

Format for Biennial Reports by UNESCO's Water-related Centres on activities related to the IHP in the period (June 2012- May 2014)

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 100048
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
Region(s) (for regional centres)		
Year of establishment		1984
Year of renewal assessment		2011
Signature date of most recent Agreement		2005
Themes of activities during reporting period	Focal Areas ♦	<input type="checkbox"/> groundwater <input type="checkbox"/> urban water management <input type="checkbox"/> rural water management <input type="checkbox"/> arid / semi-arid zones <input type="checkbox"/> humid tropics <input type="checkbox"/> cryosphere (snow, ice, glaciers) <input type="checkbox"/> water related disasters (drought/floods) <input checked="" type="checkbox"/> Erosion/sedimentation, and landslides <input type="checkbox"/> ecohydrology/ecosystems <input type="checkbox"/> water law and policy <input type="checkbox"/> social/cultural/gender dimension of water <input type="checkbox"/> transboundary river basins/ aquifers <input checked="" type="checkbox"/> mathematical modelling <input type="checkbox"/> hydroinformatics <input type="checkbox"/> remote sensing/GIS <input checked="" type="checkbox"/> IWRM <input checked="" type="checkbox"/> Watershed processes/management <input type="checkbox"/> global and change and impact assessment <input checked="" type="checkbox"/> mathematical modelling <input checked="" type="checkbox"/> water education <input type="checkbox"/> water quality <input type="checkbox"/> nano-technology <input type="checkbox"/> waste water management/re-use <input type="checkbox"/> water/energy/food nexus <input type="checkbox"/> water systems and infrastructure <input type="checkbox"/> other: (please specify) _____
	Scope of Activities ♦	<input checked="" type="checkbox"/> vocational training <input checked="" type="checkbox"/> postgraduate education <input checked="" type="checkbox"/> continuing education <input type="checkbox"/> public outreach <input checked="" type="checkbox"/> research <input checked="" type="checkbox"/> institutional capacity-building <input checked="" type="checkbox"/> advising/ consulting <input type="checkbox"/> software development

* check on appropriate box
 ♦ check all that apply

	<input checked="" type="checkbox"/> data-sets/data-bases development <input type="checkbox"/> other: (please specify) _____
Support bodies ¹	Ministry of Water Resources, China
Hosting organization ²	
Sources of financial support ³	sources of main budgetary: Ministry of Water Resources Other sources: Ministry of Science and Technology, National Natural Science Foundation, UNESCO, IRTCES service rendered
Existing networks and cooperation ⁴	<ul style="list-style-type: none"> ● World Association for Sedimentation and Erosion Research (WASER) ● 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 ● ICHARM, Japan ● RCUWM, Iran ● ICIWaRM, USA ● Elsevier
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 _2_ 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) : _16_____ number of staff who are water experts: _13_____ number of visiting scientists and postgraduate students: _4_____
Annual turnover budget in USD	0.9 million USD

2. Activities undertaken in the framework of IHP in the period June 2012 – May 2014

2.1 Educational activities (i.e., those with accreditation) that directly contributed to the IHP-VII/VIII (Appendix-1 and 2) and WWAP

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

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

The IRTCES is located in the campus of China Institute of Water Resources and Hydropower Research (IWHR) and have a close ties with the IWHR. IRTCES offers a portfolio of graduate degrees (Masters and PhD levels) in collaboration with IWHR. The degree courses on offer are delivered in the IWHR, Tsinghua University and IRTCES. Current students include:

- 3 PhD students.
- 2 Master students.

