

Low-Cost Techniques to Protect Industry Situated Besides the River

Dr. Engr. Md. Lutfor Rahman, PEng., PMP

Ex- Director General

River Research Institute, Faridpur, Bangladesh

mdlutforrahman10@yahoo.com

Abstract

BBangladesh is a land of rivers. There are about 310 small rivers in Bangladesh including the main three rivers such as the Padma, the Meghna and the Jaumuna. Most of the rivers are alluvial in nature. During the monsoon the river banks are being eroded and engulfed by the river itself. The river width is increasing and depth is decreasing. Every year these same situations are being arising. As a result, the industry situated near the river are being in risk to erode all over the country through river bank erosion which is a national disaster in Bangladesh. It is also a recurrent problem along the alluvial floodplain rivers. In this paper the performance of the low cost techniques is applied where the industry are being eroded by the river erosion.. The sediment available in the flowing water in the river deposited downstream & between the constructed bamboo bandalling structures due to the comparatively less rvelocity behind & in between the bandals.

Keywords

Bandalling, structure, construction, sedimentation.

1. Introduction

River bank erosion is the single most common problem at river which are flow on alluvial plain although the plain usually at lowland area. The erosion causes a lot of damage. That can be seen from existence of meandering symptom at the river. The erosion will result the loss of land, or property and endanger people who are live near the river. The existing bank erosion control structures are usually expensive, massive and not compatible with environment and aesthetic. This structure is made from cement concrete block etc. Those will bad influence to the vegetation growth and habitat for species that are living around water; it does not match with the spirit of eco-hydraulic. Because those are costly, the erosion control is only conducted to protect important place or populous and costly urban area, which enough worth to be protected with above construction. While, in rural area which is value of land or property is low, cannot be protect by above structure, because that is not feasible if compare the cost of structure.

Within the South-East Asia, there is a country for the land rivers Bangladesh by name in which the Jamuna is a braided river whose braiding index varies spatially as well as with time. In general, the braiding index and the overall width are large at the upstream part than further downstream, probably due to the effects of higher slope and grain sizes (Figure 1- Figure 5). The overall width of the river exhibits an increasing trend and there is tendency of shifting westwards, especially at the upstream part of the river within Bangladesh. The widening can be attributed to an advancing alluvial fan or to the not yet completed adaptation process after the shift to its new course according to FAP 24 (1994). The shifting rate of the first-order channel of the Jamuna River is 75 m to 150 m per year. The second-order channels change continuously, large channels being abandoned and new ones developing in a few years only (Klassen,G.J.and Masselink,G.,1992). A bank erosion rate of the second-order channels of 250 m to 300 m/year is common and in extreme cases, it can be more than 800 m/year (Klassen,G.J. et al, 1993). There are some attempts

taken to address the river bank erosion protection issues (Rahman, M.L. et al, 2009). The river systems of Bangladesh are shown in Figure 2 in which so many agricultural land engulfed by the river systems.



Figure 1. River System of Bangladesh

It is mentioned here that the Bamboo Bandalling Structure is one of the low cost structures are shown in Table 1 in which the comparative statements of implementation costs for the different river erosion protection structures (Rahman, M.L. et al, 2009) (Table 1).

Table1. Comparison among implementation cost of different river bank protection structures

Type of structure	Name of the River	Agency	cost US\$/m	Effective-ness
Guide Bank	Jamuna Bridge	Foreign	33,000	Effective
Hard point	Sirajganj (Jamuna)	Foreign	21,000	Effective
Solid spur	Kalitola (Jamuna)	Foreign	12,500	Effective
Revetment (Geobags)	Jamuna	Foreign	2000-3000	On going
Revetment	Jamuna	BWDB	3800-4000	70-80 %
RCC spur	Jamuna/ Ganges	BWDB	950	60-70 %
RCC spur	Teesta	BWDB	350	100 %
Bandalling structures	Jamuna	RRI	70	On going

Although the land is usually owned by impecunious farmer and become the single place drapes its life. It is to disturb sense of justice. Because above conditions, River Research Institute, Faridpur, Ministry of Water Resources, Bangladesh have developed bamboo bandalling structure which is low-cost river bank protection, easy to construct, using natural and local materials, so that will harmonies with environment. 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. 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 of using bandals for long-term channel stabilization is examined using field data and laboratory investigation (Rahman et al., 2003). The responses of large scale alluvial rivers against sudden changes created by conventional structures are not suitable for 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.

