

*Workshop on*

**SEDIMENT MANAGEMENT FOR ENSURING  
THE SUSTAINABILITY OF RESERVOIR  
AND RUN-OF-RIVER PROJECTS**

**25-26 September 2019**

**Conference Hall of CBIP, New Delhi**



*Organised by*

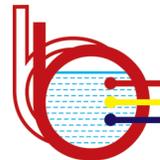


**Indian Committee  
on Large Dams**



**Central Board of  
Irrigation & Power**

*Supported by*



**BHAKRA BEAS  
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**The World Bank**

*under the aegis of*



**International Commission on Large Dams (ICOLD)**

## INTRODUCTION

The global storage capacity of reservoirs is diminishing because of sedimentation at the rate of 1% per annum. The rate of reservoir sedimentation varies across the world and is site specific, ranging from an average annual storage loss of 2.3% in China to 0.68% in North America. Since the late 1990's, the global rate of storage loss due to sedimentation has outpaced the rate of new storage construction, and without further actions, one quarter of all reservoirs will lose their storage to sedimentation in the next 25 to 50 years. Combating the storage loss corresponds to adding about 50 billion cubic meters of storage per year worldwide, with a replacement cost of nearly US\$18 billion.

Reservoirs are used worldwide to provide reliable water supply, hydropower, and flood management services. They are particularly important in areas of the world with high hydrologic variability, where the amount of water flowing in rivers varies significantly both seasonally and from year to year. In these areas, storing enough water for use during severe or multiyear droughts, and thereby ensuring the reliability of water and power supply, requires very large reservoir storage volumes. Countries where hydropower is an important source of energy often have both reservoir and run-of-river (ROR) projects. ROR projects, where preservation of storage is often a secondary objective, represent about 11% of all large dams. For the remainder of dam projects, creating and maintaining reservoir storage is crucial to providing irrigation, water supply, flood control, multiple-use, and hydropower benefits.

Sedimentation poses a significant threat to the longevity, usefulness, and Sustainable operations of both storage reservoirs and ROR projects. Over time, sediment builds up in reservoirs and displaces usable storage volume, which in turn negatively affects hydropower generation, reduces the reliability of domestic and irrigation water supply and flood management services, and degrades aquatic habitat. In ROR projects, sedimentation damages turbines and leads to inefficiencies in power generation and costly repair. In short, sedimentation is a major factor influencing the sustainability of dams, reservoir storage, and all types of ROR projects.

Dams have traditionally been designed under the "design life" paradigm, which entails estimation of the sedimentation rate and trap efficiency, and provision of a sediment storage pool volume equivalent to the design life (typically 50 or 100 years). Under this paradigm, consequences beyond the design life are not addressed, leading to decommissioning. In many regions, however, new reservoirs are both costly and difficult to construct because the best (least costly) dam sites have already been used, and because there is intense resistance to the flooding of additional lands due to competing land uses and social and environmental concerns. The cost of dam decommissioning may also be very high. Finally, deposition of sediment in reservoirs removes it from downstream river reaches, thereby causing erosion of those reaches and degradation of aquatic habitat. Therefore, as dams and reservoirs approach the end of their original design lives, most owners are interested in maintaining the infrastructure and continuing to generate economic and social benefits, including water supply, hydropower, and flood control, even if the benefits are not as large as in the original project. Extending the dam's life entails adopting a new design and operational paradigm that focuses on managing the reservoir and watershed system to bring sediment inflow and outflow into balance to the degree that doing so is practical, thereby giving the reservoir a greatly extended or even indefinite life.

Climate change is projected to increase hydrologic variability in many parts of the world, increasing the intensity of both floods and droughts. This variability will increase the need for larger reservoir volumes to ensure reliable water and power supplies and much-needed flood control. Climate change is also expected to increase sediment loads in many rivers, amplifying the threat of reservoir sedimentation. Therefore, it is essential that new dam and reservoir projects be designed, built, and maintained with the long-term threat of reservoir sedimentation in mind, and that existing projects be converted to sustainable use in so far as is possible.

Keeping in view the importance of the subject, Indian Committee on Large Dams (INCOLD), Central Board of Irrigation & Power and Central Water Commission under the aegis of International Commission on Large Dams (ICOLD) is organizing the workshop on Sediment Management for Ensuring the Sustainability of Reservoir and Run-of-River Projects, 25-26 September 2019 in the Conference Hall of Central Board of Irrigation and Power, Malcha Marg, Chanakyapuri, New Delhi - 110021. The workshop will offer a good scope for interchange of experiences in order to understand how efficiently sediment control measures can deal with reservoir sedimentation, their irrespective impacts on sediment loads and on trapping of sediment needs to be considered, to facilitate exposure of state-of-art technology in all aspects of sedimentation management, especially considering participation of eminent international experts.