2.2 Research activities that directly contributed to the IHP-VII and/or IHP-VIII activities

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

Research projects finished (Project name, financial supportor, project duration)

- Common technology on rural water resources conservation in China, Ministry of Water Resources, 2010.01-2011.12
- Variation of water flow and sediment and its influence on salt water intrusion in the Pear River Mouth, Ministry of Water Resources, 2009-2012
- Study on common technologies of soil loss estimation in soil disturbance of engineering construction, Ministry of Water Resources, 2010.01-2012.12
- Study on systems of laws and regulation in soil and water conservation, Ministry of Water Resources, 2012.01-2012.12
- Process review and future policies of soil and water conservation in China, Ministry of Water Resources, 2011.06-2012.12
- Planning on non-engineering measures of soil and water conservation, Ministry of Water Resources, 2010.12-2014.01
- Study on construction of prevention and control mechanism against corruption in the field of soil and water conservation, Ministry of Water Resources, 2012.07-2012.12
- Program of soil and water conservation for the first phase construction of ore terminals in bulk cargo ports in Huanghua, Enterprise, 2011.07-2012.06
- Acceptance of soil and water conservation for the motorway between Chengde city and the boundary of Chengde city and Tangshan city, Enterprise, 2011.10-2014.01
- Study on soil and water conservation policies in main countries over the world, China Institute of Water Resources and Hydropower Research, 2012.01-2012.12
- Strengthen infrastructure construction of irrigation and water conservancy to improve the supply of agricultural products, Research Office of the State Council, 2012.04-2013.12
- Program of soil and water conservation for the fourth phase construction of coal ports in Huanghua, Enterprise, 2013.03-2013.12
- Acceptance of soil and water conservation for the motorway between Mohe county and Beijicun village, Enterprise, 2012.04-2013.10
- Water and Sediment Allocation Theory and Techniques for River Basin, National Natural Science Foundation of China, 2011.01-2013.12
- Study on water and sediment regulation of irrigation districts of Lower Yellow River, Ministry of Water Resources, 2009.10-2012.10
- Study on key technology solving problems of local deposition sections of the Lower Yellow River, Ministry of Water Resources, 2009.9~2012.9
- Evolution process of flash flood in mountain area and formation mechanism of flood disasters, National 973 Key project, 2011.1~2012.12

Research projects being carried out (Project name, financial supportor, project duration)

- Collaborative Study on Changes in Runoff and Sediment loads of Global Rivers and Integrated River Sediment Management, Ministry of Science and Technology, PR China, 2014-2017.
- Research on Key technologies of soil erosion on disturbed surface under the action of wind, Ministry of Science and Technology, 2012.01-2014.12
- Variation trend of runoff and sediment load and its influence factors, Changjiang Water Resources Commission survey planning and Design Institute, 2012-2014
- Sediment transportation study in different space scale, Changjing River Scientific Research Institute, 2012.04-2014.12
- Study on assessment methods of soil and water conservation target-oriented responsibility system for local governments, Ministry of Water Resource, 2014.01-2014.12

- Acceptance of soil and water conservation for the motorway between Yichung city and Suihua city, Enterprise, 2012.05-2014.12
- Acceptance of soil and water conservation for the motorway between Bei'an city and Heihe city, Enterprise, 2012.05-2014.12
- Acceptance of soil and water conservation for the motorway between Neijiang city and Jigedaqi county, Enterprise, 2012.05-2014.05
- Acceptance of soil and water conservation for electric power plant in Yangcheng county, Enterprise, 2012.10-2014.10
- Strategy for water and sediment variation of China main rivers, China Institute of Water Resources and Hydro-power Research , 2012.01-2015.12
- Study on bank collapse mechanism and prediction model for lower reaches of key water control project, National Natural Science Foundation of China, 2013.01-2016.12
- Study on Fluvial Processes modeling and regulation techniques of TGP and its lower reaches, Key Projects in the National Science & Technology Pillar Program during the Twelfth Five-year Plan Period, 2012.06-2015.12
- Study on mechanism of water and sediment coupled allocation in the irrigation districts of the Lower Yellow River, National Natural Science Foundation of China, 2014.01-2016.12
- Study on runoff and sediment loads, water-sediment relation and changes in erosion and sedimentation of the Yellow River, Ministry of Water Resources, 2012.6~2014.12
- Study on optimizing water and sediment allocation in the Lower Yellow River, Key Projects in the National Science & Technology Pillar Program during the Twelfth Five-year Plan Period, 2011.11~2015.6
- Study on Lower Yellow River channel reconstruction and floodplain management, Ministry of Water Resources, 2013.5~2015.4

Please refer to publications listed under section 9.1.

