nd Conference on Healthy Rivers and Sustainable Water Resource Management, 19-24 October 2011, Chongqing, China, Keynote Speaker, ERCE as a co-organizer

- ALTER-Net Workshop: Long term socio-ecological research: What do we know from science and practice? 14-17 June 2011, Helsinki, Finland, ERCE as a co-organizer
- 3rd European Regional Workshop of the InterAcademy Panel (IAP) Water Programme, entitled 'Towards Engineering Harmony Between Water, Ecosystem and Society', 9-11 September 2010 in Zakopane, Poland
- Advanced Study Course: "Ecohydrology & Biotechnology for Sustainable Integrated Water Resources Management in HELP and Ecohydrology Basins" – 13-20 September 2010 in Lodz, Poland

Participation in meetings/conferences:

- Planet under Pressure 2012 – New Knowledge towards Solutions, 26-29 March 2012, London, UK
- POLEKO 2011 - Innovations in water and sewage management. 23 November 2011. "JPI on Water – opportunities and challenge for Poland", M. Zalewski, Invited Lecture
- ECOHCC11: International Conference on Ecohydrology and Climate Change, 15-17 September 2011, Tomar, Portugal, M. Zalewski, Plenary Lecture
- Istanbul International Water Forum. IWRM in the Face of Climate Change, 3-5 May 2011, Istanbul, Turkey, M. Zalewski, Invited Speaker
- International Conference on the Status and Future of the World's Large Rivers Vienna, 11-13 April 2011, M. Zalewski Invited Speaker,
- International Workshop on UNESCO new Ecohydrology Demonstration Site Projects, "Ecohydrology for managing sustainable water futures", Jakarta, Indonesia 21-23 March 2011, M. Zalewski, Plenary Lecture
- International Symposium on Flood Pulsed Wetlands, 1-5 February 2010, Maun Botswana; I. Wagner, Co-chairman
- 6th Study Conference on BALTEX, 14-18 June 2010, Międzyzdroje, Island of Wolin, Poland; M. Zalewski, Invited Lecture
- 4th BALWOIS scientific conference on Water Observation and Information System for Decision Support, 25-29 May 2010, Ohrid, Macedonia; K. Izydorczyk, Co-chairman
- 19th Intergovernmental Council IHP, 5-8 July 2010, Paris, France. M. Zalewski presentation IHP Phase VIII (2014-2019) concept.
- Bio-Economy Africa-Forum 2010: a Knowledge Sharing Forum on a Novel Approach to Sustainable livelihood, Wealth Creation and Climate Change Adaptation, Zalewski M., Invited Speaker
- BioForum 2010: Międzynarodowe Targi Sektora Biotechnologii, Farmacji i Life Science. 5 May 2010, Łódź, Poland
- World XXXVIII IAH Congress on "GROUNDWATER QUALITY SUSTAINABILITY", Joint IAH-UNESCO session "Interactions of Surface and Groundwater", 12-17 September 2010, Kraków. M.Zalewski Plenary Lecture At Opening Session
- Conference on Aquatic Ecosystems under Global Change (EcoChange) Sept. 8–13 2010, Kiel, Germany
- Hydrocomplexity: New Tools for Solving Wicked Water Problems. Paris, UNESCO.
- NORDIC WATER 2010. The XXVI Nordic Hydrological Conference. Hydrology: From research to water management. 9-11 August 2010, Ryga
- 8th International Conference on Toxic Cyanobacteria (ICTC8). 29 August – 4 September 2010, Istanbul, Turkey
- The II International Meeting on Revitalization of Rivers; Belo Horizonte, Brazil
- Assessment of Freshwater Ecosystems under Climate Change (EcoChange), Kiel, Germany
- The Research Workshop: Managing Risks in Aquatic Systems: Effects of Climate Change and Anthropogenic Activity, Niagara Falls, Canada
- AlterNet Seminar Ecosystem services and biodiversity: What is the link between the two? Wien, Austria
- VII konferencja Naukowo-Techniczna „Ochrona i rekultywacja jezior” 7-9 October 2010, Toruń, Poland
- Międzynarodowa Konferencja „Rolnictwo – głównym źródłem eutrofizacji morza Bałtyckiego” 3-4 November 2010, Warszawa, Poland

Films realized by ERCE:

- "Ecohydrology in the City of the Future" - a 20-minute film, including information about the Water Management in the Lodz City' (tv presentation & education)
- "Grey to Green". 2010 (local TV presentation & education)

4.2 Policy documents and advice

Policy documents:

- JPI Water Challenges for a Changing World "Vision Document" extended with Ecohydrology
- Assessment of ecosystems condition of the New Gdynia reservoir and formulation of the solution system to diminish eutrophication processes.
- The risks of flooding and environmental characteristics of the Zimna Woda valley in Lodz, at a distance from the spring of the stream to its mouth - environmental part.

5. Update on Centre Operations

5.1 Membership of the Board of Governors between designated period

- Prof. Zbigniew Kundzewicz – Chairman, Research Centre for Agricultural and Forest Environment Polish Academy of Sciences
- Prof. Shahbaz Khan - UNESCO/Division of Water Sciences
- Prof. Marek Gromiec - Institute of Meteorology and Water Management (IMGW)
- Prof. Paweł Jokiel - Department of Hydrology and Water Management University of Lodz
- Prof. David Harper - Department of Biology University of Leicester
- Prof. Luis Chicharo - University of Algarve, Portugal
- Prof. Nicola Fohrer - Ecology Centre, Department of Hydrology and Water Resources Management, CAU Kiel
- Prof. Vladimir M. Timchenko - Institute of Hydrobiology Ukrainian Academy of Sciences
- Prof. Geza Jolankai - Department of Water Resources Research Centre (VITUKI)
- Prof. Olga Gorelits - State Oceanographic Institute of Hydrometeorological Committee of the Russian Federation
- Dr Pascal Breil - Cemagref, Cemagref, Hydrology-Hydraulics Research Unit
- Prof. Cedo Maksimovic - Imperial College London
- Prof. Dr Richard D. Robarts - UNEP GEMS/Water Programme Office Environment Canada
- Prof. Artur Magnuszewski - Faculty of Geography and Regional Studies, Warsaw University

6. Evidence of the Centre's Impacts

6.1 Science Impacts (Major contributions to the science, technology, education, and regional and/or international cooperation in the field of water)

Science

List of publications attached in annex 8.1.

Education

Invited Lecturers:

- Ian Overton from CSIRO Land and Water | Water for a Healthy Country
- Prof. Artur Magnuszewski - Faculty of Geography and Regional Studies, Warsaw University
- Prof. Luis Chicharo from International Center for Coastal Ecohydrology
- Prof. Hidayat Pawitan from Asia-Pacific Center for Ecohydrology
- Paul J. DuBow, Ph.D. from Mississippi Valley Division U.S. Army Corps of Engineers

Other educational and training activities described in section 2.1, 2.2 and 2.3.

Demonstration Activities:

UNESCO EH Global Reference Project

Ecohydrology based urban water management and city planning for human health and sustainable development in City of Lodz, POLAND.

UNESCO IHP Demonstration Projects on Ecohydrology

Pilica River Catchment - "Application of Ecohydrology and Phytotechnology for Water Resources Management and Sustainable Development"

Ner River/WWTP Project:

Research and management of experimental 60ha bioenergy plantation at the Protection Zone of the Waste Water Treatment Plant in Lodz; The conversion of sewage sludge into biomass for bioenergy.

Sokolowka River Project:

The construction of the Żabieniec reservoir, with enhanced resilience for eutrophication. Elaboration of a concept, technical project, patenting and implementation of the Sequential Sedimentation/Biofiltration System on the Sokolowka river: Sequence method for water biofiltration, specially for seminatural watercourses, and sequence system form water biofiltration, specially for seminatural watercourses.

6.2 Knowledge Transfer Impacts (Major achievements in the dissemination of knowledge and technology transfer)

Lectures for international bodies and organizations:

- Prof. Maciej Zalewski - Ecohydrology - engineering harmony for sustainability in Anthropocene. University of Algarve in Faro. Portugal
- Prof. Maciej Zalewski - Ecohydrology - the dual regulation the water and nutrient cycles in the basin scale for sustainable future. Bahir Dar University. Ethiopia
- Prof. Maciej Zalewski - Ecohydrology - paradigm shift from conservation, restoration toward regulation ecological processes. Leibniz-Institute of Freshwater Ecology and Inland Fisheries, Germany
- Prof. Maciej Zalewski - Advancing towards the Eighth Phase of the International Hydrological Programme (IHP VIII, 2014-2019). UNESCO, France
- DSc Małgorzata Godlewska - Hydroacoustics in Poland. Institute of Hydrobiology, Chinese Academy of Sciences. China
- Dr Małgorzata Stolarska - Ecohydrology & GIS Models. IGB Leibniz Institute of Freshwater Ecology and Inland Fisheries, Germany
- Dr Kinga Krauze - SWITCH in city water management for sustainable future. Universidade Federal de Minas Gerais, Brasil

6.3 Policy Impacts (advice sought by government and other bodies and evidence of inputs into policy arena)

Multi-Stakeholders' Platform within EKOROB Project

Stakeholders (regional authorities, local authorities, NGO, universities and schools) has be identified and integrated through development of a multi-stakeholders' platform in order to share experience, transfer know-how and make decisions in accordance with the concept of public participation in the decision-making process for sustainable development.

7. Future activities that will contribute directly to IHP and/or to WWAP

7.1 Operational Plan (attach if available)

ERCE recently focused on:

- a. project which are implementing eh biotechnologies & systemic solutions
- b. dissemination by E&H journal and organization of congresses, symposiums & workshops, ASC & education in a framework of Erasmus Mundus MSc studies in cooperation with UL

7.2 Strategic Plan linked with IHP-VII (attach strategic plan if available)

Development of ecohydrological biotechnologies for reduction of non-point source pollution and purification of urban stormwater.

Development of systemic solutions with GIS for Decision Support Systems & Modelling for synergy with IWRM.

8. Annexes

8.1 List of publications released by the centre (there can be overlap with those listed in 2.3 above)

2012

- Frankiewicz P., Wojtal-Frankiewicz A. Two different feeding tactics of young-of-the-year perch, *Perca fluviatilis* L., inhabiting the littoral zone of the lowland Sulejów Reservoir (Central Poland). *Ecohydrology & Hydrobiology* Vol. 12, No 1, pp. 35-41
- Urbaniak M., Kiedrzyńska E., Zalewski M. The role of a lowland reservoir in the transport of micropollutants, nutrients and the suspended particulate matter along the river continuum. *Hydrology Research* 43.4, doi: 10.2166/nh.2012.108

2011

- Gała I., Goshu G., Izydorczyk K., Jurczak T., Zerihun Y., Mankiewicz-Boczek J., Zalewski M. Detection of toxigenic cyanobacteria in Bahir Dar Gulf of Lake Tana – pilot study. *Proceedings of 3rd Annual Conference of Ethiopian Fisheries and Aquatic Science*, 3-6 February 2011, Ethiopia..
- Gała I., Izydorczyk K., Jurczak T., Mankiewicz-Boczek J. The Key Parameters and Early Warning Methods to Identify Presence of Toxigenic Blooms dominated by *Microcystis aeruginosa* in the Jeziorsko Reservoir (Central Poland). *FEB Issue* 01.02.2012.
- Godlewska M., Colon M., Jóźwik A., Guillard J. Hydroacoustic measurements at 70 kHz using different pulse length: consequences for fish stock estimations. *Aquatic Living Resources* 24: 71-78.
- Godlewska M., Frouzova J., Kubecka J., Wiśniewski W., Szlakowski J. Comparison of hydroacoustic estimates with fish census in shallow Malta Reservoir – Which TS/L regression to use in horizontal applications? *Fish. Res.* Doi: 10.1016/j.fishres.2011.11.023.
- Kędziora A., Zerihun Negussie Y., Tenaw Asres M., Zalewski M. Shaping of an agricultural landscape to increase water and nutrient retention. *Ecohydrology & Hydrobiology* Vol. 11, No 3-4, pp. 205-222
- Kiedrzyńska E., Zalewski M. Water quality improvement through an integrated approach to the management of river floodplain wetlands. "Water Quality/ Book 2". ISBN 979-953-307-745-0.
- Kiedrzyńska E., Zalewski M. River floodplain as purification system. *Adaptation of Ecohydrological System Solutions and Biotechnologies for Africa* (in press).
- Kokociński M., Stefaniak K., Izydorczyk K., Jurczak T., Mankiewicz-Boczek J., Soininen J. Temporal variation in microcystin production by *Planktothrix agardhii* (Gomont) Anagnostidid and *Komárek* (Cyanobacteria, Oscillatoriales) in a temperate lake. *Ann. Limnol. - Int. J. Lim.* DOI:10.1051/limn/2011046
- Mankiewicz-Boczek J., Gała I., Kokociński M., Jurczak T., Stefaniak K. Perennial toxigenic *Planktothrix agardhii* bloom in selected lakes of Western Poland. *Environmental Toxicology* 26(1): 10-20.
- Mankiewicz-Boczek J., Izydorczyk K., Jurczak T., Gała I. Detection and monitoring of toxigenic cyanobacterial blooms. In: Maciej Zalewski, Magdalena Urbaniak, Yohannes Zerihun Negussie (Eds.). *UNESCO-IHP Technical Documents in Hydrology, Ecohydrology for water ecosystems and society in Ethiopia. A summary of the projects presented to the International Symposium Addis Ababa, Ethiopia, 18-20 November 2009* (Accepted for publication).
- Mankiewicz-Boczek J., Kokociński M., Gała I., Pawełczyk J., Jurczak T., Dziadek J. Preliminary molecular identification of cylindrospermopsin-producing cyanobacteria in two polish lakes (Central Europe). *FEMS Microbiology Letters* DOI: 10.1111/j.1574-6968.2011.02451.x.

- Mankiewicz-Boczek J., Palus J., Gągała I., Izydorczyk K., Jurczak T., Dziubałtowska E., Stępnik M., Arkusz J., Komorowska M., Skowron A., Zalewski M. Effects of microcystins-containing cyanobacteria from a temperate ecosystem on human lymphocytes culture and their potential for adverse human health effects. *Harmful Algae* 10: 356-365.
- Stolarska M., Frątczak W., Skowron A., Zalewski M. [In Polish] Wody roztopowe w zurbanizowanych zlewniach deszczowych na tle dynamiki przepływu i chemizmu wód rzecznych na przykładzie rzeki Sokołówki. In: Łomotowski J. (Ed.) *Wody opadowe a zjawiska ekstremalne*. Wyd. Seidel-Przywecki sp. z o.o. pp. 215-224. ISBN 9788360956304.
- Urbaniak M., Zalewski M. Polychlorinated dibenzo-p-dioxins and polychlorinated dibenzofurans in sediments from two Ethiopian Rift Valley Lakes. *Polish J. Environ. Stud.* 20(4): 1069-1074.
- Wagner I., da Silva Wells C., Butterworth J., Dziegielewska-Geitz M. Lodz: city of water. In: John Butterworth, Peter McIntyre and Carmen da Silva Wells [Eds.] *SWITCH in the City. Putting urban water management to the test*. IRC International Water and Sanitation Centre. The Hague, The Netherlands, pp. 210-221.
- Wagner I., Zalewski M. System solutions in urban water management: The Lodz (Poland) perspective. In: Howe, C., & Mitchell C. (Eds.). *Water Sensitive Cities*. IWA Publishing, London, pp. 231-245.
- Wojtal-Frankiewicz A., Frankiewicz P. The impact of pelagic (*Daphnia longispina*) and benthic (*Dreissena polymorpha*) filter feeders on chlorophyll and nutrient concentration. *Limnologica*. 41(3):191-200.
- Zalewski M. Towards engineering harmony between water, ecosystem and society: editorial. *Ecohydrology & Hydrobiology* Vol. 11, No 3-4, pp. 137-140
- Zalewski M. Ecohydrology for implementation of the EU water framework directive. *Proceedings of the Institution of Civil Engineering Water Management* vol. 164 issue WM8, pp 375-385
- Zalewski M. Ecohydrology. In *Encyclopedia of Agrophysics*, Gliński, J., Horabik, J. and Lipiec, J. (Eds.), Springer, 1st Edition., 2011, 900 p., ISBN 9789048135868
- Zerihun Negusie Y., Urbaniak M., Zalewski M. Ecohydrology for a sustainable future in Africa - the cases of Ethiopia, Kenya and Tanzania. *Ecohydrology & Hydrobiology* Vol. 11, No 3-4, pp. 223-230

2010

- Bednarek A., Stolarska M., Urbaniak M., Zalewski M. Application of permeable reactive barriers for groundwater protection in the agricultural areas - preliminary results. *Ecohydrology & Hydrobiology* 2010, No. 2-4, pp. 355-362
- Gągała I., Izydorczyk K., Skowron A., Kamecka-Plaskota D., Stefaniak K., Kokociński M., Mankiewicz-Boczek J. Appearance of toxigenic cyanobacteria in two Polish lakes dominated by *Microcystis aeruginosa* and *Planktothrix agardhii* and environmental factors influence. *Ecohydrology & Hydrobiology*. DOI: 10.2478/v10104-009-0045-5
- Izydorczyk K., Frątczak F., Drobnińska A., Badońska M., Zalewski M. Zastosowanie stref ekotonowych w ograniczaniu zanieczyszczeń obszarowych. *Przegląd Komunalny* 2010; 10, 79-81
- Kokociński M., Stefaniak K., Mankiewicz-Boczek J., Izydorczyk K., Soininen J. The ecology of invasive cyanobacterium *Cylindrospermopsis raciborskii* (Nostocales, Cyanophyta) in two hypereutrophic lakes dominated by *Planktothrix agardhii* (Oscillatoriales, Cyanophyta). *European Journal of Phycology* 2010, 45, 4, 365-374
- Kundzewicz Z.W., Zalewski M., Kędziora A., Pierzgalski E. Zagrożenia związane z wodą *Nauka* 2010, 4, 87-96
- Mankiewicz-Boczek J., Kaczkowski Z., Godowska M. RNA/DNA ratio as an indicator of the impact of long-term accumulative contamination for the assessment of river degradation - a pilot study. *Ecohydrology & Hydrobiology* 2010, No. 2-4, pp. 347-354
- Mueller-Wohlfeil D.I., Nachtnebel H.P., Zalewski M. Editorial. *Ecological Engineering* 2010, 36, 9, 1109-1111
- Nałęcz-Jawecki G., Baran S., Mankiewicz-Boczek J., Niemirycz E., Wolska L., Knapik J., Piekarska K., Bartosiewicz M., Piętowski G. The first Polish

- interlaboratory comparison of the luminescent bacteria bioassay with three standard toxicants. *Environ. Protection Engineering* 2010, 3(36), 95-102
- Rustadbakken A., Godlewska M., Długoszewski B., Hydroacoustic assessment of lake quality within the "DeWELopment" project. *Hydroacoustics* 2010, 13, 215-224
 - Trojanowska A., Izydorczyk K. Phosphorus fractions transformation in sediments before and after cyanobacterial bloom: implications for reduction of eutrophication symptoms in dam reservoir. *Water, Air, and Soil Pollution* 2010, 211, 287-298
 - Urbaniak M. Ekohydrologia – nauka transdyscyplinarna dla zrównoważonego rozwoju Etiopii (W:) Naukowcy pomagają. Przykłady współpracy na rzecz pomocy międzynarodowej. Fundacja Partners Polska 2010, p. 6-13.
 - Urbaniak M., Dąbrowska H., Zalewski M. Rozkład przestrzenny zawartości polichlorowanych bifenyli w zbiornikach zaporowych: Włocławskim, Jeziorsko i Sulejowskim. *Monografie Komitetu Inżynierii Środowiska Polskiej Akademii Nauk* 2010, 69, 2, 389-398
 - Urbaniak M., Kiedrzyńska E., Zalewski M., The role of a lowland reservoir in the transport of micropollutants, nutrients and the suspended particulate matter along the river continuum. *Hydrology Research* (in press)
 - Urbaniak M., Skowron A., Frątczak W., Zieliński M., Wesołowski W., 2010. Transport of polychlorinated biphenyls in urban cascade reservoirs: levels, sources and correlation to the environmental conditions. *Polish Journal of Environmental Studies* 2010, 19, 1, 201-211
 - Urbaniak M., Zalewski M. Large dams as purification systems for toxic PCDD/PCDF and dl-PCB congeners. *Hydrocomplexity: New Tools for Solving Wicked Water Problems*. IAHS Publ. 2010, 338, 256-257
 - Urbaniak M., Zieliński M., Ligocka D., Zalewski M. The comparative analysis of selected Persistent Organic Pollutants (POPs) in reservoirs of different types of anthropopression – Polish and Ethiopian studies. *Fresenius Environmental Bulletin* 2010, 19, 11a, 2710-2718
 - Wagner I., Izydorczyk K., Kiedrzyńska E., Mankiewicz-Boczek J., Jurczak T., Bednarek A., Wojtal-Frankiewicz A., Frankiewicz P., Ratajski S., Kaczkowski Z., Zalewski M. Ecohydrological system solutions to enhance ecosystem services: the Pilica River Demonstration Project. *Ecohydrology & Hydrobiology* 2009, Vol. 9, 1, 13-39
 - Wojtal-Frankiewicz A., Frankiewicz P. The impact of pelagic (*Daphnia longispina*) and benthic (*Dreissena polymorpha*) filter feeders on chlorophyll and nutrient concentration. *Limnologia Ecology and Management of Inland Waters*. 2010 Vol.41, Issue 3, pp 191-200
 - Wojtal-Frankiewicz A., Frankiewicz P. Mathematical modeling as a tool for predicting the intensity of eutrophication symptoms based on zooplankton and fish density. *Ecohydrology & Hydrobiology* 2010, No. 2-4, pp. 247-257
 - Wojtal-Frankiewicz A., Frankiewicz P., Jurczak T., Grennan J., McCarthy T. K. Comparison of fish and phantom midge influence on cladocerans diel vertical migration in a dual basin lake. *Aquatic Ecology* 2010, 44, 243-254.
 - Wojtal-Frankiewicz A., Sieczko A., Izydorczyk K., Jurczak T., Frankiewicz P. Competitive influence of zebra mussel (*Dreissena polymorpha*) on *Daphnia longispina* population dynamics on the presence of cyanobacteria. *International Review of Hydrobiology* 2010, 95: 313-329
 - Zalewski M. Ecohydrology for compensation of Global Change. *Brazilian Journal of Biology* 2010, Vol.70, No 3 - Suppl., 689-695
 - Zalewski M., Harper D.M., Wagner I. Ecohydrology - why Demonstration Projects throughout the world? *Ecohydrology & Hydrobiology* 2009, Vol. 9, 1, 3-11
 - Zalewski M., Kiedrzyńska E. System approach to sustainable management of inland floodplains – declaration on sustainable floodplain management. *CAB Reviews: Perspectives in Agriculture, Veterinary Science, Nutrition and Natural Resources* 2010, No 056, doi: 10.1079/PAVSNNR20105056
 - Zalewski M., Urbaniak M., Zerihun Negussie Y. Ecohydrology for Ethiopia – regulation of water biota interactions for sustainable water resources and ecosystem services for societies. *Ecohydrology & Hydrobiology* 2010, No. 2-4, pp. 101-106

- Zalewski M., Urbaniak M., Zerihun Negussie Y. Ecohydrological systemic solutions for reduction of siltation, eutrophication and dioxin-induced toxicity. The pilot study of the Asella BioFarm Park lake, Ethiopia. *Ecohydrology & Hydrobiology* 2010, No. 2-4, pp. 363-368

8.2 List of training courses conducted (there can be overlap with those listed in 2.1 above)

Advanced Study Course: "Ecohydrology & Biotechnology for Sustainable Integrated Water Resources Management in HELP and Ecohydrology Basins" – 13-20 September 2010 in Lodz, Poland.

Appendix-1

Overview of the Core Programme Themes of the Seventh Phase of the IHP (2008-2013)

WATER DEPENDENCIES: SYSTEMS UNDER STRESS AND SOCIETAL RESPONSES

Theme 1: ADAPTING TO THE IMPACTS OF GLOBAL CHANGES ON RIVER BASINS AND AQUIFER SYSTEMS

Focal area 1.1 - Global changes and feedback mechanisms of hydrological processes in stressed systems

Focal area 1.2 - Climate change impacts on the hydrological cycle and consequent impact on water resources

Focal area 1.3 - Hydro-hazards, hydrological extremes and water-related disasters

Focal area 1.4 - Managing groundwater systems' response to global changes

Focal area 1.5 - Global change and climate variability in arid and semi-arid regions

Theme 2: STRENGTHENING WATER GOVERNANCE FOR SUSTAINABILITY

Focal area 2.1 - Cultural, societal and scientific responses to the crises in water governance

Focal area 2.2 - Capacity development for improved governance; enhanced legislation for wise stewardship of water resources

Focal area 2.3 - Governance strategies that enhance affordability and assure financing

Focal area 2.4 - Managing water as a shared responsibility across geographical & social

boundaries

Focal area 2.5 - Addressing the water-energy nexus in basin-wide water resources

Theme 3: ECOHYDROLOGY FOR SUSTAINABILITY

Focal area 3.1 - Ecological measures to protect and remediate catchments process

Focal area 3.2 - Improving ecosystem quality and services by combining structural solutions with ecological biotechnologies

Focal area 3.3 - Risk-based environmental management and accounting

Focal area 3.4 - Groundwater-dependent ecosystems identification, inventory and assessment

Theme 4: WATER AND LIFE SUPPORT SYSTEMS

Focal area 4.1 - Protecting water quality for sustainable livelihoods and poverty alleviation

Focal area 4.2 - Augmenting scarce water resources especially in SIDS

Focal area 4.3 - Achieving sustainable urban water management

Focal area 4.4 - Achieving sustainable rural water management

Theme 5: WATER EDUCATION FOR SUSTAINABLE DEVELOPMENT

Focal area 5.1: Tertiary water education and professional development

Focal area 5.2: Vocational education and training of water technicians

Focal area 5.3: Water education in schools

Focal area 5.4: Water education for communities, stakeholders and mass-media professionals

Format for Report by UNESCO's Water-related Centres on activities related to the IHP in the period June 2010 – May 2012

1. Basic information on the centre

Name of the Centre		HIDROEX - Centro Internacional de Educação, Capacitação e Pesquisa Aplicada em Águas (International Centre for Water Education, Training & Applied Research)
Name of Director:		Octávio Elísio Alves de Brito
Name and title of contact person (for cooperation)		Octávio Elísio Alves de Brito
E-mail:		octavio.elisio@hidroex.mg.gov.br
Address:		Avenida professor Mário Palmério, 1000 – Bairro Universitário- CEP: 38.200-000 - Frutal / MG / Brasil
Website:		http://www.hidroex.mg.gov.br/
Location of the Centre		City/town: Frutal/Minas Gerais Country: Brazil
Geographic orientation: *		<input checked="" type="checkbox"/> global <input type="checkbox"/> regional
Year of establishment:		2009
Themes	Focal Areas [♦]	<input checked="" type="checkbox"/> groundwater <input type="checkbox"/> urban water <input type="checkbox"/> arid/semi-arid zones <input type="checkbox"/> humid tropics <input checked="" type="checkbox"/> droughts and floods <input type="checkbox"/> sediment transport and management <input checked="" type="checkbox"/> water and environment <input checked="" type="checkbox"/> ecohydrology <input type="checkbox"/> water law and policy <input checked="" type="checkbox"/> transboundary river basins/aquifers <input checked="" type="checkbox"/> IWRM <input type="checkbox"/> global and climate change <input type="checkbox"/> mathematical modeling <input type="checkbox"/> social and cultural dimensions of water <input checked="" type="checkbox"/> water education <input type="checkbox"/> other:
	Scope of Activities [♦]	<input checked="" type="checkbox"/> vocational training <input checked="" type="checkbox"/> postgraduate education <input checked="" type="checkbox"/> continuing education <input checked="" type="checkbox"/> research <input checked="" type="checkbox"/> institutional capacity-building <input type="checkbox"/> advising/consulting <input type="checkbox"/> software development <input type="checkbox"/> other:
Support bodies ¹		Federal Government of Brazil – Ministry of Science, Technology and Innovation (MCTI), Ministry of Education (MEC); Minas Gerais State Government – State Secretariat for Science, Technology and Higher Education (SECTES); Minas Gerais Research Support Foundation (FAPEMIG)
Hosting organization: ²		
Sources of financial support: ³		Annual budget of the State of Minas Gerais,

* check on appropriate box

♦ check all that apply

♦ 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

	transfer of federal resources
Existing networks and cooperation: ⁴	<ul style="list-style-type: none"> • The Community of Portuguese Speaking Countries (CPLP) • Cousteau Foundation, Chesapeake, Virginia, USA • International Centre For Coastal Ecohydrology (UNESCO – ICCE), Portugal • Institute for Water Education (UNESCO-IHE), Delft, The Netherlands • Helmholtz Centre for Environmental Research (UFZ), Germany • Regional Centre on Urban Water Management (UNESCO-RCUWM), Iran
Governance:	<input type="checkbox"/> director and governing board <input type="checkbox"/> other: Link to election of board members to the IHP Intergovernmental Council (IGC) and hosting country IHP National Committee Frequency of meetings: once every __year (s) <input type="checkbox"/> Existence of UNESCO presence at meetings
Institutional affiliation of director	Minas Gerais State Government – State Secretariat for Science, Technology and Higher Education (SECTES)
Number of staff and types of staff	Total number of staff (full-time, or equivalent): 32 Number of staff who are water experts: 7 Number of visiting scientists and postgraduate students: 1
Annual turnover budget in USD	US\$ 8,500,000.00

2. Activities undertaken in the framework of IHP in the period June 2008 – May 2010

- 2.1 Educational activities (i.e., those with accreditation) that directly contributed to the IHP-VII (Appendix-1) and WWAP
Please include here those activities which led to accreditation of degrees, or those held in formal school settings.

UNESCO-HIDROEX has yet to develop educational activities with university accreditation, but offers short courses at an accredited level in collaboration with UNESCO-IHE. In the near-term, UNESCO-HIDROEX proposes to offer students the opportunity to gain academic credit that can be applied to pursuing a Masters degree in any European or Brazilian institution of higher education.

- 2.2 Research activities that directly contributed to the IHP-VII and activities by WWAP
Please include research/applied projects outputs such as publications that directly contributed to the IHP-VII and WWAP objectives

2.2.1 Biodiversity of freshwater micro-crustaceans in rocky fields within Cerrado and Caatinga Biomes- Environmental

This is an ongoing 3-year study sponsored by CNPq/FAPESP (MCTI/CNPq/MEC/CAPES/FNDCT – FAPs N°47/2010 – This research - SISBIOTA BRAZIL) aims to increase knowledge about the Brazilian biodiversity through the study of micro-crustaceans in pristine water bodies within national protected areas in the biome of Rocky fields. Partners: UNESCO-HIDROEX, USP, UEMG, UNB, UCB, UNESP-Araraquara, UFMG, INPA. IHP THEME 3, FOCAL AREA 3.3 .

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

- 2.2.2 Biodiversity of freshwater micro-crustaceans in rocky fields within Cerrado and Caatinga Biomes- Socio-Ecological aspects
The selected rocky fields are all in areas of intensive agro-industry activities which have been impacted by humans. In each area the social aspects of biodiversity degradation are being studied with the aim of developing an overview of the conservation status of each environment. Partners: UNESCO-HIDROEX, USP, UEMG, UNB, UCB, UNESP-Araraquara, UFMG, INPA. IHP THEME 3, FOCAL AREA 3.3
- 2.2.3 The São Francisco Revitalization Program's research and control of water quality – RESEARCH/CAPACITY BUILDING BOAT
The São Francisco is a national river 2.830 km in length, shared by five states and receiving waters from 168 tributaries. This project will develop an assessment tool for monitoring the water quality in the middle section of the São Francisco river. Partners: UNESCO-HIDROEX, CEMIG (Minas Gerais state energy company). IHP THEME 3, FOCAL AREA 3.3, IHP THEME 5, FOCAL AREA 5.2, 5.3
- 2.2.4 Water quality control and revitalization of the Rio Grande River
This project aims to develop an assessment tool for monitoring the water quality in the middle section of the Rio Grande river at the reservoir of Volta Grande (222 km² of area and 23 x 10⁹ m³ of volume). Partners: UNESCO-HIDROEX, CEMIG (Minas Gerais state energy company). IHP THEME 2, FOCAL AREA 2.4, 2.5, IHP THEME 3, FOCAL AREA 3.1, 3.2, 3.3
- 2.2.5 Sustainable Regulation of Aquaculture Activity in the Reservoir of São Simão (Paranaíba River – Minas Gerais/Goías)
The project will produce a systematic and sustainable fishery development plan; zoning for the installation of aquaculture systems; assessment of the socioeconomic situation in the region; a detailed description of physical and biotic environments; an environmental and hydrodynamic model of the reservoir; a definition of the carrying capacity for fishery development; delimitation of aquaculture polygons, and a geographic information data base – GIS, geo-referenced charts and maps. Partners: UNESCO-HIDROEX; UFMG; EPAMIG; UEMG. IHP THEME 3, FOCAL AREAS 3.2, 3.3; IHP THEME 4, FOCAL AREAS 4.1, 4.4
- 2.2.6 Water for Life – a model of sustainable management.
The purpose is to restore the balance between development and the improvement of living standards in the town of Frutal, as well as a conservation strategy for the region's water resources. IHP THEME 2, FOCAL AREAS 2.1 to 2.5
- 2.2.7 Scientific-Technical Study of a stretch of San Francisco River for Environmental Revitalization (CETEC/UNESCO-HIDROEX/SECTES)
This project aims to develop a simplified methodology of environmental assessment guidelines for proposing interventions for environmental revitalization of the São Francisco River.
- 2.2.8 Structuring, implementation and consolidation of the Nucleus of Reference and Innovation on Irrigation and Water Resources (NURII) in Frutal, MG, with the National Water Agency (ANA) and The Brazilian Agricultural Research Corporation (EMBRAPA). This project will aggregate and disseminate information on irrigation; develop and disseminate simple techniques that contribute to the optimization of water use; as well as promote research in irrigation and water resources.

Program national partners: UNESCOHIDROEX¹, UEMG², USP-SC³, UFTM⁴, EMATER-MG⁵, COPASA⁶, GD8⁷, ANA⁸, EMBRAPA⁹, IGAM¹⁰, CEMIG¹¹, Frutal City Hall.

- 1 International Centre for Water Education, Training & Applied Research.
- 2 State University of Minas Gerais.
- 3 University of São Paulo - São Carlos Campus.
- 4 Triângulo Mineiro Federal University.
- 5 Minas Gerais State Rural Technical Assistance and Extension Company.

- 6 Minas Gerais Sanitation Company.
- 7 Grande River Basin Committee.
- 8 National Water Agency.
- 9 Brazilian Agricultural Research Corporation.
- 10 Minas Gerais Institute of Water Management.
- 11 Minas Gerais Energy Company.

2.3 Training activities that directly contributed to the IHP-VII and WWAP objectives

2.3.1 Implementation of a "WATER EDUCATION" pilot program in Frutal's public school system

Phase 1 (August/2011 to July/2012):

- Training course on "Environment/Waters" for all teachers of Frutal's public schools;
- Implementation of an Environmental Education Program for public schools, with guidance and supervision from UNESCO-HIDROEX;
- Organization of workshops on science and technology products, with the purpose of promoting sustainable development;
- Establishment of a network of partner schools between Latin American and Portuguese-speaking countries, allowing students and teachers to take part in the international debate on "Water Education";
- Organization of The International Workshop on Water Education in the pilot municipality for exchange of experiences among national and international partners;
- Setting up of the program "adopting my neighborhood", through sociocultural/environmental actions promoted by partner schools, with supervision from UNESCO-HIDROEX and participation of the local community. IHP THEME 2, FOCAL AREA 2.1, THEME 5, FOCAL AREA 5.1, 5.2, 5.3, 5.4

2.3.2 Foundations in water resources management

The course offered the basic concepts of river basins and why it should be considered as the primary planning and management unit. The role of law and the development of legislation on water management in Brazil was explained and linked with the instruments of management. IHP THEME 2, FOCAL AREA 2.4 IHP THEME 5, FOCAL AREA 5.1, 5.2, 5.3, 5.4

2.3.3 Background (cooperation UNESCO-IHE/ UNESCO-HIDROEX)

UNESCO-HIDROEX has contracted UNESCO-IHE to assist in the development of capacities of the new UNESCO Category 2 Center to be able to eventually deliver university level and post graduate level short courses in key areas of water science. Three courses are to be offered at the UNESCO-HIDROEX campus in Frutal, Brazil during the period 2011-2012: (1) Water Quality Assessment and Monitoring, (2) Integrated River Basin Management (IRBM), and (3) River Flooding. The IRBM course is also to be taught online and via video conference. A final short course will be organized and taught in Africa, in cooperation with CPLP.

2.3.4 International Course on Water Quality and Monitoring, 1st module (40 hours). November 2011.

The course content focused on physical, chemical, and biological characteristics of water bodies including rivers, lakes/reservoirs and groundwater. It also presented the topics on major pollutants and their sources and fates, water quality standards and their establishment, and the current water quality situation in Brazil. The course trained 82 people from different sectors of society, from civil and public organisms, in order to contribute to the effective management of local water. IHP THEME 2, FOCAL AREA 2.4 IHP THEME 5, FOCAL AREA 5.1, 5.2, 5.3, 5.4

- 2.3.5 International Course on Water Quality and Monitoring 2nd module (40 hours). February 2012.
During the one-week course, 27 students received information on different methodologies to get samples in field, which later they were able to perform on the field trip which complemented the course. IHP THEME 2, FOCAL AREA 2.4 IHP THEME 5, FOCAL AREA 5.1, 5.2, 5.3, 5.4
- 2.3.6 International Course on Extreme Natural Events, Risk Management (16 hours), Araras, Rio de Janeiro. March, 2012.
This short course was offered to 35 people working or involved with civil protection activities in several municipalities in the state of Rio de Janeiro which allowed the trainees to understand and relate flooding events with their experiences of flooding and landslide catastrophes. IHP THEME 1, FOCAL AREA 1.1, 1.2, 1.3, IHP THEME 2, FOCAL AREA 2.4 IHP THEME 5, FOCAL AREA 5.2
- 2.3.7 International Course on Extreme Natural Events. Risk Management (40 hours) March, 2012
This course trained 38 civilians and military personnel, offering activities related to Disaster Relief Actions. This course allowed the trainees to understand and relate flooding events with their experiences of flooding and landslide catastrophes. IHP THEME 1, FOCAL AREA 1.1, 1.2, 1.3, IHP THEME 2, FOCAL AREA 2.4 IHP THEME 5, FOCAL AREA 5.2,
- 2.3.8 Environmental Education Events
- Participation in the 6th Rio Grande River SOS (municipal district of Itapagipe), held in June 5-6, 2010. This event, which included a special cultural and educational agenda, aimed at sensitizing the local population and neighboring towns to the situation of vulnerability and environmental degradation from excessive amount of garbage discarded into regional rivers, especially in the Rio Grande River. IHP THEME 5, FOCAL AREAS 5.3, 5.4
 - Participation in the 1st Rio Grande River Cleanup (municipal district of Planura), held in June 26-27, 2010. This was an initiative of the Professional Fishermen and Aquiculturists Association of Planura Municipality and professional fishermen from Colômbia Municipality. Sixty-four fishermen collected 7,000kg of garbage within a stretch of 8 km along the river, between the municipalities of Planura and Colômbia. IHP THEME 5, FOCAL AREA 5.4
 - Rediscovering the River (municipal district of Frutal), March 22, 2011. Outreach activity involving various sectors of the community of Frutal, MG, aiming at improving public awareness concerning the environmental conditions of the Vertente Grande Stream, which crosses the urban area of Frutal. IHP THEME 5, FOCAL AREAS 5.3, 5.4
 - Participation in the 2nd Release of Fish in the Rio Grande River (municipal district of Frutal), May 15, 2011. The event took place in the margins of the Rio Grande River, with the release of fish provided by AES Tietê Company, distribution of seedlings of fruit plants and other native species, and including lectures (Water Basin Committee and UNESCO-HIDROEX. IHP THEME 5, FOCAL AREAS 5.3, 5.4
 - Environmental Festival (municipal district of Planura), June 3, 2011. Involving about 2,000 children, the Environmental Festival was part of the cultural and environmental event that opened the 2nd Rio Grande River Cleanup, in Planura, MG. There were many activities aimed at educating children about environmental issues, among which: Memory Game, Puzzle, Fishing Game, Garbage Bag Race, Garbage Race, Environmental Movies, Exhibition of Plankton Organisms, an Environmental Play etc. IHP THEME 5, FOCAL AREAS 5.3, 5.4
 - Participation in the 2nd Rio Grande River Cleanup (municipal district of Planura and Colômbia), June 4-5, 2011. Second

edition of the event organized by Planura's and Colômbia's fishermen, with the participation of more than 300 fishermen, resulting in the collection of 13,517 kg of garbage. IHP THEME 5, FOCAL AREA 5.4

- 1st Environmental Movie Fair (municipal district of Frutal), June 5-11, 2011. A free event organized for Frutal's population, which took place at UNESCO-HIDROEX's Yara Lins Eco-citizenship Centre. The Exhibition played 30 short and 10 feature movies for more than 1,600 students from Frutal's public schools. IHP THEME 5, FOCAL AREAS 5.3, 5.4
- Participation in the 3rd Release of Fish in the Grande River (municipal district of Frutal), March 17, 2012. There was release of fish (curimba) provided by AES Tietê Company, distribution of seedlings of fruit plants and other native species, lectures (Federal University of Uberlândia and UNESCO-HIDROEX). IHP THEME 5, FOCAL AREA 5.4
- Participation in the 5th Week for Preservation and Conservation of Water Resources: Water – the Right and Duty of Everybody, in Uberlândia, March 23, 2012. UNESCO-HIDROEX participated by presenting two lectures: "Sustainable Regulation of Fishing and Aquaculture in Minas Gerais' Reservoirs", and "Biological Processes in Rivers and Bio-monitoring" for technicians from public institutions of the Triângulo Mineiro region. IHP THEME 5, FOCAL AREA 5.4
- Participation in the 1st Seminar on Fish Cage Farming, Full Use of Fish Materials and its Socio-Economic Benefits (municipal district of Fronteira), March 31, 2012. UNESCO-HIDROEX participated by presenting the lecture "Sustainable Regulation of Fishing and Aquaculture in Minas Gerais' Reservoirs". IHP THEME 5, FOCAL AREA 5.4
- 2nd Environmental Movie Fair (municipal district of Frutal), March 20 to 23, 2012. A free event organized for Frutal's population, which took place at the auditorium of the State University of Minas Gerais. Some 2500 students from Frutal's public schools participated in this event which included 23 short and feature movies. IHP THEME 5, FOCAL AREA 5.4
- Participation in the 1st Week for Economic Development - Iturama and its Surroundings (municipal district of Iturama). April 23 to 25, 2012. This event was organized by SEBRAE – Brazilian Service of Support for Micro and Small Enterprises. UNESCO-HIDROEX contributed to the event by presenting three lectures: "Sustainable Regulation of Fishing and Aquaculture in Minas Gerais Reservoirs"; "The Drainage Basin as the Unity of Planning and Management of Water Resources"; and "Rainwater Harvesting Techniques for Recovering Degraded Soils". IHP THEME 5, FOCAL AREA 5.4

3. Collaboration and linkages

3.1 Participation in major international networks, programmes, partnerships with other UN or other International Agencies, media and professional bodies

3.1.1 Partnership development with UNESCO-IHE: the establishment and strengthening of UNESCO-HIDROEX as a category II international center for applied research and building capacity on water issues under the auspices of UNESCO.

Actions:

- Training in technical aspects of the logistics of project development concerning the multiple uses of water, pursuant to the guidelines established in the UNESCO - International Hydrological Programme;

- Training programs focusing on Watershed Governance for technical propagators;
 - A water resources training program through videoconference.
 - Identification of the needs concerning programs and projects on training and applied research in water within the scope of UNESCO-HIDROEX in Brazil and in the member States of CPLP;
 - Exchange of researchers within UNESCO's category II centers;
 - Courses, workshops, conferences, symposiums and seminars on needs relating to water resources, pursuant to the guidelines established in the UNESCO-International Hydrological Programme;
 - Joint development and employment of training and technology dissemination tools as well as use of methods and results achieved through research carried out jointly in the field of water resources. Partners: UNESCO-HIDROEX, UNESCO-IHE, CPLP, FAPEMIG;
- 3.1.2 UNESCO-HIDROEX attended the VIII Government State Leaders Meeting. Luanda, Angola, July, 23, 2010.
- 3.1.3 UNESCO-HIDROEX held meetings - with ICCE (Portugal) to finalize a presentation for the World Water Forum (Marseille, France); with UNESCO-Paris, UNESCO-IHE, the Cousteau Foundation (Paris, France), and the Helmholtz Centre for Environmental Research (UFZ) (Leipzig, Germany) May 31 – June 11, related to the development of UNESCO-HIDROEX.
- 3.1.4 Visit from researchers of the National Institute of Water Resources in Nigeria to the headquarters of UNESCO-HIDROEX, seeking the establishment of partnerships and exchanges. Frutal, Brazil, December 13, 2011.
- 3.1.5 Meetings with CPLP (and also with the Brazilian Ambassador to CPLP), in order to discuss the projects to be developed in Africa. Brasília, Brazil, December, 2011.
- 3.1.6 Meetings with representatives of the Brazilian Agency for Cooperation and CGCPLP Itamaraty, in order to discuss the projects to be developed in Africa. Brasília, Brazil, January, 2012
- 3.1.7 UNESCO-HIDROEX attended the 61st Meeting of International Executive Council (IEC) of the International Commission on Irrigation and Drainage (ICID). Yaguakarta, Indonesia, February, 2011.
- 3.1.8 UNESCO-HIDROEX was represented at the Meeting at the Institute for Research in Water Resources aimed at establishing partnerships in the field of Scientific and Technological Development in Water Resources. Maputo, Mozambique, February, 9 to 11, 2012.
- 3.1.9 UNESCO-HIDROEX attended the Meeting of Focal Points of Cooperation of the CPLP. Lisboa, Portugal, February, 6 to 8, 2012.
- 3.1.10 UNESCO-HIDROEX participated in the 6th World Water Forum "Marseille, France, March 12 to 17, 2012.
- 3.1.11 UNESCO-HIDROEX attended several meetings with representatives of the Ministry of External Relations, ANA, the Brazilian Agency for Cooperation and CGCPLP Itamaraty, in defining priorities for the center for this reporting period. 2010-2012.
- 3.1.12 Several meetings were held with CNPq's Agricultural, Biological and Health Sciences Board to discuss matters concerning the Programme "Science without Borders" (Ciências sem Fronteiras), including fellowship support for future UNESCO-HIDROEX faculty. Brasília, Brazil, March, 2012.
- 3.1.13 UNESCO-HIDROEX attended the Sustainable Luxury Fair. Paris, France, March, 29 to April, 1, 2012.
- 3.2 Participation in meetings related to the IHP and UNESCO (e.g., the UNESCO General Conference, the UNESCO Executive Board, the IHP Intergovernmental Council and/or other meetings organized by IHP)

UNESCO-HIDROEX attended the IX Meeting of IHP National Committee and Focal Points of Latin America and the Caribbean. Dominican Republic, June 28-29, 2011.

