

# **Sustainable Sediment Management in Storage Reservoirs and Run-of-River Hydropower Plants**

## **Workshop on RESCON 2 and numerical modeling for assessment of sediment management alternatives**

### **OVERVIEW**

Reservoir sedimentation and climate change impact the performance of surface water supply, hydropower and flood control infrastructure, including dam safety. The reduced rate of dam construction throughout the world combined with storage loss due to sedimentation currently result in more storage being lost annually than added. This problem is further exacerbated by population growth and increasing water demand per capita, which results in a sharply declining storage volume per capita. Climate change will further impact the performance of reservoirs, in some regions by reducing mean annual runoff and in all regions by increasing the intensity of flood events and the duration of dry periods. It is therefore necessary to focus increasingly on storage preservation. Whereas the 20th century focused on reservoir development, the 21st century will necessarily focus on sediment management; the objective will be to convert today's inventory of non-sustainable reservoirs into sustainable infrastructures for future generations.

### **OBJECTIVE**

The workshop will include a training on the technical analysis tool RESCON 2 that enables the identification of economically optimal and technically feasible approaches to sustainably manage reservoirs for water supply and hydropower generation in early project development phases. In addition, the capabilities of numerical and physical modeling to support detailed sediment management studies will be demonstrated.

The main objective is to showcase the application of the aforementioned technical analysis to practical examples at different stages of project development.

### **DATE AND VENUE**

The workshop on technical analysis tools developed for the assessment of sediment management alternatives is incorporated in the 14th International Symposium on River Sedimentation (14th ISRS) to be held in Chengdu, China from September 16<sup>th</sup> till September 19<sup>th</sup>.

The workshop will take place on September 17<sup>th</sup> in the Wangjiang Hotel, near Sichuan University and will have total duration of 4.5 hours.

### **PARTICIPANTS**

The workshop is addressed to the engineering community as well as reservoir operators and governmental agencies. To facilitate an interaction with the instructors the number of attendees is limited to a maximum of 30 participants.

### **CERTIFICATE**

All participants will receive a certificate of participation in the workshop signed by the UNESCO and the World Association for Sedimentation and Erosion Research.

### **OUTLINE**

In the opening of the workshop, justification for developing practical design and management strategies that will facilitate sustainable development of hydropower and dams through reservoir sedimentation management will be provided. Furthermore, the World Bank's global initiative aiming to improve the

practitioners' and decision makers' understanding of problems related to sedimentation and to support effective and sustainable sediment management will be described.

In the second block of the workshop, a training on software RESCON 2 will be provided. At the end, the participants will be able to identify the optimum sediment management approach among the available state-of-the-art methods and to tailor on the project specific needs. The capability of sediment management to provide a successful adaptation strategy to climate change, increasing thus the resilience of water infrastructure will be demonstrated. The training on RESCON 2 will be based on case studies from all over the world. All sediment management techniques will be demonstrated with the tool.

In the last block of the workshop, the capabilities of numerical and physical model in sediment management will be presented. Based on an explanation of the theoretical background of numerical and physical modelling the possibilities and limitations for sediment transport simulation will be discussed. Model setup and calibration form a central part of sediment modelling and thus the needs and options for implementation are described. As part of this modelling data quantity and quality is essential and therefore the related details are discussed. The model applicability will be demonstrated through practical examples.

## AGENDA

- Block 1**    13:30 – 14:00    **Workshop Opening**
- Welcome speech, importance of sedimentation and sediment management for water resources management in China and worldwide  
Cheng Liu, IRTCES
  - World Bank's initiatives to increase awareness of the challenge and determination to address the issue of sedimentation  
Pravin Karki, Global Lead hydropower & Dams, World Bank
- Block 2**    14:00 – 15:00    **Sedimentation and Sedimentation Management**
- Gregory L. Morris, Independent Consultant, World Bank
- Sediment yield & monitoring
  - Predicting sedimentation rates and patterns
  - Sediment management countermeasures
  - Example reservoirs and interventions
- Block 3**    15:30 – 16:30    **RESCON 2 overview and training**
- Nikolaos Efthymiou, Independent Consultant, World Bank
- Methodological approach
  - Data collection and pre-processing
  - Model set-up and calibration
  - Identification of optimum sediment management approach
  - Climate change analysis
- Block 4**    16:30 – 17:30    **Introduction to numerical and physical modeling**
- Helmut Habersack, UNESCO Chair in Integrated River Research and Engineering, BOKU
- Theoretical background to numerical and physical modelling
  - Capabilities of numerical and physical models in sediment management
  - Data requirements
  - Model setup and calibration
  - Application examples

