

SUSTAINABLE SOLUTION OF RIVER BANK PROTECTION: AN EXPERIMENTAL STUDY

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**Authors full
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H. M. Mehedi^{1*} and A.K.M. Hasanuzzaman²

Abstract

The paper focuses on the laboratory based experimental study regarding defensible river bank protection issues carried out in Bangladesh. Limited studies concerning this topic have been performed in the past. A physical model was implemented to investigate the local scour and velocity field at and around the revetments under different likely approach flow conditions. The increasing attention is given to the channel confluences are an inevitable and ubiquitous feature of all alluvial systems. Attention has significantly focused on hydraulic geometry.....[not more than 250 words]

Keywords: *Groynes, thalweg, physical model, geo-bags, CC blocks, stone chips..... [6-8 key words (8 font)]*

Introduction

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Methodology

The physically based model was investigated on a mobile bed and hydraulic similarity was established in the model to an undistorted scale. The model was constructed to an undistorted scale with scale ratio 1:30. The model was a Froude model and was studied over a generalized bathymetry. The model was designed to fulfill both flow and sediment transport criterion simultaneously. It means the model velocity will be higher than the critical flow velocity for the initiation of sediment motion. This is because for any velocity higher than the critical the scour dimensions are only function of flow direction and structure geometry. The model was, therefore, reproduced the scour holes correctly.

A closed shade area was selected for model development. It is well equipped with various kinds of facilities related to physical model. Then preliminary layout of model was given by Grid system. After setting grid point to desired alignment of channel and other following construction like, earth cutting and filling was accomplished to estimate model level by Rise-Fall method. Generalized bathymetry was given in the model.....

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Data Collection

Available data was collected from the previous river training and bank protection structures constructed on the major rivers of Bangladesh.....

Study site

Results and discussion

**Affiliations and only corresponding E-mail add.
Should be in Foot notes (8 font)**

Conclusion

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Acknowledgement (if any)

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- Mehedi, H. M and Hasanuzzaman, A. K. M. (2016). Sustainable solution of river bank protection: an experimental study. *Tech. J. River Res. Inst.* 14 (1): 1-7.
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TABLE ANATOMY

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Table 4. Summary of the test scenarios in the fixed bed model

Test	Objectives	Scenarios	Flow Condition
T0-1	Trial calibration of the model	September 2016 bathymetry with existing structures (Jetty)	Q=11489 m ³ /s(ebb) Q=6600m ³ /s(tide)
T0-2	Calibration of the model	September 2016 bathymetry with existing structures (Jetty)	Q=11489m ³ /s(ebb) Q=6600m ³ /s(tide)
T1	To test the performance of the proposed sheet pile and revetment along with Paira bridge and consequent hydraulic and morphological changes.	September 2016 bathymetry with existing structure (Jetty) in position plus proposed sheet pile + revetment and Paira bridge	Q=13861m ³ /s(50- year design discharge) Q=6600m ³ /s(tide)
T2	To test the performance of revised design of revetment along with Paira bridge and consequent hydraulic and morphological change.	September 2016 bathymetry with existing structures (Jetty) plus proposed revetment and Paira bridge	Q=13861m ³ /s(50- year design discharge) Q=6600m ³ /s(tide)
T3-a	To test the performance of final design of revetment and dredged channel along with Paira bridge and consequent hydraulic and morphological changes around the bridge corridor	September 2016 bathymetry with existing structures (Jetty) plus revetment and Paira bridge. 900m long proposed dredged channel is introduced along the right side of Pier-18.	Q=12698m ³ /s (50- year design discharge as a reverse flow), WL=3.24mPWD. Q=6600m ³ /s(tide), WL=0.79 mPWD

Note: Water Levels (WL) are based on the datum of the Public Works Department (PWD). The PWD datum is 0.46 m higher than the mean sea level (Tingsanchali and Karim, 2005)

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Technical. Journal, RRI (April), 2017 and page no. except first page (9 font)