3.3 Collaboration and networking with other UNESCO category 1 or 2 institutes/centres

3.3.1 Cross-appointment of directors of category 1 or 2 institutes or centres on the governing board

Nothing to report at this point in time, but such exchanges are being considered for the future.

3.3.2 Exchange of information on activities such as training/educational materials, and funding opportunities

3.3.2.1 Technical Cooperation Agreement signed among SECTES, UNESCO-HIDROEX, IHE and the ICCE. Objective: To stimulate partnerships and the exchange of knowledge in Water Science, Education, Research, Development and Innovation tools and methodologies, that will be used to implement water resources and coastal eco-hydrology management, according to UNESCO-IHP . Po Signed on February, 2010

3.3.2.2 Meetings were held at the International Water Hazard and Risk Management (ICHARM), Tsukuba, Japan, in order to negotiate an agreement on technology transfer in disaster prevention; and with the Japanese Deputy Minister of Infrastructure, Transport and Tourism, Kenyu Kohmura, to negotiate the transfer of technology in flood prevention. May 2010.

3.3.2.3 Memorandum of Understanding between the Regional Centre on Urban Water Management (RCUWM) and UNESCO-HIDROEX. Objective: to develop new knowledge and share experiences for the benefit of both nations and for other states nearby. Tehran, Iran

3.3.2.4 UNESCO-HIDROEX was represented at the Workshop on Application of GIS and Remote Sensing in Water Resources Management organized by RCUWM. Muscat, December 19-22, 2010.

3.3.2.5 UNESCO-HIDROEX was represented at the Meeting to Consolidate the work plan with UNESCO-IHE (new cooperation agreement). Delft, Netherlands, March, 1-4, 2011.

3.3.2.6 Cooperation Agreement signed among SECTES, UNESCO-HIDROEX and Helmholtz Centre for Environmental Research (UFZ). Objective: Promote activities focused on integrated management of surface water and groundwater. Germany, Signed on June, 2011

3.3.2.7 Protocol for Cooperation signed among SECTES, UEMG, UNESCO-HIDROEX, ICCE and University of Algarve. Objective: promote scientific and technological initiatives among the participants, in order to develop water studies, research and activities, especially in the priority countries of the CPLP. Signed on June, 2011

3.3.3 Exchange of staff, most notably professionals and students

Nothing to report at this time, but such agreements are contemplated in the near-term future.

- 3.3.4 Implementation of joint activities, such as workshops, conferences, training programmes, joint projects, field visits, software and data sharing, knowledge exchange and publications
- 3.3.4.1 Participation of researchers from the International Hydrological Programme – IHP and UNESCO Category II Centers, ICHARM (Japan) and RCUWM (Iran) in the International Workshop on Water-Related Disasters, organized by UNESCO-HIDROEX. November 17 to 19, 2009. (see 4.1.2)
- 3.3.4.2 Partnership with UNESCO-IHE, which allowed the completion of courses, workshops and attendance in events by professionals of the institute and other professionals of the water sector. See point 2.3, 4.1.4 above.
- 3.4 Relationships with the UNESCO field and regional office whose jurisdiction covers the country of location
- 3.4.1 UNESCO-HIDROEX participated in the “Workshop on Ground Water Modeling as a Management Tool” at the International Center on Hydroinformatics, ITAIPU (Binational Center), January 2012. IHP THEME 1, FOCAL AREA 1.1, 1.4
- 3.4.2 UNESCO-HIDROEX participated in The First Regional Consultation of the Project "Groundwater Governance: A Global Framework for Country Action", for Latin America and Caribbean, Montevideo, Uruguay, 18 to 20 April 2012. IHP THEME 1, FOCAL AREA 1.1, 1.2, 1.3, 1.4
- 3.5 Relationships with the UNESCO National Commission and the IHP National Committee in the country of location and with other organizations of other countries
- 3.5.1 Presentation about UNESCO-HIDROEX to the Brazilian Commission of International Hydrological Programme – COBRAPHI.
- 3.5.2 Various meetings were held with the National Water Agency (ANA), and technical Ministries with water as a component of their respective mandates in developing the strategic education and research objectives and priorities for the Center.
- 3.6 Relationship with other UNESCO-related networks, such as UNESCO Clubs, ASPnet and UNESCO chairs
- Partnership: UNESCO-HIDROEX and UNESCO Chair on Water, Women and Development - Federal University of Ouro Preto, Minas Gerais, Brazil:
- Water and Gender: Sustainable Local Practices – promote social and community mobilization through the exchange of successful experiences and the transfer of technologies and local knowledge about sustainable practices in water use and sanitation, especially among women.

4. Communication

- 4.1 Communication and knowledge dissemination activities undertaken in the framework of IHP
- 4.1.1 Seminar for the “Implementation of the Agenda 21 Regional Forum in Triângulo Mineiro and Alto Paranaíba Regions”. August 17 to 19, 2010. With the participation of more than 250 people, the seminar relied on lectures presented by professionals from the environmental sector, followed by discussions with the audience. At the end of the event, the Regional Agenda 21 Forum, along with

Frutal's Agenda 21, was adopted and implementation programmed. IHP THEME 2, FOCAL AREAS 2.1, 2.2 and 2.3

- 4.1.2 International Workshop on "Water-Related Disasters", November 17 to 19, 2009. With the participation of more than 150 people, the event presented national and international experiences concerning the control and mitigation of water-related disasters. (UFMG, UFTM, FCTH, UFRJ, USP, ANA), from the International Hydrological Programme – IHP and from UNESCO Category II Centers, ICHARM (Japan) and RCUWM (Iran) took part in the event. Organizer: UNESCO-HIDROEX. IHP THEME 1, FOCAL AREA 1.3, THEME 2, FOCAL AREA 2.4
- 4.1.3 Seminar on the State of "Irrigated Agriculture in Brazil: Challenges and Opportunities", December 9 to 10, 2010. With the attendance of more than 150 people, the event assessed the state of irrigated agriculture in the four major regions of Brazil (South, Southeast, Midwest and Northeast) as well as discussed management challenges and investment opportunities presented by this activity. IHP THEME 3, FOCAL AREAS 3.1
- 4.1.4 Workshop "Rain and Urban Disasters" in Ouro Preto, MG (16 hours), March, 2012. International Workshop organized by UNESCO-HIDROEX and other partners, with the participation of scientists and professionals from various universities and technological Brazilian institutes and UNESCO-IHE, focused on natural extreme events, rainstorm and flooding. IHP THEME 1, FOCAL AREA 1.1, 1.2, 1.3, IHP THEME 2, FOCAL AREA 2.1, 2.4

4.2 Policy documents and advice

- 4.2.1 Participation in the implementation of the Local and Regional Agenda 21 in the municipal district of Frutal and Triângulo Mineiro/Alto Paranaíba region; UNESCO-HIDROEX participates as a member of the Local Agenda 21 Council. IHP THEME 2
- 4.2.2 Member of the Lower and Middle Rio Grande River Consortium of Municipalities, a partnership between UNESCO-HIDROEX and EMATER-MG (Minas Gerais State Rural Technical Assistance and Extension Company), involving 30 municipalities. The main purpose of the Consortium is the search for resources and practices that can help solve common environmental issues such as sewage and solid waste treatment and restoration of drainage basins. IHP THEME 2
- 4.2.3 Member of CODEMA (Municipal Board of Environmental Development) since March, 2011. It provides advisory services for Frutal Municipal Administration and the Municipal Public Prosecution Service by considering issues pursuant to the guidelines established in environmental laws. IHP THEME 2

5. Update on Centre Operations

5.1 Membership of the Board of Governors between designated period

The UNESCO-HIDROEX Governing Board will be established in June 2012. Although not required of category II centers, UNESCO-HIDROEX proposes to establish a board of science advisors to help ensure the quality of education and research undertaken at the center and as recognition of the importance of eventually gaining full academic accreditation.

5.2 Key decisions made (attach minutes of meeting)

Not applicable.

6. Evidence of the Centre's Impacts

- 6.1 Science Impacts (Major contributions to the science, technology, education, and regional and/or international cooperation in the field of water)

The project "Biodiversity of freshwater microcrustaceans in rocky fields within Cerrado and Caatinga Biomes- Environmental". The project is in its second year and important data have already been gathered to improve the long-term health of the basin. For example, we have recorded 8 new species of Copepoda crustaceans and our expectations, for the end of the project, is to record circa of 30 up to 40 new species in the study area.

- 6.2 Knowledge Transfer Impacts (Major achievements in the dissemination of knowledge and technology transfer)

6.2.1 The activities of UNESCO-HIDROEX during this reporting period include training of some 200 water professionals in structured courses and an additional 600 in seminars and specialized workshops. Additionally, approximately 300 fishermen were trained in near-shore cleaning techniques and nearly 6000 students participated in a wide variety of environmental training sessions and practical field activities. The center maintains formal relationships with some 20 universities and research institutions and has undertaken activities in at least 30 municipalities in six states of Brazil.

6.2.2 The project: "Implementation of a Water treatment mini-plant in a Rural Community in the Municipality of Frutal". Considering the sanitation problems that humanity is facing today, UNESCO-HIDROEX is building a mini water demonstration treatment plant in a rural community in the municipality of Frutal. This facility, which can supply quality water at a low cost, and diminish the diseases caused by poor quality water, will be managed by members of the same community. They will be chosen by the community and trained by UNESCO-HIDROEX staff, so that the community as a whole can realize the importance of having control of its water supply. (Under development). Theme 2, Focal area 2.1, 2.4, Theme 5, Focal area 5.4

- 6.3 Policy Impacts (advice sought by government and other bodies and evidence of inputs into policy arena)

To this point in time, we do not have anything definitive to report, however with the completion of several research projects and the dissemination of the results, our research efforts will undoubtedly be reflected in new and revised environmental and development policies (See point 4.2).

7. Future activities that will contribute directly to IHP and/or to WWAP

- 7.1 Operational Plan (attach if available)

UNESCO-HIDROEX will approve its Operating Plan after installing its Governing Board. However, the Centre has been developing actions that reflect the improvement of conditions for studies of water in Brazil and in Latin America, such as the creation of the City of Water and the Minas-Inhotim Water Observatory:

- 7.1.1 City of Waters:

Focused on the management and recovery of both surface and ground water, the "Cidade das Águas UNESCO-HIDROEX" is a complex that gathers federal, state, NGO and private institutions and their scientists – national and international – in an interactive environment to bring different natural and social science knowledge

to bear on complex water management issues. Overtime, the project aims to disseminate environmental education materials based on the output of its research worldwide, especially in Latin America and in the Community of Portuguese-speaking Countries (CPLP). The "Cidade das Águas UNESCO-HIDROEX" is an initiative of the government of Minas Gerais, through the State Secretariat for Science, Technology and Higher Education (SECTES). The Brazilian government and the government of Minas Gerais have invested U.S.\$ 30 million to consolidate the cluster and an additional U.S.\$ 100 million will be invested over the next two years to operationalize this facility.

7.1.2 Water Observatory Minas-Inhotim:

The Minas-Inhotim Water Observatory is planned as a center for collection and analysis of water quality and quantity data with a focus on the Americas and as an input to the World Water Development Report (WWAP/WWDR). This center will also aim at increasing the level of cooperation among category II centers through the exchange of water data and analyzing reporting methodologies.

7.2 Strategic Plan linked with IHP-VII (attach strategic plan if available)

The Strategic Plan of the UNESCO-formal HIDROEX will be established within 60 days of implementation of the Governing Board. To date, the Center has worked with the following guidelines as underlying principals:

- o Consolidation of laboratory infrastructure and distance education classrooms with video conferencing, through financial resources of projects approved by the federal and state governments;
- o Expansion of the infrastructure to support students and teachers/researchers;
- o Expansion of the research staff and teachers through the "Science Without Borders Program for Excellence in Water" and reflected in an agreement with the National Council for Scientific and Technological Development (CNPq) signed in May 2012, and with the financial support of FAPEMIG and other public agencies and private entities.
- o Implementation of the program of short courses together with staff from UNESCO-IHE as part of a staff development and institution building program (CPLP, Latin America and the Caribbean);
- o Implementation of the program of raining courses for managers of water resources in Brazil, CPLP, Latin America and the Caribbean;
- o Intensify and diversify the program "Water Education" in schools based on the principle knowledge transfer and attitude change in the use and conservation of water, the formation of a conscious citizenry committed to sustainable development.

8. Annexes

8.1 List of publications released by the Centre (there can be overlap with those listed in 2.3 above)

Book editing project as an output of the Workshop of Water Related Disasters - Under revision. Provisionary title: "Water Related Disaster – Causes, Consequences and Case Studies."

8.2 List of training courses conducted (there can be overlap with those listed in 2.1 above)

- o Training course on "Environment/Waters" for all teachers of Frutal's public schools, either located in the urban or rural area ("WATER EDUCATION" pilot program);

- "Foundations of Water Resources Management" (32 hours) September October 2012.
- "Water Quality Assessment and Monitoring"" (cooperation UNESCO-IHE/ UNESCO-HIDROEX);
- "Integrated River Basin Management" (IRBM) (cooperation UNESCO-IHE/ UNESCO-HIDROEX);
- "River Flooding "(cooperation UNESCO-IHE/ UNESCO-HIDROEX);
- "International Course on Water Quality and Monitoring", 1st Module (40 hours). November 2011.
- "International Course on Water Quality and Monitoring" 2nd Module (40 hours). February 2012.
- "International Course on Extreme Natural Events and Risk Management" (16 hours), Araras, Rio de Janeiro. March 2012.
- "International Course on Extreme Natural Events and Risk Management" (40 hours) March 2012

Appendix-1

Overview of the Core Programme Themes of the Seventh Phase of the IHP (2008-2013) WATER DEPENDENCIES: SYSTEMS UNDER STRESS AND SOCIETAL RESPONSES

Theme 1: ADAPTING TO THE IMPACTS OF GLOBAL CHANGES ON RIVER BASINS AND AQUIFER SYSTEMS

Focal area 1.1 - Global changes and feedback mechanisms of hydrological processes in stressed systems

Focal area 1.2 - Climate change impacts on the hydrological cycle and consequent impact on water resources

Focal area 1.3 - Hydro-hazards, hydrological extremes and water-related disasters

Focal area 1.4 - Managing groundwater systems' response to global changes

Focal area 1.5 - Global change and climate variability in arid and semi-arid regions

Theme 2: STRENGTHENING WATER GOVERNANCE FOR SUSTAINABILITY

Focal area 2.1 - Cultural, societal and scientific responses to the crises in water governance

Focal area 2.2 - Capacity development for improved governance; enhanced legislation for wise stewardship of water resources

Focal area 2.3 - Governance strategies that enhance affordability and assure financing

Focal area 2.4 - Managing water as a shared responsibility across geographical & social boundaries

Focal area 2.5 - Addressing the water-energy nexus in basin-wide water resources

Theme 3: ECOHYDROLOGY FOR SUSTAINABILITY

Focal area 3.1 - Ecological measures to protect and remediate catchments process

Focal area 3.2 - Improving ecosystem quality and services by combining structural solutions with ecological biotechnologies

Focal area 3.3 - Risk-based environmental management and accounting

Focal area 3.4 - Groundwater-dependent ecosystems identification, inventory and assessment

Theme 4: WATER AND LIFE SUPPORT SYSTEMS

Focal area 4.1 - Protecting water quality for sustainable livelihoods and poverty alleviation

Focal area 4.2 - Augmenting scarce water resources especially in SIDS

Focal area 4.3 - Achieving sustainable urban water management

Focal area 4.4 - Achieving sustainable rural water management

Theme 5: WATER EDUCATION FOR SUSTAINABLE DEVELOPMENT

Focal area 5.1: Tertiary water education and professional development

Focal area 5.2: Vocational education and training of water technicians

Focal area 5.3: Water education in schools

Focal area 5.4: Water education for communities, stakeholders and mass-media professionals

Reports by UNESCO's Water-related Centres (category 1 and 2) on activities related to the IHP in the period June 2010 – May 2012

1. Basic information on the centre

Name of the Centre		The Regional Humid Tropics Hydrology and Water Resources Centre for South-East Asia and the Pacific (HTC Kuala Lumpur)
Name of Director		Dr. Mohamed Roseli bin Zainal Abidin
Name and title of contact person (for cooperation)		Rohani binti Ahmad Hezrin Haslinda binti Hashim
E-mail		rohani@water.gov.my / hezrin@water.gov.my
Address		No. 2, Jalan Ledang, Off Jalan Duta, 50480 Kuala Lumpur, Malaysia.
Website		http://www.water.gov.my/
Location of centre		city/town : <u>Kuala Lumpur</u> country : <u>Malaysia</u>
Geographic orientation *		<input type="checkbox"/> global <input checked="" type="checkbox"/> regional
Year of establishment		1999
Themes	Focal Areas *	<input type="checkbox"/> groundwater <input checked="" type="checkbox"/> urban water <input type="checkbox"/> arid / semi-arid zones <input checked="" type="checkbox"/> humid tropics <input type="checkbox"/> droughts and floods <input type="checkbox"/> sediment transport and management <input checked="" type="checkbox"/> water and environment <input checked="" type="checkbox"/> ecohydrology <input type="checkbox"/> water law and policy <input type="checkbox"/> transboundary river basins/ aquifers <input checked="" type="checkbox"/> IWRM <input type="checkbox"/> global and climate change <input type="checkbox"/> mathematical modelling <input type="checkbox"/> social and cultural dimensions of water <input checked="" type="checkbox"/> water education <input checked="" type="checkbox"/> other: <u>stormwater management, water hazard.</u>
	Scope of Activities *	<input type="checkbox"/> vocational training <input type="checkbox"/> postgraduate education <input type="checkbox"/> continuing education <input checked="" type="checkbox"/> research <input type="checkbox"/> institutional capacity-building <input checked="" type="checkbox"/> advising/ consulting <input type="checkbox"/> software development <input type="checkbox"/> 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
Existing networks and cooperation ⁴		UNESCO/ICHARM/RCUWM/RSC for Southeast Asia and the Pacific/ Partner of the GWP/ IWA/ APAC

* 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

This page was created using **BCL ALLPDF Converter** trial software.

To purchase, go to <http://store.bcltechnologies.com/productcart/pc/instPrd.asp?idproduct=1>

	Water-related Centre Category II/MyWP/Malaysian Stormwater Organization
Governance	<input checked="" type="checkbox"/> director and governing board (director only no governing board) <input checked="" type="checkbox"/> other: Operated by the Government of Malaysia through the Department of Irrigation and Drainage (DID), serving UNESCO Member States of South-East Asia and the Pacific Region, via national Committees for IHP; <u>Exco of Malaysia IHP</u> Link to election of board members to the IHP IGC and hosting country IHP National Committee Frequency of meetings: three times per year(s) <input checked="" type="checkbox"/> Existence of UNESCO presence at meetings
Institutional affiliation of director	IWA/IAHS/Partner of the GWP
Number of staff and types of staff	total number of staff (full-time, or equivalent) : <u>13 persons</u> 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 180,000.00 Programmes and Activities = USD 350,000.00

2. Activities undertaken in the framework of IHP in the period June 2010 – May 2012

- 2.1 Educational activities (i.e., those with accreditation) that directly contributed to the IHP-VII and WWAP
Please include here those activities which led to accreditation of degrees, or those held in formal school settings.

One student obtained his Bachelor's Degree in 2010 using green roof a component of UNESCO SWITCH-in-Asia: Urban Water Management; MSMA Storm water Management (SME) Ecohydrology pilot project in HTCKL. Since September 2011, pursuing for his Master's Degree using the same project with the thesis title 'Evaluation of Green Roof as Green Technology for Urban Stormwater Quantity and Quality Controls. The Director of HTC is his external supervisor.

Another Bachelor's Degree student conducted his practical training with HTC for two month in the year 2011.

- 2.2 Research activities that directly contributed to the IHP-VII and activities by WWAP
Please include research/applied projects outputs such as publications that directly contributed to the IHP-VII and WWAP objectives

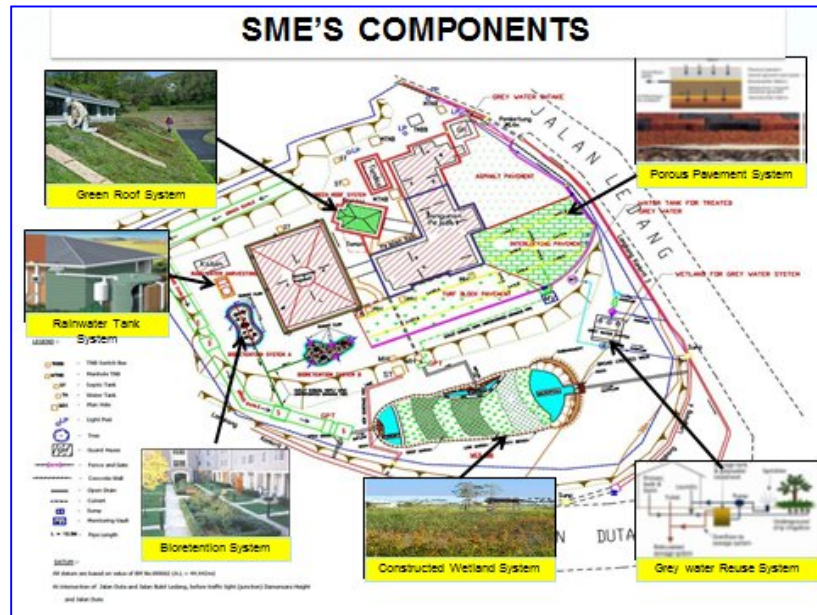
HTC carry out its R&D activities according to its first two functions under Article II (i.e. (a) to coordinate the implementation of cooperative hydrological and water resources research projects and activities, and (b) to network with IHP National Committees and other similar centres for exchange of 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 Phase IHP-VII for the themes and focal areas of Theme 1, Theme 3 and Theme 4. The main focuses are in stormwater management, river management and waste water management.

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 programmes.

The R&D carried out are as follows:

- 1) Integrated and Multidisciplinary research on Flood Hazard Assessment in the State of Johor (completed. Seminar held from 4 to 6 July, 2011). Proceeding is in preparation.
- 2) MSMA Stormwater Management Eco-Hydrology at HTCKL (SWITCH-in-Asia: UWM):
 - Construction – completed in October 2010



This page was created using **BCL ALLPDF Converter** trial software.

To purchase, go to <http://store.bcstechnologies.com/productcart/pc/instPrd.asp?idproduct=1>




- Landscaping works – completed November 2011
- Installation of instrumentation including software for monitoring program – completed October 2011
- Monitoring program – start April 2012


3) Agricultural Non-Point Source Pollution and Impact on Reservoir (Sembromg Dam) Sedimentation and Water Quality – ongoing since mid-2011.




This page was created using **BCL ALLPDF Converter** trial software.

To purchase, go to <http://store.bcstechnologies.com/productcart/pc/instPrd.asp?idproduct=1>


 United Nations
 Educational, Scientific and
 Cultural Organization


 MTC


UTM
 UNIVERSITI TEKNOLOGI MALAYSIA
 UNIVERSITI PENYELIDIKAN

AGRICULTURAL NON POINT SOURCE POLLUTION AND IMPACT ON RESERVOIR SEDIMENTATION AND WATER QUALITY

INTRODUCTION

Erosion and sedimentation are major issues in managing water quality and constitute the largest portion of Non-Point-Source (NPS) pollution in the tropical region. High erosion rate often leads to river constriction, sedimentation in lakes and reservoirs, increase flood frequency and magnitude, threaten aquatic habitats, increase water treatment costs and losses of recreation opportunities. Most studies used small catchment approach, thus the results could only represent the local effects. Assessing pollution transport from its source on hillslopes, and the transport through stream and river system and finally its deposition in lake and reservoir is crucial to develop linkages between upstream processes and the downstream impact. A lake or reservoir could provide opportunity to estimate rates of sedimentation and accumulation of pollutants in the system.

RESEARCH AREA

SEDIMENTATION

↳ Radioisotope Geochronology

EUTROPHICATION

↳ Water Quality Assessment

MODELLING

↳ Agricultural Non Point Sources (AGNPS).

STUDY AREA

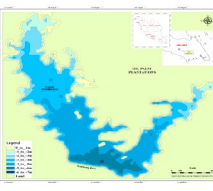
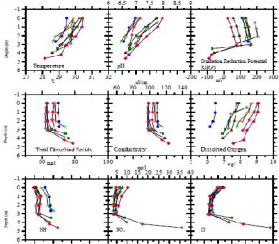


Figure 1: Sembrong Lake Bathymetric map

Sembrong Reservoir

Contour lines show depth variations in the bathymetric map with 1 meter interval. Maximum, minimum and the mean depth values calculated to be -7, 0, and -3.2±1.25 with a coefficient of variance of 0.39. Overall Sembrong bed morphology revealed a man-made reservoir in which basin margins and main open water have reformed artificially.

OBJECTIVES	METHODOLOGY
i) To determine the physical and chemical properties of the sediments ii) To establish long term sedimentation rate by means of radioisotope technique iii) To examine the man made eutrophication status iv) To investigate the land use change on sedimentation rates	<ul style="list-style-type: none"> • Develop Bathymetric Map • Lab Analysis • Sediment Core Sampling • Lead 210(²¹⁰Pb) is the most appropriate tracer for establishing geochronology (Half-life: 22.3 years) • Water profile sampling • Chemical analysis • Discuss on the result of water quality assessment and radioisotope geochronology

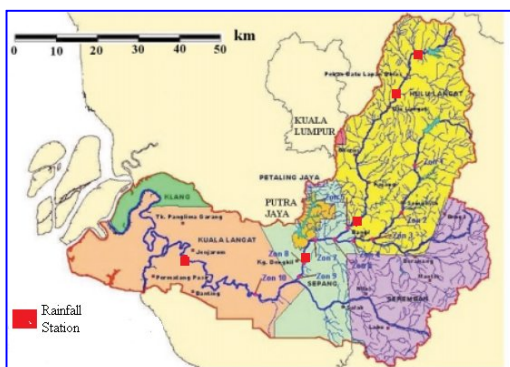
PRELIMINARY RESULT	EXPECTED OUTPUT
 <p>Figure 2: The in-situ prometers profile at Sembrong Reservoir</p>	<ul style="list-style-type: none"> • A better understanding of sedimentary processes (land use pattern) in the lake/reservoir watershed management. • Information on variability of sedimentation rates and depositional patterns. • This study will provides relevance technique for quantifying long term sedimentation dynamic and the geochronology in a dam. It also provides information on pollution chronologies and paleoenvironments. • Chronology of sediment deposits with respect to anthropogenic activities and historical events in the watershed assessment and provide strategies for future planning of appropriate sediment management with relevant authorities in order to reduce sedimentation and siltation in water supply dam and conservation on the hydrological regime of the reservoir watershed. • Trained scientists in the field of agricultural hydrology and soil erosion. • Submission of scientific papers to journals and conferences.

RESEARCHER :

Humid Tropics Centre Kuala Lumpur <ul style="list-style-type: none"> • Mohamed Kosai Zainal Abidin • Roslani Ahmad • Khairuddin Mohamed 	Universiti Teknologi Malaysia <ul style="list-style-type: none"> • Zukhri Yusop • Muhamad Askari • Nor Bakhsiah Baharim 	Malaysian Nuclear Agency <ul style="list-style-type: none"> • Wan Zakaria Wan Muhamad Tehir 	Sultan Idris Education University <ul style="list-style-type: none"> • Zanudin Othman 	University of Malaya <ul style="list-style-type: none"> • Ismail Yusoff
------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------	-----------------------------------------------------------------------------------------------------------------------------------------------------------------	-------------------------------------------------------------------------------------------------------------------	-------------------------------------------------------------------------------------------------------------	-----------------------------------------------------------------------------------------------

Corresponding author: Nor Bakhsiah Baharim
Email: norbakhsiah@gmail.com

4) Erosion Risk Categorization Potential at Langat River (part of UNESCO-HELP River Basin (Langat River) - ongoing since mid-2011.




Langat River Basin




Langat River @ Old Bangi

Langat UNESCO-HELP River Basin: HTC's R&D Programme – Erosion Risk Potential Categorization in Langat River (ongoing), scientific networking & collaboration with Kuala Lumpur Infrastructure University College (KLIUC)




Part of the Study Team


- To determine the degree of soil erodibility along Langat River.
- To evaluate rainfall erosivity risk potential along Langat River.
- To identify erosion risk potential along Langat River.
- to categorize erosion risk potential in Langat River .




Langat basin




FLOOD RISK MAP ALONG SS. LANGAT UNDER 10yr ARI



River bank erosion in Sepang district



Megasteel barge



The process river sand

5) Monitoring Rainwater Harvesting System (RWHS) Effectiveness in Perhentian Island - ongoing since mid-2011



Above Ground Storage Tank (School)



Installed Water Meter for the RWHS

6) Remediation of Pollution from Large Point Sources for Hiliran River - ongoing since mid-2011

HTC's Applied R&D Programme: scientific networking & collaboration with Muslim Water Researchers Cooperation (MUAREC) and Fakulti Kejuruteraan Alam Bina, UKM : Remediation of Pollution from Large Point Sources for Hiliran River, 1S1R, Kuala Terengganu, Terengganu (ongoing)

- To overcome leachate problem from keropok outlet, batik factories and water pollution from wet market and chemical pollution in the river through product innovation treatment system.



This page was created using **BCL ALLPDF Converter** trial software.

To purchase, go to <http://store.bcletechnologies.com/productcart/pc/instPrd.asp?idproduct=1>

UNIVERSITI KEBANGSAAN MALAYSIA
Kuala Lumpur

ZP-2011-001
Remediation of Pollution from Large Point Sources of Sungai Hiliran: One State One River Program, Terengganu

MUAMARC Malaysia (Universiti Kebangsaan Malaysia and Universiti Malaysia Perlis)
Doktor: Akmal Fauzan, Fazel Basha, Othman Isahak, Fadzlan Tajir, Amir-Husain Khodam, Irwan-Husain Md Zain, Saiful-Nizam Bin Yusoff, Siti Nurhasniyati, Abdul-Rahim, Khoo Ee-Lian, Ahmad Hery, Wan Fadzlan Mohd Noor
Nasional Toxic Center Kuala Lumpur
Mohamed Rizal Zaidi, Abdul-Rahim, Fazel Basha, Fazel Isahak and Mohd Ridwan Mohamed

INTRODUCTION

River pollution is an old problem that is still unresolved in Malaysia. As the country rapidly industrializes and urban areas grow, rivers all over the country are the recipients of excessive pollution loads from every sector of human activity. Due to this matter, the One State One River program under the Ministry of Natural Resources and Environment was implemented starting on 2010 with the objective of resolving river pollution in Malaysia. Every state in the Peninsula is to carry out a pilot project, and Hiliran River (Sg. Hiliran) in Kuala Terengganu is chosen for Terengganu State.

EXISTING CONDITION OF SG. HILIRAN

Sg. Hiliran has a catchment area of 56.5 sq. km (see Figure 1) and has 3 major tributaries along its 3.3 length, Aor Padang Hiliran (1.1 km), Aor Seborang Borah (0.7 km) and Aor Kubang Buyang (1.5 km). The land-use in the catchment is traditional Kampungs with pockets of new housing areas and industries. Water quality data gathered for this river shows that it is polluted with a Water Quality Index (WQI) of 31.0-51.0. The small scale industries that are contributing pollution to Sg. Hiliran Hiliran are keropok (fish snack) industry and traditional batik (satin printing) industry, although the biggest contributor to the pollution level is the wet market at Chabang Tiga. These three mentioned industries are the major point sources in carrying out the study of possible remediation methods for Sg. Hiliran.

Figure 1. Catchment area of Sg. Hiliran

MAJOR POINT SOURCES & POSSIBLE REMEDIATION METHODS FOR SG. HILIRAN

WET MARKET AT CHABANG TIGA

- Wet market effluent is generally high in organics, nutrients and suspended solids.
- A treatment plant using the EnviroOrgo® process is proposed, with simplified schematic as shown in Figure 2 below.
- EnviroOrgo® process biologically treats effluents from wet market that is very high in organics, thus turning wet markets into attractive, ecofriendly sites, while preventing river water pollution.
- This process employs proprietary EMM6 multimedias for adsorption and biofilm attachment, and conditions favoring biodegradation of organics and removal of nutrients from wet market effluents.

Figure 2. Schematic of wet market effluent biotreatment

KEROPOK INDUSTRY

- Keropok industry utilizes simple organic resources – fish and flour, the main components of keropok which generate highly organic waste water as a byproduct of the cleaning and processing activities.
- Figure 3 below shows the proposed fish products industry effluent treatment plant using the EnviroOrgo®.
- EnviroOrgo® process biologically treats effluents from keropok making that is very high in organics, thus turning keropok making cottage plants into ecofriendly cottage industries.
- This process employs the same as mentioned in wet market which also enables recovery of water for non-potable reuse, while not relying on chemicals for treatment resulting to lower cost and zero hazard wastes.

Figure 3. Schematic of keropok industry effluent biotreatment

BATIK INDUSTRY

- Batik processing requires wax and azo-dyes which are released in the effluent and pollute receiving waterways.
- The proposed treatment process shown in Figure 4
- EnviroTex® process biologically treats and decolorizes batik effluents thus turning batik plants into ecofriendly industries.
- The process enables recovery of silicate and water for reuse, while not relying on chemicals for treatment.
- The process employs proprietary EMM6 multimedias for adsorption and biofilm attachment, and conditions favouring biodegradation of dyes and other organics found in batik effluents.

Figure 4. Schematic of batik industry effluent biotreatment

Remediation of Pollution from Large Point Sources for Hiliran River, 1S1R, Kuala Terengganu, Terengganu (ongoing)

EnviroTex® process for batik effluent

NOTE: Rinsing tanks have screens for wax removal

EnviroTex® process biologically treats and decolorizes batik effluents thus turning batik plants into ecofriendly industries. The process enables recovery of silicate and water for reuse, while not relying on chemicals for treatment, thus lowering treatment operational costs through minimum chemical usage (only for silicate recovery as well as pH correction) and zero hazardous waste. The process employs proprietary EMM6 multimedias for adsorption and biofilm attachment, and conditions favouring biodegradation of dyes and other organics found in batik effluents.

Expected Outputs
The expected outputs of this study are as follows :

- A tested treatment design for wastewater from a medium size wet market
- A tested treatment design for effluent from a small keropok factory .
- A tested treatment design for azo-dye removal and silicate recovery from a small batek factory

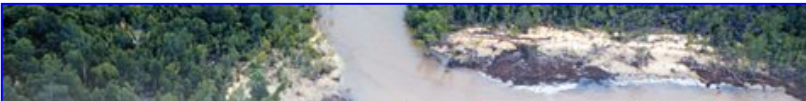
All the above, as stated, have potential for replication to treatment of similar sites all over the country.

Page 18

This page was created using **BCL ALLPDF Converter** trial software.
To purchase, go to <http://store.bcletechnologies.com/productcart/pc/instPrd.asp?idproduct=1>

7) Upscaling Of MSMA Eco-Hydrology At Catchment Level (Langat River) (under UNESCO-SWITCH-in-Asia: UWM and UNESCO-HELP Basin – negotiation stage with LESTARI, National University of Malaysia. Program for 2012:

- Memorandum of Agreement between HTCKL and Lestari, UKM.
- Design of MSMA Eco-Hydrology and Landscaping design
- Design of Community Centre
- Watershed Sustainability Index (WSI) development.
- Web base model for urban sustainability index.



Hydrology for the Environment, Life and Policy





Langat HELP River Basin, Malaysia:
UNESCO-IHP Evolving River Basin

To deliver social, economic and environmental benefit to stakeholders through sustainable and appropriate use of water by directing hydrological science towards improved integrated catchment management basins

Group E: *Evolving*HELP basin – This is a basin which is not yet fully operational.

Group O: *Operational*HELP Basin – This is an established basin which may become a World Demonstration Basin in due course.

Establishing collaboration between HTCKL & Institute for Environment and Development (LESTARI) Universiti Kebangsaan Malaysia
43600, UKM BANGI, Selangor, Malaysia

Project Scope and Area



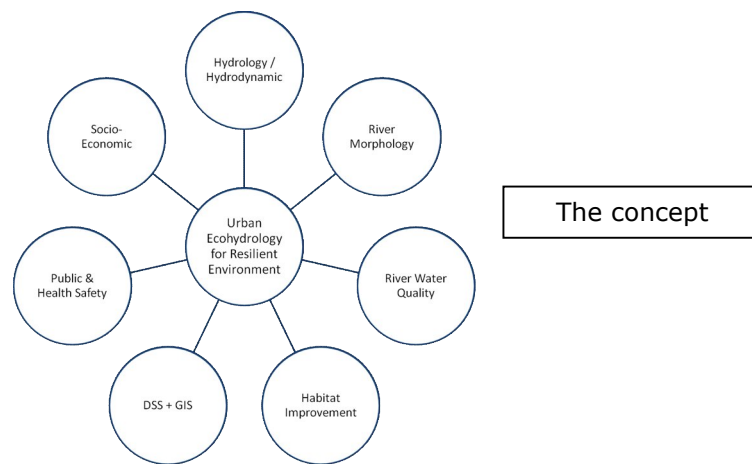
This page was created using **BCL ALLPDF Converter** trial software.

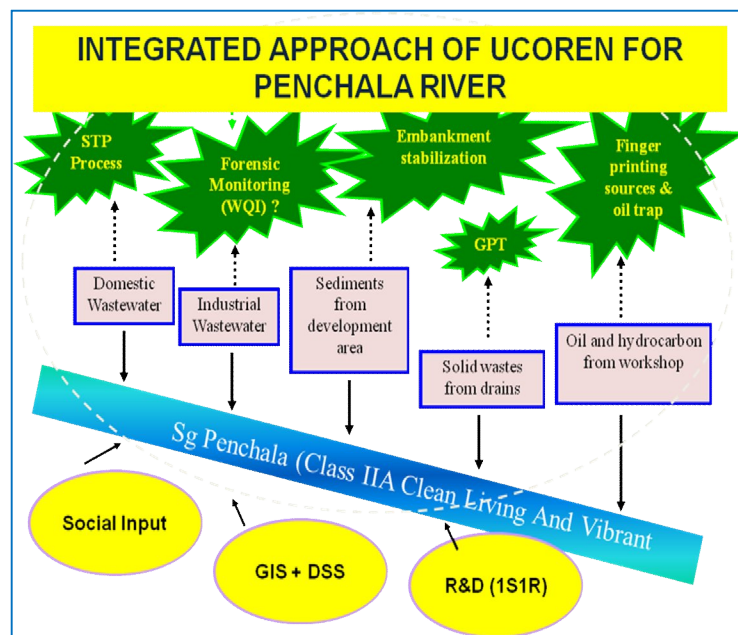
To purchase, go to <http://store.bcstechnologies.com/productcart/pc/instPrd.asp?idproduct=1>

- 8) Construction of a Large Scale Solar Still System for Treatment of Sanitary Wastewater at Perhentian Island – at planning stage



- 9) Urban Eco-Hydrology for Resilient Environment (UCOREN) – Working Group 2: Component Eco-Hydrology – ongoing since mid-2011.





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 and innovation products.

2.3 Training activities that directly contributed to the IHP-VII and WWAP objectives:

- Participate in Malaysia World Water Day 2011, Pahang, Malaysia, 12 March 2011.
- Organised Best Thesis Award (PhD; Masters; Undergraduate) in Hydrology and Water Resources for Malaysia's Universities and Higher Learning Institution in conjunction with Malaysia World Water Day 2011
- Conducted Seminar on Integrated & Multidisciplinary Research on Flood Hazard Assessment in Johor, Permaisuri Hotel MITC Melaka, 4-6 July 2011.
- Organised Best Thesis Award (PhD; Masters; Undergraduate) in Hydrology and Water Resources for Malaysia's Universities and Higher Learning Institution in conjunction with Malaysia World Water Day 2012
- Participation in Malaysia World Water Day 2012, Perak, Malaysia, 24 March 2012.
- Conducted Workshop on Water Quality Analysis, Terengganu, Malaysia, 14 – 15 May 2012

3. Collaboration and linkages

3.1 Participation in major international networks, programmes, partnerships with other UN or other International Agencies, media and professional bodies.

- SWITCH-in-ASIA Urban Water Management
- Networking/ Partnerships
 - UNESCO
 - ICHARM-Japan
 - RCUWM-Tehran
 - UNESCO Jakarta Office
 - UNESCO Water Centers
 - Partner of the GWP

This page was created using **BCL ALLPDF Converter** trial software.

To purchase, go to <http://store.bcltechnologies.com/productcart/pc/instPrd.asp?idproduct=1>

- International Water Association (IWA)
- Trainings
 - International Conference on Hydrology and Disaster Management (H&DM 2009), Wuhan, China, 2 – 3 November 2009.
 - Seminar on Integrated & Multidisciplinary Research on Flood Hazard Assessment in Johor.
 - International Atomic Energy Agency Workshop on Regulatory Requirements for Site Selection and Evaluation for Nuclear Power Plants, 6th – 12th June 2010 held in Hanoi, Vietnam.
 - 10th UNESCO/IAHS Kovacs Colloquium on Hydrocomplexity: New Tools for Solving Wicked Water Problems; Paris, France; 02nd – 3rd July 2010.
 - Seminar on Environmental Awareness and Action Plans for a Better World, Kuala Lumpur, Malaysia; 27th – 28th July 2010.
 - 12th International Conference on Wetland System for Water Pollution Control, Venice, Italy, 03rd – 10th October 2010.
 - 6th Ministerial Conference on Environment and Development in Asia and the Pacific, Astana, Kazakhstan, 27th – 02nd October 2010.
 - The 5th APHW on Hydrological Regime and Water Resources Management in the Context of Climate Change, Hanoi, Vietnam, 08th – 9th November 2010.
 - 22nd Pacific Science Congress : Asia Pacific Science in the 21st Century : Meeting the Challenges of Global Change; 14th – 17th June 2011 held in Kuala Lumpur Convention Center, Kuala Lumpur, Malaysia.
 - Water Loss Asia 2010: Managing Water Losses the Asian Way; 13th – 15th October 2010 held in Royale Chulan Hotel, Kuala Lumpur, Malaysia.
 - 1st World Congress And Exhibition Infrastructure Asset Management; 22th – 24th February 2011 held in Putra World Trade Centre, Kuala Lumpur, Malaysia
 - World Water Day Colloquium, Vistana Hotel, Kuantan, Malaysia, 11 March 2011,
 - Harnessing Development to Protect the Environment, ISIS, Kuala Lumpur, Malaysia, 1 April 2011
 - The IHP Symposium on Extreme Events: Meteorological, Hydrological and Tsunami Disasters – Social Adaptation and Future, 24th – 25th October 2011, Kyoto, Japan.
 - National Seminar on Biodiversity: Wetland and Its Management in the Context of Implementing Agencies, 21st December 2011, Hotel Pullman, Putrajaya.

3.2 Participation in meetings related to the IHP and UNESCO (e.g., the UNESCO General Conference, the UNESCO Executive Board, the IHP Intergovernmental Council and/or other meetings organized by IHP)

- International/ Regional
 - 17th IHP Regional Steering Committee Meeting for Southeast Asia and Pacific, 5-6 November 2009, Wuhan, China.
 - 19th Session of the Intergovernmental Council, 5-9 July 2010, Paris.
 - 18th IHP Regional Steering Committee Meeting for Southeast Asia and Pacific, 11-12 November 2010, Hanoi, Vietnam.
 - 18th IHP Regional Steering Committee Meeting for Southeast Asia and Pacific, 11-12 November 2010, Hanoi, Vietnam
- National
 - Malaysia National Committee for International Hydrological Programme Meeting (MIHP).
 - Preparation of Strategic Plan and the Way Forward for Exco UNESCO-IHP Malaysia, Hydro Hotel, Penang, 5 – 7 June 2011.

This page was created using **BCL ALLPDF Converter** trial software.

To purchase, go to <http://store.bcltechnologies.com/productcart/pc/instPrd.asp?idproduct=1>

- Dialog UNESCO-IHP Phase VIII, Permaisuri Hotel, Port Dickson, Negeri Sembilan, Malaysia, 12 – 13 May 2011

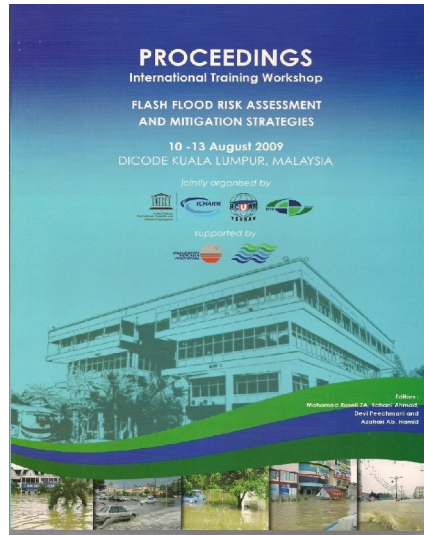
3.3 Collaboration and networking with other UNESCO category 1 or 2 institutes/ centres

3.3.1 cross-appointment of directors of the category 1 or 2 institutes or centres on the governing board

-

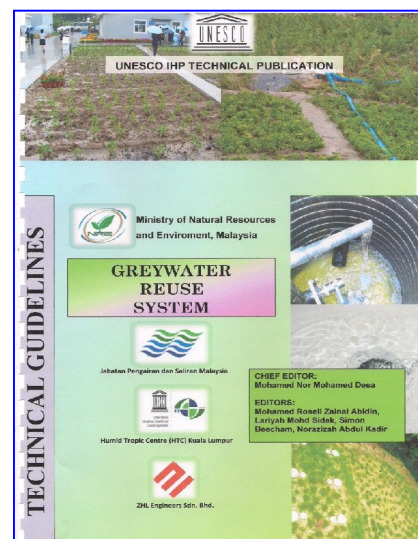
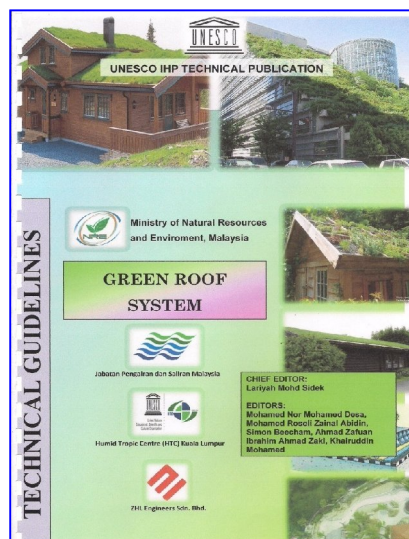
3.3.2 exchange of information on activities such as training/educational materials, and funding opportunities

- Proceedings
 - Proceeding of International Training Workshop On Flash Flood Risk Assessment And Mitigation Strategies, 10 – 13 August 2009, DICODE Kuala Lumpur, Malaysia.



- Proceeding of Integrated & Multidisciplinary Research on Flood Hazard Assessment in Johor, 4-6 July 2011, Permaisuri Hotel MITC Melaka, (in progress).

- Publications/ Reports
 - UNESCO IHP Technical Publication : Greywater Reuse System (*in progress*)
 - UNESCO IHP Technical Publication : Green Roof System (*in progress*)



This page was created using **BCL ALLPDF Converter** trial software.

