DHI SOLUTIONS

Supporting hydropower development in India

Facing the challenges of power generation in the Himalayas

High hydropower potential in India - and a high demand

India's demand for electricity is increasing rapidly, fuelled by strong economic growth and the need to improve the living conditions of a large part of the population. The country has a high hydropower potential, primarily in the Himalayas, of which less than 25% has been developed to date. To face the rising demand, the Government of India plans to exploit this potential and has therefore accelerated hydropower development.

Most rivers originating in the high Himalayas have excessive silt in the river water, particularly during the rainy season from June to October. This silt, if not removed, will cause heavy damage to run-of-river hydropower plants, such as erosion of the turbine blades and other steel structures. As a result, one of the big challenges in developing the hydropower potential in the Indian Himalayas is the management of this sediment.

Srisailam dam in the Nallamala Hills is among India's largest hydropower projects.

Sediment is money - optimising sediment management

Based on an extensive knowledge base (stemming from a thorough review and comparative study of experiences from existing hydropower projects in India), as well as years of experience and our state-of-the-art numerical models, DHI has conducted sediment optimisation studies for a number of projects. We follow the sediment throughout the system—from its entry point into the reservoir, all the way to the powerhouse. At each step of the way, some sedimentation occurs: What's left after entering the reservoir will continue through the intake to the desilting chambers, where further settling will take place before the remaining sediment reaches the powerhouse.

The amount of sediment settling in the reservoir and the desilting chambers is associated with a cost/revenue loss. Moreover, the sediment making its way to the powerhouse is directly related to the subsequent repair costs.

Our optimised sediment management is based on the economical balance between additional construction costs (e.g. desilting chambers and special coatings) against revenue loss due to repair costs and associated downtime together with storage loss and its effects.

SUMMARY

Client

Hydropower companies

Challenge

- Sediment causing damage and creating losses
- Lack of information on dam and reservoir operations
- Understanding the impact on the environment
- Assessing water availability and flow for hydropower generation

Solution

A detailed understanding of the involved processes allows for cost-efficient and sustainable sediment management, as well as proper planning and operation of hydropower projects, including their environmental impacts.

Value

- Sound knowledge base for hydropower projects
- Reduced repair and maintenance costs due to optimised sediment management
- Proper and timely decisions based on real-time information
- Minimised impact on the environment
- Increased safety

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Do the right thing – Decision Support Systems

Sufficient and reliable data on dam and reservoir operations as well as water availability is one prerequisite for good power plant management. But one also needs to properly interpret these data. Decision Support Systems (DSS) based on online simulations of your power project or the corresponding river system can help you to take the right decisions – in time and targeted to the actual demands, especially for multi-objective projects.

DHI has previously equipped several hydroelectric power projects with real-time operational DSS, which are further strengthened with state-of-the-art data acquisition and advanced communication systems for integrated real-time operation management of dams and reservoirs.

Environmental management: EIA and EMP

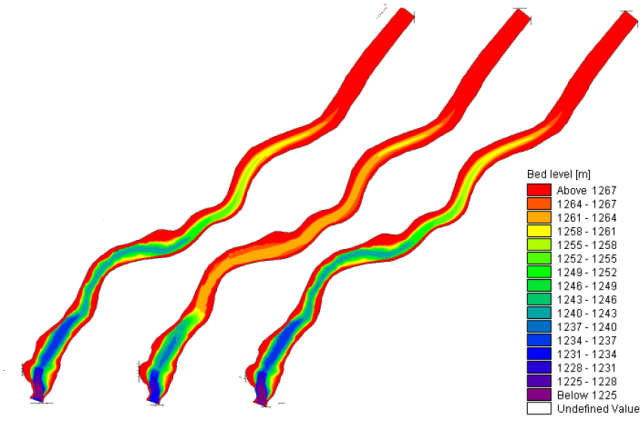
Environmental Impact Assessments (EIA's) and Environmental Management Plans (EMP's) are among the cornerstones of sustainable hydropower development, especially in environmentally sensitive regions. We have supported hydropower companies with several such studies, e.g. in Raigam, Gimiliang and Tidding.

Our environmental services for the hydropower industry include:

- Catchment Area Treatment
- Wildlife Management
- Suitable Rehabilitation and Resettlement
- Baseline studies of the local environment (air quality, noise quality, foresting, biodiversity, fisheries, socio-economic scenario etc.)
- EIA and adequate EMP
- Disaster Management Plan

Increased safety through dam break risk modelling

DHI has carried out a number of projects on the risk of dam break failure due to Glacial Lake Outburst flooding (GLOF) in the Himalayan region, for both existing and new hydropower projects. These usually include a risk management plan for the downstream population, as well as contingency and safe operations plans of the dam and its accordant rule curve.



Modelling plot depicting bathymetry changes due to flushing.

Glaciers melting as a result of global warming impose new challenges on hydropower generation.

Water Availability Studies – today and in the future

To ensure cost-efficient development, DHI carries out water availability studies for hydroelectric power projects. By simulating and analysing the availability of water resources, we support the development of run-of-river hydropower schemes. These studies usually comprise:

- Hydrological (rainfall-runoff) modelling including the snowmelt-runoff component. With almost no storage, the feasibility of a hydropower scheme often depends on a stable runoff of melt water. As global warming will potentially reduce the size of the Himalayan glaciers, climate scenarios need to be included in the models
- Siltation studies
- Investigation of various watershed protection options and risk of landslides

Supporting hydropower plant design

In addition to investigating water availability, sediment management and river morphology, we conduct numerical modelling studies in order to assess the arrangement of barrage, spillway and intake. Our models examine the hydraulic flow at the intake and spillways along with sediment deposition patterns, and shed light on the flushing ability of the barrage for various flow conditions.

Addressing limitations of current sediment management technology at the Sediment Management Workshop in New Delhi, 2011.

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