GRAPH

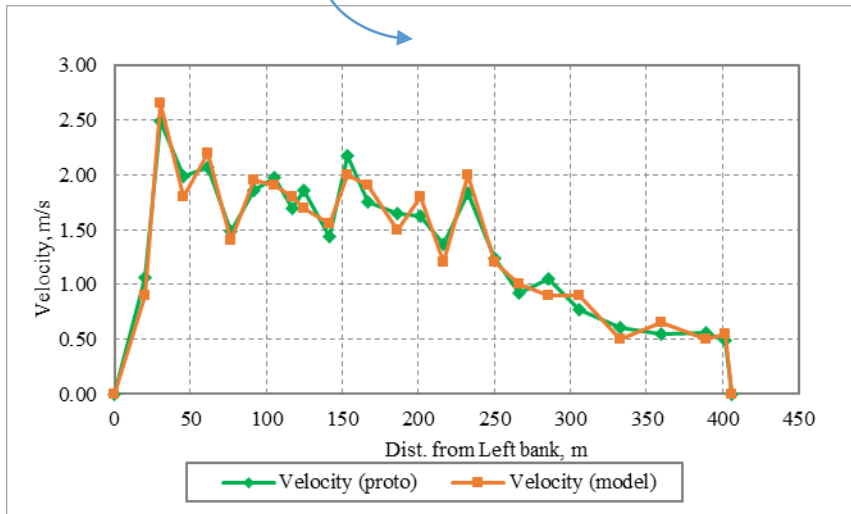


Fig. 1. Comparison of velocity at the calibration section of movable bed model

Figure caption (9 font)

IMPORTANT NOTES:

Please **avoid** sentences that **give no information** other than directing the reader to the Figure or Table.

For instance,

Scale factors for the prototype and model have been obtained for different parameters are presented in the following **Table 1**

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Write in this way instead

On the basis of the above considerations the scale factors for the prototype and model have been obtained for different parameters (**Table 1**).

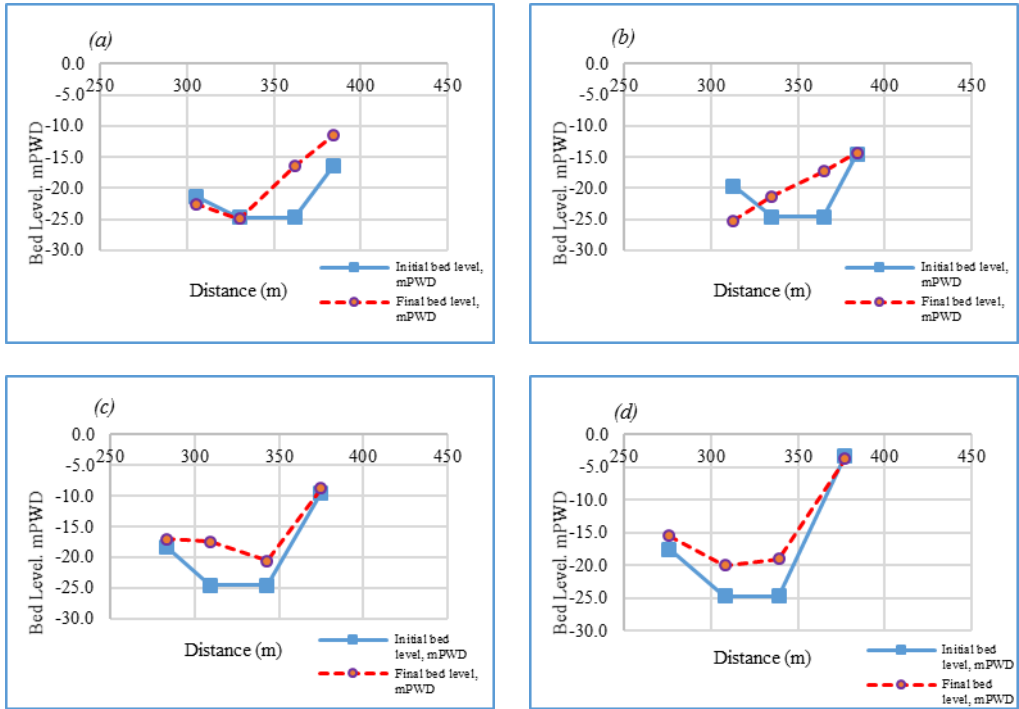


Fig. 2. The initial and final bed level of dredged channel (a) along cross-section 10 US (b) along cross-section 08US (c) along cross-section 06 US (d) along cross-section 04 US