To purchase, go to <http://store.bcstechnologies.com/productcart/pc/instPrd.asp?idproduct=1>

3.3.3 exchange of staff, most notably professionals and students

-

3.3.4 implementation of joint activities, such as workshops, conferences, training programmes, joint projects, field visits, software and data sharing, knowledge exchange and publications

- Data Archive
 - Asia Pacific FRIEND - Asian Pacific Water Archive
 - Central Node : HTC KL
 - (<http://htckl.org.my/apfriend/wa/index.shtml>)

Currently not accessible since undergoing reconstruction and updating (to be completed by December 2012)

3.4 Relationships with the UNESCO field office whose jurisdiction covers the country of location

- Good relationship with UNESCO Jakarta Office

3.5 Relationship with the UNESCO National Commission and the IHP National Committee in the country of location

- Good relationship with:
 - Malaysian National Commission for UNESCO
 - Malaysia National Committee for International Hydrological Programme (MIHP)

3.6 Relationship with other UNESCO-related networks, such as UNESCO Clubs, ASPnet, and UNESCO chairs

- Malaysian National Commission of UNESCO

4. Communication

4.1 Communication and knowledge dissemination activities undertaken in the framework of IHP

Through cross-cutting programmes:

- 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)
- UNESCO-HELP (Hydrology for the Environment, Life and Policy) River Basin

Through giving lectures such as Integrated Water Resources Management and Integrated Flood Management.

Through conducted seminars and workshops.

Through proceedings and technical guidelines publications.

Through meetings on conducted research.

This page was created using **BCL ALLPDF Converter** trial software.

To purchase, go to <http://store.bcltechnologies.com/productcart/pc/instPrd.asp?idproduct=1>

- 4.2 Policy documents and advice
- Conducted discussions on the Strategic Planning IHP Phase VIII

5. Update on Centre Operations

- 5.1 Membership of the Board of Governors during designated period
- IHP National Committee Chairman of Southeast Asia and Pacific
 - Co-ordination Committee

5.2 Key decisions made (attach minutes of meetings)

-

6. Assessment of the Centre's Impacts

6.1 Science Impacts (Major contributions to the science, technology, education, and regional and/or international cooperation in the field of water)

- MSMA Stormwater Management Eco-hydrology (MSMA SME)
 - Porous and Permeable Pavement System
 - Greywater Reuse System
 - Constructed Wetland System
 - Rain Water Harvesting System
 - Green Roof System
 - Bioretention System

6.2 Knowledge Transfer Impacts (Major achievements in the dissemination of knowledge and technology transfer)

- Many lecturers and university students come to HTCKL to see and gain knowledge through our integrated stormwater management ecohydrology project.
- Currently networking and collaboration on Eco-Friendly Erosion and Sediment Control System (Eco-ESC) a software for stormwater management. Won gold medal during the ITEX'12 held at Kuala Lumpur Convention Centre from 17 to 20th Mei 2012.

The infographic is titled "ECO-FRIENDLY EROSION AND SEDIMENT CONTROL SYSTEM (ECO-ESC)". It features a header with logos for ITEX 12, HTCKL, and CSFE. The main content is organized into several sections:

- DESCRIPTION:** Explains that construction activities typically disturb earth's covering and guiding planes, leading to erosion and sedimentation. It notes that the system was developed for minimizing erosion and sedimentation in Malaysia.
- BENEFITS:** Lists benefits such as providing a design tool for site-specific erosion control, reducing the need for expensive and bulky structures, and providing a user-friendly interface for site-specific erosion control.
- COMMERCIALIZATION:** Mentions that the system is user-friendly and can be used by engineers, contractors, and site owners.
- NOVELTY:** Highlights that the system is the first of its kind in Malaysia, designed for site-specific erosion control, and provides a user-friendly interface for site-specific erosion control.
- RESEARCHERS:** A row of 12 small portraits of the research team members.

The infographic also includes images of construction sites, a flowchart showing the "Impact of Construction to Polluted Water Bodies", and a diagram of the "ECO-ESC CD" (Compact Disc) and "LUMP MANUAL" (User Manual).

- 6.3 Policy Impacts (advice sought by government and other bodies and evidence of inputs into policy arena)

7. Future activities that will contribute directly to IHP and/or to WWAP

7.1 Operational Plan (2010-2011) (attach if available)

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 centres for exchange of scientific and technical information on research results; organizing training courses, seminars, workshops and meetings for knowledge and technology transfer; and producing related hydrological and water resources publications and media for distributions.

Functions of each units in HTCKL (Annex I)

7.2 Strategic Plan linked with IHP-VII (attach strategic plan if available)

- HTCKL Focus Area on R&D based on UNESCO IHP VII Themes (2008 – 2013) (Annex II)

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.

This year (2012) HTCKL become the host for the Regional Steering Committee (RSC) meeting for South-East Asia and the Pacific. The event will also include International Conference on Water Resources (ICWR2012) and technical visit. One of the visit sites will be to the UNESCO Geopark. All these events will be held in Langkawi, Malaysia from 5th to 9th November 2012



This page was created using **BCL ALLPDF Converter** trial software.

To purchase, go to <http://store.bcstechnologies.com/productcart/pc/instPrd.asp?idproduct=1>

8. Annexes

- 8.1 List of publications released by the centre (there can be overlap with those listed in 2.2 above)

Publications:

- HTCKL 10-year Report (1999 – 2009)
- Proceeding of International Training Workshop On Flash Flood Risk Assessment And Mitigation Strategies.

Publications in the pipeline:

- Journal of Water Resources Management.
- Proceeding of Integrated & Multidisciplinary Research on Flood Hazard Assessment in Johor.
- Technical Publication : Greywater Reuse System
- Technical Publication : Green Roof System (*in progress*)

- 8.2 List of training courses conducted (there can be overlap with those listed in 2.3 above)

- Seminar on Multidisciplinary and Integrated Research on Flood Hazard Assessment in Johor, Melaka, 4-6 July 2011.
- Participation in Malaysia World Water Day 2011, Pahang, Malaysia, 12 March 2011.
- Organised Best Thesis Award For Malaysia's Universities and Higher Learning Institution For Malaysia World Water Day 2011
- Seminar on Integrated & Multidisciplinary Research on Flood Hazard Assessment in Johor, Melaka, 4-6 July 2011.
- Organised Best Thesis Award For Malaysia's Universities and Higher Learning Institution For Malaysia World Water Day 2012
- Participation in Malaysia World Water Day 2012, Perak, Malaysia, 24 March 2012.
- Conducted Workshop on Water Quality Analysis, Terengganu, Malaysia, 14 – 15 May 2012

FUNCTION CHART OF THE REGIONAL HUMID TROPICS HYDROLOGY AND WATER RESOURCES CENTRE FOR SOUTHEAST ASIA AND THE PACIFIC (HTC KUALA LUMPUR)

DIRECTOR

DEPUTY DIRECTOR		HEAD OF ASSISTANT DIRECTOR	
IMPLEMENTATION ANF COORDINATION SECTION		ADMINISTRATION UNIT	INFORMATION AND COMMUNICATION SECTION
R & D IMPLEMENTATION UNIT	COORDINATION UNIT		
<ol style="list-style-type: none"> To develop a mechanism on research cooperation between UNESCO Water Centres Category II and water family including to identify 'areas of common interest and synergy' including preparing matric capacity. (preparing the document for evaluation of HTCKL for the continuation of MoA). To execute collaboration research in multi disciplinary with research experts from local and UNESCO Water Centres Category II for UNESCO IHP Programme. To lead research projects under the Malaysian IHP headed by experts from department and academician – collaborate with universities and 	<ol style="list-style-type: none"> To develop a matrix which compromise of HTC Kuala Lumpur's strength and other UNESCO Water Centres with expertise sharing. Collaboration of expertise among other UNESCO Water Centres to execute project 'SWITCH Asia: An Integrated and Innovative Programme Towards Sustainable Water Management in Asia' City of Future' organised by UNESCO IHE (deliver the knowledge to DID's business sector) To work together with other UNESCO Water Centres expertise in execution of project "Regional Consultation on Water Education and Training in Asia - Development of a 	<ol style="list-style-type: none"> To manage and implement the administration of the office. Staff management. To assist in preparation of annual budget. Management of funds. To assist in meetings coordination between division and other agencies. 	<ol style="list-style-type: none"> To promote the image of HTCKL as the Regional Humid Tropics Hydrology and Water Resources Centre for Southeast Asia and the Pacific. To develop strategic communication through the join website and publications for knowledge transfer and exchange of expertise among UNESCO Water Family and to promote the corporate image of UNESCO's water family. To identify other experts in hydrology and water resources areas for development of wide network global, regional and local cooperation. To develop expert networking among

DEPUTY DIRECTOR		HEAD OF ASSISTANT DIRECTOR
IMPLEMENTATION ANF COORDINATION SECTION		ADMINISTRATION UNIT
R & D IMPLEMENTATION UNIT	COORDINATION UNIT	INFORMATION AND COMMUNICATION SECTION
<p>NAHRIM.</p> <p>4. To extend technical expert advice for research programme of HTCKL which is executed from development funds.</p> <p>5. To identify latest technology in the field of hydrology and water resources.</p> <p>6. To promote output of the research through presentation of papers and publication of journal globally, regional and local-</p> <p style="margin-left: 20px;">a. Outline WSUD</p> <p style="margin-left: 20px;">b. Operational manual and maintenance of WSUD</p> <p>7. To prepare research papers and identify products those are suitable for commercialization and prepare the action plan.</p> <p>8. Monitoring the strategic plan for water centres under the auspices of UNESCO.</p> <p>9. To implement human capitalization in the field of Water Education as to strengthen development for Southeast</p>	<p>Strategic Framework (Education)".</p> <p>4. To join together with other UNESCO Water Centres expertise in execution of project "Compilation of Major Flood events in the region (outreach)".</p> <p>5. To draft an expert program on capacity building with academic expert of institute of higher learning globally, regional and local in the field of hydrology and water resources.</p> <p>6. To evaluate programmes executed as meets the expectation of UNESCO IHP.</p> <p>7. To prepare strategic plan and action for UNESCO Water Centres staff exchange.</p> <p>8. To prepare 10 Year Report of HTCKL which comprising of R&D, networking output, training, workshop and publication of technical papers and journal.</p> <p>9. To prepare documents for evaluation of HTCKL according to TOR by</p>	<p>research agencies in the field of hydrology and water resources locally, regionally and globally.</p> <p>5. To legislate strategies for strengthening the network cooperation between UNESCO water family and local experts in the field of hydrology and water resources.</p> <p>6. Analyze and validate AP FRIEND's Data Archive system from time to time as the sharing of 'River Catalogue' information is effective and to meet its needs of customers globally, regional and local (disseminating knowledge to Business Sector JPS).</p> <p>7. To execute AP FRIEND project phase II.</p> <p>8. Develop, revise and improve the database system as the technical information on hydrology and water resources and ensure the accessibility and satisfy the needs of the customer (promotes information on R&D, guidelines and other technical information through the website).</p>

DEPUTY DIRECTOR		HEAD OF ASSISTANT DIRECTOR
IMPLEMENTATION ANF COORDINATION SECTION		ADMINISTRATION UNIT
R & D IMPLEMENTATION UNIT	COORDINATION UNIT	INFORMATION AND COMMUNICATION SECTION
<p>Asia and the Pacific including Malaysia.</p> <p>10. To monitor development program in the field of R&D – construction of components of Water Sensitive Urban Drainage (WSUD) in the compound of HTCKL. (development budget RM1.4million 2010)</p> <p>11. To prepare R&D report and also guidelines on design of WSUD.</p>	<p>UNESCO.</p> <p>10. To prepare Policy and Guidelines on:- a. UNESCO Reference document b. Strategic Framework of HTC</p> <p>11. Preparing suggested transformation paperwork of HTCKL.</p> <p>12. To supervise HTCKL building and monitor training program for HTCKL staff.</p> <p>13. Coordinate in the organization of workshop, seminar and symposium in national and international category.</p>	<p>9. Study on impact of R&D of water resources – listing and monitoring the KPIs and achievement of DID R&D on 9th MP (to study the effectiveness of the research program which is undertaken and met the satisfaction of the customers and stakeholders).</p> <p>10. DID Strategic Plan – Champion of Focus Area 5 – Centre of Excellence for Hydrology, River Management, Coastal Management and Urban Drainage.</p> <p>11. To implement and monitoring the Management Quality System of MS ISO 9001:2008.</p> <p>12. To manage library and technical document database, publications, proceedings and research papers.</p>

			HEAD OF ASSISTANT DIRECTOR
IMPLEMENTATION ANF COORDINATION SECTION		ADMINISTRATION UNIT	INFORMATION AND COMMUNICATION SECTION
R & D IMPLEMENTATION UNIT	COORDINATION UNIT		
<p>12. To develop a mechanism on research cooperation between UNESCO Water Centres Category II and water family including to identify ‘areas of common interest and synergy’ including preparing matric capacity. (preparing the document for evaluation of HTCKL for the continuation of MoA).</p> <p>13. To execute collaboration research in multi disciplinary with research experts from local and UNESCO Water Centres Category II for UNESCO IHP Programme.</p> <p>14. To lead research projects under the Malaysian IHP headed by experts from department and academician – collaborate with universities and NAHRIM.</p> <p>15. To extend technical expert advice for research programme of HTCKL which is executed from development funds.</p> <p>16. To identify latest technology in the</p>	<p>14. To develop a matrix which compromise of HTC Kuala Lumpur’s strength and other UNESCO Water Centres with expertise sharing.</p> <p>15. Collaboration of expertise among other UNESCO Water Centres to execute project ‘SWITCH Asia: An Integrated and Innovative Programme Towards Sustainable Water Management in Asia’ City of Future’ organised by UNESCO IHE (deliver the knowledge to DID’s business sector)</p> <p>16. To work together with other UNESCO Water Centres expertise in execution of project “Regional Consultation on Water Education and Training in Asia - Development of a Strategic Framework (Education)”.</p> <p>17. To join together with other UNESCO Water Centres expertise in execution of project “Compilation of Major Flood events in the region (outreach)”.</p> <p>18. To draft an expert program on capacity building with academic</p>	<p>6. To manage and implement the administration of the office.</p> <p>7. Staff management.</p> <p>8. To assist in preparation of annual budget.</p> <p>9. Management of funds.</p> <p>10. To assist in meetings coordination between division and other agencies.</p>	<p>13. To promote the image of HTCKL as the Regional Humid Tropics Hydrology and Water Resources Centre for Southeast Asia and the Pacific.</p> <p>14. To develop strategic communication through the join website and publications for knowledge transfer and exchange of expertise among UNESCO Water Family and to promote the corporate image of UNESCO’s water family.</p> <p>15. To identify other experts in hydrology and water resources areas for development of wide network global, regional and local cooperation.</p> <p>16. To develop expert networking among research agencies in the field of hydrology and water resources locally, regionally and globally.</p> <p>17. To legislate strategies for strengthening the network cooperation between UNESCO water family and local experts in the field of hydrology and water resources.</p>

		ADMINISTRATION UNIT	HEAD OF ASSISTANT DIRECTOR
IMPLEMENTATION ANF COORDINATION SECTION			INFORMATION AND COMMUNICATION SECTION
R & D IMPLEMENTATION UNIT	COORDINATION UNIT		
<p>field of hydrology and water resources.</p> <p>17. To promote output of the research through presentation of papers and publication of journal globally, regional and local-</p> <ol style="list-style-type: none"> a. Outline WSUD b. Operational manual and maintenance of WSUD <p>18. To prepare research papers and identify products those are suitable for commercialization and prepare the action plan.</p> <p>19. Monitoring the strategic plan for water centres under the auspices of UNESCO.</p> <p>20. To implement human capitalization in the field of Water Education as to strengthen development for Southeast Asia and the Pacific including Malaysia.</p> <p>21. To monitor development program in the field of R&D – construction of components of Water Sensitive Urban Drainage (WSUD) in the compound of HTCKL. (development budget</p>	<p>expert of institute of higher learning globally, regional and local in the field of hydrology and water resources.</p> <p>19. To evaluate programmes executed as meets the expectation of UNESCO IHP.</p> <p>20. To prepare strategic plan and action for UNESCO Water Centres staff exchange.</p> <p>21. To prepare 10 Year Report of HTCKL which comprising of R&D, networking output, training, workshop and publication of technical papers and journal.</p> <p>22. To prepare documents for evaluation of HTCKL according to TOR by UNESCO.</p> <p>23. To prepare Policy and Guidelines on:-</p> <ol style="list-style-type: none"> a. UNESCO Reference document b. Strategic Framework of HTC <p>24. Preparing suggested transformation paperwork of HTCKL.</p>		<p>18. Analyze and validate AP FRIEND’s Data Archive system from time to time as the sharing of ‘River Catalogue’ information is effective and to meet its needs of customers globally, regional and local (disseminating knowledge to Business Sector JPS).</p> <p>19. To execute AP FRIEND project phase II.</p> <p>20. Develop, revise and improve the database system as the technical information on hydrology and water resources and ensure the accessibility and satisfy the needs of the customer (promotes information on R&D, guidelines and other technical information through the website).</p> <p>21. Study on impact of R&D of water resources – listing and monitoring the KPIs and achievement of DID R&D on 9th MP (to study the effectiveness of the research program which is undertaken and met the satisfaction of the customers and stakeholders).</p> <p>22. DID Strategic Plan – Champion of Focus Area 5 – Centre of Excellence</p>

			HEAD OF ASSISTANT DIRECTOR
IMPLEMENTATION ANF COORDINATION SECTION		ADMINISTRATION UNIT	INFORMATION AND COMMUNICATION SECTION
R & D IMPLEMENTATION UNIT	COORDINATION UNIT		
RM1.4million 2010) 22. To prepare R&D report and also guidelines on design of WSUD.	25. To supervise HTCKL building and monitor training program for HTCKL staff. 26. Coordinate in the organization of workshop, seminar and symposium in national and international category.		for Hydrology, River Management, Coastal Management and Urban Drainage. 23. To implement and monitoring the Management Quality System of MS ISO 9001:2008. 24. To manage library and technical document database, publications, proceedings and research papers.

This page was created using **BCL ALLPDF Converter** trial software.
 To purchase, go to <http://store.bcstechnologies.com/productcart/pc/instPrd.asp?idproduct=1>

EXAMPLES OF HTCKL FOCUS ON R&D UNDER UNESCO-IHP-VII THEMES (2008 – 2013)

A Global Perspective on Research and Development

‘Developing scientific skills and infrastructure is the first step towards improving a country's ability to use science and technology to promote sustainable development’ - UNESCO Institute for Statistics Fact Sheet, October 2007

- **Knowledge** Comes From Basic Research
- **Technology** is the Output of Applied R&D

Water Related Issues in Malaysia

Ranking	Water-Related Issues
1	River Water Quality
2	Catchment/Landuse Management
3	Flooding
4	Potable Water Supply
5	Institutional Arrangement
6	Segmented Management
7	River Corridor Management
8	Wetlands Management
9	Water Borne Diseases
10	Biodiversity
11	Drought
12	Environmental Flow

THEMES AND FOCAL AREA

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

- Flood mapping due to hydrological hazards (river flood from large watershed, dam failure (water release from dam), high sea water level, rainfall on site, wind wave on sea, wind wave on river and channel, swelling, seiche, ground water rising (the drainage system).
- Urban hydrology (due to urbanization)
- Estimating streamflow at ungauged site

Theme 2: Strengthening water governance for sustainability

- Delivery system through IHP programme
- Application of ICT in water resources management
- Water Resources - land use and water allocation policies
- Water Resources - legal and institutional arrangement
- Water Resources - local watershed, basin scale and beyond

This page was created using **BCL ALLPDF Converter** trial software.

To purchase, go to <http://store.bcltechnologies.com/productcart/pc/instPrd.asp?idproduct=1>

- Water Resources - Integrated Water Resources Management

Theme 3: Ecohydrology for sustainability

- IRBM (legislation, planning, preventive, curative, river basin authority, enforcement, finance, public participation) – river rehabilitation and conservation using ecohydrology technique.
- Limnology and wetland ecosystem
- Improving river biodiversity/ecosystem

Theme 4: Water and life support system

- Bringing nature back to rivers
- Enhancing the Management of Water Resources Towards Sustainable Environment: Managing Environment Flow
- Sustainable urban storm water management (e.g. MSMA-USWM-Ecohydrology, rainwater harvesting, greywater treatment system, greenroof system, porous system, bioretention system, wetland system)
- Water Resources - water availability and use
- Water Quality - water quality impacts on human socio-economics activities
- Water Quality - environmental stress
- Water Quality - impact on river aquatic ecosystem
- Water Quality - possible remedial actions
- Rainfall-Runoff flood estimation
- Flood modeling techniques guideline (hydrology and hydraulics)
- Integrated Flood Management-Making space for water

Theme 5: Water education for sustainable development

- Capacity building (training workshop)
- Manage and restore water conflicts

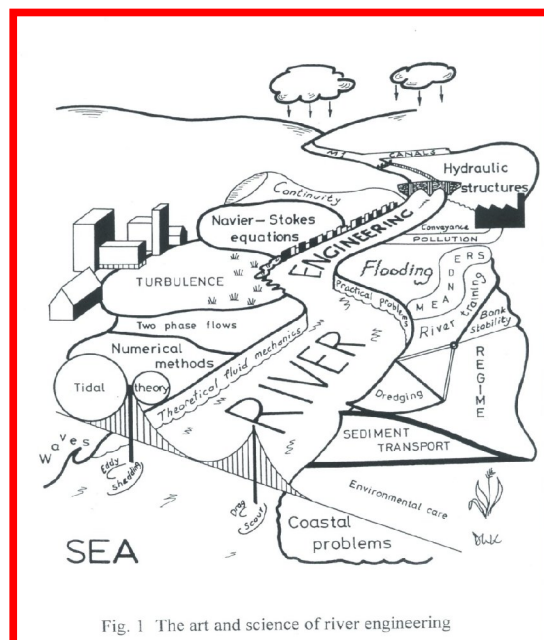


Fig. 1 The art and science of river engineering

This page was created using **BCL ALLPDF Converter** trial software.

To purchase, go to <http://store.bcltechnologies.com/productcart/pc/instPrd.asp?idproduct=1>

EXAMPLES OF R&D IN THE FIELD OF WATER RESOURCES

R&D Proposals

- Not only to concentrate on the requirement of additional water resources but also to improve the efficiency and saving on the usage of water resources (such as water demand management)
- Can be categorized as follows:
 - R&D in the field of water resources hydrology and hydraulics
 - R&D related to river basin management (upstream, middle reach, estuary)
 - R&D based on certain disciplines
 - R&D through development of intellectual property innovation products

R&D in the Field Of Water Resources Hydraulics

- Hydraulics In Industry
- Hydraulics and Hydrology in Agriculture
- Eco-hydraulics in Environment
- Urban Hydraulics and Hydrology

Examples: Eco-hydraulics in Environment

- Best Management Practices (BMP) for the problem areas
- Treatment technologies for products or processes
- River basin approach : effluent and water quality impacts on ecosystems
- Formulating standards and indices and review of current requirements
- Water quality enhancement in natural water bodies, methods to design and develop mitigating measures such as silt control, sediment inflow and minimum base flow determination
- Model development, in linking hydraulic and ecological processes

Examples: Urban Hydraulics and Hydrology

- Reliable methods of urban runoff estimation
- Effective erosion control in construction sites
- Design methodology for storm water detention facilities especially in control structures
- Characterization of sediment in storm water runoff
- Design of Gross Pollutant Trap

River - Upstream (*nature zone and nature use zone*)

- Water Resources Study –reservoir and dam
 - Balancing inflow, storage, water level in the dam, outflow and water level downstream of the dam for optimization of water supply requirement and lessen the effect of flood. Programme: eg. Optimization the operation of reservoir/dam
- Studies on river management – effect of deforestation, erosion and sedimentation.

- Involve in the catchment area (source of water meet with river tributary and form into river); effect on water resources, increase in peak discharge, river morphology; effect to 'young river' (waterfall, rapid, underground river)
- Effect of landuse change to river regime.
 - Forest to agriculture; open up of highland for agriculture, urbanization, commercial, industries, housing; reservoir.

River - Middle reach (*nature use zone and development zone*)

- Control of river banks erosion and sedimentation of river bed.
- Flood and pollution control.
 - Modelling of flood risk and water quality.
- Environmental flow requirement – river water quality guranteed – conservation of ecosystem / biodiversity .
- Development of river hydrodynamic information system.
- Effect of unregulated development on river regime– suggestion in solving the problem
 - Effect of land development.
- The need for river system to function as conveyance and storage - control at source strategy.
 - Understanding the function of river in its natural state to solve flooding problems
- Flood simulation and mapping.
- Urban area water resources management.
- Urban stormwater management.
- The use of wetland as retention pond dan facilities to reduce water quantity for flood attenuation.
- Rainwater harvesting techniques – reducing the dependant on freshwater supply.

River estuary (*development zone*)

- Modelling of water quality fenomena – point source and non point source
- Instrumentation for laboratories and testing facilities.
- Automate and software development.
- Sedimentation at river mouth – the need for breakwater and dredging.

Format for Reports by UNESCO's Water-related Centres on activities related to the IHP in the period June 2010 – May 2012

1. Basic information on the centre

Name of the Centre		International Centre for Water Hazard and Risk Management (ICHARM)
Name of Director		Prof. Kuniyoshi Takeuchi
Name and title of contact person (for cooperation)		Dr. Shigenobu Tanaka, Deputy Director
E-mail		s_tanaka@pwri.go.jp
Address		1-6 Minamihara, Tsukuba, Ibaraki, 305-8516, Japan
Website		http://www.icharm.pwri.go.jp/
Location of centre		city/town Tsukuba_____ country _Japan_____
Geographic orientation *		<input checked="" type="checkbox"/> global <input type="checkbox"/> regional
Year of establishment		
Themes	Focal Areas ♦	<input type="checkbox"/> groundwater <input type="checkbox"/> urban water <input type="checkbox"/> arid / semi-arid zones <input type="checkbox"/> humid tropics <input checked="" type="checkbox"/> droughts and floods <input checked="" type="checkbox"/> sediment transport and management <input checked="" type="checkbox"/> water and environment <input type="checkbox"/> ecohydrology <input type="checkbox"/> water law and policy <input type="checkbox"/> transboundary river basins/ aquifers <input type="checkbox"/> IWRM <input checked="" type="checkbox"/> global and climate change <input checked="" type="checkbox"/> mathematical modelling <input type="checkbox"/> social and cultural dimensions of water <input checked="" type="checkbox"/> water education <input type="checkbox"/> other: (please specify) _____
	Scope of Activities ♦	<input type="checkbox"/> vocational training <input checked="" type="checkbox"/> postgraduate education <input type="checkbox"/> continuing education <input checked="" type="checkbox"/> research <input checked="" type="checkbox"/> institutional capacity-building <input checked="" type="checkbox"/> advising/ consulting <input checked="" type="checkbox"/> software development <input type="checkbox"/> other: (please specify) _____
Support bodies ¹		Public Works Research Institute (PWRI) Ministry of Land, Infrastructure, Transport and Tourism (MLIT)
Hosting organization ²		PWRI
Sources of financial support ³		PWRI, ADB, JICA, UNESCO, MEXT (Ministry of Education, Culture, Sports, Science and Technology)
Existing networks and cooperation ⁴		
Governance		<input checked="" type="checkbox"/> director and governing board (ICHARM Advisory Board) <input type="checkbox"/> other: (please specify) _____

* 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

	<p>Link to election of board members to the IHP Intergovernmental Council (IGC) and hosting country IHP National Committee</p> <hr/> <p>Frequency of meetings: once every 2 year(s) <input checked="" type="checkbox"/> Existence of UNESCO presence at meetings</p>
Institutional affiliation of director	
Number of staff and types of staff	<p>total number of staff (full-time, or equivalent) : 44_(as of 25th April 2012) number of staff who are water experts: 32 (as of 25th April 2012) number of postgraduate students: 19 (Master Course) 4 (Doctor Course)_ (as of 25th April 2012)</p>
Annual turnover budget in USD	3.17 Mil USD (264 Mil. JPY for FY2012) in addition to this, external budget will be fixed later

2. Activities undertaken in the framework of IHP in the period June 2010 – May 2012

- 2.1** Educational activities (i.e., those with accreditation) that directly contributed to the IHP-VII (Appendix-1) and WWAP
Please include here those activities which led to accreditation of degrees, or those held in formal school settings.

Master's course Program "Water-related Disaster Management Course of Disaster Management Policy Program"

ICHARM has been conducting one-year Master's course since September 2007 in collaboration with the Japan International Cooperation Agency (JICA) and the National Graduate Institute for Policy Studies (GRIPS). The fifth batch of the course is now being conducted. The overall goal of this course is to develop the students' capacity to practically manage problems and issues concerning water-related disasters at the local level and to contribute to socio-economic and environmental improvements at the regional and national levels especially in developing countries.

The third batch was from 28 September 2009 to 18 September 2010. Twelve students (three from Indonesia, two from Bangladesh, one each from China, Ethiopia, Myanmar, Japan, the Philippines, Sri Lanka, and Thailand) finally fulfilled the graduating requirements and were awarded a master's degree in disaster management.

The fourth batch was from 28 September 2010 to 17 September 2011. Twelve students (three from Nepal, two from Bangladesh, two from China, one each from Indonesia, Columbia, Guatemala, Myanmar, Pakistan.) finally fulfilled the graduating requirements and were awarded a master's degree in disaster management.

The fifth batch began on 7 October 2011 and is scheduled to end on 15 September 2012. Nineteen students are participating from Bangladesh (2), China (2), Fiji (1), Indonesia (2), Nepal (2), Pakistan (6), the Philippines (1), Sri Lanka (1), Tunisia (1) and Vietnam (1).

Doctor Course Program, "Disaster Management,"

ICHARM has been jointly conducting a three-year doctoral course with GRIPS since October 2010. One student from Japan in the first batch and three students from Ethiopia, Nepal, and the Netherlands in the second batch have been enrolled in this program. The broad aim of the program is to nurture professionals who can train researchers and take the leadership in planning and implementation of national and international strategies and policies in the field of water-related risk management.

2.2 Research activities that directly contributed to the IHP-VII and activities by WWAP

Please include research/applied projects outputs such as publications that directly contributed to the IHP-VII and WWAP objectives

Please refer to Publications Listed under 8.1

a) Development and dissemination of flood forecasting system for poorly-gauged river basins with local ownership

ICHARM has been promoting the dissemination of the Integrated Flood Analysis System (IFAS) through various international conferences and JICA training courses. As a result, for example, IFAS has been adopted as a basic tool to implement a flood forecasting system in the Solo River Basin of Indonesia in an ADB RETA project. As IFAS becomes more widely known, ICHARM has been receiving a lot of feedbacks asking for more improvements of the system. Users request for additional functions to evaluate the effect of sea level rise under climate change, to evaluate flood risk considering the impact of land subsidence caused by groundwater overdraft, to evaluate long-term flow regimes and droughts. ICHARM will continue to improve the functions of IFAS and to conduct pilot projects to make it more competitive, persuasive, robust and well-tested.

Activities:

- 1) Incorporation (or improvement) of a hydrologic runoff analysis engine into IFAS for long-term runoff calculations.
- 2) Implementation of a hydraulic flood flow calculation system to cope with the tidal effect along coastal areas.
- 3) Development of a methodology to further improve the accuracy of global satellite-based rainfall data with/without ground-based data, and its validation for flood forecasting on a river basin scale.
- 4) Upgrading of IFAS with additional functions and libraries such as: auto downloading, importing, calculation and alert function, and implementation of 3-tank engine, modification of the method for GSMaP, application for Windows 7 & Vista and for 64bit OS PC users, and combined output interfaces with Google Earth. Such improvements ensure more consistent, more convenient setting-up and calibration of runoff forecast models in any river basins in various situations.
- 5) Assistance in the implementation of an IFAS-based early warning system for evacuation from flood and inundation in the Solo River Basin, Indonesia, in a pilot project using IFAS as the basis of implementing flood forecasting/warning systems in poorly-gauged basins in developing countries.
- 6) Promotion of the implementation of flood forecasting/warning systems by providing technical training activities designed to help developing countries develop the sense of ownership over the system.

b) Innovative Program of Climate Change Projection for the 21st Century (the Kakushin Program)

ICHARM participated for five years from 2007 to 2011 in the Innovative Program of Climate Change Projection for the 21st Century (the Kakushin Program), funded by the Ministry of Education, Culture, Sports, Science and Technology (MEXT). More specifically, ICHARM conducted research entitled "Assessment of the Impact of Climate Change on Flood Disaster Risk and its Reduction Measures over the Globe and Specific Vulnerable Areas."

In the research project assigned to ICHARM, we first developed a global-scale high-resolution flood analysis system, which maximizes the 20km mesh super-high-resolution climate projection provided by the Meteorological Research Institute of Japan (MRI-AGCM). We used this analysis system to assess changes in flood discharge due to global warming on a global scale for three different

periods of time: present (1980-2004), near-future (2015-2039) and end-of-21st century (2075-2099). We also developed a system for detailed flood risk assessment. Our plan was to use this assessment to study adaptation measures for prospective flood risk in flood-prone river basins of the Asia Monsoon region (Mekong delta and Nepal's West Rapti River basin).

The major cause of floods is extreme precipitation phenomena. It is commonly known, however, that compared with observations, precipitation projections always have some bias (difference between calculated and observed precipitations). MRI-AGCM also showed some bias in extreme precipitation and seasonal pattern when reproducing precipitation for the present period. To eliminate the bias, we developed a bias correction method named the hybrid-quantile method and tested it for validation. In this method, each order statistic is multiplied by a coefficient to match the distribution of simulated precipitation with that of observed precipitation. Extreme values are processed on a yearly basis and other values on a monthly basis. We applied this method to bias-correct precipitation projections for the near-future and end-of-21C periods, assuming no change in the coefficients used for the present projection. The results showed a global increase in the annual maximum daily precipitation during end-of-21C, and also projected a particularly large precipitation increment in some regions, for example, southern China, southeast and south Asia. However, we should always keep in mind that some level of uncertainty inevitably lies in the results in this research since they are only derived from projections based on MRI-AGCM.

c) **Activity Related to Thai Flood in 2011**

For the extreme Thai flooding in 2011, ICHARM conducted quick response-type simulations in mid-October 2011. We used a Rainfall-Runoff-Inundation model with satellite-based topographic and rainfall information to simulate river discharges and inundation over the entire Chao Phraya River basin. Inputting forecasted rainfall provided by the Japan Meteorological Agency, we tried to estimate how the inundation would expand and how long the flooding would continue. Although predictions varied depending on simulation settings, we estimated that the flooding in the Ayutthaya area might last even until the end of November. We regularly updated the simulation and released the results on our webpage.

In addition, we conducted field investigations to understand flood situations as well as to validate the simulation results. Overall, the simulation results was generally correct; however difficulty in long-term prediction became also clear, especially when the flood magnitude becomes smaller and the impact of artificial structures becomes larger. Predictions always include uncertainty. Quantifying and showing uncertainty are also an important challenge for the future.

2.3 Training activities that directly contributed to the IHP-VII and WWAP objectives

"Local Emergency Operation Plan with Hazard Map"

This training course is designed especially for flood management organizations to enhance organizational resilience against floods. The course started in 2010. The second phase was conducted for four weeks from 12 January to 16 February 2011. Twelve people participated from Bhutan, Indonesia, Lao PDR, Myanmar, Nepal, Pakistan, Tajikistan, Thailand and Bangladesh. During the four weeks, the participants studied local disaster prevention practiced in Japan through lectures, exercises and field trips, and finally made an action plan for future activities in flood management for their own local areas. The third and last phase were conducted also for four weeks from 4 July to 2 August 2011. Eleven people

participated from Bhutan, Indonesia, Lao PDR, Myanmar, Pakistan, Sri Lanka, Tajikistan, and Bangladesh.

<Follow-up training>

Short course "Early warning system for flood disaster mitigation" (Hanoi, Vietnam, 6-7 November 2010)

ICHARM conducted a short training course at the Institute of Meteorology and Hydrology in Hanoi, Vietnam, with the cooperation of UNESCO Jakarta Office. This course was planned to follow up the activities of the ex-trainees/students of ICHARM's training course and to help them further enhance their technical abilities in flood management, such as flood forecasting and early warning. The participants were all engineers from Lao PDR, Mongolia, Myanmar, Thailand, Malaysia, Vietnam and Japan, including nine invited ex-trainees of an ICHARM training course and 28 researchers of Vietnam's Institute of Meteorology and Hydrology.

Follow-up training was held simultaneously with "The Southeast Asia Flood Risk Reduction Forum" on 20 February 2012 in Bangkok and a workshop entitled "Flood Risk Reduction by Using Satellite Information" on 21 and 22 February 2012, which were jointly organized by UN/ESCAP, ICHARM and JAXA

<IFAS Training Workshop>

ICHARM conducted a seminar on the Integrated Flood Analysis System (IFAS) in Myanmar on 22-24 June 2010. It was held as a part of the activity of the APRSAF-Sentinel Asia Flood Working Group funded by JAXA. Fourteen local engineers gathered for the seminar at the Department of Meteorology and Hydrology, Ministry of Transport.

"Workshop on Space Application to Reduce Water-related Disaster Risk in Asia"

ICHARM and UNESCAP (United Nations Economic and Social Commission for Asia and the Pacific) co-organized a workshop on satellite application to reduce water-related disaster risk in Asia at the United Nations Conference Centre in Bangkok, Thailand, on 7-9 December 2010. This confirmed the usefulness of IFAS in flood management and revealed a strong demand for IFAS training. The workshop was a great opportunity for the ICHARM staff, too, to realize a high level of interest in IFAS in Asian countries and the need for providing more training such as this.

ADB Project: "IFAS Training Workshop"

ICHARM organized an IFAS training workshop as a part of the ADB TA7276-REG project from 23 to 25 November 2011 in Solo, Indonesia. It was the second workshop with 34 participants following the one previously held on March 2010.

ADB Project: "IFAS Follow Up Training"

ICHARM organized the final IFAS training workshop on 27-28 February and 2, 5 and 6 March 2012 in Solo and Jakarta, Indonesia. This was a wrap up of several trainings held before. Twenty-four people participated to check their acquisition level of the IFAS operation and to learn about the automatic acquisition and calculation module using ground observation rainfall data.

<Other Training Activities>

ADB Project: "Village community based evacuation drills in Solo River Basin"

Under the framework of the Asian Development Bank Regional Technical Assistance (TA 7276-REG), ICHARM facilitated two series of evacuation drills at Kedung Sumber and Semen Pinggir villages of Bojonegoro located in the lower Solo River Basin on 14-17 July 2011. This activity was part of capacity development in community-based disaster risk management (CBDRM) linked with advanced flood forecasting system in the Solo River.

ADB Project: "A Knowledge Sharing Workshop On Water-related Disaster Risk Management"

ADB, WECS (Water and Energy Commission Secretariat) and DWIDP (Department of Water Induced Disaster Prevention) co-organized a knowledge sharing workshop in Nepal on 15-18 January 2012. Forty-four participants from India, Bangladesh, Bhutan, Nepal, Indonesia, the Philippines and Cambodia participated including some dignitaries. The international knowledge sharing of flood prediction and early warning at the policy-management level was very fruitful and appreciated by the participants.

ADB Project: "Knowledge Sharing Workshop on Flood Vulnerability Assessment in Cambodian Flood Plains"

ADB, MRCS (Mekong River Commission Secretariat) and CNMC (Cambodian National Mekong Committee) co-organized a knowledge sharing workshop in Phnom Penh, Cambodia, on 9-10 February 2012. Twenty-four people participated from 8 countries. The workshop shared knowledge on the Mekong River flood in 2010 and its present situation, the definitions of terminology such as vulnerability, and a flood-vulnerability evaluation methodology which ICHARM developed.

Dispatch of specialists to a education and training course in "2012 Advanced Institute of Forensic Investigations of Disasters (FORIN)"

A education and training course in "2012 Advanced Institute of Forensic Investigations of Disasters (FORIN)" was organized at Academia Sinica in Taipei on 12-19 March 2012. This was a part of IRDR activities supported by ISDR. Mr. Nakasu, ICHARM research specialist, gave a lecture on critical cause analysis of FORIN based on tsunami damage cases on the Great East Japan Earthquake.

3. Collaboration and linkages

3.1 Participation in major international networks, programmes, partnerships with other UN or other International Agencies, media and professional bodies (Events are arranged in a time series)

- a) 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.
- b) ICHARM held a special session at the 5th APHW conference (Hanoi, Vietnam, 8-10 November 2010). Also, at the 5th Asian Pacific Association of Hydrology and Water Resources (APHW), ICHARM organized a special session entitled "Flood Disasters and Predictions in Asian Pacific

Countries". The session primarily discussed appropriate flood prediction for different flood types based on a common premise that types of flood hazards and damage vary significantly in different river basins.

- c) "Governmental Policy-Oriented Discussions" (Washington D.C., U.S., 30 November-1 December 2010) The conference was organized by U.S. Army Corps of Engineers in cooperation with Federal Emergency Management Agency of the United States (FEMA), Environment Agency (U.K.), Rijkswaterstaat (Bureau of Water Management in the Netherlands), EU, MLIT Ministry of Land, Infrastructure, Transport and Tourism (MLIT) and ICHARM. It drew about 100 experts from 19 countries including five from Japan.
- d) ICHARM and UN/ESCAP Co-organized the Workshop on Space Application to Reduce Water-related Disaster Risk in Asia (Bangkok, Thailand, 7-9 December 2010)
- e) HLEP/UNSGAB urgent meeting on the Great Earthquake and Tsunami of East Japan (Tokyo, Japan, 28 April 2011)
The High-Level Expert Panel on Water and Disaster (HLEP) of the United Nation Secretary General's Advisory Board on Water and Sanitation (UNSGAB) met at the JICA Research Institute in Tokyo on 28 April to discuss "How should the world improve the preparedness for mega-disasters?" at a special meeting organized by the Ministry of Land, Infrastructure, Transport and Tourism (MLIT) and the Japan International Cooperation Agency (JICA) and supported by ICHARM. The meeting was chaired by Dr. Han Seung-Soo, former prime minister of the Republic of Korea. The meeting started with an opening address by Chair and JICA President Dr. Sadako Ogata, followed by video messages from UN Secretary General Ban Ki-moon, UNSGAB Chair HRH William-Alexander Prince of Orange, the Netherlands, and Iwate Prefectural Governor Takuya Tasso.
- f) 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 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.
- g) The International Forum on Mega Water Disasters was held in the afternoon of the first day of ICFM5. The main objective of the forum was to incorporate recent experiences and lessons learned from the Great East Japan Earthquake and Tsunami into ICFM5. His Imperial Highness Crown Prince of Japan participated as a guest, and Mr. Mir Changez Khan Jamali, the minister of the Science and Technology of Pakistan, and Mr. Rogelio Singson, the secretary of the Philippine Department of Public Works and Highways (DPHW), took part in the event.
- h) Integrated Research on Disaster Risk (IRDR) Conference 2011
"IRDR Conference 2011" took place in Beijing, China, from October 31 to November 2, 2011. ICHARM Director Kuniyoshi Takeuchi is a member of the Science Committee of IRDR, which is supported by ISDR. Mr. Nakasu, ICHARM research specialist, presented the preliminary version of the Forensic Investigations of Disasters (FORIN) based on the damage analysis of the Great East Japan Earthquake and Tsunami, which was fully appreciated by participants.

- i) The Southeast Asia Flood Risk Reduction Forum was held on 20 February 2012 in Bangkok, Thailand. The forum was jointly organized by UN/ESCAP, ICHARM and JAXA to share information and lessons learned from the 2011 floods in Southeast Asia, including potential and actual applications of space and other technologies.
- j) The 6th World Water Forum was held at Marseilles, France, from 12-17 March 2012 and attended by approximately 20,000 people from 173 countries and regions from all over the world. ICHARM sent four researchers including Director Kuniyoshi Takeuchi to introduce ICHARM activities upon request of its partner organizations and support the delegate of the Japanese government.

Furthermore, ICHARM members actively participated in discussions on global- and regional-scale frameworks, as in Annex 1.

3.2 Participation in meetings related to the IHP and UNESCO (e.g., the UNESCO General Conference, the UNESCO Executive Board, the IHP Intergovernmental Council and/or other meetings organized by IHP)

- a) UNESCO science mission to Pakistan (Pakistan, 23-26 August 2010)
A multidisciplinary team of six senior science experts (five experts from UNESCO and one from ICHARM) met at length in Islamabad with leading scientific figures and heads of institutions. As a result of this mission, an integrated nationally owned scientific plan has been developed for short and long term enhancement of the country's capacity to manage floods and related geo-hazards. These actions include integrated flood and watershed management; groundwater resources for emergency situations, landslides and ground instability; and education and capacity building.

After the results of several missions in Pakistan that were undertaken by Japan and United Nations Educational, Scientific and Cultural Organization (UNESCO) experts following the July/August 2010 floods in Pakistan, UNESCO and ICHARM, International Center for Water Hazard and Risk Management under the auspices of UNESCO/ Public Works Research Institute (PWRI), have agreed the implementation partners agreement of "Strategic Strengthening of Flood Warning and Management Capacity of Pakistan" in 20 January 2012. The agreement aims to improve flood forecasting abilities of Pakistan and expects full cooperation with the relevant organizations in Pakistan for enhancement of the country's capacity to forecast and manage floods in the Indus River Basin

- b) The 19th Regional Steering Committee Meeting for Southeast Asia and the Pacific, UNESCO-IHP and The International Symposium on Extreme Events "Meteorological, Hydrological and Tsunami Disasters: Social Adaptation and Future" (EXTREME2011), 24-28 October 2011, in Uji, Kyoto, Japan ICHARM sent four researchers including Director Kuniyoshi Takeuchi to introduce ICHARM activities including flood vulnerability analysis in Cambodia and inundation simulation of Thai flood .

3.3 Collaboration and networking with other UNESCO category 1 or 2 institutes/ centres

- 3.3.1 cross-appointment of directors of the category 1 or 2 institutes or centres on the governing board
- 3.3.2 exchange of information on activities such as training/educational materials, and funding opportunities
- 3.3.3 exchange of staff, most notably professionals and students
- 3.3.4 implementation of joint activities, such as workshops, conferences, training programmes, joint projects, field visits, software and data sharing, knowledge exchange and publications

3.4 Relationships with the UNESCO field and regional office whose jurisdiction covers the country of location : Included in the list under (Annex 1)

- 3.5 Relationship with the UNESCO National Commission and the IHP National Committee in the country of location and with other organizations of other countries : Included in the list under (Annex 1)
- 3.6 Relationship with other UNESCO-related networks, such as UNESCO Clubs, ASPnet, and UNESCO chairs

4. Communication

- 4.1 Communication and knowledge dissemination activities undertaken in the framework of IHP

One-day Session in the ABD Water Learning Week

The Asian Development Bank (ADB) organized the ADB Water Learning Week from 7 to 11 November 2011 at the ADB head quarters in Manila, the Philippines. Researchers and other experts who study water-related issues in Asian countries attended the conference and shared knowledge and information with other participants. In this week-long event, ICHARM organized a one-day session on 9 November and mainly discussed the results of ADB TA 7276-REG, a Regional Capacity Development Technical Assistance project, conducted under the ADB-ICARM partnership agreement. The discussion topics were as follows:

- Recent water disaster situations including the tsunami disaster caused by the Great East Japan Earthquake.
- Innovative ideas developed by ICHARM for the in-country projects in Indonesia, Bangladesh and Lower Mekong Basin Countries.
- Panel discussion on flood damage mitigation in the future.

