## 1. Basic information on the centre

<table>
<thead>
<tr>
<th>Name of the Centre</th>
<th>International Research and Training Center on Erosion and Sedimentation (IRTCES)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Name of Director</td>
<td>Prof. Dr. Kuang Shangfu</td>
</tr>
<tr>
<td>Name and title of contact person (for cooperation)</td>
<td>Prof. Dr. Hu Chunhong, Secretary General and Deputy Director</td>
</tr>
<tr>
<td>E-mail</td>
<td><a href="mailto:huch@iwhr.com">huch@iwhr.com</a> (CC: <a href="mailto:chliu@iwhr.com">chliu@iwhr.com</a>)</td>
</tr>
<tr>
<td>Address</td>
<td>20 Chegongzhuang West Road, Beijing 100044</td>
</tr>
<tr>
<td>Website</td>
<td><a href="http://www.irtces.org">http://www.irtces.org</a></td>
</tr>
<tr>
<td>Location of centre</td>
<td>Beijing, China</td>
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<tr>
<td>Geographic orientation</td>
<td>Global</td>
</tr>
<tr>
<td>Year of establishment</td>
<td>1984</td>
</tr>
</tbody>
</table>

### Focal Areas
- groundwater
- urban water
- arid / semi-arid zones
- humid tropics
- droughts and floods
- sediment transport and management
- water and environment
- ecohydrology
- water law and policy
- transboundary river basins / aquifers
- IWRM
- global and climate change
- mathematical modelling
- social and cultural dimensions of water
- water education
- other: (please specify) ________________

### Themes
- groundwater
- urban water
- arid / semi-arid zones
- humid tropics
- droughts and floods
- sediment transport and management
- water and environment
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- water law and policy
- transboundary river basins / aquifers
- IWRM
- global and climate change
- mathematical modelling
- social and cultural dimensions of water
- water education
- other: (please specify) ________________

### Scope of Activities
- vocational training
- postgraduate education
- continuing education
- research
- institutional capacity-building
- advising / consulting
- software development
- other: (please specify) ________________

### Support bodies
- Ministry of Water Resources, China

### Hosting organization
- Ministry of Water Resources, UNESCO, IRTCES

### Sources of financial support
- Ministry of Water Resources, UNESCO, IRTCES

### Existing networks and cooperation
- ICHARM, Japan
- RCUWM-Tehran, Iran
- World Association for Sedimentation and Erosion Research (WASER)

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* 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
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.*