2. Methodology

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 river bank erosion to withstand agricultural land, homestead, hat-bazar market etc in Bangladesh. Figure 2. represents location of river cross-sections in the left river bank towards main river

The working principles of bamboo 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 of the sediment flow is concentrated, whereas, within the upper half water discharges are more. Bandals are commonly applied to improve or maintain the flow depths for navigation during low water periods in alluvial rivers of Indian 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 same direction. Therefore, much sediment is supplied to the one side of channel and relatively much water is transported to the other side. The

reduced flow passing through the opening of bandals is not sufficient to transport all the sediment coming towards this direction, resulting sedimentation over there.



Figure 2. Small industry & market named Anada Bazar in Islampur Jamalpur are being protected using Nature-based Solution (NBS) by Bamboo Bandalling



Figure 3. Crop Plantation within the recovered land



Figure 4. Recovery of land through river bank erosion protection

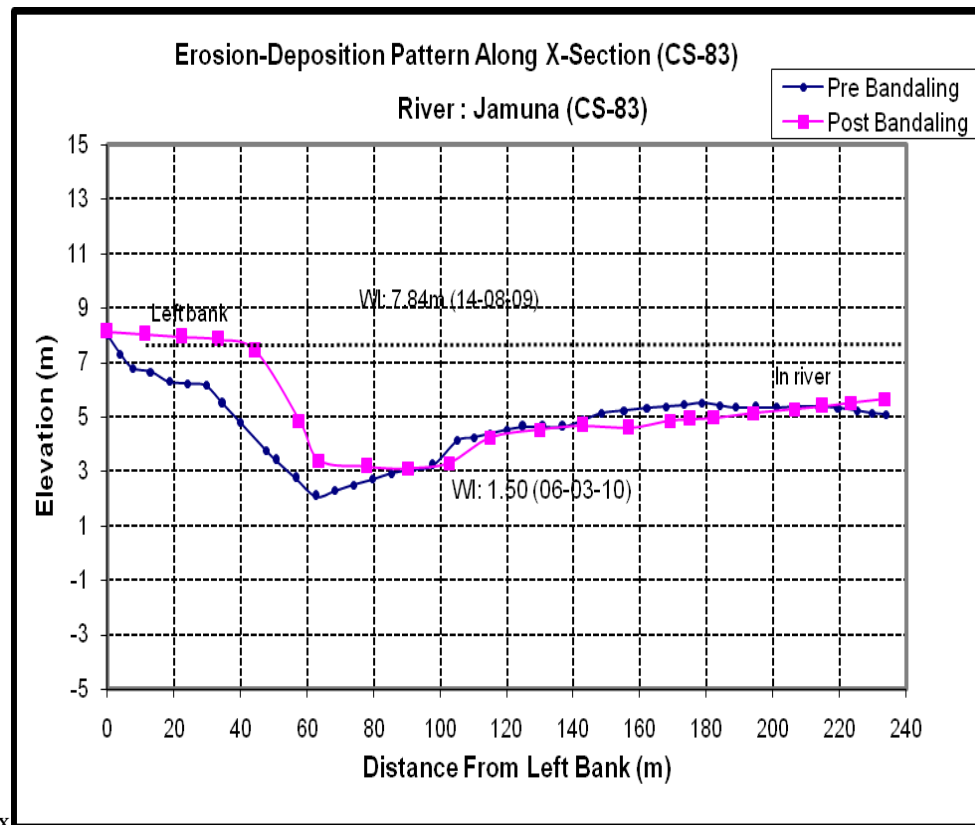


Figure 5. Land recovery by river bank erosion protection with bandalling

3. Result & Discussions

It is seen from the Figure 2 to 5 so that the construction of bamboo bandalling construction are being done in which the velocity near the river bank is low than that of less velocity away from the river channel. It is found that huge amount of sedimentation occurred in which the agricultural land and industry side is recovered during flood period due to effect of bamboo bandalling structures.

4. Conclusion

It is concluded that, due to construction of bamboo 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 bamboo bandals are working as a river bank erosion protection & recovery of agricultural land to protect the industries besides the river bank. So the bamboo bandalling structures 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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