## TOPICS

The following topics will be deliberated during the two days deliberation of the workshop

### 1. Introduction and Over View of Sedimentation Issues

- The Importance of Sediment Management for ensuring the Sustainability of Reservoir and Run-of-River Projects
- Sedimentation Impacts Upstream and Downstream of a Dam
- Severity of Storage Loss to Sedimentation
- Sedimentation and Climate Change

### 2. Climate Change, Sediment Management, and Sustainable Development

- The Dual Nature of Reservoir Storage
- Shifting Paradigms
- Economic Analysis and Sustainable Development

### 3. Sediment Monitoring and Control

- Sampling for Suspended Sediment Load
- Sediment Rating Curves
- Bed Material Load
- Bathymetric Mapping of Sedimentation
- Sediment Bulk Density
- Sediment Sampling of Grain Size Distribution
- Mechanics of Sediment Transport through Reservoirs
- Alternate Measures for Controlling Reservoir Sedimentation

### 4. Sediment Management Techniques

- Reducing Upstream Sediment Yield
- Sediment Routing
- Redistributing or Removing Sediment Deposits
- Management Options and Reservoir Capacity
- Adaptive Strategies
- Sediment Modelling Approaches

## 5. Sediment Management at Run-of-River Head Works

- Configurations of ROR Hydropower Plants and Objectives of Head works Design
- Fluvial Morphology and Site Selection
- Sediment Management at Head Works
- Removal of Sand from Diverted Water
- Monitoring and Sediment-Guided Operation

## 6. Reservoir Sustainability Best Practices Guidance

- Sustainable Reservoirs and Hydropower
- Limitations of Sediment Management
- Planning and Design Considerations
- Monitoring Sediment Management Performance
- End-of-Life Scenarios

## WHO SHOULD ATTEND?

The Workshop is of interest to Planners, Designers, Scientists, Researchers, Engineers, Geologists, Regulatory Bodies, Government Department, Developers Contractors, Consultants and Students working in hydropower Engineering, Dam Design, Hydropower Development, Environmental Engineering, and Structural Hydraulics.

## VENUE

The workshop will be held in the Conference Hall of Central Board of Irrigation and Power, Malcha Marg, Chanakyapuri, New Delhi

## OFFICIAL LANGUAGE

The official language of the workshop will be English only.

## REGISTRATION FEE

The registration fee for participation in the Workshop is Rs. 10,000/- per participant by cash/cheque at par/demand draft drawn in favour of “Central Board of Irrigation and Power”, payable at New Delhi. 10% discount in the registration fee will be extended to the members of INCOLD.

The registration fee includes working lunch, tea during the workshop. Registration fee does not include payment for hotel accommodation or meals except those specifically indicated in the Workshop. Registration fee once paid will not be refunded.

## PAYMENT

All payments are to be made by the following methods:

**Banker's Cheque payable to :** Central Board of Irrigation & Power, New Delhi

**Bank Transfer :** Name of Bank : HDFC Bank Ltd. 209-214, Kailash Building, 26 K.G. Marg, New Delhi-110 001

### Beneficiary Details

Organization : Central Board of Irrigation & Power

Account No. : 00031110004411 MICR Code No. : 110240001  
Swift Code : HDFCCINBBDEL Branch IFSC : HDFC0000003

Bank charges if any, must be borne by the organisation/participants and should not be deducted from the amount remitted to the Workshop Secretariat.

## CALL FOR PAPERS/CASE STUDIES

There will be invited presentations on the topics identified for the workshop. The case studies of some of the important Indian Dam projects will be presented by dam professionals during the workshop. If some experts would like to make the presentation on any of the subject, they may send full text of paper(s)/case study(ies) on A4 size paper so as to reach the Workshop Secretariat by **10<sup>th</sup> September 2019**. The papers/case studies accepted for presentation will be notified immediately thereafter. Only original

## PROGRAMME

25th September 2019 (Wednesday)	
09:00–10:00 hrs.	Registration
10:00–11:00 hrs.	Inaugural Session
11:30–13:00 hrs.	<b>Technical Session 1</b> Overview of Sedimentation Issues - Global Perspective
14:00–15:30 hrs.	<b>Technical Session 2</b> Climate Change, Sediment Management and Sustainable Development
16:00–17:30 hrs.	<b>Technical Session 3</b> Emerging Technologies
26th September 2019 (Thursday)	
09:30–13:00 hrs.	<b>Technical Session 4 &amp; 5</b> Sediment Monitoring and Control
14:00–15:30 hrs.	<b>Technical Session 6</b> Sediment Management Techniques
16:00–17:30 hrs.	<b>Technical Session 7</b> Reservoir Sustainability – Best Practices