- 2.3 Training activities that directly contributed to the IHP-VII/VIII and WWAP objectives
N/A

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 International Sediment Initiative (ISI) Technical Secretariat at IRTCES
 - World Association for Sedimentation and Erosion Research (WASER) Secretariat at IRTCES
 - Water and Soil Conservation Association (WASWAC) Secretariat at IRTCES
 - Participation in Network of Regional Water Knowledge Hub in Asia-Pacific Region
 - Participation in Network of Asian River Basin Organization (NARBO)
 - Partnership with International Association for Hydro-Environment Engineering and Research (IAHR)
 - Partnership with International Association of Hydrological Sciences (IAHS)
 - Partnership with Universiti Teknologi Mara (UiTM), Malaysia
 - Partnership with National Centre for Computational Hydroscience and Engineering of the University of Mississippi (NCCHE). USA
 - Partnership with National Hydroelectric Power Corporation LTD. (NHPC), India
 - Partnership with Regional Centre on Urban Water Management (RCUWM), Iran
 - Partnership with International Centre on Qanats and Historic Hydraulic Structures (ICQHS), Iran
 - Partnership with International Centre for Water Hazard and Risk Management (ICHARM), Japan
 - Partnership with International Center for Integrated Water Resources Management (ICIWaRM), USA
 - Partnership with Elsevier
- 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)

- The 37th session of the General Conference of UNESCO, Paris, November 5-20, 2013: As a representative of the Chinese delegation, IRTCES Dr. Liu Cheng participated in the SC Commission meeting (Natural sciences) of the conference. Dr. Liu attended a conference side-event the high-level panel session “Climate Change Impacts on Water Resources and Adaptation Policies in Mountainous Regions” that took place on November 13, 2013.
- The 20th session of IHP Intergovernmental Council, Paris, 4 to 7 June, 2012: IRTCES Deputy Director Prof. Hu Chunhong and Prof. Liu Cheng participated in the session. They also attended a Meeting of UNESCO water-related centres held on the evening of 5th June.

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

- UNESCO-IHE Institute for Water Education, the Netherlands
- Regional Centre on Urban Water Management (RCUWM), Iran
- International Centre on Qanats and Historic Hydraulic Structures (ICQHS), Iran
- International Centre for Water Hazard and Risk Management (ICHARM), Japan
- International Center for Integrated Water Resources Management (ICIWaRM), USA
- International Center on Water Security and Sustainable Management (i-WSSM)(establishing Category II Center), Korean

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

- Prof. Gao Zhanyi, formal Deputy Director of the IRTCES, serves as one of the members of the Governing Board of the ICQHS.

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

- Exchange of information on IRTCES’ activities with IHE, ICHARM, RCUWM, ICIWaRM, ICQHS and other related institutes.
- Exchange of information on ISI’ activities through ISI Newsletters with over 3000 subscribed experts worldwide.
- Training materials have been uploaded in IRTCES and ISI websites for free downloading.

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

- Discussion on joint activities with IHE, ICHARM, RCUWM, ICIWaRM, and other related institutes.
- Joint research project with ICIWaRM: Collaborative Study on Changes in Runoff and Sediment loads of Global Rivers and Integrated River Sediment Management supported by the Ministry of Science and Technology, PR China.

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

IRTCES keeps closed cooperative relationship with UNESCO Office Beijing. A good and regular communication has been built to exchange ideas and information and discuss some important events and special cases between both sides.

