Rahman, Lutfor; Basak, B. C.; Osman, Showkat; Hossain, Altaf

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SEDIMENTATION NEAR THE RIVER BANK WITH THE APPLICATION OF BANDAL LIKE STRUCTURE

Md. Lutfor Rahman[1], Dr. B.C.Basak[2], Dr. Md. Showkat Osman[3] and Md. Altaf Hossain[4]

Abstract: Bangladesh is a land of river as because it is a lower riparian country of India and most of the river water passing through this country. During dry season huge sediment deposited over the river bed & so the river conveyance capacity is reduced that accelerated the river near the bank which accelerated erosion during monsoon in every year. So it is important to protect the rivcr bank erosion to withstand agricultural land, homestead, hat-bazar market etc in Bangladesh. For the river bank sedimentation, a series of bandals are constructed in the left bank of the Jamuna River near the downstream of the Bangabandhu Bridge. It was found that water flow diverted towards the main river due to bandal structures resulting low velocity near the river bank. Near the river bank, the water velocity is low which results sedimentation due to effect of bandal structures.

Keywords: bandalling, structure, construction, sedimentation

INTRODUCTION

Bank erosion and channel shifting of the untrained alluvial rivers of Bangladesh are big problems to the socio-economic and environmental sector of the country. During 1960's, a number of earthen embankments were constructed along the major rivers for the protection of rural people and agricultural lands from flooding. Since then the embankments were retired several times due to river bank erosion and bank protection are often required during the monsoon and post-monsoon season. Conventionally, groynes and revetments are applied as a method of bank protection. Very recently the concept of hard points (strong revetment type structure) at the most vulnerable locations along the Jamuna river are considered, while in between hard points spurs or permeable groynes are recommended (Klaassen, 2002). By applying the spurs or groyne type conventional structures, the river bank erosion at the short term basis can be obtained, whereas, the long term stable channel or regime channel can never be developed. Alternative solutions that can be locally adaptive and friendly to environment need to be developed for the whereas, the long term stable channel or regime channel can never be developed.

[1]Chief Scientific Officer, River Research Institute, Faridpur and Ph.D.Stdent, Department of Civil Engineering, DUET, Gazipur, Bangladesh; Email: lutfor1964@yahoo.com
[2]Professor, Department of Civil Engineering, DUET, Gazipur, Bangladesh
[3]Professor, Department of Civil Engineering, DUET, Gazipur, Bangladesh; email: head_ce@duet.ac.bd
[4]Director General, River Research Institute, Faridpur-7800, Bangladesh, Email: ahuk1957@yahoo.com

Alternative solutions that can be locally adaptive and friendly to environment need to be

developed for the long-term stabilization of river channels. The possibility ofusing bandals for long-term chann el stabilization is examined us ing field data and la boratory investigation (Rahman et al., 2003).The responses oflarge scale alluvial rivers against sudden changes created by conventional stru ctures are not suitable fo r the overall stabilization of river courses. Therefore, it is important to have alternative long-term solution for river stabilization that will create minimum disturbance to river courses.

WORKING PRINCIPLES OF BANDALS

The working principles of bandals for the control of water and sediment flow where sediments are transported as bed load and suspended load. Within the lower half of the flow depth, major portion ofthe sediment flow isconcentrated, whereas, within the upper half water discharges are more. Bandals are com monly applied to im prove or m aintain th e flow depths for navigation during low water periods in alluvial rivers ofIndian sub-continent. The essential characteristics of bandals are that they are positioned at an angle with main current and there is an opening below it while the upper portion is blocked. As an empirical rule the blockage of the flow section should be about 50% in order to maintain the flow acceleration. The surface current is being forced to the upstream face creating significant pressure difference between the upstream and downstream side of bandal. The flow near the bed is directed perpendicular to the bandal resulting near bed sediment transport along the sa me direction. Therefore, m uch sediment is supplied to the one side ofchannel and relatively much water is transported to theother side. The reduced flow passing through th e opening of bandals is not sufficient to transport all the sediment coming towards this direction, resulting sedimentation over there.