**Morning Tea: 11:00–11:30 Hrs. Lunch 13:00–14:00 Hrs.**

**Evening Tea 15:30 – 16:00 Hrs.**

contributions that have not been published or presented at any other conference/symposium/seminar are acceptable, otherwise the paper will not be considered. The full length paper will be reviewed by the Technical Committee for oral presentation.

## SPONSORSHIP

Scope exists for organizations to be the Sponsor on lumpsum payment with following benefits:

**Sponsor – Rs. 2,00,000/-**

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- Name of the organization in the list of Sponsors
- Organization may nominate two delegates
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- Distribution of literature/brochures

## WORKSHOP SECRETARIAT

### Indian Committee on Large Dams

C/o Central Board of Irrigation and Power  
Plot No. 4, Institutional Area, Malcha Marg, Chanakyapuri,  
New Delhi 110 021, India

Tel: 91-11-26115984/26116567/26111294 Extn: 113;

Fax: 91-11-26116347

E-mail:sunil@cbip.org; cbip@cbip.org;

Web <http://www.cbip.org>

## CONTACT PERSON

**Mr. Sunil Sharma**, Chief Manager – Tech., M : 9811299136

## NOTES

1. Participants will have to make their own arrangement for travel, boarding and lodging, etc.
2. Last date for receipt of Registration Form is 20<sup>th</sup> September 2019. Spot registration facility will also be available, provided prior information is received.

## RESOURCE SPEAKER

**MARTIN J. TEAL, P.E., P.H., D.WRE, F.ASCE**



Martin J. Teal, has over 30 years of experience in water resources engineering and leads the San Diego office of WEST Consultants, Inc. He is a registered civil engineer in multiple states, a Diplomat of the American Academy of Water Resources Engineers and was elected Fellow of the American Society of Civil Engineers. Throughout his career, Mr. Martin Teal has focused on sedimentation and erosion processes in reservoir, riverine, and estuarine environments.

Mr. Martin Teal managed and performed technical analyses on seven flooding and sedimentation studies of the Missouri River and tributaries for the U.S. Army Corps of Engineers (USACE), Omaha District. These studies included reservoir sedimentation analyses, hydraulic modeling for habitat restoration projects, bank stability analyses, and floodplain analyses. Mr. Martin Teal also managed and performed technical analyses for a two-dimensional hydrodynamic and sediment transport model of Humboldt Bay for the California Department of Transportation (DOT), and the Tres Rios Hydraulic and Sedimentation Study in Phoenix, AZ, for the USACE, Los Angeles District.

He is a past chair of the Sedimentation Committee of the Environmental and Water Resources Institute of the American Society of Civil Engineers. He is a member of the Board of Directors of the United States Society on Dams, an active member and past Chair of the Hydraulics Committee, and Chair of the Sedimentation subcommittee. He currently serves as Chair of the International Committee on Large Dams Technical Committee on Sedimentation of Reservoirs.

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## SEDIMENT MANAGEMENT FOR ENSURING THE SUSTAINABILITY OF RESERVOIR AND RUN-OF-RIVER PROJECTS

25-26 SEPTEMBER 2019, CBIP CONFERENCE HALL AT NEW DELHI



INCOLD



### REGISTRATION FORM

(To be filled in block letters, preferably typed)

1. Name of Participant \_\_\_\_\_  
(Surname) (First Name) (Prefix Prof/Dr./Mr./Mrs./Ms.)
2. Designation : \_\_\_\_\_
3. Name of Organization: \_\_\_\_\_
4. Mailing Address : \_\_\_\_\_  
City \_\_\_\_\_ State \_\_\_\_\_  
Country \_\_\_\_\_ PIN \_\_\_\_\_  
Phone : \_\_\_\_\_ Fax \_\_\_\_\_  
E-mail : \_\_\_\_\_
5. Payment details  
Bank Draft/cheque No. \_\_\_\_\_ dated \_\_\_\_\_ INR \_\_\_\_\_ drawn on Bank \_\_\_\_\_  
is enclosed/is being sent separately.

I intend to participate in the deliberations of the workshop.

Place \_\_\_\_\_

Dated \_\_\_\_\_

Signature \_\_\_\_\_