ICARM also set up a special exhibition booth in the ADB head quarters and showed the flood simulation of the current Chao Phraya River flood and a 3.11 tsunami video. ADB staff showed considerable interest in the exhibition.

- 4.2 Policy documents and advice

5. Update on Centre Operations

- 5.1 Membership of the Board of Governors between designated period

The following is a list of ICHARM Advisory Board (IAB) Members as third IAB held on September 2010.

Avinash C. Tyagi
 Director, Climate and Water Department, World Meteorological Organization (WMO)

Kenyu Koumura
 Vice Minister for Engineering Affairs, Ministry of Land, Infrastructure, Transport and Tourism (MLIT) (Currenty Mr. Naoyoshi Sato)

Konrad Osterwalder
 Rector, United Nations University (UNU)

Noriaki Nagatomo * *Representative of the Vice President, JICA*
 Senior Advisor to Director General,
 Global Environmental Department, Japan International Cooperation Agency (JICA)

Salvano Briceno
 Director, UN/ISDR (International Strategy for Disaster Reduction)

Siegfried Demuth * *Representative of the Director General, UNESCO*
 Chief, Hydrological Processes and Climate Section, Division of Water Sciences, Natural Sciences Sector, UNESCO

Stefan Uhlenbrook * *Representative of the Rector, UNESCO-IHE*
 Professor, Hydrology and Water Resources, UNESCO-IHE
 Professor, Hydrology, Delft University of Technology

【Regional Delegates】

[Group 1: U. S. A] Eugene Z. Stakhiv
 US Co-Director, IJC Upper Lakes Study, and Technical Director,

UNESCO-ICIWaRM Institute for Water Resources
[Group 2: Russia] Zurab D. Kopaliani
Head, Laboratory for Computation and Forecasting River Channel
Changes, State Hydrological Institute (SHI)
[Group 3: Jamaica] Basil Fernandez
Managing Director, Water Resources Authority
[Group 4: Malaysia] Keizul bin Abdullah
Former Director General, Department of Irrigation and Drainage, Malaysia
[Group 5a: Cote d'Ivoire] N'Guessan Bi Tozan Michel * *Representative
of Biémi Jean*
Director, Water Resources, Ministry of Environment, Water and Forest
[Group 5b: Egypt] Mohamed-Bahaa Eldin Ahmed Mohamed Saad
Emeritus Professor, Hydraulics Research Institute, National Water
Research Center

- 5.2** Key decisions made (attach minutes of meetings)
Minutes of Meeting of third IAB is attached as (Annex 2).

6. Evidence of the Centre's Impacts

- 6.1** Science Impacts (Major contributions to the science, technology, education, and regional and/or international cooperation in the field of water)

Thai Flood in 2011 and its Related Activity

The simulation using a Rainfall-Runoff-Inundation model with satellite-based topographic and rainfall information was broadcasted by the media, and provided valuable information for viewers to understand the situation. Since this flood disaster, JICA started a new project entitled "Project on a Comprehensive Flood Management Plan for the Chao Phraya River Basin" to support the Thai government. ICHARM is involved in the project as a supporting member of JICA through technical assistance.

The effect of observation frequency by microwave radiometers on corrected GSMaP error rate

Assessment of the impact of climate change on flood disaster risk and its reduction measures over the globe and specific vulnerable areas

- 6.2** Knowledge Transfer Impacts (Major achievements in the dissemination of knowledge and technology transfer)

ADB Project

Since signing the Partnership Agreement in November 2009, ICHARM has been an implementing partner of ADB for a project named "Capacity Development Technical Assistance for Supporting Investments in Water-Related Disaster Management (CDTA7276-REG)". The project aims to help prepare and implement flood management projects through knowledge and capacity development services that will reduce vulnerability to water-related disasters with national- and regional-level assistance. This project is implementing different types of national and regional interventions, which include the application of IFAS to the Solo River basin in Indonesia, the pilot implementation of community-based flood management approaches in Indonesia, the technical review of the existing early warning system and recommendation of most feasible interventions in Bangladesh, the development of flood vulnerability indices in the Lower Mekong Basin, and the capacity development through practical training and knowledge-sharing programs for target as well as other countries in the region.

- 6.3** Policy Impacts (advice sought by government and other bodies and evidence of inputs into policy arena)

Contribution to compilation of Asian Water Development Outlook (AWDO)

In addition to above, ICHARM members contributed in various occasions to compile/deliver policy-related messages/advises listed under (Annex 1).

7. Future activities that will contribute directly to IHP and/or to WWAP

7.1 Operational Plan (attach if available)

Current ICHARM Action Plan 2010-2012 is attached as (Annex 3).

7.2 Strategic Plan linked with IHP-VII (attach strategic plan if available)

Same as the Action Plan 2010-2012 (Annex 3)

8. Annexes

8.1 List of publications released by the centre (there can be overlap with those listed in 2.3 above): Long list of publications as Annex 4

1) List of Publications

<PWRI Technical Note/Research Report and Books>

- 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
- Forms of community participation in disaster risk management practices Rabindra Osti, Katsuhito Miyake NOVA Science Publisher Mar 2011
- 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
- Report on 2009-2010 Master's Program, "Water-related Disaster Management Course of Disaster Management Policy Program Daisuke Kuribayashi, Kei Kudo, Shigenobu Tanaka Technical Note of PWRI No.4190 Dec 2010
- Planning and Design of Tsunami-mitigative Coastal Vegetation Belts Shigenobu Tanaka, Dinar Istiyanto, Daisuke Kuribayashi Technical Note of PWRI No.4177 Aug 2010
- Report on 2010-2011 "Water-related Disaster Management Course of Disaster Management Policy Program" technical Note of PWRI 4215 Jun. 2012
- 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
- Large-scale Flood Report Ali Chavoshian ICHARM Book Series ICHARM No. 1 1-207 Sep. 2011
- 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
- Existing environment and development needs Minoru Kamoto, Muanpong Juntopas Human and Natural Environment for the Mekong River TERRAPUB, Tokyo 23-42 Apr. 2011

2) List of peer-reviewed papers

- Osti R., Bhattarai T., Miyake K. Natural Hazards Springer (2011): Causes of Sabai Tsho moraine dam failure in Khumbu region, Nepal
- Rabindra Osti, Tara Nidhi Bhattarai, Katsuhito Miyake(2011): Causes of catastrophic failure of Tam Pokhari moraine dam in the Mt. Everest region Natural Hazards Springer
- Hironori Inomata, Kuniyoshi Takeuchi, Kazuhiko Fukami(2011): Development of a statistical bias correction method for daily precipitation data of GCM20 Annual Journal of Hydraulic Engineering Japan Society of Civil Engineering 55 pp.247-252
- Atsuhiko Yorozyuya, Shoji Okada, Yuya Kanno, Kazuhiko Fukami(2011): Bedload discharge measurement in developing countries 4th International Perspective on Current & Future State of Water Resources & the Environment EWRI, ASCE (Jan 2011)
- Rabindra Osti, Shinji Egashira, Katsuhito Miyake, Tara Nidhi Bhattarai(2010): E Field Assessment of Tam Pokhari Glacial Lake Outburst Flood in Khumbu Reguon, Nepal Journal of Disaster Research Fuji Technology Press Vol.5 No.3 pp.264-273
- Yoganath Adikari, Tomoyuki Noro(2010): A Global Outlook of Sediment-Related Disasters in the Context of Water-Related Disasters International Journal of Erosion Control Engineering Erosion Control Engineering Society Vol.3 No.1 pp.110-116
- Sayama, Kazuhiko Fukami, Shigenobu Tanaka, Kuniyoshi Takeuchi (2010):Rainfall-Runoff-Inundation Analysis for Flood Risk Aessment at the Regional Scale Takahiro Proceedings of the 5th Conference of Asia Pacific Association of Hydrology and Water Resources (APHW) APHW pp.568-576 (Nov 2010)
- Tomonobu Sugiura, Takahiro Kawakami, Go Ozawa, Jun Magome, Kazuhiko Fukami(2010): Experimental application of flood forecasting system (IFAS) using satellite-based rainfall Proceedings of 9th International Conference on Hydroinformatics, Beijing, China IAHR, et al. (Sep 2010)
- Atshiro Yorozyuya, Syoji Okada, Yuya Kanno, Kazuhiko Fukami(2010): Bed-load discharge measurement by ADCP in actual rivers River Flow 2010 Dittrich, Koll, Aberle & Geisenhainer (eds) - © 2010 Bundesanstalt für Wasserbau pp.1687-1692 (Sep 2010)
- Atshiro Yorozyuya, Yuya Kanno, Kazunori Odaira, Kazuhiko Fukami (2010): Development of automatic water discharge measurement system Environmental Hydraulics Christodoulou & Stamou (eds) @ 2010 Taylor & Francis Group pp.839-844 (Jun 2010)
- Atsuhiko Yorozyuya, Yuya Kanno, Kazuhiko Fukami, Kazunori Oodaira (2010): Development of automatic water discharge measurement system 6th International Symposium on Environmental Hydraulics International Association for Hydro-Environment Engineering and Research (IAHR) (Jun 2010)
- Rabindra Osti, Shinji Egashira, Katsuhito Miyake, Tara Nidhi Bhattarai(2010): Field Assessment of Tam Pokhari Glacial Lake Outburst Flood in Khumbu Reguon, Nepal Journal of Disaster Research Vol.5, No.3 pp.264-273(Apr 2010)
- Yoganath Adikari, Tomoyuki Noro (2010): A Global Outlook of Sediment- Related Disasters in the Context of Water-Related Disasters; International Journal of Erosion Control Engineering, Erosion Control Engineering Society Vol.3 No.1 pp.110-116
- Takahiro Sayama, Go Ozawa, Takahiro Kawakami, Seishi Nabesaka, Kazuhiko Fukami (2011): Rainfall-Runoff-Inundation Analysis of Pakistan Flood 2010 at the Kabul River Basin, Hydrological Science Journal International Association of Hydrological Sciences (IAHS)

- Takahiro Sayama, Jeffrey J. McDonnell, Amod Dhakal, Kate Sullivan (2011): How much water can a watershed store? Hydrological Processes Wiley
- Takahiro Sayama, Yasuto Tachikawa, Hiroki Kanno, Kaoru Takara (2011): Development of reservoir control optimization simulator by integrating a distributed-rainfall-runoff-model and dynamic programming Journal of Hydroscience and Hydraulic Engineering Japan Society of Civil Engineers (JSCE) Vol. 29 pp. 33-45 (May 2011)
- Rabindra Osti, Shiro Hishinuma, Katsuhito Miyake, Hironori Inomata Lessons (2011): learned from statistical comparison of flood impact factors among southern and eastern Asian countries Lessons learned from statistical comparison of flood impact factors among southern and eastern Asian countries Journal of Flood Risk Management, WileyInterscience, UK (Jun 2011)
- Rabindra Osti (2011): Causes of Sabai Tsho moraine dam failure in Khumbu region, Nepal.. Natural Hazards Springer (May 2011)
- Mamoru MIYAMOTO, Ai SUGIURA, Toshio OKAZUMI, Shigenobu TANAKA, Seishi NABESAKA, Kazuhiko FUKAMI (2012): Suggestion for an Advanced Early Warning System Based on Flood Forecasting in Bengawan Solo River Basin, Indonesia, 10th International Conference on Hydroinformatics
- Badri Bhakta Shrestha, Hajime Nakagawa, Kenji Kawaike, Yasuyuki Baba, Hao Zhang (2012): Driftwood deposition from debris flows at slit-check dams and fans, Natural Hazards No.61, Springer, pp.577-602, (Mar 2012)
- Muhammad Masood, Kuniyoshi (2012): Takeuchi, Assessment of flood hazard, vulnerability, and risk of mid-eastern Dhaka using DEM and 1D hydrodynamic model, Natural Hazards, Journal of the International Society for the Prevention and Mitigation of Natural Hazards ISSN 0921-030X Nat Hazards DOI 10.1007/s11069-011-0060-x (Dec 2011)

8.2 List of training courses conducted (there can be overlap with those listed in 2.1 above)

Local Disaster Operation Plan with Flood Hazard Mapping Training Course (2009-2011, with JICA)
 Master's course Program "Water-related Disaster Management Course of Disaster Management Policy Program"
 Doctor Course Program, "Disaster Management,"

Others:

Visit of UNESCO Evaluation Team to ICHARM (ICHARM, 13-14 January 2011)

The five-year evaluation of the International Centre for Water Hazard and Risk Management (ICHARM) was conducted by Professor Soontak Lee and Dr. Olivia Castillo. ICHARM, which started its operation in 2006, is one of the UNESCO's category-II water centres. The main purpose of this evaluation, which was managed by ICHARM in close consultation with the Government of Japan and UNESCO, was to provide valuable feedbacks for deciding whether the agreement between UNESCO and the host government should be renewed, and to ensure that the focus and coverage of the activities of the Centre are in line with the strategic objectives of UNESCO in accordance with the new Integrated Comprehensive Strategy for Category II Institutes and Centres (document 35C/22), approved by the 35th Session of the General Conference.

The evaluation team met at ICHARM in Tsukuba from 13-14 January 2011. The evaluation team's work was facilitated by Mr. Shahbaz Khan and Mr. Toshihiro Sonoda from UNESCO, who participated as observers.

The summery of the report is attached as (Annex5)

Appendix-1

Overview of the Core Programme Themes of the Seventh Phase of the IHP (2008-2013) WATER DEPENDENCIES: SYSTEMS UNDER STRESS AND SOCIETAL RESPONSES

Theme 1: ADAPTING TO THE IMPACTS OF GLOBAL CHANGES ON RIVER BASINS AND AQUIFER SYSTEMS

Focal area 1.1 - Global changes and feedback mechanisms of hydrological processes in stressed systems

Focal area 1.2 - Climate change impacts on the hydrological cycle and consequent impact on water resources

Focal area 1.3 - Hydro-hazards, hydrological extremes and water-related disasters

Focal area 1.4 - Managing groundwater systems' response to global changes

Focal area 1.5 - Global change and climate variability in arid and semi-arid regions

Theme 2: STRENGTHENING WATER GOVERNANCE FOR SUSTAINABILITY

Focal area 2.1 - Cultural, societal and scientific responses to the crises in water governance

Focal area 2.2 - Capacity development for improved governance; enhanced legislation for wise stewardship of water resources

Focal area 2.3 - Governance strategies that enhance affordability and assure financing

Focal area 2.4 - Managing water as a shared responsibility across geographical & social boundaries

Focal area 2.5 - Addressing the water-energy nexus in basin-wide water resources

Theme 3: ECOHYDROLOGY FOR SUSTAINABILITY

Focal area 3.1 - Ecological measures to protect and remediate catchments process

Focal area 3.2 - Improving ecosystem quality and services by combining structural solutions with ecological biotechnologies

Focal area 3.3 - Risk-based environmental management and accounting

Focal area 3.4 - Groundwater-dependent ecosystems identification, inventory and assessment

Theme 4: WATER AND LIFE SUPPORT SYSTEMS

Focal area 4.1 - Protecting water quality for sustainable livelihoods and poverty alleviation

Focal area 4.2 - Augmenting scarce water resources especially in SIDS

Focal area 4.3 - Achieving sustainable urban water management

Focal area 4.4 - Achieving sustainable rural water management

Theme 5: WATER EDUCATION FOR SUSTAINABLE DEVELOPMENT

Focal area 5.1: Tertiary water education and professional development

Focal area 5.2: Vocational education and training of water technicians

Focal area 5.3: Water education in schools

Focal area 5.4: Water education for communities, stakeholders and mass-media professionals

ICIWaRM activities related to the IHP in the period June 2010 – May 2012

1. Basic information on the centre

Name of the Centre		International Center for Integrated Water Resources Management
Name of Director		Robert A. Pietrowsky
Name and title of contact person (for cooperation)		William S. Logan
E-mail		Will.logan@usace.army.mil
Address		7701 Telegraph Rd, Casey Building
Website		www.iciwarm.org
Location of centre		city/town: Alexandria, VA 22315 country: USA
Geographic orientation *		<input checked="" type="checkbox"/> global <input type="checkbox"/> regional
Year of establishment		
Themes	Focal Areas ♦	<input type="checkbox"/> groundwater <input type="checkbox"/> urban water <input checked="" type="checkbox"/> arid / semi-arid zones <input type="checkbox"/> humid tropics <input checked="" type="checkbox"/> droughts and floods <input type="checkbox"/> sediment transport and management <input checked="" type="checkbox"/> water and environment <input type="checkbox"/> ecohydrology <input type="checkbox"/> water law and policy <input type="checkbox"/> transboundary river basins/ aquifers <input checked="" type="checkbox"/> IWRM <input checked="" type="checkbox"/> global and climate change <input checked="" type="checkbox"/> mathematical modelling <input type="checkbox"/> social and cultural dimensions of water <input type="checkbox"/> water education <input type="checkbox"/> other: (please specify) _____
	Scope of Activities ♦	<input type="checkbox"/> vocational training <input type="checkbox"/> postgraduate education <input checked="" type="checkbox"/> continuing education <input checked="" type="checkbox"/> research <input checked="" type="checkbox"/> institutional capacity-building <input type="checkbox"/> advising/ consulting <input type="checkbox"/> software development <input type="checkbox"/> other: (please specify) _____
Support bodies ¹		US Army Corps of Engineers
Hosting organization ²		USACE Institute for Water Resources
Sources of financial support ³		Other US government agencies
Existing networks and cooperation ⁴		ICIWaRM itself is designed as a network of US government, academic institutions, professional organizations, and other non-governmental organizations.
Governance		<input type="checkbox"/> director and governing board <input checked="" type="checkbox"/> other: (please specify) advisory board Link to election of board members to the IHP Intergovernmental Council (IGC) and hosting country IHP National Committee _____ Frequency of meetings: once every <u>2</u> years

* 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

	<input checked="" type="checkbox"/> Existence of UNESCO presence at meetings
Institutional affiliation of director	
Number of staff and types of staff	total number of staff (full-time, or equivalent) : __4.5__ number of staff who are water experts: __3.5__ number of visiting scientists and postgraduate students: __2__
Annual turnover budget in USD	

2. Activities undertaken in the framework of IHP in the period June 2008 – May 2010

2.1 Educational activities (i.e., those with accreditation) that directly contributed to the IHP-VII and WWAP

Please include here those activities which led to accreditation of degrees, or those held in formal school settings.

- Dr. Paul DuBowoy spent several weeks in 2011, funded by a Fulbright grant, at the University of Lodz teaching Ecosystem Planning and Restoration in association with the UNESCO category 2 center “European Regional Centre for Ecohydrology”. He was an Adjunct Professor in the Department of Applied Ecology, under the Erasmus Mundus Master of Science Programme in Ecohydrology.

2.2 Research activities that directly contributed to the IHP-VII and activities by WWAP

Please include research/applied projects outputs such as publications that directly contributed to the IHP-VII and WWAP objectives

- Contributed to the 4th Edition of the World Water Development Report (WWDR4)– “Managing Water Under Uncertainty and Risk”.
- Steering Committee co-chair for the publication of “IWRM Guidelines at a Basin Level” series, UNESCO IHP/WWAP/NARBO publication (ongoing). In 2011, Part 2-4 “The Guidelines for Managing Environmental Sustainability” was published. Two additional publications in the series are being developed—one on climate change adaptation and another on participative planning. ICIWaRM is deeply involved in both.
- Facilitation of co-chair of WWAP Expert Group on Policy Relevance (2011).
- Facilitation of network partner development of consistent indicator sets for actual renewable water resources (2011).
- Development of open source software and analytical tool for flood and drought frequency analysis based on analysis of “L-moments” statistical methods applied to areas with short or sparse data, in collaboration with CAZALAC (ongoing).
- Near real-time streamflow forecasting system using satellite precipitation measurements in the International Senegal River Basin (ongoing).
- NSF-funded Planning Visit proposal to establish a new research collaboration between The University of Arizona (ICIWaRM partner) and AGRHYMET (G-WADI-SSA secretariat) in Niger (Niamey). The research will be to improve the spatio-temporal characterization of precipitation in the African Monsoon Region.
- Support the Rwanda Integrated Water Security Program, a subprogram of the Global Water for Sustainability Program and supported by USAID.
- Pilot Study on Indicators for the WWAP (ongoing).
- Technical Secretariat for the global network Water and Development Information for Arid Lands (G-WADI) (ongoing).
- Assessment of Satellite Precipitation Products and their use in Hydrologic Applications, in collaboration with the University of Arizona.
- Agent-Based Models: Applications in water resources planning & management, in collaboration with Panagiotis Oikonomou, Colorado State University.
- Using Physical and Collaborative Modeling to Assess the [UNESCO HELP basin] Iowa-Cedar Watershed’s Vulnerability to Climate Change and Develop Risk Informed Climate Change Adaptation Strategies.
- Multi-lateral report on Flood Risk Management Approaches (U.S., Japan, Netherlands and the U.K.). <http://www.iwr.usace.army.mil/docs/iwrreports/2011-R-08.pdf>.
- (Civilian Research and Development Foundation).
- Study of climate change impacts on flood risks in the Carpathian Mountains with the Ukrainian Academy of Sciences and with funding from the Civilian Research and Development Foundation (ongoing).

- 2.3 **Training activities** that directly contributed to the IHP-VII and WWAP objectives
- Seven-day Spanish-language workshop on Hydrology and Hydraulics Modeling and Tools in Asuncion, Paraguay in collaboration with the International Hydroinformatics Center (CIH). The course featured theory, applications, tips in hydrology, hydraulics, and reservoir operation all conducted in Spanish. In excess of 40 participants from Paraguay, Brazil, Uruguay, Argentina, and Chile attended the workshop.
 - Collaboration with Peru's National Water Authority (ANA) staff to develop shared vision planning guidelines for Peru, in coordination with the World Bank and IDB (2009-present). ICIWaRM led five workshops in various watersheds that exposed stakeholders to the new water law and institutions, the shared vision planning methodology, and subsequent IWRM planning process.
 - Provided training in Water Evaluation And Planning (WEAP) System to the Ministry of Water and Irrigation in the Hashemite Kingdom of Jordan through the Stockholm Environmental Institute and in collaboration with UNESCO-IHP in Amman (2011).
 - IWR's Conflict Resolution and Public Participation Center of Expertise designed a Shared Vision Planning and Public Involvement process in support of [UNESCO HELP basin] Iowa-Cedar River Basin Comprehensive Watershed Planning Process.

3. Collaboration and linkages

- 3.1 Participation in major international networks, programmes, partnerships with other UN or other International Agencies, media and professional bodies
- See Appendix A for WWF6 participation (2012).
 - Member, Steering Committee, Global Water Partnership (GWP).
 - Member, Board of Governors, World Water Council.
 - Collaboration on the implementation of the UN Secretary General's Advisory Board on Water and Sanitation/ High-Level Expert Panel on Water and Disaster UNSGAB/HLEP on Water and Disaster Action Plan (ongoing). ICIWaRM has taken the lead on UNSGAB Recommendation No.29: "National and international hydrological institutes must take the initiative to identify underlying analytical and data requirements to meet climate changes that are likely to be highly uncertain and so as to support structural and non-structural measures for disaster risk deduction" (Water and Disasters: High Level Expert Panel on Water and Disasters/UNSGAB, March 2009).
 - Alliance for Global Water Adaptation (AGWA). In collaboration with Conservation International and the World Bank, ICIWaRM and its parent institution are providing major in-kind support for two of the four task teams: "Incorporating Climate Change into Water resources Operations, Planning and Design" and "Ecological and Hydrological Interactions".
 - MOU with the National Autonomous University of Mexico (UNAM) Water Network to support mutual cooperation and joint activities in IWRM, scientific research, and capacity building (2010).
- 3.2 Participation in meetings related to the IHP and UNESCO (e.g., the UNESCO General Conference, the UNESCO Executive Board, the IHP Intergovernmental Council and/or other meetings organized by IHP)
- As G-WADI Technical Secretariat, attended all G-WADI related meetings.
 - Co-sponsor and member of organizing committee (with ICHARM as Secretariat of the IFI as the lead) of the 5th International Conference on Flood Management (ICFM5) (Japan, 2011).
 - Co-sponsored panels (with ICHARM) at ICFM5 on Flood Risk Mgt Approaches and on Adaptation to Climate Change in connection with UNSGAB/HELP).
 - Invited paper for 2010 UNESCO-IAHS Kovacs Symposium. Practical approaches to water management under climate change uncertainty. Eugene Stakhiv 2010. "Hydrocomplexity: New Tools for Solving Wicked Water Problems" (IAHS Publ. 338, 2010).
 - Sponsored AWRA 2011 Summer Specialty Conference "Integrated Water Resources Management: The Emperor's New Clothes or Indispensable Process?" (2011, Utah), Session 4: Hydrology for the Environment, Life and Policy [HELP].
 - Funded participation of Iowa-Cedar River Basin at HELP International Symposium 2011 "Building Knowledge Bridges for a Sustainable Water Future".
 - As Co-chair of the Steering Committee of UNESCO's IWRM Guidelines at River Basin Level, attended all associated meetings and teleconferences.

- As observer for Region 2, attended annual meetings of UNESCO ROSTLAC relating to programs, national committees and other initiatives.
 - Attended Regional Training Workshop on Drought Monitoring, Niamey, Niger, 2012.
- 3.3 Collaboration and networking with other UNESCO category 1 or 2 institutes/ centres
- 3.3.1 cross-appointment of directors of the category 1 or 2 institutes or centres on the governing board and other partnerships
- Member, Governing Board of UNESCO-IHE.
 - Member, Governing Board of CAZALAC.
 - Chair, Advisory Board of ICHARM.
 - MOU with UNESCO-IHE, the Institute for Water Education, Delft.
 - MOU with ICHARM, the International Center for Hazard and Risk Management, Japan.
 - MOU with CAZALAC, the Center for Arid and Semi-arid Zones of LAC.
 - MOU with CATHALAC, the Water Center for Humid Tropics of LAC (former UNESCO center; now a regional international center affiliated with UNU).
 - MOU with CEHICA, the Center for Sustainable Management of Water Resources in the Caribbean Island States.
 - MOU with IHP proper.
 - Visit to Regional Center for Training and Water Studies, Egypt (May 2012) and associated discussions with staff of the Regional Centre for the Management of Shared Groundwater Resources (Libya) and the newly approved Regional Centre on Capacity Development and Research in Water Harvesting, Sudan.
- 3.3.2 exchange of information on activities such as training/educational materials, and funding opportunities
- Co-sponsored with ICHARM the 5th International Conference on Flood Management (2011).
 - Translation to Spanish of "IWRM Guidelines at a Basin Level" in conjunction with UNESCO ROSTLAC and IDB (2011-2012).
 - Sponsored work on publication "Science and Practice of Integrated River Basin Management: Lessons from North and Central American UNESCO-HELP basins" (ongoing).
 - Attended "CAZALAC Workshop on Region Frequency Analysis using L-moments" and the Joint Research Center's EuroClima Meeting (Chile, April 2011), and presented progress on ICIWaRM's Regional Analysis of Frequency Tool (ICI-RAFT).
- 3.3.3 exchange of staff, most notably professionals and students
- Sponsor former IHE Rector Richard Meganck activities at Oregon State University, which include advice to and other interactions with UNESCO Category 2 center HidroEx, Brazil.
- 3.3.4 implementation of joint activities, such as workshops, conferences, training programmes, joint projects, field visits, software and data sharing, knowledge exchange and publications
- ICIWaRM assisted CEHICA in investigating rising lake levels at Lake Enriquillo in the western Dominican Republic and in building local capacity to adapt to and mitigate the rise (2011).
 - Numerous other activities covered in sections 2.2 and 2.3.
- 3.4 Relationships with the UNESCO field and regional office whose jurisdiction covers the country of location
- Numerous interactions with UNESCO Regional Office for Science and Technology for Latin American and the Caribbean, Montevideo (see section 3.2).
 - Through G-WADI, many interactions with UNESCO regional office for East Africa in Nairobi, and country offices in Egypt and Jordan.
- 3.5 Relationship with the UNESCO National Commission and the IHP National Committee in the country of location and with other organizations of other countries
- One of six permanent Federal agency members of the US-IHP committee. Attended and presented updates at the semi-annual meetings, and are involved in strategic planning and in drafting recommendations of the committee to the USNC for UNESCO.

- Attended and presented updates at the bi-annual USNC for UNESCO meeting. Active in drafting recommendations of the Commission for the Natural Sciences.

4. Communication

- 4.1 Communication and knowledge dissemination activities undertaken in the framework of IHP
- Website: www.iciwarm.org
 - Website: www.gwadi.org
- 4.2 Policy documents and advice
- Co-chair of the Steering Committee of UNESCO's IWRM Guidelines at River Basin Level.
 - Editor-in-Chief for Water Policy, a peer reviewed international journal that is published six times per year.

5. Update on Centre Operations

- 5.1 Membership of the Advisory Board
- Advisory Board members include:
- Region I: Mr Ibrahim Gurer (Turkey)
 - Region II: Mr G. Jolánkai (Hungary)
 - Region III: Mr Rubem La Laina Porto (Brazil)
 - Region IV: Mr Liu Heng (China)
 - Region Va: Mr Dhesigen Naidoo (South Africa)
 - Region Vb: Mr Ahmed Murad (United Arab Emirates)
 - The IHE Rector or his/her representative
 - The Director General of UNESCO or his/her representative
 - The Executive Director of the US National Commission for UNESCO
 - The Chair of the US National Committee for IHP
 - The Assistant Secretary of the Army for Civil Works (ex-officio Chair)
 - And one other unnamed member.
- 5.2 Key decisions made

6. Evidence of the Centre's Impacts

- 6.1 Science Impacts (Major contributions to the science, technology, education, and regional and/or international cooperation in the field of water)
- 6.2 Knowledge Transfer Impacts (Major achievements in the dissemination of knowledge and technology transfer)
- 6.3 Policy Impacts (advice sought by government and other bodies and evidence of inputs into policy arena)

7. Future activities that will contribute directly to IHP and/or to WWAP

- 7.1 Operational Plan (attach if available)
- 7.2 Strategic Plan linked with IHP-VII (attach strategic plan if available)

8. Annexes

- 8.1 List of publications released by the centre (there can be overlap with those listed in 2.3 above) [not available]
- 8.2 List of training courses conducted (there can be overlap with those listed in 2.1 above) [not available]
- 8.3 Appendix A - ICIWaRM Activities at the 6th World Water Forum, Marseille, France

Appendix A

ICIWaRM Activities at the 6th World Water Forum, Marseille, France

1. 11 March. Eugene Stakhiv met with UNESCO IRBM Steering Committee members to discuss completion of two reports that ICIWaRM/IWR is completing as part of the UNESCO series on Integrated River Basin Management. Dr. Stakhiv is co-chair of this effort.
2. 12 March. Technical meeting with Japan MLIT/PWRI- ICHARM (International Center for Water Hazards and Risk Management).
3. 12 March. USACE IWR and ICIWaRM participated in the event releasing the 4th Edition of the World Water Development Report (WWDR4) – “Managing Water under Uncertainty and Risk”. USACE contributed input to the report, largely through ICIWaRM partners Drs. Gerry Galloway, University of Maryland, and Dr. Charles Vorosmarty, CCNY.
4. 12 March. ICIWaRM and CEHICA, in collaboration with our ICIWaRM partner - CSU’s Colorado Water Institute, hosted an event titled "UNESCO Category 2 Water Centers: Working Together in Capacity Building, Training and Education." Other ICIWaRM core partners – FIU, OSU, AWRA and ASCE-EWRI also attended.
5. 12 March. ICIWaRM Meeting, - USACE-IWR’s International Center for Integrated Water Resources Management (ICIWaRM) hosted a partner’s meeting with the ICIWaRM core partners which were present at the Forum - CSU’s Colorado Water Institute, FIU, OSU and ASCE-EWR.
6. 13 March. CAZALAC (Chile Category 2 Center), - USACE-IWR’s ICIWaRM reps finalized discussions with Chile’s Water Center for Arid and Semi Arid Zones in Latin America and the Caribbean (CAZALAC) regarding ICIWaRM participation on CAZALAC’s technical advisory group.
7. 13 March. IWRM Session 2.1.2, - Dr. Will Logan participated in Session 2.1.2 “IWRM for All: Make Water Resource Planning a Reality by Adopting IWRM Master Plans”. Dr. Logan represented the solution which was put forward by PIANC USA, “Inland Waterborne Transport as a Solution” in a roundtable discussion
8. 13 March. IWRM Session 2.1.1 “Getting Started: Choosing an Entry Point for a National IWRM Strategy”. This Session was sponsored by ICIWaRM and UNESCO. Eugene Stakhiv was coordinator and organizer of this session. Dr. Ania Grobicki, Exec Director of GWP served as session Chair.
9. 13 March. 11:00-13:00. Session 3.3.2 “Coping with Uncertainties Related to Climate and Global Change”. Session organized by French Water Academy and UNESCO. E. Stakhiv invited as panel speaker to present ideas on ‘pragmatic adaptation to climate change’.
10. 14 March. Meeting of the Core Organizing Group – 5th World Water Development Report (WWDR5),– Bob Pietrowsky represented USACE IWR-ICIWaRM at the inaugural meeting of the core working group for the next WWDR5 process, which took place at the Marseille World Trade Center, near the Port of Marseille. The meeting was led by Olcay Unver, director of the World Water Assessment Program (WWAP). USACE IWR- ICIWaRM was invited to serve on the core working group, whose first task is to develop the framing strategy for the next iteration of the WWDR issue in addition to the WWF 3-year cycle.
11. 14 March. 8:30-10:30. Dr. Stakhiv attended opening Panel on PFA 1.4 (Reducing Disasters and Impacts). Stakhiv is part of this PFA, organizing Session 1.4.5.
12. 14 March. 11:00-13:00. Dr. Stakhiv invited as panelist on session IWRM 2.1.5 (“How can Models be Used to Help Decisionmakers Implement IWRM”) organized by Dr. Ait Kadi (GWP) on: Target 5 of the Priority Area 2.1 "By 2015 elaborate and validate models which could be used as tools for helping decisions makers implement IWRM to balance multiple water uses to best achieve desired goals".
13. 14 March. 14:30-16:30. Dr. Stakhiv invited to speak on Session 3.3.5 Panel “Charting Unknown Waters: How do We Make Resilient Water Resources Management Decisions Consistently?” Topic presented was “Lessons Learned from the IUGLS Study”.
14. 14 March. WWF 6 Learning Village – USACE IWR ICIWaRM Event– Dr. Will Logan and Allyson Beall (Washington State University) gave a one-hour course on "Collaborative Planning: Integrating Modeling with Participatory Processes in Shared Vision Planning to inform natural resource management decisions

15. 15 March. Integrated Water Resources Management (IWRM) PFA 2.1 – Synthesis Session – “Balancing Multiple Users through IWRM: Getting the Water Resources Management Right”. USACE IWR ICIWaRM representatives Dr. Gene Stakhiv and Dr. Mike Campana (Oregon State University) reported the results for the sessions their respective institutions led, with the overall synthesis facilitated by Dr. Ari Michelson, with Bob Pietrowsky also attending.
16. 15 March. Flood Risk Management (FRM) Solution Track 1.4.5 – “Getting Started on Mitigation Strategies for Disaster Risk Reduction in Developing Countries”. This session was sponsored by USACE IWR under the auspices of the UNESCO-ICIWaRM. The thrust of the session as deftly developed by Dr. Gene Stakhiv, was to focus FRM solutions on the 25 countries around the globe which are most in need, as measured by those with the lowest scores on the scale of the Human Development Index (HDI). The target objectives are aimed at manifesting an action plan to address FRM needs in these 25 developing countries, to mobilize and align donor agencies to provide support for technological assistance, to identify a coordinator for the effort, and to present the action plan at a subsequent conference, perhaps as early as during RIO+20 in June 2012.
17. 15 March. Flood Risk Management (FRM) Solution Tracks 1.4 – Synthesis Session, - USACE IWR ICIWaRM representatives, including Bob Pietrowsky, Gene Stakhiv and Will Logan attended the overall synthesis session for FRM Solutions 1.4. Will Logan, as rapporteur for the Solution Track 1.4.5 technical session that was held earlier in the day (see number 15 above), presented the session results to the overall FRM Solution 1.4 team.
18. Additional Meeting with IHP Category 2 International Groundwater Resources Assessment Center (IGRAC).

Format for Reports by UNESCO's Water-related Centres on activities related to the IHP in the period June 2010 – May 2012

1. Basic information on the centre

Name of the Centre		International Centre on Qanats and Historic Hydraulic Structures (ICQHS)
Name of Director		Mr. A. A. Semsar Yazdi
Name and title of contact person (for cooperation)		Mr. Majid Labbaf Khaneiki, Senior Expert
E-mail		Semsar@icqhs.org / labbaf@icqhs.org
Address		Danesjoo Blvd., Yazd, Iran, POBox:89165-1553
Website		www.icqhs.org
Location of centre		city/town: Yazd country: IRAN
Geographic orientation *		<input checked="" type="checkbox"/> global <input type="checkbox"/> regional
Year of establishment		2006
Themes	Focal Areas ♦	<input checked="" type="checkbox"/> groundwater <input type="checkbox"/> urban water <input checked="" type="checkbox"/> arid / semi-arid zones <input type="checkbox"/> humid tropics <input type="checkbox"/> droughts and floods <input type="checkbox"/> sediment transport and management <input checked="" type="checkbox"/> water and environment <input type="checkbox"/> ecohydrology <input type="checkbox"/> water law and policy <input type="checkbox"/> transboundary river basins/ aquifers <input type="checkbox"/> IWRM <input type="checkbox"/> global and climate change <input type="checkbox"/> mathematical modeling <input checked="" type="checkbox"/> social and cultural dimensions of water <input checked="" type="checkbox"/> water education <input type="checkbox"/> other: (please specify) _____
	Scope of Activities ♦	<input checked="" type="checkbox"/> vocational training <input type="checkbox"/> postgraduate education <input type="checkbox"/> continuing education <input checked="" type="checkbox"/> research <input checked="" type="checkbox"/> institutional capacity-building <input checked="" type="checkbox"/> advising/ consulting <input type="checkbox"/> software development <input type="checkbox"/> other: (please specify) _____
Support bodies ¹		Ministry of Energy of the Islamic Republic of Iran (IRI)
Hosting organization ²		
Sources of financial support ³		IRI Ministry of Energy, IRI Ministry of Agriculture, UNESCO Tehran Cluster Office
Existing networks and cooperation ⁴		G-wadi network, International Water History Association, International Organization for Migration (IOM), IWA, IGRAG, IWAC
Governance		<input checked="" type="checkbox"/> director and governing board <input type="checkbox"/> other: (please specify) _____ Link to election of board members to the IHP IGC and hosting country IHP National Committee _____ Frequency of meetings: once every 1year(s)

* 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

	<input checked="" type="checkbox"/> Existence of UNESCO presence at meetings
Institutional affiliation of director	Ministry of Energy
Number of staff and types of staff	total number of staff (full-time, or equivalent) : ____11____ number of staff who are water experts: ____5____ number of visiting scientists and postgraduate students: ____10____
Annual turnover budget in USD	200,000 USD

2. Activities undertaken in the framework of IHP in the period June 2010 – May 2012

2.1 Educational activities (i.e., those with accreditation) that directly contributed to the IHP-VI and WWAP

Establishment of the qanat training center was one of the activities of ICQHS which is still playing an important role in training many students there. This training center which educates the technicians is situated in Taft a town near Yazd. The students of this collage can gain the skill of construction and rehabilitation of qanat during a two year period. This center is utilizing the experiences and knowledge of the traditional practitioners. So this center bridges the gap between the modern sciences and indigenous know how. Between the years 2010 and 2012, some 30 students graduated in the field of qanat technology. Also, during the same period, 50 students graduated from this collage in the field of water technology engineering.

2.2 Research activities that directly contributed to the IHP-VI and activities by WWAP

ICQHS has conducted some research projects in line with IHP-VII, whose results have been published as books or papers.

- A- Initiating comprehensive studies on Dehno Qanat in Hassan abad (Yazd) in order to submit a report through cultural heritage organization to UNESCO for its nomination on UNESCO World Heritage.*
- B- Publishing the book entitled: "Veins of Desert" in English which was given out to the members of 19th session of IHP intergovernmental council.*
- C- Launching comprehensive studies on Joopar Qanat (Kerman) to submit a report through cultural heritage organization to UNESCO considering it as a nominee for UNESCO World Heritage.*
- D- Launching comprehensive studies on the Qasabeh Qanat in Gonabad (in Razavi Khorasan) in order to report through cultural heritage organization to UNESCO to nominate it for UNESCO world heritage list.*
- E- Initiating comprehensive studies on Baladeh Qanats (Southern Khorasan) in order to submit a report through cultural heritage organization to consider it as UNESCO world heritage.*
- F- Submitting the final report of the research project entitled: "The Possibility Of Electric Energy Generation By Qanats And Potential Survey On The Qanats Of Yazd".*
- G- Launching studies on the modern techniques and methods in Qanat construction and restoration.*
- H- Publishing the Second Edition of the Book entitled: "Qanat from Practitioners' Point of View" with 3000 circulations.*
- I- Launching the research project of mapping the Qanat of Dehno – Hassan abad.*
- J- Initiating comprehensive studies on Ebrahim-Abad Qanat (in Arak) in order to submit a report through cultural heritage organization to nominate it for UNESCO world heritage list.*

- K- *Finalizing a technical report on the Qanats of Qasem- Abad and Emamiyeh in order to nominate them as the national properties through the Iranian Cultural Heritage Organization.*
- L- *Publishing the book "Qanat in its Cradle"*
- M- *Publishing the book "Qanat Practitioners of Kerman Province"*
- N- *Publishing the Proceedings of TKWRM Conference*
- O- *Study on negative impacts of developmental projects on qanats and possible solutions*
- P- *Study on methodology of qanat atlas with the use of GIS*

2.3 Training activities that directly contributed to the IHP-VI and WWAP objectives

- A- Holding a brief course on Procedure of Qanats Nomination in UNESCO World Heritage list for consulting engineers and experts.
- B- Holding a training course on Qanat in the province of Southern Khorasan for the experts of Cultural Heritage Organization, Ministries of Energy and Agriculture, and Azad University – Birjand.
- C- Training the new generation of Qanat workers in Nakhchivan by ICQHS experts.
- D- Cooperation in holding a training workshop on Qanats in Bam with the collaboration of the UNESCO regional office officials in Tehran.
- E- Holding the International Training Course on Qanats for the experts of Islamic countries and the experts of other countries such as: Oman, India, Sri Lanka, Afghanistan, Pakistan, Tajikistan, United Arab Emirate, Iraq, Azerbaijan, Algeria, and Morocco.
- F- Holding a Training Course on Qanat technology and Historic Hydraulic Structures in Kerman for the experts of the regional water authority, ministry of agriculture, and cultural heritage organization.
- G- Holding a one day training course on Qanats for Master and PhD students of Tarbiat Modares University.
- H- Holding a Training Course on Qanat Technology (Level 1) for the experts of Agriculture Organization of Qom.
- I- Holding the International Conference on Traditional Knowledge for Water Resources Management (TKWRM-2012) with the participation of 440 scholars and experts from 31 countries.
- J- Holding the International workshop on "Trans-boundary Waters, Opportunities for cooperation" with the presence of 44 national and International experts.
- K- Holding the short course on World History of Water Management with Collaboration of UNESCO- IHE, UNESCO IHP & IWHA with the presence of 53 national and international experts.

3. Collaboration and linkages

3.1 Participation in major international networks, programmes, partnerships with other UN or other International Agencies, media and professional bodies

ICQHS is an official member of the International Water History Association, and has a close cooperation with them. Also ICQHS is in close contact with UNESCO Regional Centre on Urban Water Management (RCUWM – Tehran) and the director of this center is one of the members of ICQHS governing board. Also, ICQHS has close cooperation with UNESCO-IHE, so that it teamed up with UNESCO-IHE to organize a short course on world history of water management. Moreover ICQHS has participated in several international events such as:

- A- *Attending Water History Conference in technical university of Delft and presenting an article about Modern techniques and methods in Qanat construction and restoration.*
- B- *Participation of ICQHS at in the International Conference of Foggara in Algeria, and giving a lecture entitled: "Application of new methods and technologies in Qanat Preservation and Restoration".*

C- Participating in Tehran G-Wadi meeting as well as introducing the ICQHS activities.

D- Attending the "International Conference on business opportunities" in Kenya to give the report on readiness for research and education collaborations in the field of water resources and historic hydraulic structures.

E- Giving a lecture on Qanats, historic hydraulic structures and the activities of ICQHS at the "International Congress on Irrigation and Drainage".

F- Giving a lecture at the International workshop on Water & History entitled: Water relics, their significance in modern world, case study: Qanat system in Iran.

3.2 Participation in meetings related to the IHP and UNESCO (e.g., the UNESCO General Conference, the UNESCO Executive Board, the IHP Intergovernmental Council and/or other meetings organized by IHP)

To date ICQHS has participated in some meetings of this kind such as:

A- Active participation in 19th session of the IHP Intergovernmental Council

B- Giving a lecture at the international conference of water and culture entitled: "Considering The Cultural Parameters In The Water Resources Management Specially Groundwater" UNESCO, Paris.9 December 2010

C- Attending the international conference on Transboundary aquifers, UNESCO, Paris.6- 8 December 2010

D- Holding a training course for the managers of GEF MENARID projects upon the recommendation of IHP

3.3 Collaboration and networking with other UNESCO category 1 or 2 institutes/ centres

3.3.1 cross-appointment of directors of the category 1 or 2 institutes or centres on the governing board

The Director of the Regional Center on Urban water Management (RCUWM) is a member of the Governing Board of ICQHS.

3.3.2 exchange of information on activities such as training/educational materials, and funding opportunities

Holding a training course on transboundary waters in cooperation with IGRAG which is a category II UNESCO center, based in Delft, the Netherlands

3.3.3 exchange of staff, most notably professionals and students

As a lecturer ICQHS director participates in the training course on world history of water management which takes place at UNESCO-IHE every year.

3.3.4 implementation of joint activities, such as workshops, conferences, training programmes, joint projects, field visits, software and data sharing, knowledge exchange and publications

The training course on world history of water management was held at ICQHS in February 2012 in cooperation with UNESCO-IHE. Moreover, in 2010, ICQHS has published a book entitled "Veins of Desert" in cooperation with Iran Water Resources Management Company. Also the books "Qanat in its Cradle", "Qanat Practitioners of Kerman Province" and the Proceedings of TKWRM Conference are among the ICQHS publications during this period.

3.4 Relationships with the UNESCO field office whose jurisdiction covers the country of location

ICQHS is in close relationship with UNESCO Tehran Cluster Office (UTCO). Most of our research and training activities are done under the supervision of

this office. Recently ICQHS and UTCO jointly organized an International Conference on traditional knowledge for water resources management. This conference was held in February 2012. Concurrently with this conference, ICQHS and UTCO jointly have launched the first qanat club meeting with the presence of representatives from Qanat holding countries: Turkey, Algeria, Pakistan, China, Oman, Azerbaijan, Morocco and Japan.