Fig.1. Bandalling construction work were going on in the Jamuna River of Bangladesh

Fig.2. Bamboo fencing attached with the vertical bamboo of Bandalling in the Jamuna River of Bangladesh

Fig.3. River Bank Erosion Protection by sedimentation during flood in the Jamuna River in Bangladesh

Bandals are constructed at the village Randhunibari of Belkuchi Upazilaunder Sirajgonj District. The constructed bandasls are worked well during monsoon of the year 2007. The bandals that are worked well during the monsoon 2007 is shown in below Figure 4 .

Fig.4. Bandals worked well in the Jamuna River of Bangladesh during the monsoon 2007

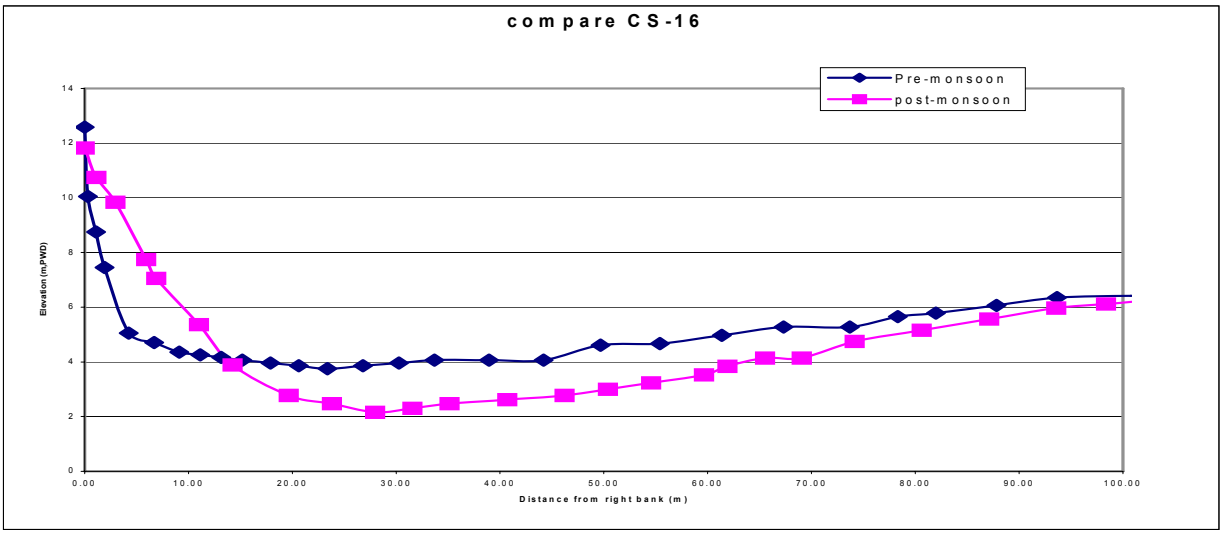

Fig.5. Erosion & siltation of sediment due to effect of Bandal in the Jamuna River for pre-flood &post-flood situation