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

Chinese National Commission for UNESCO and Chinese National Committee for IHP provided lots of 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

Some contacts with related UNESCO chairs.

4. Communication

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

- The 12th International Symposium on River Sedimentation was held in Kyoto, Japan on September 2-5, 2013. IRTCES Prof. Hu Chunhong, Prof. Liu Cheng, Prof. Liu Xiaoying, Prof. Zhang Yanjing and Prof. Chen Yuehong attended the 12th ISRS and delivered technical presentations.
- The 4th International Conferences on Estuaries and Coasts ICEC was held in Hanoi, Vietnam on October 8-11, 2012. IRTCES Prof. Liu Guangquan, Prof. Wang Yangui, Prof. Liu Cheng and Prof. Shi Hongling attended the conference and made technical presentations.
- The 2nd WASWAC World Conference was held in Chiang Rai, Thailand on Sept. 4-7, 2013. IRTCES Prof. Ning Duihu and Mr. Du Pengfei attended the conference and made technical presentations.
- Prof. Hu Chunhong, Secretary-General and Deputy Director of the IRTCES, visited the U.S. Geological Survey (USGS) National Center on December 10, 2012, together with Prof. Chen Jianguo and Prof. Liu Cheng, IRTCES Division Chief and Deputy Division Chief.
- Prof. Ning Duihu, Deputy Director of the IRTCES, participated in the WASWAC Lancon1209 conference “Sustainable land management and climate changes” held in Serbia in September 2012.
- IRTCES Prof. Wang Yangui and Prof. Shi Hongling participated in the 35th IAHR Congress held in Chengdu China and made technical presentations during September 9-13, 2013.
- Communication between IRTCES and ICIWaRM: Prof. Hu Chunhong, DG of IRTCES, Prof. Liu Cheng and Prof. Chen Jianguo, division chiefs, visited ICIWaRM on December 10, 2012. Dr. William S. Logan, Deputy Director of the ICIWaRM visited the IRTCES on September 16, 2013.
- Prof. Liu Xiaoying participated in the 4th International Congress of ECSSS held in Bari, Italy, from 2 to 6 July 2012 and made technical presentations.
- On April 8, 2014, Newly appointed Permanent Representative of the People's Republic of China to UNESCO, Ambassador Zhang Xiuqin visited the IRTCES.
- On February 6, 2013, Mr. Han Qunli, Director of the Executive Office of UNESCO's Natural Sciences Sector, visited the IRTCES.
- Dr. Won-Sil Kim and Mr. Moonhwan Sung of the i-WSSM, an establishing Category II center, visited IRTCES on December 19, 2013.
- Prof. Dano Roelvink, UNESCO-IHE, visited IRTCES on November 2, 2012.
- On April 22, 2014, Mr. Hans Dencker Thulstrup, Programme Specialist for Natural Sciences of UNESCO Office in Beijing visited the IRTCES.
- On May 31, 2012, Delegation of the Jasa Tirta I Public Corporation, Indonesia visited the IRTCES for technical exchanges. The delegation members are Mr. Tjoek Walujo Subijanto, President Director of the Corporation; Mr. Harianto, Mr. Alfian Rianto, and Mr. Taufikurrachman.
- Dr. Zhang Hao from the Kyoto University, Japan visited IRTCES on September 12, 2012
- On April 28, 2014, Senior Hydropower Specialist Mr. Pravin Karki of the World Bank and Climate Change Specialist Ms. Huang Dafei of the World Bank Beijing Office visited the IRTCES.
- International Association for Hydro-Environment Engineering and Research (IAHR) Executive Director Dr. Christopher George visited IRTCES on February 19, 2014.
- Mr. Samran Sombatpanit, WASWAC Bangkok Office, Thailand visited IRTCES in February 2013.
- Mr. Miodrag Zlatic, Belgrade University, Serbia and his 3 colleagues visited IRTCES in June 2013.
- Mr. Karika Kunta, Land Development Department, Thailand and his 4 colleagues visited IRTCES in August 2013.
- Mr. William Critchley the Associated President of WASWAC, UK visited IRTCES in November 2013.