Note: Similar figure should be clustered under a common caption like above, but every figure should be clearly specified

$$Q = (0.403 + 0.53h_w/p)(2g)^{0.5}b [(h_w + u_w^2/2g)^{1.5} - (u_w^2/2g)^{1.5}]$$

Eq. (1) (not bold)

Equation numbering style (not bold)

A SECTION WITH SEVERAL POINTS

Each test of the model continues about 16-20 hours until a dynamic equilibrium scour is reached. Considering the above issues the model scale is selected ensuring the following model requirements.

- (a) The model scale is undistorted.
- (b) The model sale is selected to ensure sufficient water depth for measurement of velocity.
- (c) The model fulfilled flow as well as sediment transport condition simultaneously.
- (d) The geometric scale should be such that it allows the model to be fitted within the available laboratory space at RRI.
- (e) The discharge requirement in the model should be within RRI pumping capacity.

Numbering style (don't insert any bullet point like • or any other style)

RESULTS AND DISCUSSIONS

Results should be clear and abridged. Discussions should explore the consequences of the outcomes of the work, don't repeat them again. Authors can write the Results and Discussions section collectively.

CONCLUSION

The main conclusion of the research should be clear as well as concise. Conclusion may be presented in a short conclusion section.

ACKNOWLEDGEMENTS

Please mention those individuals (if any) who provided help either financial or any other form during research. This section should be placed in a distinct segment towards the end of the article afore the references.

REFERENCING PARTICULARS

Citing in the text References should be cited in the text either in brackets, e.g. Earlier studies (Mehedi, 2014) showed... or using the name **as part of a sentence**, e.g. Mehedi (2014) states...

- For two authors the format is: (Moniruzzaman **and** Nayan, 2016).
- For **three** or more authors: (Uma *et al.*, 2000).
- Groups of references should be listed first alphabetically and then chronologically, e.g.
- (Hasanuzzaman, 2005; 2010; Shaha and Das, 2004; Swapan, 1999).

Personal communications - emails, conversations, letters - **should not be** in the reference list, but may be mentioned in the text, e.g. (interview with Sheela Rani Chowdhury, River Research Institute, 12 November 2014).

In reference list

Let's assume a name

Abul Kalam Mohammad Hasanuzzaman

Hasanuzzaman, A. K. M

Surname

Write

Journal articles

Hasanuzzaman, A. K. M. and Mehedi H. M. (2016). Numerical modelling using MIKE 21C for the proposed bridge on Kalni river under Habiganj road division. *Tech. J. River Res. Inst.* 13 (1): 76-86.

Moududi, M. A. A., Kanungoe, P., Hossain, M. A., Islam, M. J. and Mehedi, H.M. (2016). Post-evaluation of the Ganges left bank erosion protection projects from Pankanarayanpur to Indo-Bangladesh border. *Tech. J. River Res. Inst.* 13(1): 111-124.

Kanungoe, P., Islam, M. J., Bawali, M. D., Podder, M. A. H., Afrin, S. and Tofiquzzaman, M., *et. al.* (2016). Hydrological analysis and hydraulic assessment of the existing Pagla-Jagannathpur-Aushkandi road and road structures using MIKE 21C model. *Tech. J. River Res. Inst.* 13(1): 65-75.

**If authors are more than six nos, write et. al. at the end of the row for the rest of the author(s)*

(In case of Book example): The title should be *italic* and name of publisher should be given with total page number. e.g.

Guy H.P. (1999). *Laboratory Methods for Sediment Analysis*. Adelaide Univ. Press Australia P.500.

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Lowry, R. (2009). *Concepts and Applications of Inferential Statistics* [online]. Vassar College, Poughkeepsie NY. <http://faculty.vassar.edu/lowry/intro.html>. (Accessed 21 February 2015).

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Web sites

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