3.5 Relationship with the UNESCO National Commission and the IHP National Committee in the country of location

Director of ICQHS is member of IHP National Committee and regularly attends its meetings which are held every month in Tehran.

3.6 Relationship with other UNESCO-related networks, such as UNESCO Clubs, ASPnet, and UNESCO chairs

There are some cooperation and links between ICQHS and UNESCO Iraq Office in the field of training. Also, upon their recommendation we are in the process of translating some books for Iraqi experts.

4. Communication

4.1 Communication and knowledge dissemination activities undertaken in the framework of IHP

Herein ICQHS has taken some measures as follows:

- a. Conducting a research project on some materials on qanat which are to be added to the primary schools textbooks*
- b. Getting on Iranian TV programs to describe the importance of Qanats and historic hydraulic structures in order to enhance the public awareness about the role of traditional water harvesting systems in sustainable development.*
- c. Teaming up with some directors in making some documentary movies and animations about Qanats and historic hydraulic structures*

4.2 Policy documents and advice

5. Update on Centre Operations

5.1 Membership of the Board of Governors during designated period

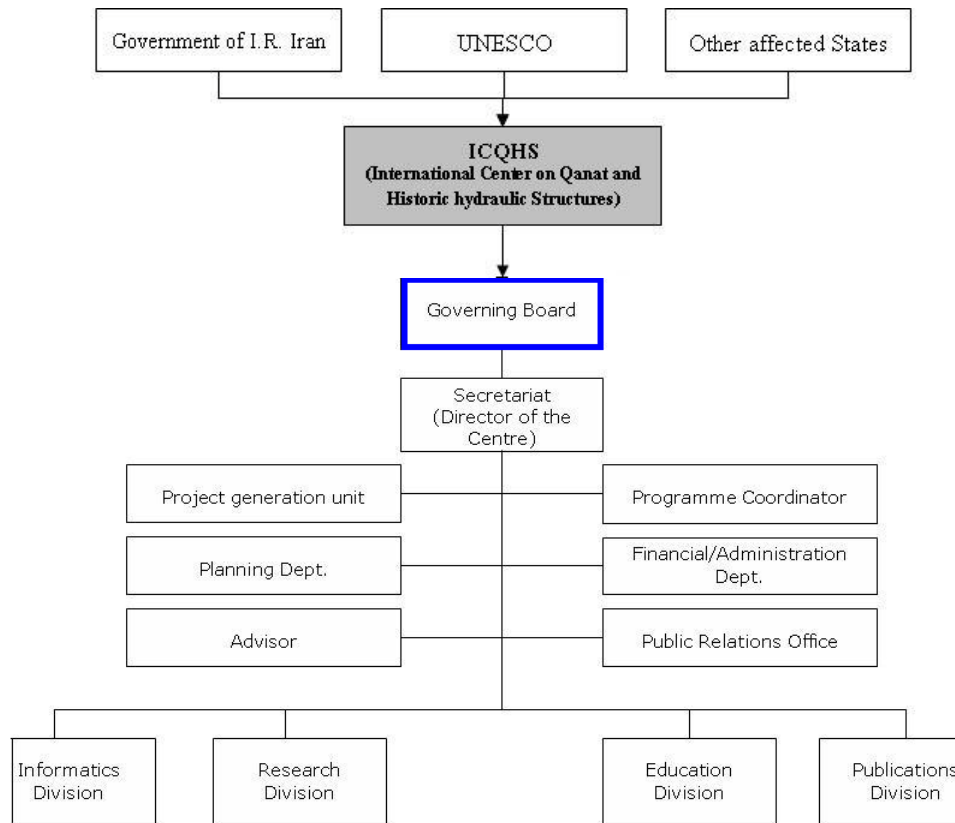
The International center is administered by a Governing Board composed of:

- a. A representative of the Iranian Government.*
- b. A representative of each of the other Member States that have sent the Director General of UNESCO notification, and make a substantial contribution to the operating budget or running of the international center, and are thus accorded a seat by a decision of the Governing Board.*
- c. A representative of the Director- General of UNESCO.*
- d. Director of the Regional center on Urban water Management (RCUWM) Tehran.*
- e. A representative of any other intergovernmental organization or international non governmental organization making a substantial contribution to the operating budget or running of the international center and accorded a seat by a decision of the Governing Board.*
- f. The Minister of Energy (Minister in charge of water affairs) of the Islamic Republic of Iran or the person he designates.*

The I.R. of Iran's minister of energy has designated deputy minister in water and wastewater affairs as the chairman of the governing board and has also invited the water-related ministers of some qanat holding countries. The first governing board meeting took place in July 2008, with the presence of Dr. Nagy UNESCO's representative and the representatives of the countries Iraq, China, Afghanistan and Pakistan. The Second Governing Board meeting of ICQHS was held in Yazd-Iran, 23 November 2009. The meeting was attended by the representatives of Azerbaijan, Iraq, UNESCO, Regional Centre on Urban Water Management (RCUWM – Tehran), Director of ICQHS, the chairperson of the governing board and UNESCO's representative.

Third Governing Board meeting of ICQHS was attended by UNESCO representatives of member countries such as Japan, China, Iraq, Syria and Algeria. Eventually 4th Governing Board Meeting (4GB) of ICQHS was attended by country members & Director of UNESCO-IHP at Tehran- Energy Ministry Building on 18 December 2011.

The organizational chart of ICQHS is as follows:



5.2 Key decisions made (attach minutes of meetings)

The 4th governing board meeting of ICQHS was held in the ministry of energy of the Islamic Republic of Iran, Tehran on 18 December 18, 2011. In the meeting qanat was introduced as an interdisciplinary subject which engages a wide range of sciences from geology to engineering to humanities and sustainable development, so every organization can take part in this mission no matter what their specialty is. It was agreed that ICQHS would take such measures as documentation of traditional knowledge, enhancing public awareness, improving the qanat practitioners' livelihood, etc to be taken in order to better preserve intangible heritage of qanat. The chairperson of the governing board stated that the Government of the Islamic Republic of Iran is trying to allocate more financial resources to the research projects of the center as well as its current activities. In this regard a budget equal to around 250,000 dollars has been allotted to the Center during 2011-2012 for its operating costs. The Iraqi representative announced his preparedness to have a MoU signed between the government of Iraq and ICQHS in terms of holding training courses on qanat for Iraqi experts. He stated that Iraq is in need of training and capacity building regarding rehabilitation and construction of qanats. Also the Algerian representative called for bringing into effect the MoU exchanged between Algeria and ICQHS. He also requested for holding an international training course on historic hydraulic structures in cooperation with UNESCO and ICQHS in Algeria in 2012. He assured that the government of Algeria would support this training course. Also, the governing board agreed that ICQHS would define its programs and activities only within the framework of IHP and develop the sectors of training, education, capacity building, publication and networking.

6. Assessment of the Centre's Impacts

6.1 Science Impacts (Major contributions to the science, technology, education, and regional and/or international cooperation in the field of water)

Publications of ICQHS are playing an important role in enhancing public awareness about qanat system and rational exploitation of groundwater, not only in the host country, Iran but also in the other qanat holding countries.

6.2 Knowledge Transfer Impacts (Major achievements in the dissemination of knowledge and technology transfer)

ICQHS could to date have made some progresses in disseminating knowledge and transferring technology through the following activities:

- *Training students: ICQHS set up the training center of Qanat where the traditional methods are handed down to tens of students learning how to protect and develop the system of Qanat.*
- *Documenting indigenous know how: ICQHS has sent out expeditions to gather traditional knowledge on Qanat through interviewing the elderly Qanat masters the last generation who are vanishing.*
- *Holding technical workshops: ICQHS periodically holds technical workshops for those who are involved in groundwater or Qanat-related issues. These events are aimed at incorporating the indigenous knowledge into the new methods of construction, preservation, rehabilitation and operation of Qanat systems. Through such workshops the participants can get familiar with the significant role the Qanats can play in sustainable groundwater exploitation, and also with the cultural and technical values the system of Qanat carries.*

6.3 Policy Impacts (advice sought by government and other bodies and evidence of inputs into policy arena)

ICQHS started some negotiations at governmental level which eventually led to an official agreement between the Iranian Ministry of Energy and Ministry of Agriculture. This agreement emphasizes the necessity of training on Qanat technology that the experts of both ministries should receive from ICQHS. Also this agreement stipulates that both ministries should allocate a fund to research projects on different aspects of Qanats, which would be done by ICQHS. Also ICQHS took the lead to organize a qanat committee including representatives of the ministries of agriculture and energy and the cultural heritage organization in order to achieve a convergence between those involved in qanats. Also, ICQHS has put forward a proposal to the Iranian ministry of energy on modifying the existing water fair distribution law in favor of qanats and having it ratified in the parliament in terms of qanat and protection of this ancient legacy against groundwater over-exploitation and structural damages.

7. Future activities that will contribute directly to IHP and/or to WWAP

7.1 Operational Plan

ICQHS's future activities mostly pertain to research and training as follows:

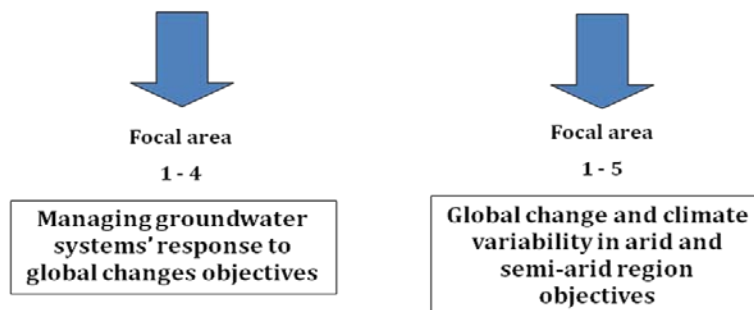
- *Disseminate world experiences on various aspects of Qanats and historic hydraulic structures;*
- *Incorporate the indigenous knowledge into the new methods of construction, preservation, rehabilitation and operation of Qanat systems as well as historic hydraulic structures;*
- *Turn Qanats into an interdisciplinary tool where the traditional know - how and the modern techniques work together;*
- *Acquaint experts with the importance of cultural and technical aspects of historic hydraulic systems as well as the community life linked to these systems.*

7.2 Strategic Plan linked with IHP-VII (attach strategic plan for 2008-11 if available)

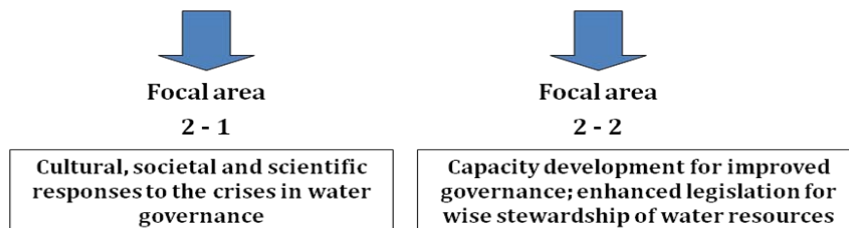
Due to global changes, a considerable number of aquifers over the world are subjected to over exploitation. Qanat is one of the rational groundwater exploitation methods. In this regard we have planned the construction of new qanats in Azerbaijan and Iraq with the cooperation of these countries which is in line with item 1.4 of the draft strategic plan.

One of the actions suggested through item 1-5 is to develop regional networks and inter-regional transfer of knowledge with the participation of IHP national committees and UNESCO category II centers for hydrology in arid zones. In this regard we declare our willingness to share this network and to transfer the knowledge of qanat constructions to the other communities. One of the research projects of the center focuses on the enhancement of the economic efficiency of qanats which is completely in line with the objectives of item 4-4 of the IHP strategic plan. One of the main activities of the center is focusing on capacity buildings and educating different groups of people on the issue of sustainable use of underground water, this activity includes items 5-1 to 5-4 of the strategic plan of IHP.

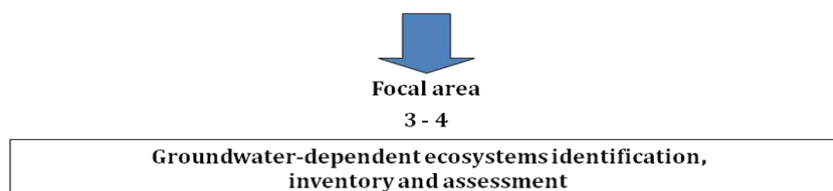
- **Theme 1: adapting to the impacts of global changes on river basins & aquifer system**



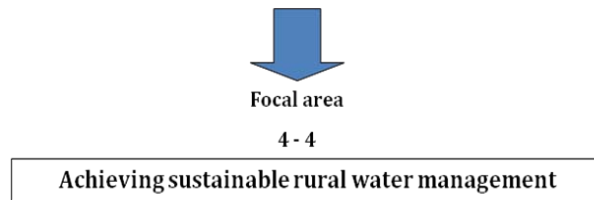
- **Theme 2: Strengthening Water Governance for Sustainability**



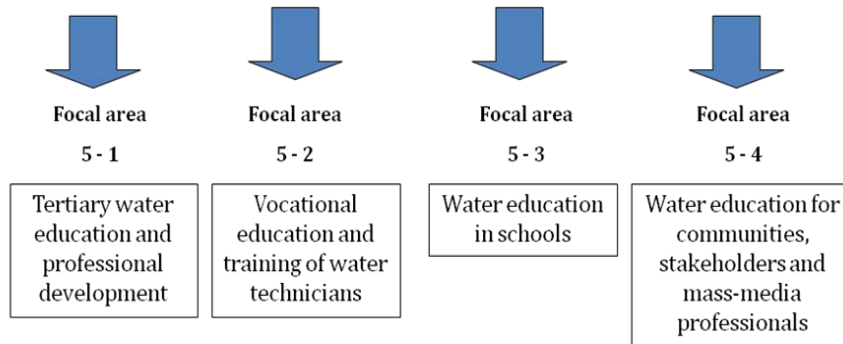
- **Theme 3: Eco hydrology for Sustainability**



- **Theme 4: Water and Life Support Systems**



- **Theme 5: Strengthening Water Governance for Sustainability**



8. Annexes

8.1 List of publications released by the centre (there can be overlap with those listed in 2.2 above)

- A- *The book Qanat from Practitioners' Point of View*
- B- *The book A Survey on the Qanats of Bam from Engineering Point of View*
- C- *English version of the book A Survey on the Qanats of Bam from Engineering Point of View*
- D- *Country report of Qanats of Afghanistan, Iran and Pakistan*
- E- *The book Qanat of Zarch*
- F- *Proceedings of the workshop on Groundwater Artificial Recharge and Rainwater Harvesting in Arid and Semi – Arid Regions of Asia*
- G- *Proceedings of the first international training course on Qanat; A Multidisciplinary Approach to Integrating Traditional Knowledge with Modern Development*
- H- *Veins of Desert*
- I- *Qanat in its Cradle*
- J- *Qanat Practitioners of Kerman Province*
- K- *Proceedings of TKWRM Conference*

8.2 List of training courses conducted (there can be overlap with those listed in 2.3 above)

- A- *Training Course on "Restoration and Maintenance of Karez: Advanced Techniques in Planning, Methodology and Applications" for Iraqi Experts*
- B- *a brief course on Procedure of Qanats Nomination in UNESCO World Heritage list for consulting engineers and experts.*
- C- *Training course on Qanat in the province of Southern Khorasan for the experts of Cultural Heritage Organization, Ministries of Energy and Agriculture, and Azad University – Birjand.*
- D- *Training the new generation of Qanat workers in Nakhchivan by ICQHS experts.*
- E- *Training workshop on Qanats in Bam with the collaboration of the UNESCO regional office officials in Tehran.*

- F- *International Training Course on Qanats for the experts of Islamic countries and the experts of other countries such as: Oman, India, Sri Lanka, Afghanistan, Pakistan, Tajikistan, United Arab Emirate, Iraq, Azerbaijan, Algeria, and Morocco.*
- G- *Training Course on Qanat technology and Historic Hydraulic Structures in Kerman for the experts of the regional water authority, ministry of agriculture, and cultural heritage organization.*
- H- *Training course on Qanats for Master and PhD students of Tarbiat Modares University.*
- I- *Training Course on Qanat Technology (Level 1) for the experts of Agriculture Organization of Qom.*
- J- *International Conference on Traditional Knowledge for Water Resources Management (TKWRM-2012) with the participation of 440 scholars and experts from 31 countries.*
- K- *International workshop on "Trans-boundary Waters, Opportunities for cooperation" with the presence of 44 national and International experts.*
- L- *First Qanat club meeting with the presence of representatives from Qanat holding countries: Turkey, Algeria, Pakistan, China, Oman, Azerbaijan, Morocco and Japan.*
- M- *Short course on World History of Water Management with Collaboration of UNESCO- IHE, UNESCO IHP & IWHA with the presence of 53 national and international experts.*

Format for Reports by UNESCO's Water-related Centres on activities related to the IHP in the period June 2010 – May 2012

1. Basic information on the centre

Name of the Centre		Dundee IHP-HELP Centre for Water Law, Policy and Science
Name of Director		Professor Dr Patricia Wouters
Name and title of contact person (for cooperation)		Dr Sarah Hendry
E-mail		s.m.hendry@dundee.ac.uk
Address		Peters Building University of Dundee
Website		www.dundee.ac.uk/water
Location of centre		city/town <u>Dundee</u> country: <u>Scotland, UK</u>
Geographic orientation *		<input checked="" type="checkbox"/> global <input type="checkbox"/> regional
Year of establishment		
Themes	Focal Areas ♦	<input checked="" type="checkbox"/> X groundwater <input checked="" type="checkbox"/> X urban water <input checked="" type="checkbox"/> X arid / semi-arid zones <input type="checkbox"/> humid tropics <input checked="" type="checkbox"/> X droughts and floods <input type="checkbox"/> sediment transport and management <input checked="" type="checkbox"/> X water and environment <input checked="" type="checkbox"/> X ecohydrology <input checked="" type="checkbox"/> XX water law and policy <input checked="" type="checkbox"/> XX transboundary river basins/ aquifers <input checked="" type="checkbox"/> XX IWRM <input checked="" type="checkbox"/> X global and climate change <input type="checkbox"/> mathematical modelling <input checked="" type="checkbox"/> X social and cultural dimensions of water <input checked="" type="checkbox"/> XX water education <input type="checkbox"/> other: (please specify) _____
	Scope of Activities ♦	<input checked="" type="checkbox"/> X vocational training

* check on appropriate box

♦ check all that apply

	<input type="checkbox"/> X postgraduate education <input checked="" type="checkbox"/> X continuing education <input checked="" type="checkbox"/> X research <input checked="" type="checkbox"/> X institutional capacity-building <input checked="" type="checkbox"/> X advising/ consulting <input type="checkbox"/> software development <input type="checkbox"/> other: (please specify) _____
Support bodies ¹	University of Dundee (Scottish Government)
Hosting organization ²	University of Dundee
Sources of financial support ³	Scottish Government; University of Dundee; research project funding
Existing networks and cooperation ⁴	
Governance	<input type="checkbox"/> X director and governing board <input checked="" type="checkbox"/> X other: (please specify) __University of Dundee_____ Link to election of board members to the IHP Intergovernmental Council (IGC) and hosting country IHP National Committee _____ Frequency of meetings: once every 1 __year(s) <input type="checkbox"/> X Existence of UNESCO presence at meetings
Institutional affiliation of director	
Number of staff and types of staff	total number of staff (full-time, or equivalent) : ____6.5 FTE____ number of staff who are water experts: ____6.5 ____ number of visiting scientists and postgraduate students: ____10____
Annual turnover budget in USD	\$1.5M

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 extra budgetary 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

2. Activities undertaken in the framework of IHP in the period June 2010 – May 2012

- 2.1 Educational activities (i.e., those with accreditation) that directly contributed to the IHP-VII (Appendix-1) and WWAP
Please include here those activities which led to accreditation of degrees, or those held in formal school settings.

The Dundee IHP-HELP Centre, which is located in the Graduate School of Natural Resources Law, Policy and Management (University of Dundee), offers a portfolio of graduate degrees (Masters and PhD levels) under the umbrella of its “Water Law, Water Leaders” (WLWL) programme. The degree courses on offer during this reporting period are presented in executive-style modules, presented over short periods of time, primarily through our summer WLWL taught programme. The degrees on offer include:

- LLM (and MSc) Water Governance and Conflict Resolution first cohort enrolled October 2008 – in partnership with UNESCO IHE-Delft;
- LLM Water Law validated summer 2008, first cohort enrolled January 2009
- MSc Water Resources Management and Law validated spring 2010 – in partnership with UNU INWEH. First cohort commenced January 2011.
- PhD in water law; water science; water policy.

Enrolment, through an international recruitment, of 7 scholarship PhDs under start-up grant from Scottish Government – each of these SRDG scholars is now finishing up with viva exams set over the next months; 2 post-doc researchers appointed under SRDG grant (in their final year); Research Assistants appointed on research project work.

The current suite of graduate programmes is being revisited, with more traditional offering under the Graduate School programme, commencing from 2012.

- 2.2 Research activities that directly contributed to the IHP-VII and activities by WWAP
Please include research/applied projects outputs such as publications that directly contributed to the IHP-VII and WWAP objectives

The Dundee IHP-HELP Centre contributes actively to the IHP-VII and WWAP through its considerable research in water law, policy and science. The Dundee Centre continues to attract significant research and project grants to support our research work. In summary, we have been successful in being awarded close to £2M for research projects, including a significant number of EU projects over the past years, with several of these projects now completed (Brahmatwinn, Striver, LiveDiverse) and new projects brought on board over the reporting period (GENESIS; LAGOONS; ESPA Deltas project). Most of these research projects are EU framework or UK Research Council-financed large international projects; the Dundee HELP Centre provides research inputs on differing components of the water law, policy and science; most of the research consortia involve multiple international and multi-disciplinary partners. These projects include research work on river basins in such countries as Bangladesh; Cambodia; Costa Rica; Finland; India; Norway; Portugal; South Africa; Spain; and Vietnam. We are also actively involved across Scotland (Tweed Basin) and the UK and work to consolidate our EU HELP basin network.

The Dundee IHP-HELP Centre has presented its research in numerous international meetings, and on the graduate teaching programmes provided in Dundee. The Dundee IHP-HELP Centre also continues to support the PCCP programme (Stockholm World Water Week session on Transboundary waters) and the ISARM programme (Professor Wouters was on the scientific committee for the December 2010 conference). The Centre contributed to the follow-on work from the 4th World Water Forum in Istanbul in 2010 (publication of policy briefs and research) and Marseille World Water Forum (2012).

At the Stockholm Water Week in 2011 Dr Rieu-Clarke convened a seminar *Strengthening Water Diplomacy in Transboundary Basins*, together with IUCN, GWP, UNESCO-IHP and the Swiss Agency for Development and Cooperation. . Andrew Allan presented the research findings on groundwater management from the Genesis project at the European Geosciences Union's General Assembly in Vienna (April 2012), emphasising the impact of governance quality on vulnerability and sustainable groundwater management. At the Stockholm Water Week 2010, Professor Wouters was invited to present on several panels, including a jointly convened session with UNESCO PCCP and UNECE on transboundary water resources management and with UNU-INWEH on transboundary lakes management (Great Lakes in Canada and Uganda).

Our participation at 6th World Water Forum, included a High Level Panel Global Water Governance organised by World Water Council; a WWF organised side event on UN Watercourses Convention; a thematic Session co-organised along with IUCN, WWF, UNESCO-IHP and others; and participation in a side event organised with the Finnish Government (SYKE) and UN ECE on the relationship between the UN Watercourses Convention and the UNECE Water Convention.

The Centre also collaborated with UNDP-CAPNET in preparing a training manual for Latin American water law, which continues to be used.

- **Contributions to IHP-VII (selected sample from Appendix I - Annex 3 attached to this report).**

The Dundee IHP-HELP Centre continues to contribute to a range of topics under the IHP-VII. Our group focuses primarily on our areas of expertise – water law, policy and science. Our activities are within the objectives and functions specified under our UNESCO agreement (see below).

On the HELP programme, we are currently actively engaged with two important projects -- *River Restoration on the Eddleston Water* (with M Bonell, C J Spray, T Ball, Josselin Rouillard, Nicole Archer and Brian Cook). Following on from the successful £38k Scoping Study managed by the Tweed Forum, the Dundee UNESCO team are now implementing a three-year project in which, following monitoring of surface and sub-surface water systems, a programme of river restoration and natural flood management measures will be deployed across the catchment. This work is supported by an investment by the Scottish Government and SEPA of around £250k over the reporting period 2010-12. The second project, *Invisible hazard: pluvial flooding in urban areas*, (with Donald Houston and Alistair Geddes - Geography). This is an 18 month £87k project funded by the Joseph Rowntree Trust which explores the potential impact of increased pluvial (urban) flooding on vulnerable people and communities across the UK. The UKCP09 weather generator will be used to determine potential uplifts in 24 hour maximum rainfall and, at four sites; the resulting pluvial flooding will be modelled using state of the art inundation models. Indices of social deprivation in the targeted urban areas will then ascertain whether the socially most vulnerable will be disproportionately impacted.

The Dundee IHP-HELP Centre's research projects under the EU framework programmes and the UK Research Councils / DFID ESPA programme also support many of the themes under IHP-VII; following is a summary of this work:

EU Funded Applied Research Projects:

- **LIVEDIVERSE (2009-2012):** This research project, coordinated by Professor Geoffrey Gooch, seeks to develop new knowledge on the interaction between livelihoods and biodiversity within the riparian and aquatic contexts. Our role is to seed engagement across civil society in the project. The Dundee team, with Dr Alistair Rieu-Clarke as Principal Investigator (PI) led the work on stakeholder participation and legal and policy analyses. <http://www.livediverse.eu/> - Country Focus – (Vietnam, India, Costa Rica and South Africa)
- **Assessing Climate Impacts on the Quantity and quality of Water (ACQWA)** ACQWA aims to assess the impacts of a changing climate, focusing on the quantity and quality of water originating in mountain regions, particularly where snow- and ice melt represent a large, sometimes the largest, stream-flow component. The Dundee team, with Andrew Allan as PI is to focus on the social and environmental impacts of climate change. (<http://www.acqwa.ch/>).
- **Groundwater and Dependent Ecosystems: New Scientific and Technological Basis for Assessing Climate Change and Land-use Impacts on Groundwater (GENESIS).** The objective of GENESIS is to integrate pre-existing and new scientific knowledge into new methods, concepts and tools for the revision of the Ground Water Directive and better management of groundwater resources. The Dundee team, with Andrew Allan as PI provide a legal assessment of this Directive. http://www.bioforsk.no/ikbViewer/page/prosjekt/forside?p_menu_id=16904&p_sub_id=16859&p_dimension_id=16858&p_dim2=16859
- **LAGOONS:** a new EU FP7 project assessing water status and the future management of coastal lagoons in the context of climate change. As well as a preliminary legal assessment, the Dundee team, with Prof Gooch as PI, leads on the stakeholder analysis, organises the stakeholder and public participation meetings. The Dundee team also lead on the work with qualitative scenarios, utilising several methodologies to ascertain management scenarios in the context of environmental pressures and multiple uses of the lagoons and their catchments.
- **Assessing Health, livelihoods, ecosystem services and poverty alleviation in populous deltas (April 2012 – March 2016),** funded through the UK NERC/DFID/ESRC Ecosystem Services for Poverty Alleviation programme. Dundee will lead the governance component of the project, a core element that will aid the development of model-based tools that take account of legal, institutional and policy realities. The project focuses on the Ganges-Brahmaputra-Meghna delta in Bangladesh, with the broader aim of more international application in India and China especially.
- **Suez Research Contract:** Led by Professor Patricia Wouters as PI, involves a comparative analysis of governance in water services provision (sanitation and water supply) as part of a contract for Suez Environment. The focus of this contract is the need for transparency, public participation and access to justice for water consumers. This research project resulted in a policy brief that was launched at the Marseille World Water Forum (2012).

National/Regional Projects: (Scotland)

- **Tweed HELP Basin. The Dundee IHP-HELP Centre** is working with the Tweed Forum to develop this as a HELP basin. This moves forward on a number of fronts, with Professor Chris Spray as one of the Directors. *The Eddleston Scoping Study* (a tributary of the TWEED HELP basin) financed by the Scottish Govt. and SEPA through the Tweed Forum. Initiated in 2009 (and on-going) to set out a trans-disciplinary research framework linked with Natural Flood Management (IHP Focal Areas 1.1/ 1.2/ 1.3/1.4/2.4/ 3.1/3.2/3.3/3.4/4.1/4.4/5.1) (for more details, see Annexes 6 and 7 – Minutes of UK-IHP National Commission).
- **Tweed HELP Basin: River Restoration on the Eddleston Water** (2010-12). Following on from the successful £38k Scoping Study managed by the Tweed Forum (see above in publications), the UNESCO team are now planning a three year project in which, following monitoring of surface and sub-surface water systems, a programme of river restoration and natural flood management measures will be deployed across the catchment. This work will be supported by an investment by the Scottish Government and SEPA of around £250k.
- **Tweed HELP Basin: Managing Borderlands** (2011/12). With Tweed Forum, Newcastle, Durham & York universities – part of a £190k RELU project looking at community knowledge and flood risk management in the Borders.
- **Insight Institute Water Management at the interface of government and society: Participatory Catchment Organisations**(2011). Workshops and field visits exploring the role of non-governmental organisations in four river basins (the **Tweed and the Dee HELP basins**, the Fraser basin in Canada and the **Motueka HELP Basin** in N Zealand) and how they contribute to policy delivery and participatory catchment management.
- **Fully Integrated Catchment Management Planning** (2011/12) –working with the James Hutton Institute to review the activities, objectives and successes of integrated catchment management projects and participatory organisations in the UK, Europe and overseas. Collaborated and assessed operational success of **UNESCO IHP-HELP Basins in UK, Europe, America and Australia.**
- **Invisible hazard: pluvial flooding in urban areas**, (with Donald Houston and Alistair Geddes - Geography). (2010-2012) This is an 18 month £87k project funded by the Joseph Rowntree Trust which explores the potential impact of increased pluvial (urban) flooding on vulnerable people and communities across the UK. The UKCP09 weather generator will be used to determine potential uplifts in 24 hour maximum rainfall and, at four sites, the resulting pluvial flooding will be modelled using state of the art inundation models. Indices of social deprivation in the targeted urban areas will then ascertain whether the socially most vulnerable will be disproportionately impacted.

Associate Programmes:

The Dundee IHP-HELP Centre has contributed to the IHP-VII Associate Programmes in a number of ways, including:

- Founding member of the International Flood Initiative (IFI) and contributing to the legal inputs under the IFI.
 - Water for Peace (PCCP) programme; Collaborated with UNESCO PCCP in the preparation and convening of the day-long transboundary waters workshop at the Stockholm World Water Week (August 2009).
 - ISARM programme - Professor Wouters is on the scientific committee for the December 2010 conference
 - Education, Training and Capacity Building across all the themes – Water Law Water Leaders, PhD programme
 - Collaborated with UNDP-CAPNET in preparing a training manual for Latin American water law.
 - Contributed to the Marseille World Water Forum (2012)
-
- **Contribution to WWAP**

The Dundee IHP-HELP Centre contributes to the work of the WWAP on several fronts. Professor Patricia Wouters contributed to the World Water Development Report on a number of occasions and continues to offer support to WWAP. The Dundee Centre is involved already in the preparation of the water law, policy and science contribution to the next WWDR and work closely with Olcay Unver and Bill Cosgrove in supporting the WWAP work. The Dundee Centre works with WWAP to produce two new legal publications as part of the side publications to the World Water Development Report 2012.

2.3 Training activities that directly contributed to the IHP-VII and WWAP objectives

The Dundee IHP-HELP Centre continues to provide training in the area of water law, policy and science. Over the past two years, we can highlight our collaboration with our sister UNESCO Centre – the Tehran RCUWM Centre, under which we jointly convened two international training workshops on international water law (in Dundee and in Iran).

Professor Patricia Wouters convened and contributed to a week-long specialized training programme for a high-level delegation from Malawi, “Water Sector Reform – PPP Options & Transactions, and Regulatory Issues” (May 2010). Talks are now underway to see how we might build on this undertaking, with a view to supporting improved implementation of the Malawi national water policy and water law reform.

Professor Patricia Wouters and Dr Alistair Rieu-Clarke have convened 3 international water law workshops in Dundee (June 2010; August 2011; June 2012) with participants from across the globe being hosted in Dundee with training in international water law and policy. This year’s training will feature participants from across the HELP basins and include the 2nd year of scholarship funding for participants from across the Global Water Partnership network. This year’s international water law workshop will involve

contributions from UNESCO-IHP (Shahbaz Kahn), as well as featuring UNESCO HELP basins in Europe and Australasia. In addition, Dr Alistair Rieu-Clarke, in collaboration with WWF, Hatfield Consultants and Government Ministries, has run a series of training workshops on international water law and the UN Watercourses Convention in Ethiopia, Cambodia and Vietnam.

The three Masters programmes currently on offer have enabled water professionals across the world to develop and extend their qualifications in water management, with modules in international water law, comparative national water law, the regulation of water services, and water resources management. The portfolio of modules and programmes is reviewed regularly to ensure its sustainability and fitness for purpose and to respond to student demand. This can include the provision of tailor-made training and short courses when demand exists.

Professor Chris Spray supports education, training and policy advice across Scotland and the UK. He co-hosted a visit to the Tweed Forum and HELP Basin by the new Scottish Minister for the Environment in July 2011. He co-convened the setting up and first Conference of the new Scottish research network, Cooperative for Zoonoses Experience and Expertise, working with the Moredun Institute in Edinburgh and Dr Roger Sokol from the New York State Department of Health. Professor Chris Spray is the Water Theme leader for the Centre for Environmental Change & Human Resilience (CECHR), University of Dundee.

3. Collaboration and linkages

3.1 Participation in major international networks, programmes, partnerships with other UN or other International Agencies, media and professional bodies

UN linkages

- IHE-Delft; joined up Masters programme in conflict prevention.
- Regional Centre on Urban Water Management-Tehran. The RCUWM and Dundee jointly convened a successful international water law symposium in Dundee on International Water Law (June 2010), which attracted a significant number of international speakers and delegates; this led to a follow-up request by RCUWM to conduct regional international water law training, in Kish (March 2011).
- UNU-INWEH: a joined-up degree programme under the Dundee Water Law, Water Leaders umbrella; new MSc in Water Resources Management and Law validated spring 2010, in partnership with UNU INWEH, had its first cohort of students in January 2011. The programme is now under review in light of the new School programme offerings.

Research Networks

UK

- UK : Scottish Alliance for Geoscience, Environment and Society; Royal Society of Edinburgh (Vice Chair of Climate Change Inquiry);
- Scottish Executive/Scottish Government : (Flooding Issues Advisory Committee; Flooding Bill Advisory Group; Flood Risk Management Advisory Group) ;

- Macaulay Land use Research Institute (Aberdeen): Member of Governing Board and Trustee
- Member of Board of the New Institute: (merger of the Macaulay Land Use Research Institute and the Scottish Crop Research Institute.);
- UK Environmental Law Association;
- Scottish Centre for Research Excellence in Waters (CREW) – member of Programme Advisory Group;
- Natural Environment Research Council – College
- Cooperative for Zoonoses Experience and Expertise – member of Steering Group

EU

- EU Framework programmes through research projects
- IHE Delft collaborative graduate programme

International

- Professor Wouters is a member of Global Water Partnership Technical Experts Committee (GWP-TEC);
- Professor Wouters sits on the Global Agenda Council of the World Economic Forum (2010)
- Research Collaboration Network (RCN) on Hydro-Diplomacy with Tufts, Harvard and MIT (2012-2015) funded by USA National Science Foundation.
- Dr Alistair Rieu-Clarke is a member of IUCN Commission on Environmental Law on transboundary waters matters
- Member of the Universities Partnership on Transboundary Waters, which works closely with UNESCO PCCP.

3.2 Participation in meetings related to the IHP and UNESCO (e.g., the UNESCO General Conference, the UNESCO Executive Board, the IHP Intergovernmental Council and/or other meetings organized by IHP)

Representatives of the Centre have attended the UNESCO General Conference and the IHP intergovernmental council (2010 and 2012). Professor Wouters was invited to speak at the Global Futures seminar (April 2012) convened by DG Hans D'Orville. Professor Wouters contributes to the UNESCO Scotland committee.

3.3 Collaboration and networking with other UNESCO category 1 or 2 institutes/ centres (see below)

Representatives from the Dundee Centre have attended meetings and initiatives by category 1 and 2 Centres. The Dundee HELP Centre has a shared Masters programme with IHE-Delft and explores collaborations in research and under Erasmus Mundus with the Delft Centre. Dr Hendry, Dr Rieu-Clarke, Prof Bonell, Prof Spray have attended category 2 Centre / IHP HELP conferences and programmes, including the recently convened meeting in Panama.

3.4 Cross-appointment of directors of the category 1 or 2 institutes or centres on the governing board, exchange of information on activities such as training/educational materials, and funding opportunities

The Dundee IHP-HELP Centre through its Governing Board involves directly a UNESCO IHP representative (Professor Shahbaz Khan sits on the Governing Board of the Dundee Centre), with provision in the statutes as well for UNESCO member state involvement. Professor Wouters has been invited to be on the board of the Regional Centre on Urban Water Management-Tehran. Professor Wouters sits on the International Advisory Committee of United Nations University Institute of Water, Environment and Health (UNU-INWEH).

Prof Spray hosted a visit from the Swedish EPA for West Jutland to the Tweed HELP Basin and Eddleston Water in Sept 2011, and also a visit from the Danish Councils of the Gudenna river basin. Subsequently, he was invited to Denmark in December as keynote speaker and adviser to the set of the new Danish Catchment Organisation for the Gudenna river basin.

3.4.1 exchange of staff, most notably professionals and students

The Dundee IHP-HELP Centre regularly exchanges information on its activities, including a broad dissemination of its learning materials on-line.

- Dr Hendry is in regular contact with staff at UNESCO IHE-Delft, where she is a guest lecturer, and attended the European inaugural workshop of the water education network.
- New MSc in WRM & Law – Dundee Centre is a regional centre accredited by UNU- INWEH and accepts the UNU INWEH Diploma for entry with advanced standing.
- Professor Wouters, Dr Alistair Rieu-Clarke and Andrew Allan have been involved in UNESCO PCCP training and programmes in the past.
- Contribution to the University of Dundee MSc programme on Sustainable Catchment Management in the School of Geography – Prof Chris Spray and Dr Sarah Hendry.

3.4.2 implementation of joint activities, such as workshops, conferences, training programmes, joint projects, field visits, software and data sharing, knowledge exchange and publications

The Dundee IHP-HELP Centre is active in its participation and convening of workshops, conferences, training programmes and knowledge exchange. As a unit of higher education these activities are central to the Centre's core mission, including its commitment to high quality research under the UK Research Excellence Framework (REF), which our Centre staff contributes to.

- Professor Mike Bonell and Dr Sarah Hendry held a Scottish Carnegie grant during this period to visit other UK HELP basins and assess the potential for research collaboration building on HELP.
- Professor Wouters sits on the UNESCO Scotland committee and contributes also the UK UNESCO national commission programme.
- Hosted UNESCO Scotland meetings and works closely with the committee to promote UNESCO Scotland and UNESCO UK events.

- The Centre under its Water Leaders programme convenes annual training workshops in three areas of water law: international water law; national water law; governance and regulation; in addition, the MSc programme provides opportunities for enhancing knowledge in water science and policy.
- The Centre is involved in numerous international research projects and actively engages in knowledge exchange and publications in peer-reviewed journals, books and policy forums (see details in Annexes).

3.5 Relationships with the UNESCO field and regional office whose jurisdiction covers the country of location

- Professor Wouters sits on the UNESCO Scotland Committee and supports relevant activities of the UNESCO UK national committee.
- The Centre reports to the UNESCO UK IHP committee.
- Professor Spray attended the IHP-HELP conference in Panama (November 2011).

3.6 Relationship with the UNESCO National Commission and the IHP National Committee in the country of location and with other organizations of other countries

- Dr Hendry has attended the UK Committee for National and International Hydrology since 2008. This Committee is part of the UK's reporting mechanism to UNESCO for the IHP.
- Professor Wouters sits on the UNESCO Scotland Committee and contributes also the UK UNESCO National Commission Programme.
- Hosted UNESCO Scotland meetings and works closely with the committee to promote UNESCO Scotland and UNESCO UK events

3.7 Relationship with other UNESCO-related networks, such as UNESCO Clubs, ASPnet, and UNESCO chairs

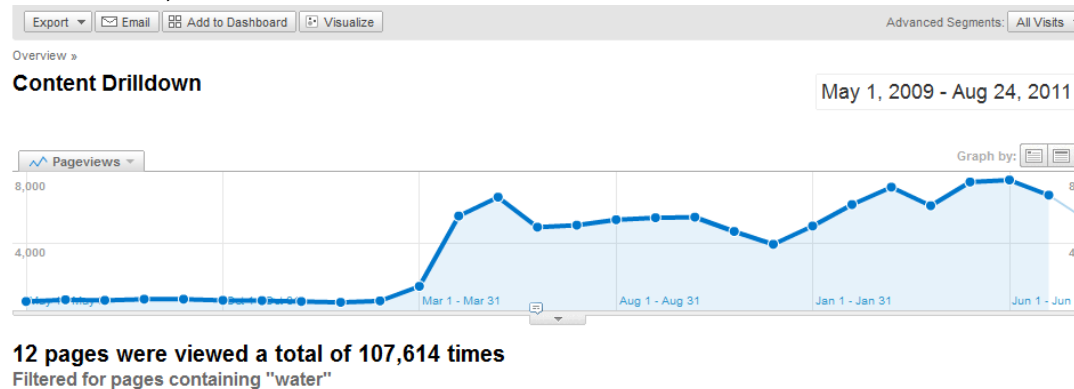
The Dundee IHP-HELP Centre through its Governing Board involves directly a UNESCO IHP representative (Professor Shahbaz Khan sits on the Governing Board of the Dundee Centre), with provision in the statutes as well for UNESCO member state involvement. Professor Wouters has been invited to be on the board of the Regional Centre on Urban Water Management-Tehran. Professor Wouters sits on the International Advisory Committee of United Nations University Institute of Water, Environment and Health (UNU-INWEH). Centre staff have been actively engaged in UNESCO related networks, including across research projects and training activities.

4. Communication

4.1 Communication and knowledge dissemination activities undertaken in the framework of IHP

Knowledge transfer has been central to our research dissemination and uptake. Through the many efforts of our Knowledge Exchange Coordinator, the Centre has pioneered an innovative strategy for outreach and engagement. We have devised a range of mechanisms – from tailor-made in-house website design and brand development, through the proactive use of a range of social media (eg. Linked-in), and through convening and presenting our research in Dundee and around the world, and publications in leading research journals and policy for a, in addition to our WLWL programme uptake -- the Centre has actively undertaken knowledge

transfer activities, with demonstrable success. Our website traffic continues to grow with our policy of open engagement – making our research available to the global community. The Dundee IHP-HELP Centre publishes and disseminates across its networks, including UNESCO, a monthly newsletter related to its research and activities, in addition to its Linked-in outreach.



In addition to website and e-based dissemination, the Centre's research has been published in a number of peer-reviewed journals and international publications, including the UN World Water Development Report, the leading policy document in this area, published each 3 years compiling the UN expertise. A list of the Centre's publications is appended to this report.

4.2 Policy documents and advice (see relevant details in Annexes attached)

Knowledge transfer has occurred through professional training to government officials from Ethiopia, Iran, Namibia, Uganda, Belarus, Latvia, Russia to the States of the Aral Sea and Mekong River basins on the sustainable use of water and on the development of national water legislation and international legal and institutional mechanisms. We have also developed with the Global Water Partnership the innovative Knowledge Chain scholarship to identify and train water resources experts from across the GWP network in water law and policy. The inaugural session was completed in Dundee in August 2011, a successful venture, which has prompted the GWP to embed this within its capacity development programme (5-year plan). This endeavour created an operational platform for the export of Scottish knowledge in water law, policy and science around the world. This is supplemented also by the international dissemination of our research through the many EU and international research projects that we continue to undertake – another vehicle for exporting Scottish knowledge. We have used our unique knowledge to assist with improving water governance, legal frameworks, policies and science in countries around the world. Our work has also informed global policy bodies such as the UN (numerous UN organs), the World Economic Forum Global Agenda Council on Water Security, the Global Water Partnership, the WWF and others.

In Scotland, the Centre has been active in its support for the Scottish Government, under the Hydro-Nation initiative, and an active participant in the Centre for Expertise in Water (CREW). It also participates on UNESCO Scotland, with programme support under its science and higher education programmes. The Centre has been very active on the Tweed basin, which is now a UNESCO HELP basin. The UNESCO Centre organised and hosted several workshops in collaboration with several partners [Tweed Forum, British Geological Survey, School of Social and Environmental Sciences of the University of Dundee (Geography) and the Scottish Crop Research Institute] with the objective of setting out a short-term, as well as a mid-term, research agenda which could address both the land - water management and water legislation issues, as identified in the Catchment Management Plan of the River Tweed basin. This research agenda offered a point of departure for continued discussions with the Scottish Government (e.g. Scottish Environment Protection Agency, SEPA; Scottish Natural Heritage, Scotland Northern Ireland Forum for Environmental Research, SNIFFER); and the development of this agenda within the context of the national priorities in water policy and water law and the EU Water Framework Directive (WFD).

5. Update on Centre Operations

5.1 Membership of the Board of Governors between designated period

The Membership of the Governing Board comprises Chair, Professor Peter Downes (Principal and Vice-Chancellor, University of Dundee); Vice-Principal Professor Christopher Whatley; Dr Bill Cosgrove (WWAP); Dr John Francis (UNESCO Scotland); Dr Alan Sutherland (Scotland Water Industries Commissioner); Professor Shahbaz Khan (UNESCO IHP).

5.2 Key decisions made

The Centre focuses on research and higher education teaching and training, with emphasis on knowledge exchange.

Minutes of meetings are available upon request. Major decisions focus on the need to achieve research excellence, deliver on UNESCO IHP objectives and accomplish financial sustainability. As part of the University of Dundee, we have a number of deliverables on the research, graduate teaching/training, and financial sustainability fronts. We also have commitments to the Scottish Funding Council, which provided the significant start-up funding. The Strategic Research Development Grant start-up funding for the Dundee UNESCO Centre finished in 2011.

6. Evidence of the Centre's Impacts

6.1 Science Impacts (Major contributions to the science, technology, education, and regional and/or international cooperation in the field of water)

The Dundee IHP-HELP Centre contributes to science impacts on two levels: through its substantial body of research and also through its graduate teaching and training programme (under the umbrella of the Water Law Water Leaders programme). The list of publications and policy briefs referred to in this document provide evidence of some of the impact of our work. In addition, the Centre is involved in numerous peer reviews of global, regional and national research projects and initiatives in the area of water law, policy and science (Australia; Canada; Netherlands; EU) and Centre staff sit on international advisory boards and research panels where they influence research agendas and policy initiatives.

