

## Challenges of Sedimentation in River Ganga and Remedial approach

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Ganga, the sacred river for Indian Masses is not only facing the challenge of pollution but is also facing obstruction to its flow because of a number of structures in course of its stream. Tehri Dam constructed on River Bhagirathi, Dams constructed on river Alaknanda and Farakka Barrage are a few important examples to be mentioned in this context. Such structures not only impede the flow of the river but also bring adverse environmental and ecological impacts. With the reduced flow velocity and erosion of silt particles due to such numerous structures, suspended silt particles in the river settle down. Such phenomena in the reservoir are viewed as sedimentation.

A number of factors are responsible for sedimentation. But the size, shape and length of the reservoir is one of the important factors. Though over the year neglect has necessitated dredging, de silting is preferable idea for sustaining eco system. Sediment management and control is a challenging task and can-not be handled by “one- size- fits- all” approach. The factors which can have large impact on sediment loads in rivers are topography, river control structures, soil and water conservation measures, tree cover and riparian land use or land disturbance, agriculture, mining etc. While on the one hand river control structures like reservoirs, soil conservation measures and sediment control programme can cause increased sediment loads to decrease, factors like land disturbance such as clearing of vegetation or agricultural practices can cause increased sediments load. Moreover indiscriminate de-siltation works may prove to be more harmful to ecology and environment flow. Hence to address the issue of better silt management we need to involve better guidelines and better broad principles.

In July 2016, Ministry of Water Resources, River Development and Ganga Rejuvenation constituted a committee headed by Sri Madhav Chitale, Expert Member of NGRBA for preparation of guidelines for works on de-siltation from Bhimgauda (Uttarakhand) to Farakka (West Bengal). One of the key objectives led down for Chitale Committee was to establish a need for Ecology and eFlow of the river. The study undertaken by the above mentioned Chitale Committee made the following key observations:

- I. Erosion, movement and deposition of sediment are natural regulating functions of river and sediment equilibrium of river should be maintained.
- II. Rivers should be provided with sufficient flood plains (Lateral connectivity) without any hindrance to the flow
- III. Instead of “*keeping the silt away*”, strategy to “*giving the silt way*” should be adopted.

In the light of the above, the committee suggested that reach wise sediment transport processes should be studied along with establishing annual sediments budget to guide de silting activities. It also suggested entrusting to a technical institute the task to conduct sediment budget, morphological and flood routing studies that would examine and confirm the necessities of the de silting of the reach under consideration.

The Chitale Committee also emphasized the need to study the feasibility of introducing an arrangement to facilitate the passing of incoming sediments safely to downstream of the dams/barrage structure to maintain the sediment equilibrium. It also suggested ensuring that the concentrated sediment flux passed downstream will not create any major morphological changes on the downstream reaches. It further observed that any bridges across river Ganga which are causing large afflux (more than 1% of normal depth) should be modified to reduce the afflux which in turn will also reduce the sediment deposition and erosion of banks on the upstream.

Last but not the least the Chitale Committee also suggested to entrust a body comprising of the representatives of the Ganga Flood Commission, Member NITI Ayog (erstwhile Planning Commission), Chief Ministers of Ganga river basin states to carry out necessary studies with regard to sediment management in river Ganga and incorporate sediment management strategies in their comprehensive plans prepared for all sub basins of river Ganga. These integrated plans, the committee felt, could serve as base documents for Central, State and District level Authorities for considering proposals for Environmental Clearance for works related to river Ganga. In this context it would be appropriate to refer to the Gazette notification dated 7<sup>th</sup> October 2016 according to the status of Authority to National Mission for Clean Ganga.

Analyzing the issue of siltation in the context of Farakka Barrage, the Chitale Committee suggested the shores formed maybe de silted/dredged by taking care of the river training works around it. Sediments removed may be used for regarding the Farakka Feeder Canal or may be used for strengthening the existing embankments around the barrage pond. It suggested that sediment sluicing may be incorporated to maintain sediment continuity from upstream to downstream reaches after carrying out necessary studies.

When we are talking of the issue of sedimentation in river Ganga, the observations by Sri Jhunjhunwala during the Patna Conference in February 2017 needs to be given due consideration. He observed that an amicable solution needs to be found out to this complex issue while the water supply in the large part of Kolkata city is an important issue involved in this, the adverse impact in Gangetic belt covering the geographical region of Bihar also needs to be kept in view.

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