

# Flood Propagation Processes in the Jamuna River Floodplain in Sirajganj

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## Abstract

Monsoon flooding inundates a substantial part of Bangladesh, where 80% of the areas are floodplains. Sirajganj, located beside the Jamuna River in northwestern Bangladesh, is home to many communities living in the low-lying unprotected floodplains. The Ranigram village of Sirajganj has a hydraulic connection with the Jamuna River and is flooded almost every year. This study aims to explore how flood propagates in the floodplain, determine the water level variation in the floodplain with respect to the Jamuna River stage, and develop a hydrodynamic model of the flood propagation process in Ranigram. Water level gauges were installed at strategically selected locations in Ranigram, and flood data were collected during the 2018 and 2020 monsoons. In the R<sup>2</sup>, NSE, MSE, and RMSE analyses, the observed floodwater level in Ranigram shows an excellent dynamic relation with the water level at Sirajganj on the Jamuna River. The statistical relation derived from the 2018 data is validated with the observed data of 2020. A two-dimensional hydrodynamic model is developed with HEC-RAS using a DEM generated with surveyed bathymetry and UAV-based data and is calibrated and validated with the observed water level data and flood images. The maps of flood arrival time, duration, and maximum extent and depth were extracted from the model. The outcomes of this study will be useful in flood risk and damage assessments and forecasting of floods in floodplain areas.

## Keywords

Flood propagation, floodplain, Jamuna River, 2D hydrodynamic model, HEC-RAS

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