6.2 Knowledge Transfer Impacts (Major achievements in the dissemination of knowledge and technology transfer)

The Dundee IHP-HELP Centre under the umbrella of its Water Law Water Leaders programme provides on-going graduate teaching and training in the areas of water law, policy and science, in Dundee, across Scotland, the UK, and Europe and around the world. We work with sister UNESCO Centres, and UN bodies and EU framework partners to achieve knowledge transfer through our taught programmes and training sessions. As a direct result of these activities, we have influenced national water law and policy reform and set global policy agendas in a number of ways.

The Centre has achieved high international visibility over the short period since its creation enhancing Scotland's global reputation in our field of expertise. We have engaged with leading researchers and stakeholders from around the world on a range of EU and other research projects and presented our work across the globe. We have been invited to the top tables nationally (in Scotland) and internationally and have had an impact on crystallising the national and global agenda on water. The Centre assisted the Scottish Government in putting forward its bid to host the World Water Forum, which is the largest international meeting of water experts; Scotland was shortlisted and just missed out on winning this first proposal. The Centre now works closely with the Scottish Government and Scottish Water to articulate and roll out the Hydro-nation agenda for Scotland, including embedding this within the global water policy forum, through the Centre's international networks. At the international level, the Centre has been invited to contribute to global policy fora, including the World Economic Forum, the UN World Water Development programme; the Inter-Action Council and through its extensive engagement with the UN, and EU.

6.3 Policy Impacts (advice sought by government and other bodies and evidence of inputs into policy arena)

National Level

- On-going consultancy work requested by the UK Department for International Development and World Wildlife Fund Project to examine the *International Architecture for Transboundary Water Resources Management*.
- Expert Advice UK government to provide expert advice on global and national water security issues.
- Policy support to the Scottish government on European Union Water Framework Directive, and Floods Directive matters.
- Membership of the Customer Forum, a new body set up to improve the representation of consumers in the price setting process for water services in Scotland – Dr Hendry was invited to be a member of that committee.
- Dr Hendry co-convenes the Scots water law sub-group of the UK Environmental Law Association and as such coordinates responses from the profession to government policy initiatives.
- Member of Scottish Government Flood Advisory Implementation Forum – Prof Chris Spray
- Member of NERC College Review Panel – Prof Chris Spray
- Chairman of Freshwater Biological Association – Prof Chris Spray
- Member of British Waterways (Scotland) Advisory Board – Prof Chris Spray
- Provided extensive support to the Scottish Government in its proposal to host the World Water Forum 2015 (Scotland was short-listed)
- Provide support for Scottish Government "Hydro-Nation" policy initiative.

International level

- Provided Advice to WWF for ratification campaign around UN Watercourses Convention. This work continues with a significant funding grant from the Norwegian government that will result in major publications (UN WC User's Guide; Earthscan book) and an international symposium to be hosted in Dundee (June 2012).
- Provided advice to the Government of Kazakhstan on improving the governance framework for farmer-managed irrigation schemes under a EuropeAid project.
- Policy advice to the Mekong River Commission and Asian Development Bank relating to the governance of the Sesan River Basin.
- Professor Wouters sits on the GWP-TEC, and also on the World Economic Forum Global Agenda Council on Water Security, where she provides support for transboundary water law and policy issues, including water security.
- Andrew Allan contributed to the UNECE Guidance on Water and Adaptation to Climate Change (2009).
- Professor Wouters was invited to High Level Panel of Experts for meeting of Inter-Action Council (comprised of former heads of State) for prep com meeting on Global Water Security; the impacts are reflected in the IAC annual meeting, which recognised the role of water law, policy and science in the management of the world's shared water resources (see "World needs Water Leadership", <http://interactioncouncil.org/former-heads-government-world-needs-water-leadership>).
- Professor Wouters was recognised as IUCN Academy of Environmental Law Distinguished Scholar at their annual meeting (South Africa, 2011).
- Professor Wouters has been named under the China 1000 Talents programme as visiting professor at Xiamen University, home to China's leading international law school, where she will assist the Chinese to establish an international research and graduate teaching programme on international water law.
- Professor Wouters was invited to a regional meeting on the Tigris-Euphrates (May 2012) to speak on the role of international law in managing transboundary water resources. The meeting included discussions with the Minister of Energy and Water.
- Professor Wouters has been invited to speak at several high-level panels on water security at Chatham House, one of the world's leading policy bodies.

POLICY BRIEFS

- P. Wouters, Water Security: Global, Regional and Local Challenges, Institute for Public Policy Research (IPPC) for the Commission on National Security in the 21st Century (2010)
- Water and Sanitation Services in Europe, Policy Makers Guidance Document, Do Legal Frameworks provide for "Good Governance"? IHP-HELP Centre for Water Law, Policy and Science, under the auspices of UNESCO, University of Dundee, Scotland, UK.
- **LiveDiverse Policy Brief: Stakeholder Participation in Research Projects, December 2011, Armelle Guignier and Alistair Rieu-Clarke**, IHP-HELP Centre for Water Law Policy and Science under the auspices of UNESCO, University of Dundee.

- **LiveDiverse Policy Brief: GIS database support for decision-making, August 2011, Do Minh Phuong and Nguyen Thanh Xuan**, National Institute of Agricultural Planning and Projection Hanoi, Vietnam.
- C.J.Spray. Water Management at the Interface of Government and Society; the role of Participatory Catchment Organisations – Implications for Policy Development (2012)
- series of policy briefs on the portfolio of EU projects.

7. Future activities that will contribute directly to IHP and/or to WWAP

7.1 Operational Plan (attach if available)

The Operational Plan for the UNESCO Centre has been governed by its agreement which set forth the following objectives and functions:

The Dundee IHP-HELP Centre will continue to support the work of the IHP and WWAP. In particular, our commitments in this respect are reviewed and validated by the annual meetings of the Governing Board. The annual work plans for the Centre are approved by the Governing Board, meeting annually and in line with the UNESCO agreement and the Scottish Government Strategic Research Development Grant. Following is a summary of the Key Objectives of the Dundee HELP Centre under its founding agreement with UNESCO:

Annex-1 – Key Objectives

UNESCO Resolution: Article 3 Objectives and functions

1. The objectives of the IHP-HELP Centre are:

- (a) to provide a facility that promotes an interdisciplinary approach to addressing global water issues with a focus on poverty reduction and international development issues (including the United Nations Millennium Development Goals related to water), and, including water law (international, national and transnational water law) as an essential and integral element thereof;
- (b) to provide the intellectual leadership necessary in achieving this approach and to establish a dedicated institution for the dissemination of relevant research and scholarship on the topic, available to the global water-concerned community worldwide and aimed at generating goodwill with the international community;
- (c) to communicate legal expertise on global water issues for the HELP Programme of the UNESCO IHP, especially through the IHP-HELP Regional Coordinating Units, as well as to support the other water-related activities of IHP.
- (d) to act as the Regional Coordinating Unit for the European HELP basins and proactively interact with other HELP Regional Coordinating Units.

2. The functions of the IHP-HELP Centre shall be to:

- (a) design, develop and deliver educational and training activities related to its interdisciplinary approach to water-resources management, with a particular focus on poverty reduction and international development, including assisting States to achieve the United Nations Millennium Development Goals related to water;
 - (b) convene interdisciplinary scientific symposia and conferences at regional and international levels, as well as training workshops, with a particular focus on interfacing water law, policy and science and to developing capacity within nation-states worldwide;
 - (c) provide a focal point for HELP basins worldwide on issues related to water law and the interface between water law, policy and science issues;
 - (d) endeavour to establish the Spey Basin (Scotland) as a HELP basin for research and training within the IHP-HELP Centre's mandate of providing an interface between hydrological research and water policy and law; and act as liaison with related UK-based research programmes, such as CHASM-HELP (Catchment Hydrology and Sustainable Management), SNIFFER (Scotland and Northern Ireland Forum for Environmental Research), RELU (Rural Economy and Land Use Programme);
 - (e) develop new approaches to water resources management incorporating water law, policy and science as integrated components to address global water problems, with efforts also to support the development of a new generation of water leaders at the national level worldwide, familiar with the IHP-HELP Centre approach;
 - (f) provide a forum for think-tank meetings on water-related topics;
 - (g) provide expert input as required by UNESCO IHP; and
 - (h) collaborate proactively with other UNESCO HELP Regional Coordinating Units and IHP Water Centres.
3. The IHP-HELP Centre shall pursue the above objectives and functions in close coordination with UNESCO IHP, and in particular, the IHP-HELP Programme.
 4. The IHP-HELP Centre shall carry out the above functions to the extent to which resources and international support can be mobilized.

As part of its start-up funding, the Scottish Government agreed the following key objectives for the Dundee HELP Centre:

Scottish Funding Council - Key objectives

1. To establish a global Centre of Excellence in water law, policy and science and enhance Scottish excellence in water-related research;
2. To enhance existing excellence in water law through the creation of a new Chair and a Senior Lectureship in Water Law, supported by PhD research studentships (a broader research base);
3. To enhance existing excellence in water science through the creation of a new Chair in Water Science, to serve the UNESCO HELP programme, supported by PhD research studentships;
4. To develop an operational model of engagement that enhances the integration of research and uptake of research across the disciplines of water law, policy and science (broadly defined, i.e. hydrology, life sciences, social sciences);
5. To focus on identifying means to assist States to address their water related challenges, including supporting developing countries to meet their Millennium Development Goals (MDGs) through research outputs and training developed and disseminated by the Centre;
6. To act as the Regional Coordinating Unit for the European UNESCO HELP basins and provide water law and policy input for the global HELP network of 67 basins;
7. To develop and implement the "Water Law - Water Leaders" LLM postgraduate programme, especially in developing country regions, e.g., Africa, Central Asia, South-east Asia;

8. To convene international symposia, including high-level meetings on relevant topics, featuring UNESCO HELP basins as developmental case studies for the integrated approach to water law, policy and science;
9. To develop a Scottish river basin as a model HELP basin for developing expertise on integrated water law, policy and science approaches to addressing basin-wide water resource management issues; to link the Scottish basin to other HELP basins which seek to integrate water law, policy and science;
10. To act as an international think-tank, bringing together researchers from Scotland and abroad for symposia and experts meetings to address the world's water resource management problems, with a particular focus on poverty reduction.

The Dundee UNESCO Centre, following a recent independent evaluation will work to align its future activities with the Key Objectives under the UNESCO agreement.

7.2 Strategic Plan linked with IHP-VII (attach strategic plan if available)

The Dundee IHP-HELP Centre will deliver under the UNESCO IHP objectives, guided by the Centre's Governing Board, taking on board the recommendations of the Evaluation Panel (March 2012).

8. Annexes

- 8.1 List of publications released by the centre (there can be overlap with those listed in 2.3 above)
- 8.2 List of training courses conducted (there can be overlap with those listed in 2.1 above)
- 8.3 List of Research Projects
- 8.4 International Water Law Workshop Programme (June 2012) (see www.dundee.ac.uk/water)

Appendix-1

Overview of the Core Programme Themes of the Seventh Phase of the IHP (2008-2013) WATER DEPENDENCIES: SYSTEMS UNDER STRESS AND SOCIETAL RESPONSES

Theme 1: ADAPTING TO THE IMPACTS OF GLOBAL CHANGES ON RIVER BASINS AND AQUIFER SYSTEMS

- Focal area 1.1 - Global changes and feedback mechanisms of hydrological processes in stressed systems
- Focal area 1.2 - Climate change impacts on the hydrological cycle and consequent impact on water resources
- Focal area 1.3 - Hydro-hazards, hydrological extremes and water-related disasters
- Focal area 1.4 - Managing groundwater systems' response to global changes
- Focal area 1.5 - Global change and climate variability in arid and semi-arid regions

Theme 2: STRENGTHENING WATER GOVERNANCE FOR SUSTAINABILITY

- Focal area 2.1 - Cultural, societal and scientific responses to the crises in water governance
- Focal area 2.2 - Capacity development for improved governance; enhanced legislation for wise stewardship of water resources
- Focal area 2.3 - Governance strategies that enhance affordability and assure financing
- Focal area 2.4 - Managing water as a shared responsibility across geographical & social boundaries
- Focal area 2.5 - Addressing the water-energy nexus in basin-wide water resources

Theme 3: ECOHYDROLOGY FOR SUSTAINABILITY

- Focal area 3.1 - Ecological measures to protect and remediate catchments process
- Focal area 3.2 - Improving ecosystem quality and services by combining structural solutions with ecological biotechnologies
- Focal area 3.3 - Risk-based environmental management and accounting
- Focal area 3.4 - Groundwater-dependent ecosystems identification, inventory and assessment

Theme 4: WATER AND LIFE SUPPORT SYSTEMS

- Focal area 4.1 - Protecting water quality for sustainable livelihoods and poverty alleviation
- Focal area 4.2 - Augmenting scarce water resources especially in SIDS
- Focal area 4.3 - Achieving sustainable urban water management
- Focal area 4.4 - Achieving sustainable rural water management

Theme 5: WATER EDUCATION FOR SUSTAINABLE DEVELOPMENT

- Focal area 5.1: Tertiary water education and professional development
- Focal area 5.2: Vocational education and training of water technicians
- Focal area 5.3: Water education in schools
- Focal area 5.4: Water education for communities, stakeholders and mass-media professionals

ANNEX 3 – TABLES FOR REPORTING CONTRIBUTIONS

1) Activities your organisation has been involved in that contributed to the IHP

	Activity (inc. dates and key outputs/publications)	Individual(s) Involved (if appropriate)	Nature of Contribution (Lead / Contributing Partner / Funder)	Type of Contribution (Please tick all those that apply)					Area of IHP (See page 1)	
				Research	IHP Related Meeting	Education/Training Course	Funding of IHP Related Activities	Cooperation with IHP Centre	IHP-VII Theme	Programme (if appropriate)
IHP-HELP Centre for Water Law, Policy and Science	Scoping study on the Eddleston subcatchment, completed and a report submitted to the funders (Scottish Government, SEPA and the Tweed Forum).	A Werrity, C Spray, T Ball, N Archer, M Bonell	Lead	Y					1.1, 3.1, 3.2, 3.3, 4.4	HELP – Tweed is a HELP basin
IHP-HELP Centre for Water Law, Policy and Science	Eddleston Phase II ()takes forward twin objectives of habitat maintenance and natural flood management, with particular emphasis on surface water – groundwater interactions and flood pathways, within a catchment approach and considering the inputs of stakeholders. It is delivered by a partnership, and funded by the Scottish Government and SEPA’s river restoration fund. Partners include BGS, Forestry Commission, Scottish Borders Council and UoD and it is managed by the Tweed Forum.	C Spray, M Bonell, T Ball, N Archer, A Black, A Werrity ; with BGS and other partners	Lead	Y					1.1, 3.1, 3.2, 3.3, 4.4	HELP – Tweed is a HELP basin
IHP-HELP Centre for Water Law, Policy and Science	RELU grant to work with Newcastle, Durham and York Universities and Tweed Forum, looking at knowledge controversies around	C Spray, B Cook	Contributing partner	Y					2.1, 2.2, 2.4, 4.4, 5.4	HELP – Tweed is a HELP basin

	flood management in the Wooler and the Eddleston.									
IHP-HELP Centre for Water Law, Policy and Science	Scottish Universities Insight Institute grant with St Andrews university to bring together the non-governmental organisations in four river basins (the Tweed and the Dee, the Fraser basin in Canada and the Motueka in N Zealand) to explore their roles in policy delivery and participatory management. Final report and a policy brief have been produced and one paper out for review.	C Spray, B Cook	lead	Y					2.1, 2.2, 2.3, 2.4	HELP – 3 of the 4 basins involved are HELP basins
IHP-HELP Centre	Integrated Catchment Management (CREW ()): - reviewing experiences of non-governmental catchment organisations outside Scotland and their relationship with statutory delivery of catchment improvements. Working with a wide range of HELP basins in the UK, Europe and further afield to compare approaches to priority setting; to stakeholder engagement, and to aligning plans between local communities and national targets.	C Spray, B Cook, J Rouillard	Lead	Y					2.1, 2.2, 2.3, 2.4, 3.2, 4.3, 4.4	HELP Basins are the focus of this project – UK, Europe, Philippines, US, Australia.
IHP-HELP Centre for Water Law, Policy and Science	Undertake and disseminate results of comparative studies into governance, legal regimes for good water governance, and indicators for governance, working with stakeholders on basin and global scale. Under FP6, BRAHMATWINN and STRIVER; under FP7, LiveDiverse, GENESIS, AQWA, LAGOONS. These projects build capacity and develop better legal and administrative frameworks. A range of publications are available.	A Allan, A Rieu-Clarke, G Gooch, S Hendry	Lead for LiveDiverse, Contributing partner for others	Y					2.2, but the wider project activities are also relevant to other themes.	
	Production of a 300 page <i>User's Guide</i> on the 1997 UN Watercourses Convention, which seeks to make the text of Convention more	A Rieu-Clarke, Bjoern-Oliver Magsig and Ruby Moynihan	Lead				Y		2.4 and 5.4	

	accessible to a range of stakeholders	Y								
IHP-HELP Centre for Water Law Policy & Science	Regional assessments of the role and relevance of the 1997 UN Watercourses Convention in East Africa, South East Asia, China, Central Asia, South America and the Congo Y	A Rieu-Clarke, Musa Abseno Dinara Zighanshina	Lead	Y					2.4	
IHP-HELP Centre for Water Law, Policy & Science	An edited book to be published by Earthscan which gathers together expert opinion regarding the relevance of the 1997 UN Watercourses Convention	A Rieu-Clarke, Ruby Moynihan, Patricia Wouters		Y					2.4	
IHP-HELP Centre for Water Law, Policy & Science	A series of training and awareness raising workshops related to the 1997 UN Watercourses Convention in East Africa, Addis Ababa (Ethiopia); and SE Asia, Siem Reap (Cambodia) and Hanoi (Vietnam)	A Rieu-Clarke	Lead			Y			2.4 and 5.4	
IHP-HELP Centre for Water Law, Policy & Science	Participation in 6th World Water Forum , including participation in High Level Panel Global Water Governance organised by World Water Council; WWF organised side event on UN Watercourses Convention; Thematic Session co-organised along with IUCN, WWF and others; and participation in a side event organised with Finnish Government (SYKE) and UN ECE on relationship between the UN Watercourses Convention and the UNECE Water Convention.	A Rieu-Clarke	Lead		Y				2.4	
	Research project with Environmental Law Centre, IUCN related to Climate Change Governance Capacity – Building regionally- and nationally- tailored ecosystem-based adaptation in Mesoamerica. The project will develop policy guidelines useful for the design of water management strategies as part of climate change adaptation responses,	A Rieu-Clarke, Ruby Moynihan, Bjoern-Oliver Magsig	Lead	Y					1.2	

	with a special attention to the Central America context.									
IHP-HELP Centre for Water Law, Policy and Science	Carnegie grant “Developing Networks Amongst UK River Basins: Interfacing Science With Emerging Law And Policy Frameworks” – collaborative project to identify synergies across UK and Irish HELP basins	S Hendry, M Bonell	Lead	Y					2.1-24	All the UK and Irish HELP Basins
IHP-HELP Centre for Water Law, Policy and Science	Hydrologic and Carbon Services in the Western Ghats: responses of Forests and Agro-Ecosystems to Extreme Rainfall. Research funded by the UK NERC and MoES (India)	M Bonell , UK lead in collaboration with Indian leadership in ATREE (Bangalore) and several other Indian institutions	Contributing Partner	Y					1.1 to 1.3; 3.1 and 3.2	HELP; FRIEND
IHP-HELP Centre for Water Law, Policy and Science	The hydrological impacts of reforestation of the Middle hills of Nepal and links with community water supply Research (Dutch funds and on the UK side funded by UK Royal society).	M. Bonell , Dundee and under the leadership of ITC, Enscheide and VU Amsterdam The Netherlands	Contributing Partner	Y					1.1 to 1.3; 3.1 and 3.2	HELP; FRIEND
IHP-HELP Centre for Water Law, Policy and Science	The impacts of forestation and forest degradation in the Western Ghats , India and north west China on basin water balances and the storm runoff generation processes linked with community water supply (two separate projects on the same topic) . Research (funded on the UK side by the Carnegie Trust and Royal Society of Edinburgh and Indian and Chinese financial sources)	M.Bonell in collaboration with ATREE (Bangalore) and the National Institute of Hydrology, India; and in China with the Chinese Academy of Forestry, Beijing.	Contributing partner	Y					1.1 to 1.3; 3.1 and 3.2	HELP; FRIEND
IHP-HELP Centre for Water Law, Policy and Science	Understanding soil water storage capacity and infiltration in view of landuse management and flood alleviation in the Scottish Borders. Research funded by the University of Western Australia.	M Bonell, UK lead; N Archer; in collaboration with University of Western Australia.	Contributing partner	Y					1.1 to 1.3; 3.1 and 3.2	HELP; FRIEND

Dundee IHP-HELP Centre Report (2010-2012)
UNESCO Category II- Centre

IHP-HELP Centre for Water Law, Policy and Science	Forest management and flood alleviation: Understanding water storage capacity of organic soil-subsoil below ancient forest, planted forest and grassland. Research funded by Centre for Environmental Change and Human Resilience, University of Dundee, UK.	N Archer, M Bonell, in collaboration with the James Hutton Institute, Abertay University and Forest Research.	Lead	Y					1.1 to 1.3; 3.1 and 3.2	HELP; FRIEND
IHP-HELP Centre for Water Law, Policy and Science	External symposium on International Water Law in cooperation with the Regional Centre on Urban Water Management in Tehran	P Wouters, A Rieu-Clarke	Lead			Y		Y	5.1	IHP – two Cat2 Centres
IHP-HELP Centre for Water Law, Policy and Science	Training in cooperation with the Regional Centre for Urban and Water Resources Management in Kish (April 2011); 30 Iranian water resources experts participating in a week-long training in water law.	S Vinogradov, O McIntyre, R Moynihan	Lead					Y	5.2	IHP – two Cat2 Centres
IHP-HELP Centre for Water Law, Policy and Science	Delivery of LLM Water Law, LLM Water Governance and Conflict Resolution (with UNESCO-IHE) and MSc Water Resources Management and Law (with UNU-INWEH)	S Hendry, A Allan, A Rieu-Clarke, C Spray, P Wouters	Lead			Y			5.1	
IHP-HELP Centre for Water Law, Policy and Science	Global Water Partnership International Knowledge Chain Scholarship programme bringing students over 3 years to study international water law	P Wouters, A Rieu-Clarke	Lead			Y			5.1	
IHP-HELP Centre for Water Law, Policy and Science	Stockholm World Water Week 2011, seminar <i>Strengthening Water Diplomacy in Transboundary Basins</i> , together with IUCN, GWP, UNESCO-IHP and the Swiss Agency for Development and Cooperation	A Rieu-Clarke	Lead					Y	5.1, 5.4	Partners included UNESCO IHE
IHP-HELP Centre for Water Law, Policy and Science	INBO/GWP/UNESCO Handbook for Integrated Water Resources Management in Transboundary Basins	P Wouters, R Moynihan	Contributing Partner			Y			5.4	Partners included UNESCO
IHP-HELP Centre for Water Law, Policy and Science	International Symposium on the UN Watercourses Convention, to take place June 2011, with WWF. Outcomes of the symposium will be published in a special	A Rieu-Clarke	Lead		Y				5.1	

journal issue.									
----------------	--	--	--	--	--	--	--	--	--

2) Participation by yourself or others in an IHP Steering Committees/Working Groups

Steering Committee/Working Group	Individual	UK Organisation	Role on Committee/Group	Period of Office	Activity over Reporting Period
<i>Example: HKH-FRIEND Steering Committee</i>	<i>Gwyn Rees</i>	<i>CEH</i>	<i>SC Member</i>	<i>On-going</i>	<i>.....</i>
UNESCO Scotland Committee	Patricia Wouters	IHP-HELP Centre	member	on-going	
UK UNESCO Chairs group	Patricia Wouters	IHP-HELP Centre	member	on-going	
International Advisory Committee of the United Nations University Institute of Water, Environment and Health (UNU-INWEH)	Patricia Wouters	IHP-HELP Centre	member	on-going	

Annex 8.1 -- List of Publications (2010-2012)

Allan, Andrew

- 2010 Allan A, and Rieu-Clarke, A. “Good governance in the context of IWRM – moving from theoretical to practical considerations”, Irrigation and Drainage Systems’
- 2011 Allan A, “Water accounting: its role in dispute avoidance and resolution”, in Godfrey, J. and Chalmers, K., eds, International Water Accounting: Effective Management of a Scarce Resource, (Edward Elgar, forthcoming, 2011).
- 2010 Allan A, Rieu-Clarke, A., Baggett, S., Gooch, G.D. “The Policy-Science Interface in Sustainable Water Management: Creating Scenarios Together with Stakeholders”, in Science, Policy and Stakeholders in Water Management (Earthscan, London) (in Press),
- 2010 Allan A, Flügel, W-A et al, Results of the BRAHMATWINN Project (Copernicus, forthcoming)
- 2010 Allan A, Flügel, W-A, Sharma, N. et al, “Applied Geoinformatics for sustainable Integrated Water Resources Management (IWRM) First Results from the EU-project BRAHMATWINN” (Springer, forthcoming)

Bonell, Michael

- 2009 Howard, A., Bonell, M., Cassells, D.S., and Gilmour, D.A. Is rainfall intensity significant in the rainfall-runoff process within tropical rainforests of north-east Queensland? : The Hewlett regression analyses revisited. Hydrological Processes (in press).
- 2009 Kristof Koch, Jochen Wenninger, Stefan Uhlenbrook, and Mike Bonell Electrical resistivity tomography (ERT) for identifying hillslope processes in the Black Forest Mountains, Germany. Hydrological Processes 23 (10): 1501-1513.
- 2009 Bonell, M and Williams, J. A review of hydrology research within the open eucalypt woodlands of tropical semi-arid Central-North Queensland, Australia: a possible source of baseline information for the West African Sahel. Sécheresse 20(1): 31-47. Science et changements planétaires /Sécheresse. John Libbey Eurotext journal.

Gooch, Geoffrey

- Gooch, Geoffrey Becker, A., A. Castelletti, G.D. Gooch, F.F. Hatterman, S. Kaden, Z.W. Kundzewicz, Y. Laurens, S. Muhar, R. Soncini-Sessa, P. Stålnacke and P. Willems (2010): ‘Practical Experiences from Existing Case Studies and Pilot River Basins’, pp.99-202 in ‘Water Framework Directive: Model Supported Implementation’ Hatterman, F., Z.W. Kundzewicz (eds), London: IWA Publishing.

- Bots, P., G. D. Gooch, Brian S. McIntosh, Claudia Pahl-Wostl (2010). Understanding the role of perception and valuation in the development and use of models for water management, in *Integrated Assessment for Water Framework Directive Implementation: data, economic and Human Dimension*. P. Vanrolleghem (ed). London, IWA. 2.
- Gooch, G.D. and P. Stålnacke (eds.) (2010): *'Science, Policy and Stakeholders in Water Management'*, London: Earthscan.
- Gooch, G.D. and P. Stålnacke (2010): 'Introduction, the Science-Policy-Stakeholder Interface, in *'Science, Policy and Stakeholders in Water Management'*, London: Earthscan.
- Bruna Grizzetti, Fayçal Bouraoui, Geoffrey Gooch and Per Stålnacke (2010): 'Putting the 'Integration' in the Science-Policy-Stakeholder Interface, , in *'Science, Policy and Stakeholders in Water Management'*, London: Earthscan.
- Gooch, G.D., A. Allan, A. Rieu-Clarke and Susan Baggett (2010): 'The Science-Policy-Stakeholder Interface in Sustainable Water Management: Creating Interactive Participatory Scenarios together with Stakeholders, in *'Science, Policy and Stakeholders in Water Management'*, London: Earthscan.
- Gooch, G.D and A. Rieu-Clarke (2010): 'The Science-Policy-Stakeholder Interface and Transboundary Water Regimes', in *'Science, Policy and Stakeholders in Water Management'*, London: Earthscan.
- Gooch, G.D and P. Stålnacke (2010): 'The Science-Policy-Stakeholder Interface in Water Management: Lessons Learned and the Challenges Ahead', in *'Science, Policy and Stakeholders in Water Management'*, London: Earthscan.
- Gooch, G.,D., Rieu-Clarke A. and Stålnacke, P. (2010) (eds.): *'Integrating Water Resources Management'*, London: IWA
- Gooch, G.D., A. Rieu-Clarke and P. Stålnacke (2010): 'Introduction: IWRM as product or process?' in *'Integrating Water Resources Management'*, London: IWA.
- G.D. Gooch, Rieu-Clarke, A. and P. Stålnacke (2010): 'STRIVER in the context of Integrated Water Resources Management' , in *'Integrating Water Resources Management'*, London: IWA.
- Gooch, G.D., A. Rieu-Clarke (2010): 'IWRM Status in the Sesan River', in *'Integrating Water Resources Management'*, London: IWA.
- Stålnacke, P., G.D. Gooch and A. Rieu-Clarke (2010): 'Striver: overall findings', in *'Integrating Water Resources Management'*, London: IWA.
- Stålnacke, P., G.D. Gooch, et al. (2011) 'Integrated Water Resources Management: STRIVER efforts to assess the current status and future possibilities in four river basins', in Jaeger, C.C., Tàbara, J.D. and Jäger, J. (Eds) (2011), *Transformative Research for Sustainable Development*, Berlin: Springer
- Rieu-Clarke, A. and G.D. Gooch (2010): 'Governing the tributaries of the Mekong – the Contribution of International Law and Institutions to Enhancing Equitable Cooperation over the Sesan', *Pacific McGeorge Global Business and Development Law Journal'*, Vol. 22, Number 2, pp. 193-224.
- Stålnacke, P. And G.D. Gooch (2010): 'Integrated Water Resource Management', *Irrigation and Drainage Systems*, 24: p.155–159.
- Gooch, G.D. and A. Rieu-Clarke (2011): *Law, Policy, Actors and Institutions in Transboundary Water Governance*, XIV World Water Congress, Porto De Galinhas, Brazil, September 25-29, 2011.
- Gooch, G.D., A. Rieu-Clarke, S. Baggett (2011): 'Law and Policy, Actors and Institutions in Water Governance in Protected Areas in Vietnam, Costa Rica, India and South Africa', International Conference on Integrated Water Resource Management: management of Water in a Changing World, Lessons Learnt and Innovative Perspectives, 12-13 October 2011, Dresden, Germany.

Hendry, Sarah

- *Scotland the Hydro Nation* (2012) Journal of Water Law (in press, summer 2012) (Commentary)
- Water Management in the UK in Alberton M and Palermo F, (Eds) *Environmental protection in multi-layered systems: Comparative lessons from the water sector* EURAC (in press, summer 2012)
- The Human Right to Water in Scotland in Smets, H (Ed) *The Implementation Of The Right To Safe Drinking Water And Sanitation In Europe* Johann press / Académie de l'Eau France 2012.
- Kløve B., Ala-aho P., Allan A., Bertrand G., Druzynska E., Ertürk A., Goldscheider N., Hendry S., Karakaya N., Koundouri P., Kværner J., Lundberg A., Muotka T., Preda E., Pulido Velázquez M., Schipper P. *Groundwater Dependent Ecosystems: Part II - Ecosystem services and management under risk of climate Change and Land-Use Management*. Environmental Science and Policy 14(2011) 782-793.
- *Scottish Water and the "Hydro Economy"* Journal of Water Law (2011) 21 (2) 78-82 (Review)
- Ownership Models for Water Services: Implications for Regulation in *Property Rights in Energy and Natural Resources Law* OUP 2010
- Scottish Editor, Journal of Environmental Law and Management, Journal of Water Law.

Spray, Christopher

- **Spray** (2010). Targeted species management within a wider ecosystem approach. *In* Species Management - Challenges and Solutions for the 21st Century, HMSO (497-515).
- Sutherland et al (2010). **Spray** one of 30 co-authors. The identification of priority opportunities for UK Nature conservation policy. Journal of Applied Ecology 47 (955-965)
- Werritty, **Spray**, Ball, Bonell, Rouillard, Comins & Richardson (2010 published on line). Integrated catchment management: from rhetoric to reality in a Scottish HELP basin. Published BHS Conference papers, Newcastle.

- Lee et al (2010) **Spray** one of 34 co-authors. Priority water research questions, as determined by UK practitioners and policy-makers. *Science of the Total Environment*. Vol 409, 256-266.
- **Spray**, Ball & Rouillard (2010). Bridging the Water Law, Policy, Science interface: Flood Risk Management in Scotland. *Journal of Water Law* Vol 20, 165-174
- Gilvear, Casas-Mulet & **Spray** (2011). Trends and issues in delivery of integrated catchment scale river restoration: lessons learned from a national River Restoration Survey within Scotland. *River Research & Applications*.
- Maltby, Ormerod, Acreman, Blackwell, Durance, Everard, Morris & **Spray** (2011). Freshwaters - Open waters, Wetlands and Floodplains. *In the UK National Ecosystem Assessment Technical Report*. UK National Ecosystem Assessment, UNEP-WCMC, Cambridge, 296-365
- Aspinall, Green, **Spray**, Shimmield & Wilson (2011). Status and Changes in the UK Ecosystems and their Services to Society: Scotland *In the UK National Ecosystem Assessment Technical Report*. UK National Ecosystem Assessment, UNEP-WCMC, Cambridge, 896-977.
- **Spray** (2011) The changing nature of Scotland's Fresh Water Environment. *In The Changing Nature of Scotland*, TSO. (219-236).
- **Cook & Spray** (in press) - Ecosystem Services and Integrated Water Resource Management: drawing from one approach to inform another. *Journal of Environmental Management*.
- Sutherland et al (in press) **Spray** one of 14 co-authors. An horizon scanning assessment of the current and potential future natural and anthropogenic issues facing migratory shorebirds. *Ibis*
- **Muir, Spray & Rowan** (in press) Climate change, ecohydrology and Scotland's standing freshwaters: Informing adaptation strategies for conservation at the landscape scale. *Area*.
- **Cook, Spray** et al (In review) How Participatory Catchment Organizations Succeed: Lessons from Canada, New Zealand, Scotland and the Scottish-English Borderlands. *Geographical Journal*
- Forrester, Donaldson, Bracken, **Spray**, Cinderby, **Cook & Oughton** (in review) Why multi-level, multi-method, participatory understandings are necessary for managing complex environmental problems. *Journal of Environmental Policy & Management*

- Gilvear, **Spray** & Casas-Mulet (in review) - River restoration and ecosystem services: A framework for linking river rehabilitation and ecosystem services to bring about multiple benefits at the catchment scale. River Research & Applications
- **Rieu-Clarke & Spray** (in review) Ecosystem Services and International Water Law: towards a more effective determination and implementation of equity? Potchefstroom Electronic Law Journal

Rieu-Clarke, Alistair

- Alistair Rieu-Clarke and Flavia Loures, 'Still not in force: should states support the 1997 UN Watercourses Convention', Chris White, ed., *Water security, governance, and economics* (Tilde University Press 2012)
- Alistair Rieu-Clarke, 'International Freshwater Law', Shawkat Allam and Erika Techera, eds., *Handbook of International Environmental Law* (Routledge 2012)
- Alistair Rieu-Clarke and Flavia Loures, 'Introduction', in Flavia Loures and Alistair Rieu-Clarke, eds., *The 1997 UN Watercourses Convention in Force – strengthening transboundary water resources management* (Earthscan 2012)
- Alistair Rieu-Clarke, Flavia Loures and Joseph Dellapenna, 'Possible reasons slowing down the ratification process', in Flavia Loures and Alistair Rieu-Clarke, eds., *The 1997 UN Watercourses Convention in Force – strengthening transboundary water resources management* (Earthscan 2012)
- Alistair Rieu-Clarke and Alexander Lopez, 'Why have states joined the UN Watercourses Convention' in Flavia Loures and Alistair Rieu-Clarke, eds., *The 1997 UN Watercourses Convention in Force – strengthening transboundary water resources management* (Earthscan 2012)
- Alistair Rieu-Clarke, Johan Lammers and Flavia Loures, 'Possible effect from entry and non-entry into force' in Flavia Loures and Alistair Rieu-Clarke, eds., *The 1997 UN Watercourses Convention in Force – strengthening transboundary water resources management* (Earthscan 2012)
- 2012 Alistair Rieu-Clarke and Alexander Lopez, 'Factors that could limit the effectiveness of the UN Watercourses Convention upon entry into force', in Flavia Loures and Alistair Rieu-Clarke, eds., *The 1997 UN Watercourses Convention in Force – strengthening transboundary water resources management* (Earthscan 2012)
- 2012 Armelle Guignier and Alistair Rieu-Clarke, 'Payment for Ecosystems Services – Vietnam Country Report', IUCN Academy of Environment Law eJournal (2002) Issue 1.

- 2012 Armelle Guignier, Alistair Rieu-Clarke and others, 'A legal perspective on the challenges to implementing good (protected area) governance – lessons from Makuya Park, South Africa and Ba Be/ Na Hang complex, Vietnam', *Natural Resources Journal* (submitted for peer review).
- Gooch, G.D. and A. Rieu-Clarke (2011): *Law, Policy, Actors and Institutions in Transboundary Water Governance*, XIV World Water Congress, Porto De Galinhas, Brazil, September 25-29, 2011.
- Gooch, G.D., A. Rieu-Clarke, S. Baggett (2011): 'Law and Policy, Actors and Institutions in Water Governance in Protected Areas in Vietnam, Costa Rica, India and South Africa', International Conference on Integrated Water Resource Management: management of Water in a Changing World, Lessons Learnt and Innovative Perspectives, 12-13 October 2011, Dresden, Germany.
- 2011 Alistair Rieu-Clarke and others, 'Integrated Water Resources Management: STRIVER Efforts to Assess the Current Status and Future Possibilities in Four River Basins', in Carlo Jaeger, David Tabara and Julia Jaeger, *European Research on Sustainable Development* (Volume 1 – Transformative Science Approaches for Sustainability (Springer 2011).
- 2010 Alistair Rieu-Clarke, Geoffrey Gooch and Per Stalnacke, 'Striver in the context of integrated water resources management: interdisciplinary methodologies and strategies in practice' (IWA Publishing London 2010)
- 2010 Alistair Rieu-Clarke and Andrew Allan, 'The legal framework for the Tagus River Basin', in Gooch, G., Rieu-Clarke, A and Stalnacke, P, *Integrating Water Resources Management: Interdisciplinary methodologies and strategies in practice* (IWA Publishing 2010).
- 2010 Alistair Rieu-Clarke, Geoffrey Gooch and Per Stalnacke, 'Striver: overall findings' in Gooch, G., Rieu-Clarke, A and Stalnacke, P, *Integrating Water Resources Management: Interdisciplinary methodologies and strategies in practice* (IWA Publishing 2010).
- 2010 Alistair Rieu-Clarke and Geoffrey Gooch, 'IWRM in the Sesan Basin' in Gooch, G., Rieu-Clarke, A and Stalnacke, P, *Integrating Water Resources Management: Interdisciplinary methodologies and strategies in practice* (IWA Publishing 2010).
- 2010 Alistair Rieu-Clarke and others, 'IWRM in the Tagus Basin', in Gooch, G., Rieu-Clarke, A and Stalnacke, P, *Integrating Water Resources Management: Interdisciplinary methodologies and strategies in practice* (IWA Publishing 2010).
- 2010 Alistair Rieu-Clarke and Geoffrey Gooch, 'The Science-Policy-Stakeholder Interface and Transboundary Water Regime', in Gooch, G. & Stalnacke, P., *Science, Policy and Stakeholders in Water Management* (Earthscan, London 2010)

- 2010 Alistair Rieu-Clarke and others, 'The Science-Policy-Stakeholder Interface in sustainable management: creating interactive, participatory scenarios together with stakeholders', in Gooch, G. & Stalnacke, P., *Science, Policy and Stakeholders in Water Management* (Earthscan, London 2010)
- 2010 Alistair Rieu-Clarke and others, 'The science-policy-interface and participation', in Gooch, G. & Stalnacke, P., *Science, Policy and Stakeholders in Water Management* (Earthscan, London 2010)
- 2010 Alistair Rieu-Clarke and Andrew Allan 'Good governance in the context of IWRM – moving from theoretical to practical considerations; Irrigation and Drainage Systems 239 (2010)
- 2010 Alistair Rieu-Clarke 'The Role of Treaties in Building International Watercourse Regimes: A Legal Perspective on Existing Knowledge' *Water Policy* 12 822.
- 2010 Alistair Rieu-Clarke and Geoffrey Gooch 'Governing the Tributaries of the Mekong : The Contribution of International Law and Institutions to Enhancing Equitable Cooperation over the Sesan' *Pacific McGeorge Global Business & Development Law Journal* 22 (2) 193-224.

Wouters, Patricia

- "Tackling the Global Water Crisis: Unlocking International Law as Fundamental to the Peaceful Management of the World's Shared Transboundary Waters – Introducing the H2O Paradigm" in Quentin Grafton and Karen Hussey (eds), *Water Resources Planning and Management: Challenges and Solutions* (Cambridge University Press, 2011) (with D. Ziganshina).
- "The International Law of Watercourses: New Dimensions", *The Xiamen Academy of International Law, Collected Courses 2010*, Volume 3, 349–541 (2011).
- "Reframing the Water Security Dialogue", *20 Journal of Water Law* (2010). (with D. Tarlock).
- *Water Security: Global, Regional and Local Challenges*, IPPR policy brief for the National Security Commission (2010) *commissioned by the Institute for Public Policy Research, Commission on National Security in the 21st Century* (Commission, co-chaired by Lord Paddy Ashdown and Lord George Robertson).
- "Legal Frameworks and the UN Watercourses Convention" (with R. Moynihan), (2012, forthcoming).
- "Benefit Sharing in the UNWC and under International Water Law," (with R. Moynihan) (2012, forthcoming)

Journal of Water Law, Special Issue (Wouters and Hendry, Guest Editors) 2010 Edition (featuring the work of Dundee researchers)

- Patricia Wouters and Sarah Hendry 'Promoting Water for All – the relevance and role of water law in addressing global water issues through integrated water resources management'.
- Dan Tarlock and Patricia Wouters 'Reframing the Water Security'.
- Musa Abseno 'Equitable and Reasonable Utilization and No-significant Harm under the Nile River Basin Cooperative Framework Agreement and their Relationship with the Concept of Benefit-sharing'.
- Michael Azulay 'Can the Flathead River be Protected? - Examining the Thresholds of Harm for International Watercourses in the Canada–U.S. Context'.
- Bjørn-Oliver Magsig 'Introducing an Analytical Framework for Water Security: A Platform for the Refinement of International Water Law'.
- Dinara Ziganshina 'International Water Law in Central Asia: Commitments, Compliance and Beyond'.
- Hilary J. Grimes 'Responding to the 'Water Crisis': The Complementary Roles of Water Governance and the Human Right to Water'.
- Chris Spray, Tom Ball & Josselin Rouillard 'Bridging the Water Law, Policy, Science Interface: Flood Risk Management in Scotland'.
- Tran Tran 'Valuing Water in Law: How Can Indigenous Cultural Values Be Reconciled with Australia's Water Law in Order to Strengthen Indigenous Water Rights?'
- Hugo Tremblay 'An Analytical Framework for Legal Regimes Applicable to Freshwater Ecosystems'.
- Mohamad Mova Al' Afghani 'The Transparency Agenda in Water Utilities Regulation and the Role of Freedom of Information: England and Jakarta Case Studies'.
- Ana Maria Daza 'The Protection of Foreign Investment and its Implications for the Management of Water Services and Water Resources: Challenges for Investment Arbitration'.

Annex 8.2 -- List of Training courses (2010-2012)

June 2010 – International Water Law Workshop, co-convened with RCUWM (Iran UNESCO Centre), Dundee.

March 2011 – International Water Law Workshop, co-convened with RCUWM (Iran UNESCO Centre), Kish.

August 2011 – International Water Law Workshop, Dundee.

June 2012 – International Water Law Workshop, Dundee.

May 2012 – UN Watercourses Convention Training Regional Workshop, Siem Reap, Cambodia

May 2012 – UN Watercourses Convention Training National Workshop, Siem Reap, Cambodia

May 2012 – UN Watercourses Convention Training National Workshop, Do Son, Vietnam

Annex 8.3 – List of Research Projects

EU Funded Applied Research Projects:

- UN Watercourses Convention (UNWC) Global Initiative: This project is funded by the Norwegian government and is run in partnership with WWF. Its objective is to support the entry into force and widespread support for the UNWC; and to examine issues around effective implementation of this global instrument. We have a long history of working with WWF and the Green Cross promoting the UNWC, and recent years have seen sustained momentum around this ratification campaign. The IHP-HELP Centre is delivering a key role in this project taking responsibility for a range of key tasks relating to legal research, technical advice, awareness raising and training.
- LAGOONS (2011- 2014) Integrated water resources and coastal zone management in European lagoons in the context of climate change This project will combine knowledge and insights from a range of natural sciences, alongside water law, working together to adjust and apply dynamic models of drainage basins for a range of scenarios with quantitative models of lagoons. Through a series of three stakeholder workshops in each of the four case basins, the LAGOONS will facilitate the consideration of the combined local community and overall policy interests in the evaluation and adjustment of these models and scenarios; additionally, projected climatic change, urbanization and industrialisation drivers will be incorporated into this modelling.
- LIVEDIVERSE (2009-2012): This research project seeks to develop new knowledge on the interaction between livelihoods and biodiversity within the riparian and aquatic contexts. Our role is to seed engagement across civil society in the project. <http://www.livediverse.eu/> - Country Focus – (Vietnam, India, Costa Rica and South Africa)
- STRIVER (2006-2009) Strategy and methodology for improved IWRM - An integrated interdisciplinary assessment in four twinning river basins is a three year EC funded project under the 6th framework programme (FP6) STRIVER developed methodologies for Integrated water resources management (IWRM) in an Asian-European context. The project had a strong emphasis on local stakeholder involvement, enabling and supporting local capacity development and uptake.” (<http://kvina.niva.no/striver/>)
- BRAHMATWINN (2006-2009); BRAHMATWINN enhanced capacity to carry out a harmonised integrated water resources management (IWRM) approach as addressed by the European Water Initiative in headwater river systems of alpine mountain massifs already impacted from climate change, and to establish transfer of professional IWRM expertise, approaches and tools based on case studies carried out in twinning European and Asian river basins. The project addresses all important IWRM issues in a balanced way, including conflict resolution in the trans-boundary Danube and Brahmaputra River Basins in Europe and South Asia respectively. <http://www.brahmatwinn.uni-jena.de/index.php?id=5314&L=2>
- ACQWA - Assessing Climate Impacts on the Quantity and quality of Water. ACQWA aims to assess the impacts of a changing climate, focusing on the quantity and quality of water originating in mountain regions, particularly where snow- and ice melt represent a large, sometimes the largest, stream-flow component. Our role in the project is to focus on the social and environmental impacts of climate change. (<http://www.acqwa.ch/>)
- GENESIS - Groundwater and Dependent Ecosystems: New Scientific and Technological Basis for Assessing Climate Change and Land-use Impacts on Groundwater (GENESIS. The objective of GENESIS is to integrate pre-existing and new scientific knowledge into new methods, concepts and tools for the revision of the Ground Water Directive and better management of groundwater resources. We focus on providing legal assessment of this Directive. http://www.bioforsk.no/ikbViewer/page/prosjekt/forside?p_menu_id=16904&p_sub_id=16859&p_dimension_id=16858&p_dim2=16859
- Kish International Water Law Training Project: Two Water Centres IHP-HELP Centre and 'Regional Centre for Urban Water Management' (RCUWM), Iran, under the auspices of UNESCO linked up from 10th April to the 14th April 2011 to deliver an important Joint Seminar and Workshop on International Water Law: Introduction to

general principles of the international law governing transboundary freshwaters, with a focus on local regional issues. The training was delivered on the Iranian island of Kish (see left) in the Persian Gulf.