**IRTCES** 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*

**IRTCES** 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

<table>
<thead>
<tr>
<th>No</th>
<th>Contracto r/Team leader</th>
<th>Project Title</th>
<th>Funding resources</th>
<th>Duratio n</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Gao Zhanyi</td>
<td>Comprehensive Research on the Key Technologies for Modernization and Water</td>
<td>Ministry of Science and Technology</td>
<td>2008-2011</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Saving in Large Irrigation Schemes in China</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2.</td>
<td>Gao Zhanyi</td>
<td>Assessment Procedure for the Performance and Statue of Large Irrigation Schemes in China</td>
<td>Ministry of Science and Technology</td>
<td>2006-2011</td>
</tr>
<tr>
<td>3.</td>
<td>Ning Duihu</td>
<td>An investigation on current situation of implementation of soil and water</td>
<td>Chinese Society of Water and Soil Conservation</td>
<td>2010</td>
</tr>
<tr>
<td></td>
<td></td>
<td>conservation administrative license</td>
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</tr>
<tr>
<td>4.</td>
<td>Wang Zhaoyin</td>
<td>Habitat moderation of biological species in the middle of the West River</td>
<td>Enterprises and institutions entrusted</td>
<td>2009-2010</td>
</tr>
<tr>
<td>5.</td>
<td>Wang Zhaoyin</td>
<td>Relationship between benthonic animal and composition of riverbed and its application in the ecological evaluation of hydraulic engineering</td>
<td>National Natural Science Foundation of China</td>
<td>2008-2010</td>
</tr>
<tr>
<td>6.</td>
<td>Wang Zhaoyin</td>
<td>Management and mitigation of chain disasters of mass movements and debris flows induced by the Wenchuan Earthquake</td>
<td>973 program of the Ministry of Science and Technology</td>
<td>2008-2010</td>
</tr>
<tr>
<td>7.</td>
<td>Wang Zhaoyin</td>
<td>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</td>
<td>State Key Laboratory of Hydro-science and Engineering</td>
<td>2009-2010</td>
</tr>
<tr>
<td>8.</td>
<td>Liu Guangquan</td>
<td>Study on controlling mode of ecological construction and it’s demonstration in the overlapping area of the water and wind erosion</td>
<td>Ministry of Science and Technology</td>
<td>2006-2010</td>
</tr>
<tr>
<td>9.</td>
<td>Liu Guangquan</td>
<td>Study on vegetation restoration and afforestation technology in the serious erosion region of the northwest ecotone</td>
<td>Ministry of Science and Technology</td>
<td>2006-2010</td>
</tr>
<tr>
<td>11.</td>
<td>Chen Jianguo</td>
<td>Simulation and Adjustment of Watershed Hydrologic Cycle</td>
<td></td>
<td>2008~2010</td>
</tr>
<tr>
<td>13.</td>
<td>Chen Jianguo</td>
<td>Analysis on Sedimentation Reduction at Xiaobeiganliu and the Lower Yellow River in Different Operation Modes for Regulation and Control System of Runoff and Sediment</td>
<td></td>
<td>2010</td>
</tr>
<tr>
<td>No.</td>
<td>Authors</td>
<td>Project Title</td>
<td>Funding Agency</td>
<td>Duration</td>
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<tr>
<td>15.</td>
<td>Yu Qiyang, Liu Xiaoying</td>
<td>Cutting-edge Research and Technology on Erosion and Sedimentation in Typical Countries</td>
<td>China Institute of Water Resource and Hydropower Research</td>
<td>2009-2010</td>
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<tr>
<td>16.</td>
<td>Yu Qiyang, Liu Xiaoying</td>
<td>Research on Regulation of Eco-hydrological Measures in the Arid Valley of Water Transfer Area of South to North Water Transfer Project</td>
<td>Ministry of Science and Technology</td>
<td>2008-2010</td>
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<tr>
<td>18.</td>
<td>Gao Zhanyi</td>
<td>Managing Climate Change Effect on Groundwater through Monitoring and Modelling Groundwater</td>
<td>MDG fund</td>
<td>2008-2011</td>
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<tr>
<td>19.</td>
<td>Gao Zhanyi</td>
<td>Multiple Use Services (MUS) system in China,</td>
<td>FAO</td>
<td>2010-2011</td>
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<tr>
<td>20.</td>
<td>Gao Zhanyi</td>
<td>Demonstration on Application of Low Pressure Pipeline Technologies in Yumenkou Irrigation Scheme in Shanxi Province China</td>
<td>Ministry of Water Resources, China</td>
<td>2010-2012</td>
</tr>
<tr>
<td>22.</td>
<td>Ning Duihu</td>
<td>Research for common technology of soil and water loss calculation in production and construction projects</td>
<td>Ministry of Water Resources</td>
<td>2010-2011</td>
</tr>
<tr>
<td>23.</td>
<td>Ning Duihu</td>
<td>Soil and water conservation in China: development course and future policy</td>
<td>Development and research center of ministry of water resources of P.R. China</td>
<td>2011-2012</td>
</tr>
<tr>
<td>24.</td>
<td>Ning Duihu</td>
<td>Compiling non-engineering measures in national soil and water conservation planning</td>
<td>Development and research center of ministry of water resources of P.R. China</td>
<td>2010-2011</td>
</tr>
<tr>
<td>27.</td>
<td>Wang Zhaoyin</td>
<td>Control strategy of golden mussel (Limnoperna fortunei) invasion into water transfer tunnels</td>
<td>Ministry of Water Resources Research Project</td>
<td>2009-2012</td>
</tr>
<tr>
<td>28.</td>
<td>Wang Zhaoyin</td>
<td>Forming mechanism and modeling of mountain flood disasters under extreme conditions</td>
<td>National Natural Science Foundation of China</td>
<td>2009-2012</td>
</tr>
<tr>
<td>29.</td>
<td>Wang Zhaoyin</td>
<td>Study on channel change and ecological security of the Yarlung Zangbo River</td>
<td>The local government of science and technology plan fund projects</td>
<td>2010-2013</td>
</tr>
<tr>
<td>30.</td>
<td>Chen Jianguo</td>
<td>Research on Percheding Sediment of Local Reach and the Key Technologies of Hump Reach of the Lower Yellow River</td>
<td>Ministry of water..</td>
<td>2009~2012</td>
</tr>
<tr>
<td>31.</td>
<td>Chen Jianguo</td>
<td>Evolution of Storm Flooding in a Small Watershed of Mountainous Areas and Formation Mechanism of Mountain Torrents</td>
<td>Ministry of Science</td>
<td>2011~2012</td>
</tr>
<tr>
<td>33.</td>
<td>Zhang Yanjing</td>
<td>Variation of water and sediment and response to salt water intrusion in the Pearl River Mouth</td>
<td>Ministry of Water Resources</td>
<td>2009-2012</td>
</tr>
<tr>
<td>34.</td>
<td>Shi Hongling</td>
<td>Study on Diversion Water Demand for the Yellow River Irrigation Districts.</td>
<td>Ministry of Water Resources</td>
<td>2009-2012</td>
</tr>
</tbody>
</table>

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

**IRTCES** 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
• 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

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 online 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. Kopaliani (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
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 ITRCES. 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 complied 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 date 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
2. “China Gazette of River Sedimentation (2 Volumes 2010-2011)” in Chinese
3. UNESCO-ISI Newsletters 8 issues (Quarterly newsletter) from 2010-2012
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


Journal Papers in English


Papers Submitted by IRTCES Staff to International and Regional Conferences
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.
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.

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 observation 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.
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