4.2 Policy documents and advice

See list of publications under 9.1.

5. Update on Centre Operations

5.1 Membership of the Board of Governors between designated period

IRTCES is administrated by a Board of 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.

Director: Prof. Kuang Shangfu

Deputy Directors: Prof. Hu Chunhong (Secretary General), Prof. Ning Duihu and Prof. Liu Guangquan

IRTCES' Advisory Council (2005-2011):

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.

New IRTCES Governing Board will be formed after the Agreement between UNESCO and Chinese Government on IRTCES is renewed.

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)

- Contribution to the science development on erosion and sedimentation: All activities conducted by IRTCES not only focused on study of traditional sediment theories, such as sediment transport, fluvial processes and related topics, but also put great efforts into combination of traditional theories with engineering problems and solution of natural problems in erosion and sedimentation management of river basin. In recent years, IRTCES organized some research projects and important conferences and themed workshops for studying and discussing some key issues and advanced concepts on ecological environment, river system management, river channels training and environmental sedimentation, etc. These activities made a great impact on erosion and sedimentation research in the future.

See list of research projects under 2.2.

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

- Publication of a quarterly *International Journal of Sediment Research*. 29 volumes of the journal have been published till 2014.
- Publication of a quarterly *International Soil and Water Conservation Research* since 2013. 4 issues of journal have been published.
- Publication of annual official publication *China Gezatte on River Sedimentation* since 2000. 13 issues of gezatte have been published.
- Organization the triennial International Symposia on River Sedimentation (ISRS). The 12th ISRS was held in Kyoto, Japan with 388 participants from 28 countries/regions on September 2-5, 2013. The next symposium will be held in Germany in 2016.
- Organization the triennial International Conferences on Estuaries and Coasts (ICEC). The 4th ICEC was held in Hanoi, Vietnam on October 8-11, 2012, with 200 participants from 15 countries and regions. The next conference will be held in Oman in 2015.
- Organization the triennial WASWAC World Conference. The 2nd WASWAC World Conference with topic "Threats to land and water resources in the 21st century: prevention, mitigation and restoration" was held in Chiang Rai, Thailand on Sept. 4-7, 2013. More than 300 participants from 24 counties or regions attended this conference.
- Proceedings of above mentioned conferences have been published containing a wealth of knowledge, practical experience and theoretical information.

- Knowledge dissemination through WebPages of IRTCES (<http://www.irtces.org/>), UNESCO-ISI (<http://www.irtces.org/isi/>), WASER (<http://www.waser.cn>) and WASWAC(<http://www.waswac.org>), as well as ISI Newsletters, WASER Newsletters and WASWAC Newsletters.
- Free access database “Global Data on Erosion and Sedimentation” (<http://data.irtces.org/>).

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

- Synthesis of the ISI Case Study Reports: Case studies prepared as a key component of the ISI, have been produced for the Nile River Basin, the Mississippi River Basin, the Rhine River Basin, the Volga River Basin, the Yellow River Basin, and the Haihe and Liaohe River Basins. These case studies are available online from the ISI website. The synthesis of these existing case studies is intended to provide an accessible overview of sediment problems and sediment management around the world for water managers and policy makers. Key issues relating to sediment management are explored using examples from the various case studies and recommendations for developing management strategies have been extracted from these experiences.
- Technical support to the Sedimentation Panel of the Three Gorges Project under State Council of China: IRTCES is responsible for Sedimentation Panel of the Three Gorges Project. Before and during construction of TGP a large number of research projects including physical and mathematical models on TGP sedimentation problems were organized. The research results and analysis reports were directly submitted to the State Council for decision making on Project operation and utilization.
- China Gazette of River Sedimentation for Ministry of Water Resources: Since 2002 IRTCES has been in charge of editing Gazette of River Sediment in China for collection and analysis of erosion and sedimentation data in main river systems in the country. It provided observation data for governmental decision makers in dealing with problems of river regulation, water resources management and investment.