- Suez – Governance Research Contract: Comparative analysis of governance in water services provision (sanitation and water supply) as part of a contract for Suez Environment. The focus of this contract is the need for transparency, public participation and access to justice for water consumers.

European HELP Regional Coordination Unit (RCU)

RCU for Europe on Hydrology for the Environment, Life and Policy (HELP) and also the single International Hydrological Programme (INP)-HELP Centre, under the auspices of UNESCO, globally.

National/Regional Projects: (Scotland)

- Gatekeepers of Participation: Water Management at the Government & Society Interface: In 2011 the IHP-HELP Centre received funding from the Scottish Universities Insight Institute, with additional support from the Scottish Government, to investigate the facilitating role of Non-Governmental Organisations in delivering participative river catchment management. This project is born out of challenges that result from multiple competing interests and dependencies on finite water resources, raising important questions over problem-resolution and the organisations that mediate discourse. We are particularly interested in the growing complexities that result from a collision between competing understandings of water management.
- Flood Management in the Borders: In 2010 the IHP-HELP Centre won funding from the Scottish Government to join a multidisciplinary team led by Newcastle University, and including Tweed Forum, Durham & York universities, to examine access to information about flood management in the Borders. This case study looks at the challenges of managing a river across various different types of "border", including geographic and conceptual. Tweed Forum are active partners on the project, thus ensuring continual exchange between researchers and stakeholders.
- Tweed Basin. The Dundee IHP-HELP Centre is working with the Tweed River basin forum to develop this as a HELP basin. This moves forward on a number of fronts. *The Eddleston Scoping Study* (a tributary of the TWEED HELP basin) financed by the Scottish Govt. and SEPA through the Tweed Forum. Initiated in 2009 (and on-going) to set out a trans-disciplinary research framework linked with Natural Flood Management (IHP Focal Areas 1.1/ 1.2/ 1.3/1.4/2.4/ 3.1/3.2/3.3/3.4/4.1/4.4/5.1) (for more details, see Annexes 6 and 7 – Minutes of UK-IHP National Commission).
- Tweed Wetland Ecosystem Services Project: The objective is to better understand the way in which water and wetlands are valued and managed across the English/Scottish Borders. It will build on the innovative work of the Tweed Forum and its partners in The Tweed HELP basin, including the IHP-HELP Centre, in taking forward such initiatives as the Tweed Catchment Management Plan, the Borders Wetland Vision and the Tweed Wetland Strategy.
- River Restoration on the Eddleston Water (2010-12). Following on from the successful £38k Scoping Study managed by the Tweed Forum (see above in publications), the UNESCO team are now planning a three year project in which, following monitoring of surface and sub-surface water systems, a programme of river restoration and natural flood management measures will be deployed across the catchment. This work will be supported by an investment by the Scottish Government and SEPA of around £250k.
- Invisible hazard: pluvial flooding in urban areas, (with Donald Houston and Alistair Geddes - Geography). (2010-2012). This is an 18 month £87k project funded by the Joseph Rowntree Trust which explores the potential impact of increased pluvial (urban) flooding on vulnerable people and communities across the UK. The UKCP09

weather generator will be used to determine potential uplifts in 24 hour maximum rainfall and, at four sites, the resulting pluvial flooding will be modelled using state of the art inundation models. Indices of social deprivation in the targeted urban areas will then ascertain whether the socially most vulnerable will be disproportionately impacted.

Annex 8.4 – International Water Law Workshop Programme (June 2012)

www.dundee.ac.uk/water/workshop

3rd Annual International Law and Transboundary Freshwaters Workshop 2012

Preparing for the 2013 International Year of Co-operation

June 11-14, 2012

IHP - HELP Centre for Water Law, Policy & Science under the auspices of UNESCO, University of Dundee, UK

“The challenges that humankind is now facing as a result of the global economic development, climate change and the growing world population are unprecedented. The need for a rule-based international society has never been greater.”

Ingvar Carlsson • Chairman of Global Interaction Council • Former Prime Minister of Sweden - 2008

International law related to transboundary freshwater serves three basic functions: (1) it defines and identifies the legal entitlements and rights and obligations tied to water use, providing the prescriptive parameters for its development; (2) it provides a framework for ensuring the continuous integrity of the regime, i.e. through monitoring, regulation, compliance, stakeholder participation, dispute avoidance and settlement; and (3) it allows for rational modifications of the existing regime, in order to be able to adapt to the constantly changing needs and circumstances.

The purpose of the workshop will be to explore these three functions of international law within the context of existing and potential challenges faced by transboundary basins (rivers, lakes and aquifers) throughout the world. The workshop will benefit from the collective knowledge and expertise of world-renowned speakers, all of whom have a 'real world' focus.

Key Questions:

- What is international water law and how does it promote regional peace and security?
- How do international legal frameworks support national decision-making related to transboundary water resources planning and management?
- Who is entitled to use transboundary freshwater resources – why and how?
- How does international law reconcile competing claims over transboundary freshwaters?
- How can states use international law to promote hydro-diplomacy?

“I urge governments to recognize the urban water crisis for what it is – a crisis of governance, weak policies and poor management, rather than one of scarcity.”

Ban Ki-Moon • Secretary-General of the United Nations – 2011

Who should attend?

The workshop will benefit anyone concerned with the world’s international watercourses, especially water resources experts, lawyers and non-lawyers, practitioners - including civil servants, policy makers, regulators and water suppliers - as well as academics, who wish to gain fresh insights into how international law can contribute to addressing existing and future challenges over the world’s transboundary freshwater resources.

Comments on previous workshops

Water Law Water Leaders Programme

International Water Law is one of the three core areas of water law covered by our Water Law Water Leaders (WLWL) programme. We also offer modules in national water law and the regulation of water services. Our aim is to develop a new generation of local water leaders globally. Further details can be found at www.dundee.ac.uk/water/wlwl

“I had participated in many workshops and symposiums in different parts of the world. The International Law and Transboundary Fresh Waters Symposium and Workshop is unparalleled in terms of coverage, content, details and relevance.”

Fekahmed Negash Nuru, Ministry of Water Resources, Ethiopia

“Dundee UNESCO Centre for Water Law, Policy and Science has carried out a fabulous international training event in which we have gained basic required information on water laws and policy.”

Alireza Salamat, RCUWM-Tehran

University of Dundee / Global Water Partnership Joint Scholarships

This Workshop on International Law and Transboundary Freshwaters forms the first week of the IHP-HELP Centre’s module on International Water Law, and the Centre has joined with the Global Water Partnership in offering 30 International Water Law Scholarships for each of the next 5 years. The Scholarships are available to applicants from any of the 2300 partner organisations which comprise the Global Water Partnership, and will allow participants to undertake the module in International Water Law, one of the core components of the UNESCO Centre’s Water Law Water Leaders Programme. Further details on the Programme, including details on how to apply may be found at

Workshop Chairs

Professor Patricia Wouters, Chair of International Water Law and Director of the IHP - HELP Centre for Water Law, Policy & Science under the auspices of UNESCO, has published, lectured and worked around the world on international water law and developed a globally renowned research team that also specializes in comparative national water law and the regulation of water services.

Dr. Alistair Rieu-Clarke, LLB, LLM, PhD is a Senior Lecturer at the IHP - HELP Centre. An expert on measuring the effectiveness of transboundary water governance regimes, his research focuses on governance and water resources management and involves case studies in Bhutan, Cambodia, China, Costa Rica, India, Portugal, South Africa, Spain and Vietnam.

Workshop Presenters

Mr. Musa M. Abseno is currently a PhD Candidate at the IHP-HELP Centre, whose research interests include Nile water issues; African river basins; the UN watercourses convention; and the interface between international-national water laws. A graduate of the Law Faculty of Addis Ababa University, Musa has worked as expert, Head of Transboundary Rivers Affairs Department of the Ministry of Water Resources of Ethiopia; member of the Panel of Experts and Negotiating Committee for the Nile River Basin Cooperative Framework Agreement; head of the National Nile Basin Initiative Office for Ethiopia; national legal consultant and later national project coordinator for FAO-Italy, Nile Basin Project.

Dr Zafar Adeel is the Director of United Nations University Institute on Water, Environment and Health (UNU-INWEH). He also served as the Chair of UN-Water in 2010 and 2011; a group that coordinates water-related work in 28 United Nations organizations and a number of international water organizations. He has served with UNU since 1998 and holds a Master's Degree from Iowa State University (1992) and a PhD from Carnegie Mellon University (1995). He served as a Senior Engineer at GeoTrans Inc. (USA) for a number of years before joining UNU. He has experience in a range of water and environmental issues, including monitoring and control of water pollution, water management in dry areas, solutions to industrial environmental problems, modeling of environmental systems and environmental policy formulation. He has led the development of a network of scientists working in water-scarce countries, particularly those in Africa, Middle East and Asia.

Professor Jeff Camkin is currently Professor (Water Resource Management) at the University of Western Australia Centre of Excellence for Ecohydrology, Visiting Professor at the National Laboratory of Civil Engineering in Portugal, and Research Associate with the UNESCO International Centre for Coastal Ecohydrology. He holds tertiary qualifications in science and natural resources law, and has worked in urban and rural water, irrigation, fisheries and other natural resources research, management, policy and governance for the last 20 years. In 2004 Jeff was a Churchill Fellow and has just received a 2012 Endeavour Executive Award to continue his work developing links between Europe and Australia in water research and management. He is the Australian Coordinator for the UNESCO HELP program.

Professor Geoffrey D. Gooch is Professor of Political Science and holds the EU Jean Monnet Chair of European Political Integration at Linköping University, Sweden. He is the IHP-HELP Centre's lead on Policy issues, projects and research. He works closely with water lawyers and scientists at the Centre on environmental issues, helping to integrate the Centre's different subject areas through his multidisciplinary Policy focus.

Dr. Alejandro Iza is Head of the IUCN Environmental Law Programme and Director of the IUCN Environmental Law Centre since January 2005, five years after joining the Law Programme as a Legal Officer. From a combined academic and practical background, his area of expertise includes a broad knowledge of international environmental law, with special focus on water resources and marine law, environmental protection and regional integration, especially in Latin America. In his academic career, he has taught public international law, the law of European Integration, environmental risks, and international environmental law. He was awarded a Doctor of Laws from the University of Buenos Aires, where he was also a lecturer and research fellow; and has conducted post-doctorate work at the University of Hamburg.

Professor Shahbaz Khan joined UNESCO in April 2008 as Senior Programme Specialist and Chief of Section on Sustainable Water Resources Development and Management. Before joining UNESCO, Dr. Khan was Professor and Director at the Charles Sturt University, Research Leader at CSIRO, and Programme Leader for System Harmonisation at the Cooperative Research Centre for Irrigation Futures, Australia. He has received a number of awards including the 2008 CSIRO's Research Achievement Medal, the 2007 Land and Water Australia Eureka Prize, the 2006 Charles Sturt University's Vice Chancellor's Research Excellence Award, the 2004 CSIRO Land and Water Partner or Perish Award, and the 2000 CSIRO Land and Water Exceptional Achievements Award.

Ms. Flavia Rocha Loures, JD., works in the field of environmental law and policy, first as an environmental attorney, and professor in Brazil, and more recently as Senior Programme Officer for WWF – the global conservation organisation – in the USA. Her focus is on the codification and development of international water law and on the implementation of water-related international conventions.

Mr. Bjørn-Oliver Magsig is currently doing his PhD in international water law focusing on water security at the IHP-HELP Centre. He holds a diploma in Business- and Environmental Law (University of Applied Sciences Trier, UC Birkenfeld, Germany), and an LLM in Environmental Law and Policy (CEPMLP, University of Dundee). Bjørn-Oliver is a member of the IUCN Commission on Environmental Law, the European Society of International Law, and the International Law Association.

Mr John Metzger is Head of Network Operations at the Global Water Partnership in Stockholm. He is from Canada with a background in Agricultural Engineering. He has more than 30 years of experience in water resources management and development in Canada and in many countries in Africa, Asia and Latin America. During his career he worked for governmental and international organisations and with private consulting companies. His interest in water law stems from his work in enabling just water management and development through projects and programmes ranging from local and regional water user associations for irrigation and drainage (e.g. in Canada, Pakistan and Egypt) through to international river basin organisations in Asia and Africa (e.g. the Mekong River Commission).

Dr. Owen McIntyre lectures in Environmental Law, EU Law, International Law, and Comparative Law at University College, Cork, Ireland. He has published extensively in all areas of environmental law, in particular in relation to emerging principles of environmental law and environmental liability. He serves on the editorial boards of a number of Irish and International journals.

Ms Ruby Moynihan is a researcher with the International Water Law Cluster at the IHP-HELP Centre for Water Law, Policy & Science, under the auspices of UNESCO, focusing on the development of normative principles of international water law and water security. Ruby also works on a research project with the World Wildlife Fund to enhance awareness of the 1997 UN Watercourses Convention. Ruby joins the Centre from New Zealand where she practised as an Environmental Lawyer. Prior to this Ruby was awarded Distinction from the University of Otago, New Zealand, for a Master's thesis on the International Law and Policy of Water Management and Allocation.

Dr Susana Neto is a researcher with the New University of Lisbon. She holds a degree in Civil Engineering, a Master of Science in Urban and Regional Planning and a PhD in Water and Territorial Planning from the Technical University of Lisbon. Susana is an Associate Researcher with the UNESCO International Centre for Coastal Ecohydrology. Between 1997 and 2001 she played a coordinating role in the development of the National Water Plan and 15 river basin plans for Portugal in the National Water Institute (INAG). Susana is the coordinator for the Guadiana river basin in the UNESCO-IHP HELP program.

Mr Juan Carlos Sánchez works in the International Union for the Conservation of Nature (IUCN) - Environmental Law Centre (ELC) as a Legal Officer since December 2009. Mr. Sánchez initially came to the ELC as a research fellow and has been working on water governance related issues since then. He holds a law degree from the University of Costa Rica and a Masters degree on Environmental Governance from the Albert-Ludwig University of Freiburg. His focus is on the development of cross boundary cooperation agreements at the local level for benefit sharing.

Dr. Francesco Sindico has recently joined the staff of the Graduate School of Natural Resources Law, Policy and Management at the University of Dundee where he works as Lecturer in International Law at the Centre for Energy, Petroleum and Mineral Law and Policy (CEPMLP). He previously worked as Lecturer in Law at the School of Law of the University of Surrey, where he also acted as Deputy Director of the Environmental Regulatory Research Group. From 2009 to 2011 he led an EPSRC-KT fellowship project in which he focused on the impact of the UN International Law Commission Draft Articles on the law of transboundary aquifers on the management of the Guarani Aquifer System in Latin America. Dr Sindico's research focuses on international groundwater law, but expands also to other International Environmental Law areas, such as international climate change and energy law and policy and its interaction with international trade rules.

Dr. Stylianos G. Skias, Assistant Professor of Engineering Geology and Environmental Geotechnics, at the Department of Civil Engineering, Democritus University of Thrace. His area of research and lecturing consists of the assessment/mitigation of geo-environmental hazards (mainly: landslides, floods, earthquakes and coastal erosion), natural degradation processes, natural slope stability and geotechnical evaluation of soft and complex rock formations. Besides, his interests include application of matrices and fuzzy sets theory on geotechnical and environmental problems, engineering geological aspects of waste disposal landfills, Environmental Impact Assessment (EIA), Sustainable Development (regarding the geo-environment and geo-environmental education and environmental legislation). Lately, he is engaged in research work regarding the integrated management of floods, especially as far as transboundary river basins are concerned (e.g. the Evros basin, where the intervention of hydro-politics/diplomacy means and legislative water-governance tools are of vital importance, in safeguarding an effective and efficient cooperation among the three riparian countries).

Professor Chris Spray is the IHP-HELP Centre's Chair of Water Science and Policy. His research interests focus on wetland ecosystem services; particularly how emerging research on wetland ecosystem services can be translated into policy and practice on the ground, with the focus on such ecosystem services as flood risk management, water quality improvements, habitat restoration and conservation of biodiversity - with a particular interest in swans and other waterfowl. Chris is interested in how to link the ecosystem service approach more directly to governance issues around how we value and protect the wetland environment for multiple benefits; and how this is communicated to and from stakeholders.

Chris has 25 years previous experience working in environmental regulation, and the water industry, including Director of Environmental Science for the Scottish Environment Protection Agency (2004-09), Director of Environment, Northumbrian Water Group; Conservation Manager for National Rivers Authority (Anglian region); and Research Fellow Aberdeen University.

Professor Dan Tarlock is Distinguished Professor of Law at the Chicago - Kent College of Law, Chicago. He is an internationally recognized expert in environmental law and the law of land and water use. Professor Tarlock is currently one of three United States special legal advisers to the NAFTA Commission on Environmental Cooperation.

Danka Thalmeinerova is a water expert who worked with the Slovak Ministry of Environment. She participated in projects related to EU approximation, water policy and legislative development, IPPC implementation, international treaty implementation and water pricing. For five years she was project manager for a Harvard University USAID project on environmental economics and policy in Central and Eastern Europe (CEE). She also led a team for several EU and UNDP/GEF-funded projects in CEE on implementing the EU Water Framework Directive. Danka has been a university lecturer, and received her Ph.D. from the Slovak Technical University in Bratislava.

Dr Mara Tignino is a Senior Researcher at the Platform for International Water Law at the Faculty of Law at the University of Geneva. Her areas of expertise include the protection of water in time of armed conflict, the rights and duties of non-state actors, and the settlement of water disputes. Dr. Tignino also serves as a consultant to governments, international organizations, NGOs and the private sector. She has been a Visiting Scholar at the George Washington University School of Law in Washington DC.

Dr. Sergei Vinogradov's main field of expertise includes international environmental law, international law of natural resources, law of the sea, as well as environmental and natural resource law of Russia and the CIS. He is a member of the Water Resources Committee of the International Law Association and of the Global Commission on Environmental Law.

Ms. Dinara Ziganshina is a PhD student at the IHP-HELP Centre. Dinara focuses on public international law as applied to transboundary waters in Central Asia and its effectiveness. She earned her law degree (J.D. equivalent) from Tashkent State Institute of Law in 2001. In May 2008 she successfully completed an LLM in Environmental and Natural Resources Law Program at the University of Oregon School of Law.

DAY 1 • Monday 11th June 2012

8:30 - 9:00 Coffee and Registration

9:00 - 9:15 Welcome • *Principal Pete Downes*

9:15 - 10:00 Transboundary Challenges - a HELP perspective, *Professor Shabaz Khan*

10:00 - 10:45 Why does international law matter?, *Professor Patricia Wouters*

10:45 - 11:00 Break

11:00 - 12:00 Keynote lecture continued

12:00 – 12:30 Climate proofing international water law as a way to address water insecurity, *Bjørn-Oliver Magsig*

12:30 - 13:30 Lunch

13:30 - 15:00 The codification and progressive development of the international law of watercourses, *Dr Sergei Vinogradov*

15:00 - 15:15 Break

15:15 - 17:00 Reconciling competing interests – the theories of allocation,
Dr Sergei Vinogradov

Day 2 • Tuesday 12th June 2012

Special Session • Exploring the linkages between science and law from a transboundary perspective

9:00 - 9:15 Introduction, *Dr Alistair Rieu-Clarke*

9:15 - 9:45 Feeding science into decision-making at the transboundary level,
Professor Shahbaz Khan

9:45 - 10:15 Enhancing the accessibility of science for improved stakeholder decision-making – Experiences from Australian HELP Basins, *Professor Jeff Camkin*

10:15 - 10:45 Ecosystems services and international watercourses, *Professor Chris Spray and Dr Alistair Rieu-Clarke*

10:45 - 11:00 Break

11:00 - 11:30 The role of scientific knowledge in the implementation of the Albufeira Convention, *Dr Susana Neto*

11:30 - 12:00 The law-policy-science interface in the Evros River Basin, *Dr Stelios Skias tbc*

12:00 - 12:30 Wrap Up, *Dr Alistair Rieu-Clarke*

12:30 - 13:30 Lunch

13:30 - 15:00 Reconciling completing interests through the principle of equity,
Dr Owen McIntyre

15:00 - 15:15 Break

15:15 - 17:00 Keynote lecture continued

Day 3 • Wednesday 13th June 2012

9:00 - 10:45 Procedural and institutional aspects of the law of international watercourses, *Dr Owen McIntyre*

10:45 - 11:00 Break

11:00 - 12:30 Keynote lecture continued

12:30 - 13:30 Lunch

13:30 - 14:00 Joint institutions in Practice – an introduction, *Professor Geoffrey Gooch*

14:00 - 14:30 The Aral Sea Basin, *Dinara Ziganshina*

14:30 - 15:00 The Nile Basin, *Musa Abseno*

15:00 - 15:15 Break

15:15 - 15:45 The Okavango Basin, *Chaminda Rajapakse*

15:45 - 16:15 The Danube Basin, *Danka Thalmeinerova*

16:15 - 16:45 The Mekong Basin, *John Metzger*

16:45 - 17:00 Wrap up, *Professor Geoffrey Gooch*

Conference Dinner

DAY 4 • Thursday 14th June 2012

9:00 - 10:45 Dispute settlement mechanisms, *Professor Dan Tarlock*

10:45 - 11:00 Break

11:00 - 12:00 Defining equity – experiences from US Supreme Court practice,
Professor Dan Tarlock

12:00 - 12:30 Non-state actors and the law of international watercourses, *Dr Mara Tignino*

12:30 - 13:30 Lunch

13:30 - 14:15 The role of hard and soft law in regulating international watercourse -
insights from the Mekong, *Professor Philip Hirsch*

14:15 - 15:00 Building River Dialogue and Governance, *Dr Alejandro Iza* and
Juan Carlos Sanchez

15:00 - 15:15 Break

15:15 - 16:15 International law and transboundary aquifers: the role of the UNESCO ICHARM Programme, *Dr Francesco Sindico*

16:15 - 16:30 Wrap up, *Professor Patricia Wouters* and *Dr Alistair Rieu-Clarke*

Registration Information

Further information and to reserve your place, contact: Hugh Gunn

IHP - HELP Centre for Water Law, Policy & Science (under the auspices of UNESCO)

tel +44 (0) 1382 385871 *fax* +44 (0) 1382 385854 *email* h.j.b.gunn@dundee.ac.uk

or to reserve your place online, please complete the online registration form at: www.dundee.ac.uk/ad/buyworldwater

Registration fee

The attendance fee for the 4 day workshop is £995.00

A discounted fee is available to those reserving their space by 11th May 2012

Discounted accommodation rates may be available in the area, please contact

h.j.b.gunn@dundee.ac.uk for further information

Travel

Dundee has its own airport and train station and can also be reached easily from Edinburgh airport. Local travel can be made by foot, bus or taxi. Full details of the venues and maps will be sent to all registered delegates.

Cancellation

Cancellations must be received in writing no later than 11th May 2012 in order to be eligible for partial refund. Substitutions for registered participants may be made at any time, but we would appreciate prior notification.

The IHP-HELP Centre for Water Law, Policy and Science under the auspices of UNESCO reserve the right to change the advertised presenters and agenda without prior notice to registered delegates.

**Reports by IRTCES under the auspices of UNESCO on activities related to the
IHP in the period June 2010 – May 2012**

1. Basic information on the centre

Name of the Centre		International Research and Training Center on Erosion and Sedimentation (IRTCES)
Name of Director		Prof.Dr. Kuang Shangfu
Name and title of contact person (for cooperation)		Prof.Dr. Hu Chunhong, Secretary General and Deputy Director
E-mail		huch@iwhr.com (CC: chliu@iwhr.com)
Address		20 Chegongzhuang West Road, Beijing 100044
Website		http://www.irtces.org
Location of centre		city/town <u>Beijing</u> country <u>China</u>
Geographic orientation *		<input checked="" type="checkbox"/> global <input type="checkbox"/> regional
Year of establishment		1984
Themes	Focal Areas	<input type="checkbox"/> groundwater <input type="checkbox"/> urban water <input type="checkbox"/> arid / semi-arid zones <input type="checkbox"/> humid tropics <input type="checkbox"/> droughts and floods <input checked="" type="checkbox"/> sediment transport and management <input checked="" type="checkbox"/> water and environment <input type="checkbox"/> ecohydrology <input type="checkbox"/> water law and policy <input type="checkbox"/> transboundary river basins/ aquifers <input checked="" type="checkbox"/> IWRM <input type="checkbox"/> global and climate change <input checked="" type="checkbox"/> mathematical modelling <input type="checkbox"/> social and cultural dimensions of water <input checked="" type="checkbox"/> water education <input type="checkbox"/> other: (please specify) _____
	Scope of Activities ♦	<input checked="" type="checkbox"/> vocational training <input type="checkbox"/> postgraduate education <input checked="" type="checkbox"/> continuing education <input checked="" type="checkbox"/> research <input checked="" type="checkbox"/> institutional capacity-building <input checked="" type="checkbox"/> advising/ consulting <input type="checkbox"/> software development <input type="checkbox"/> other: (please specify) _____
Support bodies ¹		Ministry of Water Resources, China
Hosting organization ²		
Sources of financial support ³		Ministry of Water Resources, UNESCO, IRTCES service rendered
Existing networks and cooperation ⁴		<ul style="list-style-type: none"> ● ICHARM, Japan ● RCUWM-Tehran, Iran ● World Association for Sedimentation and Erosion Research (WASER)

* check on appropriate box

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

	<ul style="list-style-type: none"> ● World Association Of Soil & Water Conservation (WASWAC) ● Network of Regional Water Knowledge Hub in Asia-Pacific Region ● Network of Asian River Basin Organization ● International Association of Hydraulic Engineering and Research (IAHR) ● International Association of Hydrological Science (IAHS) ● Universiti Teknologi Mara (UiTM), Malaysia ● National Centre for Computational Hydrosience and Engineering of the University of Mississippi (NCCHE), USA ● National Hydroelectric Power Corporation LTD. (NHPC), India ● Elsevier ● General Directorate of State Water Works (DSI) of Turkey and DSI Technical Research and Quality Control Department (TAKK) ● Regional Centre for Integrated River Basin Management (RC-IRBM), Nigeria ● Regional Centre on Urban Water Management (RCUWM-Tehran) , Iran
Governance	<input checked="" type="checkbox"/> director and governing board <input checked="" type="checkbox"/> other: (please specify) International Advisory Council Link to election of board members to the IHP IGC and hosting country IHP National Committee Frequency of meetings: once every <u>2</u> year(s) <input checked="" type="checkbox"/> Existence of UNESCO presence at meetings
Institutional affiliation of director	Ministry of Water Resources, China
Number of staff and types of staff	total number of staff (full-time, or equivalent) : <u>17</u> number of staff who are water experts: <u>13</u> number of visiting scientists and postgraduate students:
Annual turnover budget in USD	<u>0.6 million USD</u>

2. Activities undertaken in the framework of IHP in the period June 2010 – May 2012

- 2.1 Educational activities (i.e., those with accreditation) that directly contributed to the IHP-VII (Appendix-1) and WWAP
Please include here those activities which led to accreditation of degrees, or those held in formal school settings.

IRTCS offers graduate degree education (Masters and PhD levels) with collaboration of China Institute of Water Resources and Hydro Power Research. Two students received their Master degree in the field of "hydraulics and river dynamics", and two student for PhD and one for Mater degrees in the field of "hydraulics and river dynamics" are studying in IRTCES in the period June 2010 – May 2012.

- 2.2 Research activities that directly contributed to the IHP-VII and activities by WWAP
Please include research/applied projects outputs such as publications that directly contributed to the IHP-VII and WWAP objectives

IRTCS continues to contribute to a range of topics under the IHP-VII.

[UNESCO and MWR funded project](#)

Pilot case study on "Utilization of Sediment Resource in the Lower Yellow River": The Yellow River is a well-known sediment heavily laden river in the world. It is statistics that the annual sediment load yielded from the upper of the middle reaches of the Yellow River has reached to 1.6 billion t, while the annual sediment emptied into the Bohai Sea has only been 0.4 billion t, which means 1.2 billion t of sediment deposits and use annually in the Lower Yellow River. The Yellow River encounters serious problems such as flood control by the secondary perched river in the Lower Reach, reservoir sedimentation, environment protection, etc. However, as one kind of special resource, sediment can be used for several aspects such as the reclamation land by sediment, warping for the barren land, warping for reinforcing river dikes. The rational sediment utilization is not only significant to resolve the sediment issues in the Yellow River Basin, but also available for other sediment heavily laden river. The project aims to sum up some methods and experience of sediment utilization in the Lower Yellow River. These methods and experience of sediment utilization are understood and used for other river in the world. The Research results will not only be useful for river management authorities of the Yellow River, but also have good reference importance for the ISI community, engineers, scientists and decision-makers around world.

Other Completed and Ongoing Research Projects

No	Contractor/Team leader	Project Title	Funding resources	Duration
1.	Gao Zhanyi	Comprehensive Research on the Key Technologies for Modernization and Water Saving in Large Irrigation Schemes in China	Ministry of Science and Technology	2008-2011
2.	Gao Zhanyi	Assessment Procedure for the Performance and Statue of Large Irrigation Schemes in China,	Ministry of Science and Technology	2006-2011
3.	Ning Duihu	An investigation on current situation of implementation of soil and water conservation administrative license	Chinese Society of Water and Soil Conservation	2010
4.	Wang Zhaoyin	Habitat moderation of biological species in the middle of the West River	Enterprises and institutions entrusted	2009-2010
5.	Wang Zhaoyin	Relationship between benthonic animal and composition of riverbed and its application in the ecological evaluation of hydraulic engineering	National Natural Science Foundation of China	2008-2010
6.	Wang Zhaoyin	Management and mitigation of chain disasters of mass movements and debris flows induced by the Wenchuan Earthquake	973 program of the Ministry of Science and Technology	2008-2010
7.	Wang Zhaoyin	Effect of bed structure on the rate of bed load transportation in mountain streams and application of artificial bed structure to control a mountain stream	State Key Laboratory of Hydro-science and Engineering	2009-2010
8.	Liu Guangquan	Study on controlling mode of ecological construction and it's demonstration in the overlapping area of the water and wind erosion	Ministry of Science and Technology	2006-2010
9.	Liu Guangquan	Study on vegetation restoration and afforestation technology in the serious erosion region of the northwest ecotone	Ministry of Science and Technology	2006-2010
10.	Chen Jianguo	Optimal Deployment of Runoff and Sediment Load Resource in Rivers and Controlling Measures of Sustaining Health of Rivers		2008~2011
11.	Chen Jianguo	Simulation and Adjustment of Watershed Hydrologic Cycle		2008~2010
12.	Chen Jianguo	Research on Mathematical Modeling of Flow and Sediment for Tunnel Outlet of Dahuofang Water Transfer Poject		2009~2010
13.	Chen Jianguo	Analysis on Sedimentation Reduction at Xiaobeiganliu and the Lower Yellow River in Different Operation Modes for Regulation and Control System of Runoff and Sediment		2010

		of the Yellow River		
14.	Yu Qiyang, Liu Xiaoying	Evaluation System and Indicators of Impact of Reservoir Function	Ministry of Water Resources	2008-2010
15.	Yu Qiyang, Liu Xiaoying	Cutting-edge Research and Technology on Erosion and Sedimentation in Typical Countries	China Institute of Water Resource and Hydropower Research	2009-2010
16.	Yu Qiyang, Liu Xiaoying	Research on Regulation of Eco-hydrological Measures in the Arid Valley of Water Transfer Area of South to North Water Transfer Project	Ministry of Science and Technology	2008-2010
17.	Liu Xiaoying	Research on Common Technologies of Rural Water Resource Protection	Ministry of Water Resources	2010
18.	Gao Zhanyi	Managing Climate Change Effect on Groundwater through Monitoring and Modelling Groundwater	MDG fund	2008-2011
19.	Gao Zhanyi	Multiple Use Services (MUS) system in China,	FAO	2010-2011
20.	Gao Zhanyi	Demonstration on Application of Low Pressure Pipeline Technologies in Yumenkou Irrigation Scheme in Shanxi Province China	Ministry of Water Resources, China	2010-2012
21.	Gao Zhanyi	Extension project on Using Solar Photovoltaic (PV)-Driven Irrigation in major pasture area in China	Ministry of Water Resources	2011-2012
22.	Ning Duihu	Research for common technology of soil and water loss calculation in production and construction projects	Ministry of Water Resources	2010-2011
23.	Ning Duihu	Soil and water conservation in China: development course and future policy	Development and research center of ministry of water resources of P.R. China	2011-2012
24.	Ning Duihu	Compiling non-engineering measures in national soil and water conservation planning	Development and research center of ministry of water resources of P.R. China	2010-2011
25.	Wang Zhaoyin	Knickpoints on the Yalutsangpo River and Ecology	National Natural Science Foundation of China	2010-2012
26.	Wang Zhaoyin	Stream networks and ecological management of the Sanjiangyuan Region	Ministry of Science and Technology	2011-2013
27.	Wang Zhaoyin	Control strategy of golden mussel (<i>Limnoperna fortunei</i>) invasion into water transfer tunnels	Ministry of Water Resources Research Project	2009-2012
28.	Wang Zhaoyin	Forming mechanism and modeling of mountain flood disasters under extreme conditions	National Natural Science Foundation of China	2009-2012
29.	Wang Zhaoyin	Study on channel change and ecological security of the Yarlung Zangbo River	The local government of science and technology plan fund projects	2010-2013
30.	Chen Jianguo	Research on Perched Sediment of Local Reach and the Key Technologies of Hump Reach of the Lower Yellow River	Ministry of water..	2009~2012
31.	Chen Jianguo	Evolution of Storm Flooding in a Small Watershed of Mountainous Areas and Formation Mechanism of Mountain Torrents	Ministry of Science	2011~2012
32.	Liu Xiaoying	Research on Common Technologies of Rural Water Resource Protection	Ministry of Water Resources	2011
33.	Zhang Yanjing	Variation of water and sediment and response to salt water intrusion in the Pear River Mouth	Ministry of Water Resources	2009-2012
34.	Shi Hongling	Study on Diversion Water Demand for the Yellow River Irrigation Districts.	Ministry of Water Resources	2009-2012

2.3 Training activities that directly contributed to the IHP-VII and WWAP objectives

IRTCS continues to provide training in the area of erosion and sediment.

International Advanced Training Workshop on Water and Soil Conservation: Within the framework of UNESCO's Intergovernmental Programme for the "International Hydrological Programme (IHP-VII)" activities within the International Sediment Initiative (ISI), a contract (No. 4500142419) was signed between IRTCES and UNESCO in May, 2011. According to this contract IRTCES should prepare and organize the International Advanced Training Workshop on Water and Soil Conservation in Beijing from September 12 to 20, 2011. The training workshop is aimed at the trainees mastering the fundamental knowledge, modern technology, method and new concept in this field and exchanging practical experiences among participants. The topics and contents of the training workshop included: Global soil erosion situation in general; Basic theory of soil erosion; Principal measures of Water and Soil Conservation; Types and distribution characteristics of soil erosion in China; Experiences on developing and applying technologies for Water and Soil Conservation; Introduction of Soil conservation and check-dam construction in Loess plateau in China; Laboratory visit to Institute of Water Resources and Hydropower Research, China (IWHR); Field visit to demonstration of Water and Soil Conservation in suburb of Beijing; Presentation by participants for technical or scientific exchange of information and experience. Owing to financial contribution from UNESCO and Ministry of Water Resources, China, and grant efforts made by UNESCO Beijing Office and IRTCES, the International Advanced Training Workshop on Water and Soil Conservation was held successfully and smoothly. The total number of 24 participants from 11 countries and regions in Asia, Europe and Africa attended the International Advanced Training Workshop on Water and Soil Conservation; they are from Mongolia, Iran, Nepal, India, Sri Lanka, Sudan, Lesotho, Zimbabwe, Turkey, UK and China.

3. Collaboration and linkages

3.1 Participation in major international networks, programmes, partnerships with other UN or other International Agencies, media and professional bodies

IRTCES has a number of agreements for cooperation and exchange with various organizations in different countries including Yugoslavia, Pakistan, Sudan, Iran, the United States, India and Malaysia, etc. IRTCES maintains close relationship with a large number of professional associations, research centers and government agencies around the world.

IRTCES has hosted secretariats for World Association for Sedimentation and Erosion Research (WASER) and World Association of Soil & Water Conservation (WASWAC). Prof. Hu Chunhong and Prof. Ning Duihui, Deputy Directors of IRTCES, are the Secretary Generals of WASER and WASWAC, respectively.

IRTCES has cooperative agreements with various research institutes in China, such as the Chinese Academy of Sciences, Nanjing Hydraulic Research Institute and the Yellow River Institute of Hydraulic Research, etc., as well as with various renowned Chinese higher education institutions, such as Tsinghua University, Wuhan University and Hohai University. IRTCES exchanges information, documents and books with about 60 institutions in China and 84 other institutions in 48 countries and regions around the world.

Currently, **IRTCES** enjoys partnerships with many institutions abroad and participates in cooperative networks at local, regional, national and international levels. Public and private sector entities working on erosion and sedimentation are invited to join the network of partners, which include:

- UNESCO
- Farmer-centered Agricultural Resources Management Programme (UNDP/FAO/UNIDO)
- Participatory Watershed Management Training in Asia Program, Food and Agriculture Organization (FAO)
- World Association for Sedimentation and Erosion Research (WASER)
- International Association of Hydraulic Engineering and Research (IAHR)
- World Association of Soil and Water Conservation (WASWC)

- Pakistan Council of Research in Water Resources (PCRWR), Pakistan
- National Hydroelectric Power Corporation Ltd. (NHPC), India
- University of Technology MARA (UiTM), Malaysia
- Royal Forest Department, Thailand
- Environmental and Water Research Center, Iran
- National Center for Computational Hydroscience and Engineering, University of Mississippi (NCCHE), United States
- Universities in the PRC, Italy, Japan, Russia, South Africa, and the United Kingdom
- Network of Asian River Basin Organizations (NARBO)
- APWF's Network of Regional Water Knowledge Hubs (APWF-Knowledge Hubs)
- Various Chinese research institutes: China Institute of Water Resources and Hydropower Research, Nanjing Hydraulic
- Research Institute, Changjiang River Scientific Research Institute, Yellow River Institute of Hydraulic Research and
- Pearl River Hydraulic Research Institute

3.2 Participation in meetings related to the IHP and UNESCO (e.g., the UNESCO General Conference, the UNESCO Executive Board, the IHP Intergovernmental Council and/or other meetings organized by IHP)

IRTCES has participated in IHP and UNESCO meetings, including:

- □ IHP Intergovernmental Council (July 2010)
- □ UNESCO-IHP Workshop on 'Education for Managing Hydrological Extremes and Related Geo-Hazards' (Islamabad, Pakistan, January 2011)
- UNESCO-IHP ISI Steering Committee Core Member Meeting and International Conference on the Status and Future of the World's Large Rivers (Austria, April, 2011)

3.3 Collaboration and networking with other UNESCO category 1 or 2 institutes/ centres

- 3.3.1 cross-appointment of directors of the category 1 or 2 institutes or centres on the governing board
- 3.3.2 exchange of information on activities such as training/educational materials, and funding opportunities
- 3.3.3 exchange of staff, most notably professionals and students
- 3.3.4 implementation of joint activities, such as workshops, conferences, training programmes, joint projects, field visits, software and data sharing, knowledge exchange and publications

IRTCES has signed the MOUs with International Centre for Water Hazard and Risk Management (ICHARM, Japan), and Regional Centre on Urban Water Management (RCUWM-Tehran, Iran).

Professor Gao Zhanyi, Deputy Director of IRTCES, has been invited on the Governing Board of the International Centre on Qanats and Historic Hydraulic Structures (ICQHS, Iran), and also invited to be Governing Board of the UNESCO-IHP-International Drought Initiative (IDI).

Delegation of the National Water Resources Institute, Nigeria (NWRI) visited the IRTCES for its taking-off of a Category II center under the auspices of UNESCO, Regional Centre for Integrated River Basin Management (RC-IRBM) in Nigeria (November, 2011).

IRTCES visited General Directorate of State Water Works (DSI) of Turkey and DSI Technical Research and Quality Control Department (TAKK) for cooperation (November, 2011). Regional Centre on Sediment Transport, Erosion and Isotope Technology has been approved to be established in TAKK by IHP council meeting.

Exchange visits between IRTCES and other UNESCO category 2 centers in China, such as International Research Center on Karst (China) and International Centre on Space Technologies for Cultural and Natural Heritage (China).

IRTCES regularly exchanges publications among UNESCO category 1 and 2 centers, and regularly exchanges information on its activities, including a broad dissemination of its training materials, international conference proceedings on-line and by its newsletters.

- 3.4 Relationships with the UNESCO field and regional office whose jurisdiction covers the country of location

IRTCES has worked with, and keeps closed and good cooperative relationship with UNESCO Office Beijing. IRTCES training activities usually get supports from many UNESCO field and regional offices worldwide.

- 3.5 Relationship with the UNESCO National Commission and the IHP National Committee in the country of location and with other organizations of other countries

Prof. HU Chunhong, Deputy Director and Secretary General of IRTCES has been a member of Chinese National Committee for the IHP of the UNESCO.

Chinese National Commission for UNESCO and Chinese National Committee for IHP provided guidance to IRTCES in capacity building and development of IRTCES and also gave full supports to IRTCES activities.

- 3.6 Relationship with other UNESCO-related networks, such as UNESCO Clubs, ASPnet, and UNESCO chairs

IRTCES has hosted secretariat for UNESCO-International Sediment Initiative (ISI), and Prof. Wang Zhaoyin and Prof. Liu Cheng are members of ISI Steering Committee.

Prof. Abdalla Abdelsalam Ahmed, Director General of the UNESCO Chair in Water Resources (Sudan), serves as a member of IRTCES Advisory Council, and he participated in IRTCES training workshops three times.

4. Communication

- 4.1 Communication and knowledge dissemination activities undertaken in the framework of IHP

IRTCES has housed the IHP-ISI Technical Secretariat within IRTCES. The comments and opinions by "ISI Steering Committee" praises the successful efforts by IRTCES and remarks that "The ISI Secretariat provides strong support in organizing meetings and workshops around the world and is organizing such events in China in an appropriate way" and "The ISI Secretariat and IRTCES have done an excellent job in setting up, operating, and maintaining the ISI Information System. The importance of the Information System is borne out by the many hits to the ISI webpage." The ISI Web Pages and Information System has released 360 items of news, 69 notices of coming events, 20 issues of newsletters, 12 reports on case studies, 20 special reports on conferences and training activities, 100 study reports and books, etc., and they have attracted many visitors.

IRTCES is active in dissemination of its research work. Several examples include:

- Sponsored 11th International Symposium on River Sedimentation (South Africa, 2010) as the Permanent Secretariat, and presented keynote and other lectures.
- Organized the 7th IAHR Symposium on River, Coastal and Estuarine Morphodynamics (Beijing, China, Oct. 2011) with the Tsinghua University. Technical presentations were delivered.
- Publication a quarterly journal "International Journal of Sediment Research".
- Publication annually "China Gazette of River Sediment".

- Publication quarterly UNESCO-IHP "ISI Newsletter"
- Presentation "IRTCES and its Trainings" in UNESCO-IHP Workshop on 'Education for Managing Hydrological Extremes and Related Geo-Hazards' (Islamabad, Pakistan, January 2011)
- Presentation "Changes of Runoff and Sediment Loads of the Yangtze River" in International Conference on the Status and Future of the World's Large Rivers (Austria, April, 2011)
- Presentations in International Conference on Sediment Dynamics for a Changing Future (Poland, June, 2010), 8th IAHR International Symposium on Eco-hydraulics (South Korea, Sep. 2010), FAO and IFAD workshop on Multiple Use Services (MUS) system (Italy, May, 2011), Workshop on Climate change and food security (Sri Lanka, Feb, 2011), 34th IAHR Congress (Australia, June, 2011)

4.2 Policy documents and advice

IRTCES has involved in UNESCO ISI publications "ISI Fact Sheets: River Basin Case Study Reports" and "Sediment Issues and Sediment Management in Large River Basins – Interim Case Study Synthesis Report".

"Summary of Field data for Sedimentation in the Three Gorges Project during the Initial Filling period (2006-2008)" published by the Sedimentation Panel of the Three Gorges Project (the office is located in IRTCES, and Prof. Hu Chunhong, IRTCES Secretary General, is the Panel head).

5. Update on Centre Operations

5.1 Membership of the Board of Governors between designated period

IRTCES is administrated by Directors, which is appointed by the Ministry of Water Resources, P. R. of China. The Secretary General presides over the routine work of IRTCES. The Board consist one director and three deputy directors.

Prof. Dr. Kuang Shangfu, Director

Prof. Dr. Hu Chunhong, Deputy Director and Secretary General

Prof. Dr. Gao Zhanyi, Deputy Director (before February 2012)

Prof. Ning Duihu, Deputy Director

IRTCES is assisted by an Advisory Council with 13 members, including one representative of the Chinese Government, one representative of the Director General of UNESCO, six members elected by the IHP Intergovernmental Council and five members selected by the Government in consultation with the Director-General of UNESCO. The Council members are: Dr. Andras Szollosi-Nagy (UNESCO), Mr. Liu Zhiguang (MWR), Prof. Des Walling (UK), Prof. Zurab D. Kopalani (Russia), Dr. Roberto Pizarro Tapia (Chile), Mr. Djoko Legono (Indonesia), Prof. Francis Mutua (Kenya), Prof. Abdalla Abdelsalam Ahmed (Sudan), Prof. Wang Zhaoyin (China) – Chairman of the Advisory Council, Prof. HAN Qiwei (China), Prof. DOU Xiping(China), Prof. LI Wenxue(China), Prof. TAN Ying(China).

5.2 Key decisions made (attach minutes of meetings)

Minutes of meetings are available upon request. Major decisions focus on the need to achieve research excellence, deliver on UNESCO IHP objectives and accomplish financial sustainability.

6. Evidence of the Centre's Impacts

6.1 Science Impacts (Major contributions to the science, technology, education, and regional and/or international cooperation in the field of water)

IRTCES contributes to science impacts through its research projects, and also through its international training activities, international journal "International

Journal of Sediment Research” and international conferences “International Symposia on River Sedimentation”, “International Conference on Estuaries and Coasts” and other bilateral workshops. The lists of research projects and publications in this document provide evidence of some of the impact of our work.