## INSTRUCTORS



**Cheng Liu** works at the UNESCO International Research and Training Center on Erosion and Sedimentation (IRTCES) as a professor and Deputy Division Chief. He is the Executive Secretary General and Treasurer of the World Association for Sedimentation and Erosion Research (WASER), Associate Editor of the International Journal of Sediment Research, member of Advisory Group of UNESCO IHP – International Sediment Initiative (ISI). He graduated in Environmental Engineering and obtained a Ph.D. in Water Pollution Controlling from Tongji University, China in 2009. He is the author of over 120 journal and international conference publications, 2 UNESCO publications, and editor of 2 international conference proceedings.



**Pravin Karki** has over 25 years of professional experience relating to hydropower and water resources, mainly in hydropower engineering, international policy and academic research. He completed his bachelor's degree in water resources and hydraulic structures from the Czech Technical University followed by an MSc in hydropower engineering from Norway. He graduated with a MPhil in engineering for sustainable development from Darwin College, Cambridge University, UK. He joined the World Bank in 2008 and is currently in the Energy and Extractives Global Practice working on hydropower projects. He is leading the World Bank's work on sediment management and climate change resilience in the hydropower and dam sectors. He managed the RESCON2 project on behalf of the World Bank.



**Gregory Morris** is the co-author of Reservoir Sedimentation Handbook, published by McGraw-Hill. He has over 40 years of experience in consulting and lecturing on water resource and sediment issues in 30 countries, including work related to sediment management in reservoirs and hydropower projects on four continents. He was the major reviewer of RESCON 2 and provided valuable improvement recommendations.



**Nikos Efthymiou** is a consulting engineer with expertise in hydraulics and river engineering. He has all round experience in hydropower and sediment management studies. He graduated in Civil Engineering in 2003 and obtained a Master's degree in Environmental Protection and Sustainable Development from the Aristotle University of Thessaloniki, Greece in 2004. From 2005 till 2012 he worked as research associate at the Technical University of Munich. In 2012 he joined Fichtner GmbH & Co. KG Consulting Engineers, where he was involved in sediment management studies and in the design of small and large hydropower projects. Since 2019 he works as freelancer consultant for the World Bank. He was responsible for development of the RESCON2 software.



**Helmut Habersack** holds currently a UNESCO Chair on "Integrated River Research and Management", coordinating the "World's Large Rivers Initiative", and is a Full Professor of Hydraulic Engineering and Modelling at the Department of Water, Atmosphere and Environment at the University of Natural Resources and Life Sciences Vienna (BOKU), Austria. In 2019 he became Head of the Institute of Hydraulic

Engineering and River Research, he has been the Head of the Christian Doppler Laboratory for Advanced Methods in River Monitoring, Modelling and Engineering. He has over 25 years of experience in sediment transport, hydropower, river engineering / morphology / restoration, flood risk management, ecohydraulics and navigation. He is the author of over 80 SCI journal publications, 10 monographs, over 100 proceedings etc. and gave over 150 national and international (keynote) lectures. Helmut Habersack organized the International Conferences „On the Status and Future of the Worlds´ s Large Rivers“, which were held in 2011 in Vienna, 2015 in Manaus/Amazon and 2017 in New Delhi. He won the “Science2Business 2015” Award.

## **APPLICATION**

The number of participants will be limited to a maximum of 30 attendees to facilitate an interaction with the instructors. If the number of persons interest to participate in the event exceeds the limit of 30 participants, the ISRS organizers will conclude on the participants list.

Interested participants should submit an application to attend the Workshop using the enclosed form.

**APPLICATIONS SHOULD REACH THE LOC OF THE 14<sup>TH</sup> ISRS BY AUGUST 15, 2019.**

**Mr. Liu Chao**

Tel: +86-18482298883

Email: [liuchaoscu@vip.qq.com](mailto:liuchaoscu@vip.qq.com)

## Sustainable Sediment Management in Storage Reservoirs and Run-of-River Hydropower Plants

### Workshop on RESCON 2 and numerical modeling for assesment of sediment management alternatives

September 17, 2019, Chengdu, China

#### Application Form

Family Name		Given Name	
Gender (M /F)		Date of Birth (Year-Month-Day)	
Country		Present Position	
E-mail		Participant of the 14 <sup>th</sup> ISRS (Y /N)	
Phone No. (cellphone)		Fax	
Institution			
Educational Qualification			
Previous knowledge of reservoir sedimentation			