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

7.1 Operational Plan (attach if available)

- (1) Fulfill responsibilities for serving several secretariats:
 - For ISI technical secretariat, IRTCES will continue to provide technical services to ISI activities including assisting in organization and arrangement of ISI Steering Committee meeting, update of webpage and Sediment Information system, editing Newsletter and other necessary jobs;
 - For WASER and WASWAC secretariats, IRTCES will assist WASER and WASWAC Councils to keep good operation and develop network and related projects.
- (2) Conference organization
 - The 13th International Symposium on River Sedimentation to be held in Stuttgart, Germany in 2016.
 - The 5th International Conference on Estuaries and Coasts to be held in Muscat, Oman in 2015.
- (3) Research projects
 - Carry out research projects being listed in 2.1.
 - Try to win more international research projects and collaborate project.
- (4) Publications
 - International Journal of Sediment Research
 - International Soil and Water Conservation Research
 - China Gazette of River sedimentation
- (5) Training workshops organization
 - To organize International and National training workshop on relevant themes.
- (6) Networking
 - Collaboration and networking with other UNESCO’s water related centers (Category I and II), such as exchange visit and staff and students exchange.

- Collaboration with ISI to continue ISI case studies.
- Collaboration with IHP member states to further develop the database of Global Date of Erosion and Sedimentation.
- Promote WASER and WASWAC activities and capacity building in networking
- Collaboration with all hubs in Network of Regional Water Knowledge Hub in Asia-Pacific Region, such as exchange visit and mutual supportive of activities

7.2 Strategic Plan linked with IHP-VIII (Appendix 2) (attach strategic plan if available)

Same as the Operational Plan

8. Strategic Alignment with IHP-VIII

8.1 Focal areas within IHP-VIII the centre plans to contribute to and specific actions the centre will undertake to align its activities with the strategic plan for IHP-VIII (Please see Appendix-2)

Sound governance policies, based on well-grounded science, are the precondition to address “water security” challenges in today’s setting. Sediment management must be seen as playing a key role in achieving ‘water security’ at different scales. Across the world, erosion, sediment transport and sedimentation processes have wide-ranging social, economic and environmental impacts. However, there are major gaps in baseline sediment data, in current knowledge and understanding of sediment mobilization, transport and storage and sediment budgets, and in our understanding of socio-economic and environmental impacts. Sediment management strategies and practices must be improved if we are to deal effectively with erosion and sedimentation problems.

Focal areas within IHP-VIII the IRTCES plans to contribute to and specific actions the centre will undertake to: Focal area 1.1, Focal area 1.5, Focal area 3.1, Focal area 3.2, Focal area 5.1, Focal area 6.1, Focal area 6.2, Focal area 6.3 and Focal area 6.4.