The following paragraph is abstracted from the “Final Report of Six Year Assessment of The International Research and Training Center on Erosion and Sedimentation (IRTCES) under the auspices of UNESCO”:

“During the assessment it became obvious that IRTCES is now a key player, both regionally and internationally, in producing and promoting scientific research on erosion and sedimentation and in the application of the findings in a wide spectrum of fundamental and applied disciplines. Equipped also with laboratory facilities, field work capabilities, IRTCES serves as a regional and international center of excellence and expertise, and provides a platform for exchange of scientific and technical ideas and solutions in sediment and erosion research among the scientists and practitioners. IRTCES staff supports government agencies in China and other countries on development and conservation policies, regulations, and investments related to sediment management. The courses, workshops, and similar activities organized by IRTCES in partnership with UNESCO-ISI and other partners, continue to train hundreds of participants composed of scientists from different disciplines, engineers, managers, stakeholders and decision-makers, and responds to the UNESCO-IHP-ISI objective regarding “Education and Capacity building for Sustainable Sediment management”. IRTCES continues to organize international conferences and symposia, where scientists and practitioners discuss the latest scientific research on erosion and sedimentation, and exchange ideas. IRTCES has done an excellent job in housing the ISI Technical Secretariat within IRTCES. IRTCES also provides experts to various countries in the region and in the world faced with sedimentation and erosion problems and participates in cooperative research activities.”

6.2 Knowledge Transfer Impacts (Major achievements in the dissemination of knowledge and technology transfer)

IRTCES provides training activities in the areas of erosion and sedimentation regionally and internationally. International training courses, workshops, seminars have been conducted regularly. Through these activities, update concepts, knowledge, technology and good practices could be disseminated to participants for improving water resources management in their regions.

Lots of knowledge products, such as the international journal, conference proceedings, training lecture notes and various related publications, act good roles of the dissemination of knowledge and technology transfer in the field of erosion and sedimentation. In order to promote research in the erosion and sedimentation area and contribute to the dissemination of knowledge, IRTCES publishes the International Journal of Sediment Research (IJSR), which is published quarterly, the “China Gazette of River Sedimentation”, which is published annually and contains data from 11 rivers in China, and “UNESCO-ISI Newsletters”, which is published quarterly. The IJSR, with an impact factor of 1.708, is the official journal of both IRTCES and WASER. The IJSR constitutes an extremely important platform for researchers to communicate the results of their research, not only in the mechanics of sediment transport and fluvial processes, but also in geography, geomorphology, soil erosion, sediment yield, soil conservation, environmental and ecological impact of sedimentation, social and economic aspects of sedimentation and its assessment, etc

6.3 Policy Impacts (advice sought by government and other bodies and evidence of inputs into policy arena)

Ongoing consultancy work requested the Chinese Government by the Sedimentation Panel of the Three Gorges Project (the office is located in IRTCES,

and Prof. Hu Chunhong, IRTCES Secretary General, is the Panel head) for the major issues of sediment problems of the Three Gorges Project.

Annual publication of China Gazette of River Sediment has been compiled and edited by IRTCES since 2000 for collection and analysis of erosion and sedimentation data in main river systems in the country. It provided valuable observation data for governmental decision makers in considering river regulation, water resources management and investment.

A database Global Data on Erosion and Sedimentation has been established for releasing related data, publication and information of world rivers for policy makers and researchers.

7. Future activities that will contribute directly to IHP and/or to WWAP

7.1 Operational Plan (attach if available)

IRTCES will continue to support the work of the IHP, in particular to support the work of the IHP – International Sediment Initiative (ISI).

We anticipate contributing to the IHP and its ISI in the following ways:

(i) Continued relevant research (with effective dissemination) on focal research topics in alignment with IHP themes and contributing to our main function of “to promote scientific research on erosion and sedimentation”;

(ii) Continued relevant trainings , symposia or workshops in the fields of erosion and sedimentation in alignment with IHP themes for the exchange of scientific and technical information;

(iii) Continued contribution the ISI in hosting its Technical Secretariat, updating ISI Websites, compiling and distributing ISI Newsletters, and active contacts with UNESCO and ISI Steering Committee members, for ongoing efforts aiming at sustainable sediment management, in the context of sustainable water resources development at global scale;

(iv) Further development of operational links with sister UNESCO Centres, including IHE-Delft, ICHARM, RCUWM-Tehran and others;

(v) Seeking research funding such that we can meet the imperatives of financial sustainability.

(vi) Detail future activities includes: ISI research studies; ISI training workshops; ISI Information System construction; 12th International Symposium on River Sedimentation to be held in Kyoto, Japan on Sep. 2-5, 2013; 4th International Conference on Estuaries and Coasts to be held in Hanoi, Vietnam on Oct. 8-11, 2012; Continued construction of Global Data on Erosion and Sedimentation; acting as secretariats of ISI, WASER and WASWAC.

7.2 Strategic Plan linked with IHP-VII (attach strategic plan if available)

IRTCES will continue to deliver on the working plan agree with strategic plan passed through IRTCES Advisory Council Meeting which align with UNESCO IHP objectives.

8. Annexes

8.1 List of publications released by the centre (there can be overlap with those listed in 2.3 above)

[List of Publications by IRTCES](#)

1. "International Journal of Sediment Research", Quarterly Journal in English version, 2 Volumes 25-27 from 2010 – 2012
2. "China Gazette of River Sedimentation (2 Volumes 2010-2011)" in Chinese
3. UNESCO-ISI Newsletters 8 issues (Quarterly newsletter) from 2010-2012
4. Summary of Field Data for Sedimentation in the Three Gorges Project (during the Initial Filling period 2006-2008) in July 2010
5. Proceedings of 11th International Symposium on River Sedimentation, in September 2010
6. Lecture Notes of International Advanced Training Workshop on Water and Soil Conservation, in September 2011

List of Publications by IRTCES Staff

Journal Papers in Chinese

1. WANG Shuo, LIU Guang-quan, TU Xiao-ning. 2011. Photosynthetic Characteristics of *Armeniacia sibirica* in the Crop-grazing Crisscross Ecotone on the Loess Plateau[J]. JOURNAL OF SOUTHWEST FORESTRY COLLEGE. 31(1): 22-26(in Chinese)
2. Liu, C., Hu, CH and Shi, HL, 2011, Changes of runoff and sediment fluxes of rivers in mainland of China discharged into Pacific. Sediment Research, No. 1, pp. 70-75 (in Chinese)
3. Liu, C., Hu, CH and Shi, HL, 2011, Changes of runoff and sediment fluxes of rivers in mainland of China discharged into Pacific. Sediment Research, No. 1, pp. 70-75(in Chinese with English abstract)
4. DENG An-jun, GUO Qing-chao, CHEN Jian-guo, 2011. Study of evolution of erosion and deposition in Xiaobeiganliu reach of Yellow River, Journal of Sediment Research, No.2 (in Chinese)
5. Gao Zhanyi, 2010: "The Development of Irrigation and Drainage and Technical Research and Extension in China", in: Journal of Water Resources and Hydropower Engineering", Vol. 41 No.12, (December, 2010): 8-14. (in Chinese)
6. Tian Shimin, Wang Zhaoyin, Xu Mengzhen, Zhang Kang, 2010, Study on Coupling Mechanism of Benthonic Animal and Area of Aquatic Habitat, Yellow River, 32(11), pp.19-20.(in Chinese)
7. Jia Yanhong, Wang Zhaoyin, Zhang Zhirong, Li Zhiwei, 2010, Soil erosion of cultivated lands in the Xihanshui River Basin, Journal of Tsinghua University(Science and Technology), 50 (9) : 1342-1345,1349. (EI) (in Chinese)
8. Xu Mengzhen, Wang Zhaoyin, Shi Wenjing, Wang Xuzhao, 2010, Mountain disaster chain induced by the Wenchuan earthquake in the Huoshiguo Gorge, Journal of Tsinghua University(Science and Technology), 50 (9) : 1338-1341. (in Chinese)
9. Wang Zhaoyin, Cui Peng, Liu Huaixiang, 2010, Management of quake lakes and triggered mass movements in Wenchuan earthquake, Journal of Hydraulic Engineering, 41 (7) , pp.1-7. (in Chinese)
10. Yu Guoan, Wang Zhaoyin, Huang Heqing, Liu Huaixiang, 2010, Geomorphology and Environment Effects of Landslide Dams (Dammed Lakes), Advances in Earth Science, 25(9):934-940. (in Chinese)
11. Jiao Xing, Liu Guangquan, Kuang Shangfu. 2010.Review on application of Penman-Monteith Equation to studying forest vegetation evapotranspiration[J]. Journal of Hydraulic Engineering. 41(2): 245-252 (in Chinese)
12. Liu Guangquan, Kuang Shangfu, Tu Xiao. 2010. Water Resources Carrying Capacity for Vegetation Restoration of Eco-fragile Region in the Loess Plateau[J]. The Global Seabuckthorn Research and Development. 8(1):13-20(in Chinese)
13. Liu Guangquan, Kuang Shangfu, Tu Xiao. 2010. Simulating Potential Evapotranspiration and its Spatial and Temporal Changes of the Loess Plateau [J]. The Global Seabuckthorn Research and Development. 8(2):23-30 (in Chinese)
14. YAN Hui, LIU Guang-quan, LI Hong-sheng. 2010. Changes of root biomass, root surface area, and root length density in a *Populus cathayana* plantation[J]. Journal of Applied Ecology. 21(11): 2763-2768 (in Chinese)
15. DENG Lei, WANG Hongzhe, SHANGGUANG Zhouping, LIU Guangquan. 2010.Variations of specific leaf area and nutrients of Chinese caragana in the Loess Plateau region suffering both wind and water erosions[J]. ACTA ECOLOGICA SINICA.30(18):4889-4897 (in Chinese)

16. ZHANG Jun-Feng, LI Qing-Mei, DUAN Xin-Fang, LIU Guang-Quan. 2010. Effect of chitosan on germination and enzyme activity of *Caragana korshinskii* Kom seed from different provenances[J]. CHINESE JOURNAL OF ECO-AGRICULTURE. 18(5): 1026-1030 (in Chinese)
17. ZHANG Jun-feng, LI Qing-mei, DUAN Xin-fang, LIU Guang-quan. 2010. Effects of chitosan on seed germination and seedling growth of *Ziziphus acidujuba*[J]. Journal of Beijing Forestry University. 32(6): 146-150 (in Chinese)
18. QIN Wei¹, ZHU Qing-ke, LIU Guang-quan. 2010. Regulation effects of runoff and sediment of ecological conservation in the upper reaches of Beiluo River[J]. Journal of Hydraulic Engineering. 41(11): 1325-1332 (in Chinese)
19. Yan Liu, Guang-Quan Liu, Qing-Mei Li. 2010. Effects of Ultra-drying Treatment on Physiological Characteristics of *Ziziphus jujuba* vat. *spinosa* and *Hippophae rhamnoides* Seeds[J]. Seed. 29(9): 13-16 (in Chinese)
20. ZHANG Jun-feng, LI Qing-mei¹, DUAN Xin-fang¹, LIU Guang-quan. 2010. Effect of Chitosan on Seed Germination of *Hippophae rhamnoides* Linn. [J]. Seed. 29(9): 33-37 (in Chinese)
21. HU Chun-hong, CHEN Xu-jian, CHEN Jian-guo, GUO Qing-chao, 2010. Research on optimal spatial allocation of sediment in main channel of Yellow River(I)-theory and model, Journal of Hydraulic Engineering, No.3 (in Chinese)
22. HU Chun-hong, CHEN Xu-jian, CHEN Jian-guo, 2010. Allocation and regulation of sediment in the Yellow River in the 21th century, China Water Resources, No.9 (in Chinese)
23. HU Chun-hong, CHEN Xu-jian, CHEN Jian-guo, AN Cui-hua, 2010. Research on optimal spatial allocation of sediment in main channel of Yellow River(III)-Allocation modes and schemes, Journal of Hydraulic Engineering, No.5 (in Chinese)
24. Chen Jianguo, Zhou Wenhao, Chen Qiang, 2010. Problems that should study in the further water and sediment Regulation of Xiaolangdi Reservoir China Water Resources, No.16 (in Chinese)
25. CHEN Jian-guo, ZHOU Wen-hao, SUN Ping, 2010. On the formation mechanism of hump reach of the Lower Yellow River, Journal of Hydraulic Engineering, No.8 (in Chinese)
26. CHEN Xu-jian, HU Chun-hong, CHEN Jian-guo, 2010. Method for comprehensive evaluation of sediment optimal allocations in the mainstream of Yellow River, Advances in Water Science, No.5 (in Chinese)
27. Hu Chunhong, Chen Jianguo, Chen Xujian, 2010. Discussion on the role of Guxian Reservoir in the improvement of Yellow River China Water Resources, No.18 (in Chinese)
28. Zhang Yanjing, Hu Chunhong, Wang Yangui, Scouring and silting characteristics of downstream river channel of hydropower projects at abroad, Yangtze River, Vol.41, No.24, 2010 (in Chinese)

Journal Papers in English

1. Xu Mengzhen, Wang Zhaoyin, Qi Lijian and Liu Le, 2011, Disaster chains initiated by the Wenchuan Earthquake, Environmental Earth Science, DOI 10.1007/s12665-011-0905-3. (SCI)
2. Wang Zhaoyin, Shi Wenjing, Liu Dandan, 2011, Continual erosion of bare rocks after the Wenchuan earthquake and control strategies. Journal of Asian Earth Sciences, Volume 40, Issue 4, 3 March 2011, Pages 915-925 (SCI)
3. He, Yun and LIU, C., 2011. Optimizing the design of in situ sediment oxygen demand measurement chambers, International Journal of Sediment Research, Vol. 26, No. 2, pp. 222-229
4. Chen Yuehong, Wang Feixin, Liu Guanguan, et al. 2011 Modified vegetation-erosion dynamics model and its application in typical watersheds in the Loess Plateau, International Journal of Sediment Research, Vol.26, No.1, pp. 83-93
5. Wang Zhaoyin, Cui Peng, Yu Guoan and Zhang Kang, 2010, Stability of landslide dams and development of knickpoints, Environmental Earth Sciences, DOI: 10.1007/s12665-010-0863-1. (SCI)

6. Li Yanfu Wang Zhaoyin Shi Wenjing and Wang Xuzhao, 2010, Slope debris flow in the Wenchuan Earthquake Area, *Journal of Mountain Science*, 7: 226-233. (SCI).
7. Yi, Y., Wang Zhaoyin and Yang Zhifeng, 2010. Impact of the Gezhouba and Three Gorges Dams on habitat suitability of carps in the Yangtze River. *J. Hydrol.* (2010), doi:10.1016/j.jhydrol.2010.04.018 *Journal of Hydrology* 387 (2010) 283–291, (SCI)
8. Tian Shimin, Wang Zhaoyin, Liu Xiangjun and Liang Shikui, 2010, Coupling interaction between biodiversity and aquatic habitat area in western route project vicinity, *Water Science and Engineering*, 3(3), 354-360, Doi 10.3882/j.issn.1674-2370. (EI).
9. Wang Zhaoyin, Pan Baozhu, Xu Mengzhen, and Yu Guoan, 2010, Preliminary investigation of aquatic ecology in the source region of the Yellow River, in Brierley, Li and Chen (eds), *Landscape and Environment science and management in the Sanjiangyuan Region*, pp. 80-91, Qinghai People's Publishing House.
10. Wang Zhaoyin, Liu Dandan and Shi Wenjing, 2010, Grain erosion – an intense form of rock erosion, *Sediment Dynamics for a Changing Future*, IAHR Publication 337, ISSN0144-7815, pp. 27-34.
11. Wang Zhaoyin, Yu Guoan, Brierley G. and Liu Le, 2010, Stream networks and knickpoints in the Sanjiangyuan region, *Annals of Warsaw University of Life Sciences, Land Reclamation*, No. 42(1),2010, 79-91.
12. Yu, Guo-an , Wang, Zhao-Yin , Zhang, Kang , Duan Xuehua, Tung-chiung Chang, 2010, Restoration of an incised mountain stream using artificial step-pool system[J], *IAHR Journal of Hydraulic Research*, Vol.48, No.2, pp.178-187. (SCI)
13. Liu Yan, LIU Guang-quan, Li Qingmei,et.al. Effects of Ultra-drying on Vigor and Physiological Characteristics of Hippophae rhamnoides Seeds[J]. *Chinese Forestry Science and Technology*. 2010,9(1):53-59
14. HE Yun, LIU Cheng. Experimental Study of Critical Submerged Depth and Near Field Hydraulic Characteristics of Pump Suction[J]. *Journal of Xi'an University of Technology*, 2010,26(1): 92-96.
15. Li Wei, Liu Xiaoying, Xu Bingfeng, Wu Baosheng, 2010, Review of soil erosion research in UK. *Science of Soil and Water Conservation*, 2010,Vol.8, No.1,pp113-118
16. Chunhong Hu, Qingchao Guo, Jianguo Chen, Wenhong Cao, Applications of numerical simulation to the sedimentation in the Sanmenxia reservoir and the Lower Yellow River, *Int. J. Environment and Pollution*, Vol. 42, Nos. 1/2/3, 2010,P.148~165
17. Zhou Zhide and Tong Yuling, 2010, Sediment in Rivers – Origin and Challenge, *Stockholm "Water Front" No.4*, December, pp.8-10

Papers Submitted by IRTCES Staff to International and Regional Conferences

1. Gao Zhanyi, Managing Climate Change Effect on Groundwater through Monitoring Groundwater, UN China Climate Change Partnership Framework Forum, June 2011, Beijing.
2. Gao Zhanyi, understanding multiple uses (MUS) of water in China, using the MASSMUS approach, IFAD, MUS Group meeting 31 May – 1 June 2011, Rome.
3. Gao Zhanyi, Research on Food Security and Irrigation Development Under Climate Change, Forum on Irrigation Water Management and Water Saving, Organized by China Agricultural Water Saving Association, April 26, 2011, Nanjing, Jiangsu Province, China. (in Chinese)
4. Gao Zhanyi, Food Security and Irrigation Development in China, GWP Regional Workshop Climate Change, Food and Water Security 24 - 25 February 2011, IWMI Colombo, Sri Lanka.
5. Gao Zhanyi, China Adaption Research Project Overview, US-China Climate Change Workshop on Mitigation, Adaptation, and Integration for Climate Change Science and Agriculture Nov. 9 -11, 2010, San Diego, USA.
6. Gao Zhanyi, Impact of Climate Changes on Groundwater, High Level Roundtable Conference on Climate Change and Water Security organized by GWP, July 9th, 2010, Beijing, China. (in Chinese)
7. Gao Zhanyi, The Impact of Interaction of Climate Change and Human Activities on Groundwater Management , International Groundwater Forum 2010, Beijing University.

8. Gao Zhanyi, Food Security and Irrigation Development in China, Third McGill Conference on Global Food Security, OCTOBER 19 – 21, 2010, MONTREAL, CANADA.
9. Gao Zhanyi, 'Multiple use of poor quality water', WORKING GROUP ON USE OF POOR QUALITY WATER FOR IRRIGATION (WG-PQW), Yogyakarta, Indonesia, 13 October 2010. (in Chinese)
10. Zhang K., Wang Z. Y. and Liu L., Sep. 2010, The effect of riverbed structure on bed load transport in mountain, Proceedings of International Conference on Fluvial Hydraulics, Braunschweig, Germany.
11. Fabio Teodoro de Souza, Zhaoyin Wang. Aug . 2010, A Data Mining approach to predict mass movements induced by seismic events in Sichuan ,Proceedings of 6th International Conference on Natural Computation, Yantai, China.(ISTP)
12. Wang Zhaoyin, 2010, New researches in erosion and fluvial processes, Keynote lecture, Proceedings of 11th International Symposium on River Sedimentation, Stellenbosch, South Africa. Sep. 2010
13. Chang Tung-Chiung, Wang Zhao-Yin, Yu Guo-an, and Xu Mengzhen, Sep. 2010, Particle size characteristics of step-pool of mountain river and the quantitative study ,Proceedings of 11th International Symposium on River Sedimentation, Stellenbosch, South Africa.
14. Wang Zhaoyin and Xu Mengzhen, 2010, Habitat diversity and its relation with biodiversity , Keynote lecture, Proceedings of 8th IAHR International Symposium on Eco-hydraulics, Seoul, South Korea, Sep. 2010.
15. Wang Zhaoyin, Pan Baozhu, Xu Mengzhen, Yu Guoan, Sep. 2010, Community Characteristics of Benthic Macroinvertebrates in the Source Region of the Yellow River, Proceedings of 8th IAHR International Symposium on Eco-hydraulics, Seoul, South Korea.
16. Xu Mengzhen, Wang Zhaoyin, Pan Baozhu, Jin Xin, Sep. 2010, Thickness of hyporheic zone and vertical distribution of hyporheic macroinvertebrates in mountain streams, Proceedings of 8th IAHR International Symposium on Eco-hydraulics, Seoul, South Korea .
17. Li Yanfu, Wang Zhaoyin, Shi Wenjing, Wang Xuzhao, 2010, Investigation of the slope debris flows in the Wenchuan earthquake area., Proceedings of ICCE-IAHS 2010 International Symposium on Sediment Dynamics for a Changing Future, Warsaw ,Poland.
18. Zhang Yanjing, Hu Chunhong, et al, Changes in channel fluvial processes of the Lower Yellow River after the commissioning of the Xiaolangdi Project , 11th International Symposium on River Sedimentation , (11-th ISRS) Sept 6-9, 2010.
19. Zhang Yanjing, Hu Chunhong, et al, Influence of human activities on variation of runoff and sediment load in the Pearl River Basin, 11th International Symposium on River Sedimentation, (11-th ISRS) Sept 6-9, 2010.

8.2 List of training courses conducted (there can be overlap with those listed in 2.1 above)

International Advanced Training Workshop on Water and Soil Conservation
September 12-19, 2011 under the contract No. 861.360.1
30 participants from 11 countries

8.3 Key Findings in the "Final Report of Six Year Assessment of The International Research and Training Center on Erosion and Sedimentation (IRTCES) under the auspices of UNESCO" written by Prof. Mustafa S. ALTINAKAR and Prof. Liu Heng

A detailed thematic analysis of the activities of IRTCES during the last six years is presented in APPENDIX 3 within the framework of the UNESCO, International Hydrologic Program goals, especially Phase VI and VII themes and objectives, and the existing agreement of IRTCES.

Referring to APPENDIX 3, key findings for administrative and financial matters are:

- Considering an average total budget of 3.45 million RMB per year during the last six years, of which only 35% is the operating budget base allocated by the Government of China, IRTCES has been operating extremely well and has accomplished all its objectives and responsibilities under the existing agreement with UNESCO and within the framework of IHP-VI and VII program themes and activities.
- It is remarkable to note that, on the average, 65% of IRTCES total budget has been secured by the staff from external funds in the form of funded projects. All the funded projects are in full alignment with the strategic objectives of UNESCO-IHP, phases VI and VII.
- Over the years, IRTCES has been able to attract and maintain a world class, highly skilled expert staff with great dedication to the achievement of the objectives. This workforce with world renown achievements must be maintained and strengthened for ensuring the continued success of IRTCES, which plays a unique role globally and regionally in the area of erosion and sedimentation.
- The erosion and sedimentation problems continue to be a major issue globally, but especially for the developing countries that need extensive technical assistance and capacity building for creating a critical mass of well trained professionals that can tackle these technical problems with important economic and social impacts. The demand in technical assistance and capacity building is even increasing due to anthropogenic effects of population increase and the impact of the global climate change. Considering also the growing costs of salary, operation, research and training, the escalating demands can only be met by an increase in both the funding base through core funds provided by the Government of China and the extra-budgetary resources.

The thematic analysis concerning the activities of IRTCES clearly shows that, since its establishment as a UNESCO category II center, IRTCES has contributed significantly to the achievement of UNESCO-IHP VI and VII strategic goals by becoming a regional and global center of excellence and expertise and a platform of exchange, cooperation, and training in the area of erosion and sedimentation research and applications. The activities accomplished during the last six years has maintained and strengthened the unique leadership role played by IRTCES in

- producing, disseminating new knowledge in the area of theoretical and applied erosion and sediment research and its applications in the other scientific areas through publication of scientific journals, papers, research reports, and organization of conferences, symposia and other meetings;
- providing training and education for capacity building towards sustainable development;
- performing funded research projects in full alignment with its responsibilities defined by the agreement with UNESCO;
- establishing and maintaining erosion and sedimentation related databases that can be accessed online by researchers around the world; and
- encouraging research, exchange of ideas and communication between researchers by serving as the secretariat for WASER (the World Association for Sedimentation and Erosion Research) and the Chien Ning Memorial Foundation for Erosion and Sedimentation which awards the "Chien Ning Prize for Erosion and Sedimentation Studies" to outstanding sediment researchers and engineers.

Without repeating the detailed thematic analysis results given in APPENDIX 3, the key findings of the review of the activities of IRTCES, their global and regional impact and the significant contributions to strategic goals of UNESCO-IHP can be summarized as follows:

- The achievements in the 27-year development of IRTCES, which is the first established water-related Category II center, received the highest marks for its sediment and erosion-related research, training, conference series of International Symposia of River Sedimentation, as well as the quarterly published International Journal of Sediment Research.

- IRTCES has been working remarkably well during the last 6 years to accomplish its roles and responsibilities defined under the Agreement between UNESCO and Chinese Government, which was renewed in November 30, 2005. The activities accomplished by IRTCES are relevant to the strategic goals of UNESCO-IHP VI and VII and respond to a real need expressed by scientists, engineers and other professionals in the field as well as decision makers. The unique and extremely important role played by IRTCES has also been clearly expressed in evaluation comments and opinions expressed by experts in the field, such as Prof. Sam S. Y. Wang (USA), ISI Steering Committee (UNESCO), Prof. Des E. Walling (UK), Prof. Rollin Hotchkiss (USA), Prof. M. El Motasem (Egypt), Mr. Jose Alberto Zuniga (Costa Rica), Prof. Dou Xiping (China). Considering the mission statement provided in the Chapter "PROGRAM DESCRIPTION", the following observations are made for IRTCES activities in last six years:
 - IRTCES Staff has contributed to research in erosion and sedimentation by bringing in 60 funded research projects, of which 18 are currently under way. These funded research projects provided, on the average, 65% of the total budget of the Center and allowed financing of the training education activities. In addition, IRTCES performed 25 other research projects and shared their important findings and data by publishing research reports.
 - IRTCES has sponsored 6 conferences, organized 11 seminars and meetings, and co-sponsored 7 other conferences. These conferences provide an important platform that brings experts in erosion and sedimentation research and engineering from all over the world for showcasing their latest research findings and application projects, exchange ideas and shape the future of the erosion and sedimentation research.
 - IRTCES serves as permanent Secretariat of the International Symposia on River Sedimentation (ISRS), which is organized triennially. The 2007 edition of ISRS in Moscow, Russia, and the 2010 edition in Stellenbosch in South Africa attracted about 400 participants in total from 30 different countries. Large participation by experts around the world is a good indicator of the important and increasing role played by this conference as a platform for sharing research findings and exchanging ideas on erosion and sedimentation research and applications.
 - In alignment with the UNESCO-IHP-ISI regarding "Education and Capacity building for Sustainable Sediment Management", IRTCES has organized seven training courses. These courses trained about 300 participants from more than 30 countries around the world. Many of these are developing countries that are faced with serious erosion and sedimentation problems with significant impact on the economic and social development. The training courses organized by IRTCES constitute an important platform for capacity building and for educating local experts and decision makers who can tackle the problems of erosion and sedimentation in their respective countries. The lecture notes of these training courses are freely available on IRTCES website.
 - IRTCES staff has shared their knowledge and expertise by publishing their research results and expertise in refereed scientific journals and conference proceedings. The total number of published journal papers in both Chinese and English is 208. In addition, a total 62 conference papers have been presented at various international and regional conferences and published in their proceedings. IRTCES staff has also communicated the results of their funded research in 25 research reports. Considering the small number of staff members, this is an impressive achievement by any standard, and IRTCES staff must be commended for their productivity and commitment.
 - In order to promote research in the erosion and sedimentation area and contribute to the dissemination of knowledge, IRTCES publishes the International Journal of Sediment Research (IJSR), which is published quarterly, the "China Gazette of River Sedimentation", which is published annually and contains data from 11 rivers in China, and "UNESCO-ISI Newsletters", which is published quarterly. The IJSR, with an impact factor of 1.708, is the official journal of both IRTCES and WASER. The IJSR constitutes an extremely important platform for researchers to communicate the results of their research, not only in the mechanics of sediment transport and fluvial processes, but also in geography, geomorphology, soil erosion, sediment yield, soil conservation, environmental

and ecological impact of sedimentation, social and economic aspects of sedimentation and its assessment, etc.

- IRTCES has done an excellent job in housing the ISI Technical Secretariat within IRTCES. Appendix 1-21 of the Evaluation Comments and Opinions by "ISI Steering Committee" praises the successful efforts by IRTCES and remarks that "*The ISI Secretariat provides strong support in organizing meetings and workshops around the world and is organizing such events in China in an appropriate way*" and "*The ISI Secretariat and IRTCES have done an excellent job in setting up, operating, and maintaining the ISI Information System. The importance of the Information System is borne out by the many hits to the ISI webpage.*" The ISI Web Pages and Information System has released 360 items of news, 69 notices of coming events, 20 issues of newsletters, 12 reports on case studies, 20 special reports on conferences and training activities, 100 study reports and books, etc., and they have attracted many visitors.
- IRTCES promotes regional and international collaboration and serves as a hub of expertise and exchange for sharing research and data. A number of agreements for cooperation and exchange have been signed with various organizations in different countries. IRTCES has cooperative agreements with numerous research institutes in China, and exchanges information, documents and books with about 60 institutions in China and 84 other institutions in 48 countries and regions around the world. A number of international scholars and delegations visit IRTCES each year to establish contact, to discuss and explore collaborative research and activities, plan for international conferences, symposia, and meetings, and to attend conferences and meetings organized by IRTCES, etc. IRTCES staff has also made numerous trips abroad to interact with their colleagues in various institutions and international organizations, and to give lectures and seminars.
- As a means for promoting high quality research in erosion and sedimentation, IRTCES manages the Chien Ning Memorial Foundation for Erosion and Sedimentation and awards the "Chien Ning Prize for Erosion and Sedimentation Studies" to outstanding sediment researchers and engineers.
- IRTCES serves as the Secretariat of WASER (the World Association for Sedimentation and Erosion Research). IRTCES and WASER activities are complementary and together contribute to the IHP-VI and VII themes and activities.
- IRTCES has built and maintains a series of extremely important databases in the domain of erosion and sedimentation research and practice. IRTCES web site serves also as a global sediment portal providing links to data sources maintained by various organizations around the world.

By providing these extremely important activities and services, IRTCES occupies a unique position both regionally and internationally, which must be continued. Based on the above observations, the following final remarks are in order:

- The efforts that the Chinese Government put into IRTCES as well as the extraordinary efforts and dedication by IRTCES itself should be highly appreciated.
- IRTCES has established an effective operation mode as a UNESCO category II center through its exploration and development for twenty-seven years. It has been playing the role of bridge between research and practice and creating linkages to promote the dissemination, exchange, application and advancement of sediment-related knowledge on a global scale.
- Growing international importance with erosion and sediment-related problems in water resources management and river basin management in many parts of the world demands greater role of UNESCO through IRTCES to strengthen awareness about the importance of erosion and sediment processes and their impacts, to promote exchange of information on relevant data, monitoring and management methods, and to improve sustainable management for soil and sediment resources.

Appendix-1

Overview of the Core Programme Themes of the Seventh Phase of the IHP (2008-2013) WATER DEPENDENCIES: SYSTEMS UNDER STRESS AND SOCIETAL RESPONSES

Theme 1: ADAPTING TO THE IMPACTS OF GLOBAL CHANGES ON RIVER BASINS AND AQUIFER SYSTEMS

Focal area 1.1 - Global changes and feedback mechanisms of hydrological processes in stressed systems

Focal area 1.2 - Climate change impacts on the hydrological cycle and consequent impact on water resources

Focal area 1.3 - Hydro-hazards, hydrological extremes and water-related disasters

Focal area 1.4 - Managing groundwater systems' response to global changes

Focal area 1.5 - Global change and climate variability in arid and semi-arid regions

Theme 2: STRENGTHENING WATER GOVERNANCE FOR SUSTAINABILITY

Focal area 2.1 - Cultural, societal and scientific responses to the crises in water governance

Focal area 2.2 - Capacity development for improved governance; enhanced legislation for wise stewardship of water resources

Focal area 2.3 - Governance strategies that enhance affordability and assure financing

Focal area 2.4 - Managing water as a shared responsibility across geographical & social boundaries

Focal area 2.5 - Addressing the water-energy nexus in basin-wide water resources

Theme 3: ECOHYDROLOGY FOR SUSTAINABILITY

Focal area 3.1 - Ecological measures to protect and remediate catchments process

Focal area 3.2 - Improving ecosystem quality and services by combining structural solutions with ecological biotechnologies

Focal area 3.3 - Risk-based environmental management and accounting

Focal area 3.4 - Groundwater-dependent ecosystems identification, inventory and assessment

Theme 4: WATER AND LIFE SUPPORT SYSTEMS

Focal area 4.1 - Protecting water quality for sustainable livelihoods and poverty alleviation

Focal area 4.2 - Augmenting scarce water resources especially in SIDS

Focal area 4.3 - Achieving sustainable urban water management

Focal area 4.4 - Achieving sustainable rural water management

Theme 5: WATER EDUCATION FOR SUSTAINABLE DEVELOPMENT

Focal area 5.1: Tertiary water education and professional development

Focal area 5.2: Vocational education and training of water technicians

Focal area 5.3: Water education in schools

Focal area 5.4: Water education for communities, stakeholders and mass-media professionals

Format for Reports by UNESCO's Water-related Centres on activities related to the IHP in the period June 2010 – May 2012

1. Basic information on the centre

Name of the Centre		Regional Centre on Urban Water Management - Tehran
Name of Director		Dr. Homayoun Motiee
Name and title of contact person (for cooperation)		Mr. Alireza Salamat
E-mail		info@rcuwm.org.ir
Address		No 1, Shahrshaz Alley, Kargozar St., Dastgerdi Ave.
Website		www.rcuwm.org.ir
Location of centre		city/town Tehran__ country _Iran_____
Geographic orientation *		<input type="checkbox"/> global <input checked="" type="checkbox"/> regional
Year of establishment		2002
Themes	Focal Areas ♦	<input checked="" type="checkbox"/> groundwater <input checked="" type="checkbox"/> urban water <input checked="" type="checkbox"/> arid / semi-arid zones <input type="checkbox"/> humid tropics <input checked="" type="checkbox"/> droughts and floods <input checked="" type="checkbox"/> sediment transport and management <input checked="" type="checkbox"/> water and environment <input type="checkbox"/> ecohydrology <input checked="" type="checkbox"/> water law and policy <input checked="" type="checkbox"/> transboundary river basins/ aquifers <input checked="" type="checkbox"/> IWRM <input checked="" type="checkbox"/> global and climate change <input type="checkbox"/> mathematical modeling <input type="checkbox"/> social and cultural dimensions of water <input checked="" type="checkbox"/> water education <input type="checkbox"/> other: (please specify) _____
	Scope of Activities ♦	<input type="checkbox"/> vocational training <input type="checkbox"/> postgraduate education <input type="checkbox"/> continuing education <input checked="" type="checkbox"/> research <input checked="" type="checkbox"/> institutional capacity-building <input checked="" type="checkbox"/> advising/ consulting <input checked="" type="checkbox"/> software development <input type="checkbox"/> other: (please specify) _____
Support bodies ¹		Government of I.R. Iran
Hosting organization ²		Ministry of Energy, I.R. Iran
Sources of financial support ³		Government of I.R. Iran, UNESCO and some Governing Board Member States
Existing networks and cooperation ⁴		G-WADI, UNESCO-IHP, IAHR, UNESCO-IHE,
Governance		<input checked="" type="checkbox"/> director and governing board <input type="checkbox"/> other: (please specify) _____ Link to election of board members to the IHP Intergovernmental Council (IGC) and hosting country IHP National Committee Frequency of meetings: once every one year(s) <input checked="" type="checkbox"/> Existence of UNESCO presence at meetings

* 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

Institutional affiliation of director	Power and Water University of Technology, Assistant Professor
Number of staff and types of staff	total number of staff (full-time, or equivalent) : _4_____ number of staff who are water experts: _3_____ number of visiting scientists and postgraduate students: _2_____
Annual turnover budget in USD	~ 300 000

2. Activities undertaken in the framework of IHP in the period June 2010 – May 2012

- 2.1 Educational activities (i.e., those with accreditation) that directly contributed to the IHP-VII (Appendix-1) and WWAP
Please include here those activities which led to accreditation of degrees, or those held in formal school settings.
- 2.2 Research activities that directly contributed to the IHP-VII and activities by WWAP
Please include research/applied projects outputs such as publications that directly contributed to the IHP-VII and WWAP objectives
- 2.3 Training activities that directly contributed to the IHP-VII and WWAP objectives
- *Training International Law and Trans-boundary Freshwater Symposium, 21 - 24 June 2010, Dundee – Scotland*
 - *Integrated Urban Water Management, 2-5 August 2010, Dushanbe – Tajikistan*
 - *Training Course on “Water Resources Management” for Iraqi Experts, 3-7 July 2010, Tehran-Iran*
 - *Training Workshop on “Application of GIS and RS in Water Resources Management”, 19 - 22 December 2010, Muscat - Oman*
 - *National Training Workshop on "Capacity Development for Farm Management Strategies to Improve Crop-Water Productivity using Aqua Crop", 12 - 16 February 2011, Ahwaz – Iran*
 - *Training Workshop on “International Water Laws & Trans boundary Issues”, 10 - 13 April 2011, Kish Island – Iran*
 - *International Training Workshop on “Water and Sanitation Facilities in Disaster Situations”, 30 May - 01 July 2011, Kish Island – Iran*
 - *International Training Workshop on “Sustainable Water Use in Conditions of Climate Change”, 25 - 27 July 2011, Izmir – Turkey*
 - *International Workshop on “Water Pollution Prevention, Abatement and Control Strategies”, 19 - 22 December 2011, Tehran – Iran*
 - *21st UNESCO-IHP Training Course, 28 November – 9 December 2011, Kyoto – Japan*

3. Collaboration and linkages

- 3.1 *Participation in major international networks, programmes, partnerships with other UN or other International Agencies, media and professional bodies*
- *The International Water Academy*
 - *The International Water Association*
 - *UNESCO-IHE*
 - *UNW-DPC*
 - *UN-HABITAT*
 - *CENTER FOR HYDROMETEROLOGY AND REMOTE SENSING*
 - *International Research and Training Centre on Erosion and Sedimentation (IRTCES)*
 - *International Sediment Initiative (ISI)*
 - *International Drought Initiative (IDI)*
 - *International Flood Initiative*
 - *The International Centre for Water Hazard (ICHARM)*

- 3.2 *Participation in meetings related to the IHP and UNESCO (e.g., the UNESCO General Conference, the UNESCO Executive Board, the IHP Intergovernmental Council and/or other meetings organized by IHP)*
- *19th session of IHP Intergovernmental Council, UNESCO HQ, July 2010, Paris-France*
 - *Regional G-WADI Workshop on Climate Change Impacts on Water Resources Management in Arid and Semi-Arid Zones, 20 – 23 June 2011, Tehran – Iran*
 - *Organizing IDI Initiative Meeting (Drought, Sedimentation and Flood), 9-10 November 2011, Tehran*
 - *Organizing International Workshop on “Water Pollution Prevention, Abatement and Control Strategies”, 19 - 22 December 2011, Tehran – Iran*
- 3.3 *Collaboration and networking with other UNESCO category 1 or 2 institutes/ centres*
- 3.3.1 *cross-appointment of directors of the category 1 or 2 institutes or centres on the governing board*
- *UNESCO-IHE*
 - *RCTWS-Cairo*
 - *ICHARM*
 - *IRTCES-Beijing*
- 3.3.2 *exchange of information on activities such as training/educational materials, and funding opportunities*
- *The International Centre for Water Hazard (ICHARM)*
 - *Regional Humid Tropics Hydrology and Water Resources Centre for South-East Asia and the Pacific (HTC Kuala Lumpur)*
 - *Dundee UNESCO Centre for Water Law, Policy and Science*
 - *HIDROEX Foundation International Centre for Education, Capability Building and Applied Research in Water (HIDROEX-UNESCO)*
 - *International Centre on Qanats and Historic Hydraulic Structures (ICQHS)*
- 3.3.3 *exchange of staff, most notably professionals and students*
- 3.3.4 *implementation of joint activities, such as workshops, conferences, training programmes, joint projects, field visits, software and data sharing, knowledge exchange and publications*
- *Dundee UNESCO Centre for Water Law, Policy and Science*
 - *International Centre on Qanats and Historic Hydraulic Structures (ICQHS)*
 - *HIDROEX Foundation International Centre for Education, Capability Building and Applied Research in Water (HIDROEX-UNESCO)*
 - *The International Centre for Water Hazard*
 - *Regional Humid Tropics Hydrology and Water Resources Centre for South-East Asia and the Pacific (HTC Kuala Lumpur)*
- 3.4 *Relationships with the UNESCO field and regional office whose jurisdiction covers the country of location*
- *UNESCO Tehran Cluster Office*
 - *UNESCO Afghanistan Office*
- 3.5 *Relationship with the UNESCO National Commission and the IHP National Committee in the country of location and with other organizations of other countries*
- *Iranian National Commission for UNESCO*

- *Oman National Commission for UNESCO*
 - *Afghanistan National Commission for UNESCO*
- 3.6 *Relationship with other UNESCO-related networks, such as UNESCO Clubs, ASPnet, and UNESCO chairs*
- *UNESCO Headquarter in Paris*
 - *UNESCO-IHE*
 - *SWITCH*
 - *G-WADI*
4. *Communication*
- 4.1 *Communication and knowledge dissemination activities undertaken in the framework of IHP*
- 4.2 *Policy documents and advice*
5. *Update on Centre Operations*
- 5.1 *Membership of the Board of Governors between designated period*
1 new member of Governing Board:
- *State Committee of Water System, Ministry of Territorial, Republic of Armenia*
- 5.2 *Key decisions made (attach minutes of meetings)*
6. *Evidence of the Centre's Impacts*
- 6.1 *Science Impacts (Major contributions to the science, technology, education, and regional and/or international cooperation in the field of water)*
- *As an indicator we have managed to train several Iraqi experts in the field of water resources issues.*
 - *An evaluation form has been compiled and filled by the participants of our training courses enabling us to evaluate the scientific impacts.*
 - *Promoting public awareness on water related issues throughout the region.*
- 6.2 *Knowledge Transfer Impacts (Major achievements in the dissemination of knowledge and technology transfer)*
- *Promoting knowledge and experience exchange among the experts in the region.*
 - *Around 1000 person per-days have been trained by the events held by our Centre.*
- 6.3 *Policy Impacts (advice sought by government and other bodies and evidence of inputs into policy arena)*
- *Several experts and decision makers have been trained on international water law related issues.*
 - *High rank authorities have been updated on the challenges posed by climate change issues.*
 - *Drought consequences have been highlighted and political will have been mobilized for taking necessary actions.*
7. *Future activities that will contribute directly to IHP and/or to WWAP*
- 7.1 *Operational Plan (attach if available)*
- *Holding a training event on Drought Management Strategies in the framework of the International Drought Initiative (IDI)*
 - *Translating and publishing a book on "Integrated Urban Water Managements: Arid and Semi-Arid Regions" into Farsi*
 - *Publishing a book on drought management in arid and semi arid regions in the framework of IDI.*
- 7.2 *Strategic Plan linked with IHP-VII (attach strategic plan if available)*
- *8th Governing Board meeting of the Centre with the attendance of its Governing Board member states and organizations.*

- *Attending the 20th UNESCO General Conference*

-

-

8. Annexes

8.1 *List of publications released by the centre (there can be overlap with those listed in 2.3 above)*

- *Translating a book titled " Integrated Urban Water Managements: Arid and Semi-Arid Regions" to Farsi*

8.2 *List of training courses conducted (there can be overlap with those listed in 2.1 above)*

- *Training International Law and Trans-boundary Freshwater Symposium, 21 - 24 June 2010, Dundee – Scotland*
- *Integrated Urban Water Management, 2-5 August 2010, Dushanbe – Tajikistan*
- *Training Course on "Water Resources Management" for Iraqi Experts, 3-7 July 2010, Tehran-Iran*
- *Technical visit for the Iraqi General Managers, 9 - 14 October 2010, Iran*
- *Participating in the 6th Water and Wastewater Exhibition, WATEX 2010, 27-30 October 2010, Tehran-Iran*
- *Training Workshop on "Application of GIS and RS in Water Resources Management", 19 - 22 December 2010, Muscat - Oman*
- *National Training Workshop on "Capacity Development for Farm Management Strategies to Improve Crop-Water Productivity using AauaCrop", 12 - 16 February 2011, Ahwaz – Iran*
- *Training Workshop on "International Water Laws & Trans boundary Issues", 10 - 13 April 2011, Kish Island – Iran*
- *International Training Workshop on "Water and Sanitation Facilities in Disaster Situations", 30 May - 01 July 2011, Kish Island – Iran*
- *International Training Workshop on "Sustainable Water Use in Conditions of Climate Change", 25 - 27 July 2011, Izmir – Turkey*
- *International Conference on Drought Management strategies in Arid and Semi-Arid Regions, 11 - 14 December 2011*
- *International Workshop on "Water Pollution Prevention, Abatement and Control Strategies", 19 - 22 December 2011, Tehran - Iran*

Appendix-1

Overview of the Core Programme Themes of the Seventh Phase of the IHP (2008-2013) WATER DEPENDENCIES: SYSTEMS UNDER STRESS AND SOCIETAL RESPONSES

Theme 1: ADAPTING TO THE IMPACTS OF GLOBAL CHANGES ON RIVER BASINS AND AQUIFER SYSTEMS

Focal area 1.1 - Global changes and feedback mechanisms of hydrological processes in stressed systems

Focal area 1.2 - Climate change impacts on the hydrological cycle and consequent impact on water resources

Focal area 1.3 - Hydro-hazards, hydrological extremes and water-related disasters

Focal area 1.4 - Managing groundwater systems' response to global changes

Focal area 1.5 - Global change and climate variability in arid and semi-arid regions

Theme 2: STRENGTHENING WATER GOVERNANCE FOR SUSTAINABILITY

Focal area 2.1 - Cultural, societal and scientific responses to the crises in water governance

Focal area 2.2 - Capacity development for improved governance; enhanced legislation for wise stewardship of water resources

Focal area 2.3 - Governance strategies that enhance affordability and assure financing

Focal area 2.4 - Managing water as a shared responsibility across geographical & social boundaries

Focal area 2.5 - Addressing the water-energy nexus in basin-wide water resources

Theme 3: ECOHYDROLOGY FOR SUSTAINABILITY

Focal area 3.1 - Ecological measures to protect and remediate catchments process

Focal area 3.2 - Improving ecosystem quality and services by combining structural solutions with ecological biotechnologies

Focal area 3.3 - Risk-based environmental management and accounting

Focal area 3.4 - Groundwater-dependent ecosystems identification, inventory and assessment

Theme 4: WATER AND LIFE SUPPORT SYSTEMS

Focal area 4.1 - Protecting water quality for sustainable livelihoods and poverty alleviation

Focal area 4.2 - Augmenting scarce water resources especially in SIDS

Focal area 4.3 - Achieving sustainable urban water management

Focal area 4.4 - Achieving sustainable rural water management

Theme 5: WATER EDUCATION FOR SUSTAINABLE DEVELOPMENT

Focal area 5.1: Tertiary water education and professional development

Focal area 5.2: Vocational education and training of water technicians

Focal area 5.3: Water education in schools

Focal area 5.4: Water education for communities, stakeholders and mass-media professionals