# MATHEMATICAL MODEL STUDIES FOR RESERVOIR SEDIMENTATION FOR PUNATSANGCHHU H.E. PROJECT, BHUTAN

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Service Through Research

## BACKGROUND

Punatsangchhu-I Hydro Electric Project is located on Punatsangchhu river in Wangdue District (Bhutan) about 6 km downstream of Wangdi Bridge. Project site is about 80 km from the Capital Thimpu. Project is planned as a run-of-the-river scheme and will utilise design head of 343 m for generation of 1200 MW power.

## OBJECTIVES

➢ To estimate the reservoir sedimentation profile .

## METHODOLOGY

➢ One-dimensional HEC-RAS model of river Punatsangchhu covering a reach of about 18.5 km upstream of dam and 1.5 km downstream was developed.
➢ Sediment rating curve developed from suspended sediment data available at Wangdi rapid gauging site for the period from July 1992 to July 2009 and bed material gradation curve at five locations upstream of dam was used for simulating sediment transport and deposition.

## STUDIES CONDUCTED

➢ Model was calibrated for the existing flow condition.
➢ Simulations were carried out to predict the sedimentation profile after various durations (5, 10,15, 20, 25 years etc.)



Dam Site
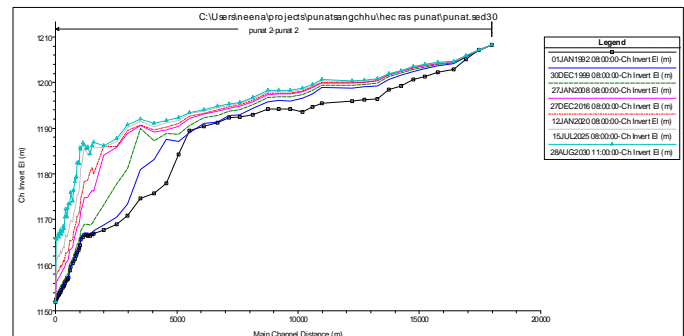


Bed Profile near Dam Axis Operating at MDDL

## OBSERVATIONS

➢ The bed profile obtained by the simulation of daily hydrograph for a period from January 1992 to July 2025, reservoir operating at MDDL indicated that during the initial period, the sediment deposition is occurring in the upstream reaches.
➢ The sedimentation level at dam axis reaches the spillway crest level of RL.1166 m after about 33 years.

## SIGNIFICANCE OF THE STUDIES

➢ The sedimentation profile will be helpful to analyse the pattern of sedimentation over the years and in turn finalizing the design of various components of the project (spillway crest level, location, alignment and invert level of intake etc.).
➢ The sedimentation profile will be the input for the physical model for studying the effect of flushing of reservoir in regaining storage capacity.