9. Annexes

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

Journal Paper

- Chen Jianguo, Wenhao Zhou, Qiang Chen, Reservoir sedimentation and transformation of morphology in the Lower Yellow River during 10 years initial operation of the Xiaolangdi Reservoir, *Journal of Hydrodynamics*, 2012,24(6): 914-924
- Chen Jianguo, Zhou Wenhao, and Chen Qiang, Channel re-establishment of in Lower Yellow River in ten years operation of Xiaolangdi Reservoir, *Journal of Hysraulic Engineering*, 2012, No.02, P.127-135 (in Chinese)
- Chen Jianguo, Zhou Wenhao, Chen Qiang, Considerations on water-sediment regulation in later sediment retaining stage of Xiaolangdi Reservoir, *Yellow River*, 2012, No. 5, P.1-3 (in Chinese)
- Chen Qiang and Chen Jianguo, Study on water and sediment variation and tendency in the Lower Weihe River, *Water Conservancy Science and Technology and Economy*, 2012, No. 4, P.45-47 (in Chinese)
- Du Pengfei, Liu Xiaoying, Ning Duihu. Discussion on monitoring methods and prediction models of wind erosion in production and construction projects, *Science of Soil and Water Conservation*, 2013, 11, 1:117-122. (in Chinese)
- Du Pengfei, Liu Xiaoying. A review of measurement of wind erosion rate in China, *Research of Soil and Water Conservation*, 2012, 19, 6: 275-281. (in Chinese)
- Du, P. D.E. Walling. Using 210Pb measurements to estimate sedimentation rates on river floodplains. *Journal of Environmental Radioactivity*, 2012, 103, 59-75.
- Guo Qingchao, Huang Liemin, Chen Jianguo, and Deng Anjun, Formation and development of hump reach in Lower Yellow River *Sediment Research*, , No. 5, P. 38-42 (in Chinese)
- Hu Chunhong and Chen Jianguo, New exploration on water-sediment variation of river and its barnessing, *Water resources and Hydropower Engineering*, 2014, No. 1, P.11-15(in Chinese)
- HU Chunhong, Jian-guo CHEN, Qing-chao GUO, Shaping and maintaining a medium-sized main channel in the Lower Yellow River, *International Journal of Sediment Research*, Vol.27, No.3, Sep 2012, P.259-270.
- HU Chunhong, WANG Yangui, CHEN Senmei, HE Qing. Effect of sediment flux change on intertidal zone in coast line of Zhejiang province. *Journal of Zhejiang Water Technology* (in Chinese)

- Liu C, Wang JJ and He Y, 2013. Change in sediment loads in the Lancang-Mekong River and its influencing factors. *Advances in Science and Technology of Water Resources*, Vol. 33, No. 1, pp. 7-12 (in Chinese)
- Liu C., Sui J.Y., He Y. and Hirshefield F., 2013. Changes in runoff and sediment load from major Chinese rivers to the Pacific Ocean over the period 1955-2010. *International Journal of Sediment Research*, Vol. 28, No. 4, pp. 486-495.
- LIU Cheng, HE Yun, WALLING Des E et al. Changes in the sediment load of the Lancang-Mekong River over the period 1965-2003[J]. *SCIENCE CHINA Technological Sciences*, 2013, 56(4): 843-852.
- LU Hongwei, WANG Yangui, SHI Hongling. Study on main techniques of water and sediment resources allocation in irrigation system of the Lower Yellow River. *Journal of Hydraulic Engineering*, Vol.43 No.12 (in Chinese)
- Ning Duihu, Du Pengfei. Build claim mechanism to control man-made soil loss effectively, *Soil and Water Conservation in China*, 2012, 9: 3-4. (in Chinese)
- SHI Hongling, HU Chunhong, WANG Yangui, Tian Qingqi. Analysis of trends and reasons of variations in runoff and sediment load of the Huaihe River. *Journal of Hydraulic Engineering*, Vol.43 No.05 (in Chinese)
- Wang Dangwei, Chen Jianguo, and Fu Xudong, Review of flow resistance of mountain river, *Journal of Hydraulic Engineering*, 2012, add. 2:12-19 (in Chinese)
- Wang Dangwei, Chen Jianguo, Ji Zuwen, and Hu Haihua, Research on feasibility and quantity of sediment detention in Lower Yellow River, *Sediment Research*, 2012, No. 5, P.26-32 (in Chinese)
- Wang Dangwei, Chen Jianguo, Ji Zuwen, Method for keeping balance in shallow-water simulation over irregular topography, *Chinese Journal of Computational Mechanics*, 2012, No. 4, P.604-608 (in Chinese)
- Wang Dang-wei, Liu Xiao-fang, Chen Jian-guo, Ji Zu-wen, The Slop Flux Method For Numerical Balance In Using Roe's Approximate Riemann Silver, *Journal of Hydrodynamics*, 2012, 24(1):58-64.
- WANG Yangui, et al. Mechanism and analysis mode of sinking failures of river banks. *Advances in Science and Technology of Water Resources*, 2012(5)
- XIE JINMING, WU BAOSEHNG, MAO JIXIN, LIU XIAOYING. Study on evaluation model for impacts of sedimentation on reservoir function. 2012.12 (in Chinese)
- Zhang Yanjing, Hu Chunhong, Wang Yangui, Variation of runoff and sediment load in the Liaohe River and its influence factors, *Yangtze River*, No.2, Feb.2014(in Chinese)

