

Integrated Sediment Management in Ganga River System for Bihar Flood Mitigation Using State-of-the-Art Techniques

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Abstract

The management of sediment in Ganga river basin and its sub-basins has been a challenging task for water management professionals due to its intimate ramifications on floods and erosion in the Ganga river system. The inherent intricacies of sediment management owe their complexities to rising demographic pressure on land and the dynamics of land use land cover changes with sharply rising water use. Furthermore, there are related issues of effects on river regime due to hydraulic structures such as dams and barrages to fulfill the development goals which has meant that river engineers and water managers today face complex technical and environmental challenges in relation to sediment management in the Ganga river system. Three fold integrated sequential framework namely - (i) Problem Appraisal, (ii) Quantitative analyses on multifaceted problem domain, and (iii) analyses for developing sustainable mitigating solutions, can intertwine to synthesize solutions to the sediment issues for mitigation of vexed flood problems caused by increasing sediment deposits in Ganga River system vis-a-vis Bihar.

(i) Problem Appraisal:

- ❖ Overview of sediment issues, their causes and impacts
- ❖ Identification of priority issues and areas with respect to inter-basin contrasts
- ❖ Type and scale of sediment problems
- ❖ SEE (Social Environmental Ecological) aspects of sediment

(ii) Quantitative Analyses on Multifaceted Problem Domain:

- ❖ Geomorphological changes: pre-Farakka and post-Farakka Barrage Scenario
- ❖ Estimation of sediment ingress to Ganga River basins affecting Bihar
- ❖ 2-D Bursting Analysis of the Ganga streamflow from Buxar to Farakka (Turbulence Analysis) to comprehend impact of sediment dynamics on critical channel processes of sediment entrainment, transport and deposition.
- ❖ Hydrologic-hydraulic modelling for flood propagation and prediction accounting for vagaries of climate change – vulnerability and risk appraisal of embanked river network of Ganga river system.
- ❖ Flood inundation area mapping
- ❖ Vulnerability Mapping for natural environment and socio-economic human dimensions.

(iii) Analyses for Developing Sustainable Mitigating Solutions:

- ❖ Sediment Management prospects using Catchment Area Treatment plans.
- ❖ Reduction of sediment input to the river system in concurrence with its local SEE approach.
- ❖ Control of the sediment inflows using innovative techniques in highly risked sediment induced flood prone area.
- ❖ Channelization for Channel Improvement in Ganga, Kosi, Gandak, Sone etc. within the ambit of concerned study area of river network using cost-effective State-of-the-Art Techniques.
- ❖ Analysis for remodelling prospects of Farakka barrage system to upgrade its hydraulic performance as well as sustainability using state-of-the-art design techniques.
