A SUSTAINABLE SOLUTION FOR THE STABILIZATION OFNAVIGATIONAL CHANNELS IN FLOODPLAIN ENVIRONMENT

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Only 25% of the 24000 km of river network in Bangladesh are navigable due to insufficient water depth caused by huge sedimentation in the river systems. Scour-deposition and sediment transport processes, channel development, shifting and abandonment are very rapid in the floodplain rivers. As a result, navigational routes are often hampered and usually ships/boats are forced to travel longer distance on the way towards the destination, especially, during the dry season. Sometimes waterway vehicles cannot move inside rivers for several hours and even for several days because of the rapid unknown siltation in the navigational channels. In order to mitigate such undesirable situations in the navigational channels, dredging is often employed as an emergency measure. It is a temporary method and not sustainable even for a period shorted than a single hydrological season. On the other hand, bandals are used at some specific reaches where water depth is expected to be insufficient for navigation during the upcoming dry season. The necessary condition for the effectiveness of bandals is that the river must have certain minimum flow so that flow acceleration within the desired navigational channel will be ensured during the dry season. Bangladesh Inland Water Transport Authority (BIWTA) is the sole authority to maintain navigability of the rivers in Bangladesh. As mentioned earlier that depending on the existing field problems, both dredging and bandals are adopted by BIWTA for the maintenance of navigational routes. From BIWTA experiences, it was found that dredging is very expensive (about 10 times) as compared with the bandals in order to maintain navigational channels.

In an alluvial river, major portion of the sediment flow is concentrated within the lower half of the flow depth, while, the major part of water flows within the upper half. The essential characteristics of bandals are that they are positioned at an angle with main flow and there is an opening below it while the upper portion is blocked. As a thumb rule, the blockage of the flow section at upper part should be about 50% of the flow depth in order to maintain the flow acceleration. The surface flow is being forced to the upstream face creating significant pressure difference between the upstream and downstream sides of bandals. The bottom flow is directed perpendicular to bandals resulting near bed sediment transport along the same direction. Therefore, much sediment is supplied towards 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 (bank side). On the other

hand, more water flows with little sediment move towards the main channel that develop deeper navigational channels over there (Fig. 1).

Based on Fig. 1, Rahman et al. (2005) discussed the effect of bandals for the formation of navigational channels. The analytical model developed in that study for the estimation of average main channel degradation was tested with the laboratory data obtained from bandal experiments. But related field problems were not adequately addressed in that study which is very important for the successful implementation of such a method to solve the problems in navigational routes.

In the present paper, issues related to the use of dredging or bandals for the maintenance of navigational channels are addressed based a couple of field visits. The simplified model developed by Rahman et al. (2005) is tested with field data at the Upper Jamuna and the Kushiyara river in Bangladesh. Finally, the issues related to bandal/dredging alternatives and some upcoming field experiments in collaboration with BIWTA and BUET are discussed.

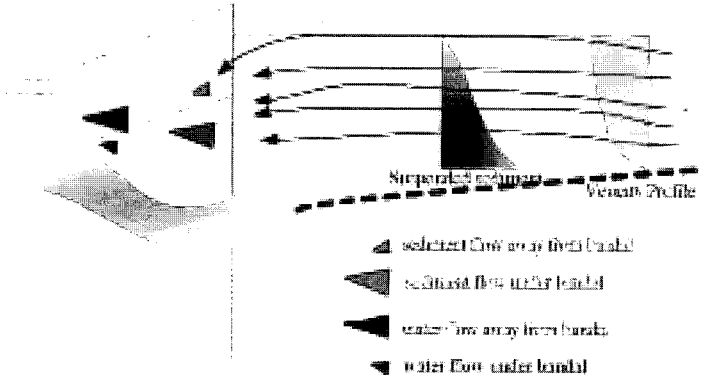

Fig. 1 Working principles of bandals