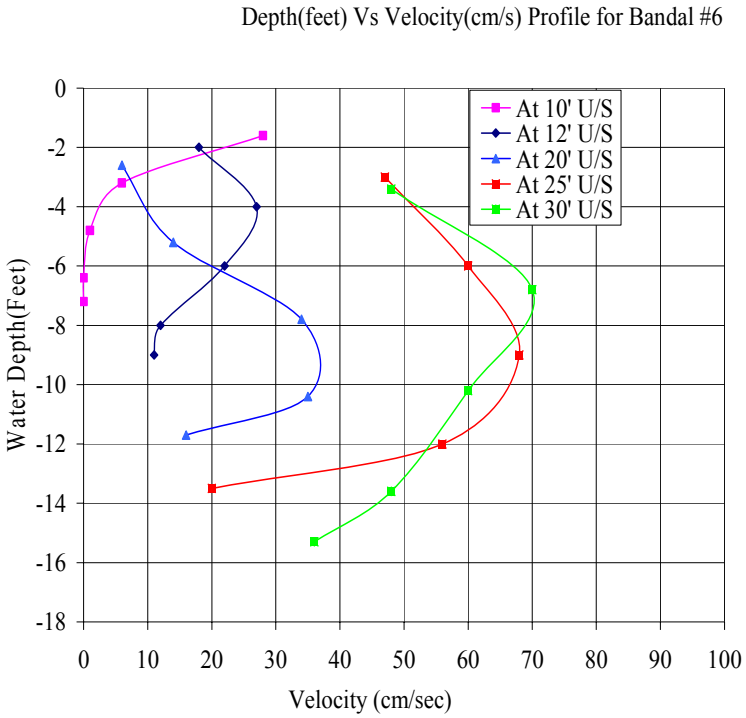

Fig.6. Velocity distribution at different depth at the upstream of the bandal #6

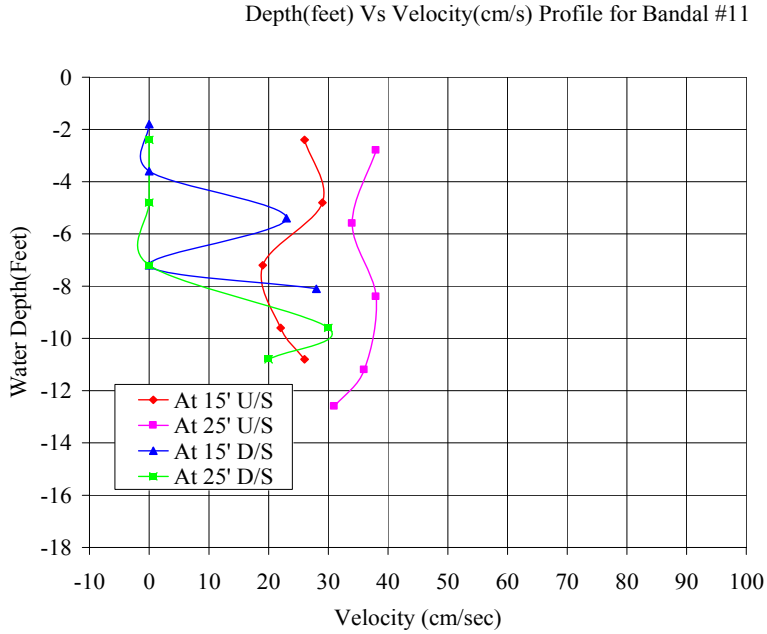

Fig.7. Velocity distribution at different depth at the upstream & downstream of the bandal #1

RESULT & DISCUSSIONS

It is seen from the above Figure 1 that the construction of bandalling is going on. It is found in Figure 2 that the top of the bamboo bandalling is blocked by the bamboo fencing for which the velocity near the river bank is low than that of less velocity away from the river channel. It is appeared from Figure 3 & Figure 4 so that huge amount of sedimentation occurred during flood period due to effect of bandalling. Figure 5 has given us the erosion and siltation pattern which has given the indication of the good performance of bandalling to protect river bank erosion as well as navigational channel development. Figure 6 & Figure 7 has given an idea about the velocity distribution due to construction of bandals in the Jamuna River near Sirajgonj District & Bangabandhu Bridge in Bangladesh. It is concluded that , due to construction of bandals, there is a siltation near the river bank where as there is deep pool away from the river bank. So it is obvious that the bandals are working as a river bank erosion protection & navigation channel development structures with the aid of sedimentation.

CONCLUSION

Bandals are capable for protecting river banks by flow diversion towards the main channel leading to deep navigational channel formation in the main river. On the other hand, flow velocities are higher at the main channel increased the depth of the navigational channel that ensure the navigational channel development. If the bandal structure functions optimistically, the river can get sufficient time for its adjustment and new main channel and bank line development.

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