INDIAN INSTITUTE OF TECHNOLOGY GUWAHATI
SHORT ABSTRACT OF THESIS

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Programme of Study : **Ph.D.**

Thesis Title: SEDIMENT PROPERTIES AND PROCESSES INFLUENCING KEY GEOENVIRONMENTAL ASPECTS OF A LARGE ALLUVIAL RIVER, THE BRAHMAPUTRA IN ASSAM

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SHORT ABSTRACT

The research attempted to evaluate key sediment properties and processes of a large alluvial river, the Brahmaputra in Assam, India and examine how different sediment properties and processes influence major geoenvironmental behavior of the river. Based on primary as well as secondary data, the thesis focusses physico-chemical properties of sediments including contamination status, sediment budget, bank line shifting, river bank erosion, role of geochemical properties of bank materials in erosion, braiding and land use & land cover of the river in post-monsoon months. One objective of the research was to understand geoenvironmental changes of Brahmaputra and seeking solution to the bank erosion problem.

Suspended sediment and bed sediment samples were collected from six different locations of Brahmaputra River in Assam. Considering severity of erosion problem in the last few years, another six locations were selected for collection of bank material samples. pH, organic content, carbonate content, sodium absorption ratio, exchangeable sodium percentage, cation exchange capacity, mineralogy and particle size of collected sediments and bank materials were analyzed by standard methods and instruments. Angle of internal friction and cohesion of bank materials were estimated by direct shear tests. Role of bank material properties in erosion were studied with binary logistic regression using SPSS. Braiding, erosion-deposition and land use and land cover of Brahmaputra was studied extracting information from Landsat images using Remote sensing and GIS techniques.

Sudden decrease of slope of Brahmaputra in Assam is the main cause of sediment deposition, river instability and erosion problem. Total area of erosion and deposition in the river in Assam during 1973 – 2014 were 1557 km^2 and 204 km^2 respectively. Tributaries, bank erosion and scouring of river bed were found to contribute 52%, 27% and 21% respectively to sediment load of Brahmaputra at downstream. Geo-accumulation indices show uncontaminated sediment quality. Experimental and statistical analysis revealed that value of OC, SAR and d_{90} of bank materials could be used for rapid assessment of probability of erosion in a particular location in Brahmaputra.

The study has potential scope of studying fate and transport of sediments of a large alluvial river with more data from tributaries as well as the main stem. Integration of all findings and a strong R&D backup can be a base for a detailed survey of entire Brahmaputra for effectiveness of erosion management measures.