

Sediment Flux to Ganges-Brahmaputra-Meghna Delta

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The Ganges-Brahmaputra-Meghna (GBM) is one of the youngest fluvio-tidal-deltaic systems in the world. It encompasses with a very dynamic sedimentation process that receives sediment accumulation both from the Himalayas and the natural tidal effect of the Bay of Bengal. Water and sediment discharges are highly skewed to the monsoon resulting 80% of the annual water discharge and 95% of the annual sediment load is come out during the monsoon months of June to September. Bed material, flow condition, geological setting and land use patterns profoundly govern the amount of sediment input and its transport processes. Furthermore, human interventions massively influence the flow pattern and sediment dispersion, which plays an important role in GBM delta formation processes. Several dam construction (planned and executed) and river-linked-project (proposed) at the upper riparian system would influence the flow and sediment input in the GBM systems.

A number of attempts had been taken by many researchers for budgeting the total annual sediment flux of this river systems during the last century. The total sediment flux of the GBM basins is not obvious from literatures as it ranges from 1.06 to 1.67 billion ton of combined mean annual sediment flux stated in several documents. Previous measurements are too old and that also do not represent the present value since a large number of human interventions have been executed in the upper riparian during the last two decades. Also, estimation of the sediment flux vary from river to river because of different measurement methods, time and inter annual river variabilities. Moreover, these measurements were not conducted in the same time series and there was a seasonal effect on the estimation. From literature, it is observed that the Brahmaputra has a mean annual sediment flux of 387 to 650 million tons, on the other hand, the Ganges sediment ranges from 196 to 480 million tons. For the Upper Meghna river systems, the estimation is more dispersed where a maximum mean annual sediment flux of 20 million tons was documented. There is a distinct variation in the mean annual sediment flux of the GBM basin and the reason behind this fluctuation is not clarified yet. Future prediction of sediment flux is very important to assess the sustainability of this delta and accurate quantification of present sediment load is a pre-requisite for this. Any attempt to predict future sediment load in this region needs information about the present-day condition. As a result, it is very important to have reasonable estimate of current sediment flux based on reliable field measurement that will provide the basis of prediction for future sediment fluxes in the GBM system. This kind of prediction is important to support the long-term planning strategies like Bangladesh delta plan 2100 (BDP2100).

Considering all these, a field measurement (4 times a year) programme is planned for the three major river system (at strategic section) of GBM basins—the Ganges, the Brahmaputa and the Upper Meghna, respectively. The measurements will be conducted by using ADCP that considers the Doppler effect of sound waves scattered back from particles within the water column. Sediment concentration obtained from ADCP will be calibrated with the sediment concentration obtained from the water sample collected during the measurement. Moreover, the available sediment concentration data during the last 30 years collected by Bangladesh Water Development Board (BWDB) will be used to determine the trend of the sediment flux. This will be the first of this kind of sediment measurement to compute the sediment flux in the GBM delta and is expected to constitute the basis of all future sediment related research in this region.

Keywords: GBM delta, Sediment Flux, ADCP