Conference Paper

- Chen Jianguo, Wang Chonghao and Wang Yuhai, Modeling of tide-wave-surge induced sediment transport at Wentuozi region in liaodong bay, *The Fourth International Conference on Estuaries and Coasts*, 2012, Hanoi, Vietnam.
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- LIU XIAOYING, YANG AIMIN ET.AL, Report on control technology system development of rural water resources conservation, 2013.01 (in Chinese)
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- IRTCES, Study on water and sediment regulation of irrigation districts of Lower Yellow River, 2012.12 (in Chinese)

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

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

Appendix-2

Overview of the Core Programme Themes of the Eighth Phase of the IHP (2014-2021) WATER SECURITY: ADDRESSING LOCAL, REGIONAL, AND GLOBAL CHALLENGES

THEME 1: WATER-RELATED DISASTERS AND HYDROLOGICAL CHANGE

- Focal area 1.1 - Risk management as adaptation to global changes
- Focal area 1.2 - Understanding coupled human and natural processes
- Focal area 1.3 - Benefiting from global and local Earth observation systems
- Focal area 1.4 - Addressing uncertainty and improving its communication
- Focal area 1.5 - Improve scientific basis for hydrology and water sciences for preparation and response to extreme hydrological events

THEME 2: GROUNDWATER IN A CHANGING ENVIRONMENT

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

THEME 3: ADDRESSING WATER SCARCITY AND QUALITY

- Focal area 3.1 - Improving governance, planning, management, allocation, and efficient use of water resources
- Focal area 3.2 - Dealing with present water scarcity and developing foresight to prevent undesirable trends
- Focal area 3.3 - Promoting tools for stakeholders involvement and awareness and conflict resolution
- Focal area 3.4 - Addressing water quality and pollution issues within an IWRM framework - improving legal, policy, institutional, and human capacity
- Focal area 3.5 - Promoting innovative tools for safety of water supplies and controlling pollution

THEME 4: WATER AND HUMAN SETTLEMENTS OF THE FUTURE

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

THEME 5: ECOHYDROLOGY, ENGINEERING HARMONY FOR A SUSTAINABLE WORLD

- Focal area 5.1 - Hydrological dimension of a catchment– identification of potential threats and opportunities for a sustainable development
- Focal area 5.2 - Shaping of the catchment ecological structure for ecosystem potential enhancement – biological productivity and biodiversity
- Focal area 5.3 - Ecohydrology system solution and ecological engineering for the enhancement of water and ecosystem resilience and ecosystem services
- Focal area 5.4 - Urban Ecohydrology – storm water purification and retention in the city landscape, potential for improvement of health and quality of life
- Focal area 5.5 - Ecohydrological regulation for sustaining and restoring continental to coastal connectivity and ecosystem functioning

THEME 6: WATER EDUCATION, KEY FOR WATER SECURITY

- Focal area 6.1 - Enhancing tertiary water education and professional capabilities in the water sector
- Focal area 6.2 - Addressing vocational education and training of water technicians
- Focal area 6.3 - Water education for children and youth
- Focal area 6.4 - Promoting awareness of water issues through informal water education
- Focal area 6.5 - Education for transboundary water cooperation