INDIAN INSTITUTE OF TECHNOLOGY GUWAHATI
SHORT ABSTRACT OF THESIS

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Thesis Title: HYDRODYNAMIC MODELING OF VEGETATED ALLUVIAL CHANNEL & ITS APPLICATION IN AQUATIC ECOLOGY

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SHORT ABSTRACT

In this work a stable two-dimensional depth averaged shallow water model in open channel flow is developed. The shallow water formulation uses the water surface gradient in the source term and gives more flexibility to the model for application in natural terrains, especially in braided morphology. A braided stretch of the Brahmaputra River near Umananda Island and the Majuli Island, and hilly terrain in Tiding River, Arunachal Pradesh, are considered for the model application to test its robustness. The vegetation influence on the open channel flow is investigated by incorporating the vegetation drag forces within the developed shallow water model. Both rigid and flexible vegetations are used in the study. It is observed that with different vegetation arrangements, the transcritical flow profile gets modified and gradually reaches a subcritical state. A quasi-three-dimensional framework is proposed during the study by linking the developed shallow water model with the entropy theory to compute the vertical velocity profile in open channels with and without vegetation and applied to Brahmaputra River near the Majuli Island. The ecohydrological application of the model is extended for a target fish species commonly known as Bhangun fish. The environmental flow in the domain is calculated and the flow parameters are computed at different ecological management class. Applicability of the shallow water model is extended in habitat modelling study in the Bhogdoi River, Assam, India