Predicting geomorphic change on the great rivers of Bangladesh

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# ABSTRACT

The great braided and wandering rivers of Bangladesh (the Ganges, Brahmaputra-Jamuna, Padma and Meghna) are certainly amongst the most geomorphically dynamic rivers on earth. It is also likely that no regular geomorphic processes affect more human lives than bank erosion on these rivers, which is estimated to displace half a million people per year. The World Bank commissioned a series of studies to make better use of the abundant hydrological data available in Bangladesh. Here we describe a study to improve prediction of river channel change (including sediment transport, island formation, and bank erosion) across these major rivers. The goal is to predict change produced by the next year’s monsoon flood (the size of which can be predicted up to four months in advance). Empirical predictions have been made in the past by extrapolating past changes from satellite images. We complement these approaches by developing a full 2D hydrodynamic model (Delft3D) of the rivers based on a method that extracts the river boundary from this year’s Landsat imagery and reconstructs the bathymetry from over 100 cross-sections that are surveyed each year. Each channel of the braided system was considered as a separate meandering river. There is a good relationship between bed scour above 1.5m per year and bank erosion rates. The velocity profiles in the model also allows us to apply the Hasegawa excess velocity method to predict bank erosion which ranges from 50m to a kilometre per year. The project is continuing and this is a preliminary discussion of what has been achieved. We discuss the challenges and opportunities of this type of geomorphic prediction.