BIOGRAPHICAL SKETCH

Md Nowfel Mahmud Bhuyian was born in Narayanganj, Bangladesh in 1987. He earned his Bachelor of Science in Water Resources Engineering from Bangladesh University of Engineering and Technology in September 2009. He earned a Master of Science degree in Civil and Environmental Engineering in August 2014 from Tennessee Technological University. Currently, Mr. Bhuyian is a Doctoral Candidate of the same department at Tennessee Technological University.

EDUCATION

Ph.D., Civil and Environmental Engineering

Tennessee Technological University

Cookeville, Tennessee, USA. 2014-2019

M.S., Civil and Environmental Engineering

Tennessee Technological University

Cookeville, Tennessee, USA. 2012-2014

B.Sc., Water Resources Engineering

Bangladesh University of Engineering and Technology

Dhaka, Bangladesh. 2004-2009

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TENNESSEE TECH

The Department of

Civil and Environmental Engineering

Announces the Dissertation Defense

Of

Md Nowfel Mahmud Bhuyian

In Partial Fulfillment of the Requirements

For the degree of

Doctor of Philosophy in Engineering

Wednesday, April 24, 2019

1:30 p.m.

Held at

Prescott Hall 313

1020 Stadium Drive

Cookeville, TN 38505

FIELD OF STUDY

Civil and Environmental Engineering

Water Resources Engineering

DISSERTATION TOPIC

Development of morphologically consistent digital elevation model for improving riverine flood impact assessment in data-poor areas.

EXAMINING COMMITTEE

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ABSTRACT

Flood Impact Assessment (FIA) is an integral part of flood risk management (FRM) that requires extensive data collection and rigorous modeling. Elevation data is one of the main inputs for this venture that is often fulfilled by digital elevation models (DEM). DEM provides a continuous representation of terrain and may cover a large area. However, the accuracy and details of terrain in a DEM depend on its source and spatial resolution. Regardless of the source and spatial resolution, DEMs most often do not provide accurate river bathymetric elevations thus misrepresent conveyance. Additionally, DEM is a static dataset providing a snapshot of the terrain during the time of data acquisition. Therefore, DEM cannot show any change in terrain that may have happened afterward. But, waterbodies such as rivers are among the most dynamic terrain features that change both in short (annual) and long term (decadal) scale. Therefore, representing the conveyance and capturing the planform dynamics of rivers in terrain dataset is especially critical for FIA. These shortcomings of a DEM are often addressed via merging ground surveyed data with DEM. However, collecting ground surveyed data is challenging in remote, inaccessible and data-poor areas. Thus, the objective of this dissertation is ***to assess the uncertainties in DEMs for representing river morphology (planform and conveyance) and propose DEM correction algorithms for producing morphologically consistent DEM to improve riverine FIA in data-poor areas***. This dissertation has proposed three algorithms (or methods) that can predict planform and effective river conveyance for developing morphologically consistent DEM. The methods are Slope Adjusted Mean Bed Level Elevation (SAMBLE), River Bathymetry via Satellite Image Compilation (RiBaSIC) and Altimeter-based River Bathymetry via Satellite Image Compilation (Alt-RiBaSIC). They are designed to suit hydrologically well gauged, partially-gauged, and ungauged areas. The algorithms are tested on multiple rivers representing different morphological characteristics and varying levels of data-gap. The application of these algorithms for FIA over the Kushiyara River in Bangladesh showed DEMs corrected by each of these algorithms outperform the FIA via uncorrected DEM. Therefore, the algorithms are expected to be useful in FIA in other data-poor areas as well.