A NEW METHOD OF DEVELOPING SEDIMENT RATING CURVE FOR THE GANGES RIVER IN BANGLADESH

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The relationship between the discharge and the sediment transport, which is calculated from the samples taken in a transit, can be expressed by an average curve. This curve, generally referred to as a sediment rating curve, is often an exponential function, which can be determined either by a regression analysis or from a graph with the data points (discharge, sediment transport). The curve is widely used to estimate the sediment concentration or the sediment transport for periods where discharge data are available, but sediment data are not. The reliability of the sediment transport calculated from a rating curve depends upon the quantity and reliability of data used to define that rating curve, and whether the data are representative for the discharge and sediment transports occurring during the period for which sediment transports have to be estimated.

Conventional sediment rating curve establishes relationship between sediment load as dependent variable and discharge as independent variable (Hossain, 1992). A sediment rating curve between sediment discharge and water discharge assumes a unique relationship between the average flow velocity in a cross-section and the shear stress at river bed. This unique relationship requires more or less prismatic cross-sections with only one channel in a cross-section of the river. However, in an accelerating flow, deviations can be expected relative to a sediment transport rating curve. Several factors can have an effect on the shape, slope and interception of the sediment rating curve such as the different seasons, the time lag between the peak with the maximum sediment concentration and the peak with the maximum discharge, and the extreme high water events. The seasons can have a significant effect on the sediment yield. A time lag between the peak in the sediment concentration and the discharge peak can also drastically affect the shape of a sediment rating curve. Akhter (2004) found that the peak sediment load of the Ganges at Hardinge bridge point is followed by peak discharge for most of the cases. While developing sediment rating curve, all these factors have to be taken into account.

In this study, the existing data on sediment load have been plotted against water discharge and unit stream power. The least scattered curve without systematic deviation from a one-to-one correlation between dependent and independent variables has been selected as the sediment rating curve. The measure of scattering is determined by the coefficient of determination. The curve having the highest coefficient of determination is taken as the sediment rating curve. It was found that the coefficient of determination is higher in case of unit stream power than discharge. This suggests that the sediment rating curve should be developed by taking unit stream power as independent variable.

The Ganges is a morphologically active river and its cross-sectional geometry changes

during flood flow due to erosion, deposition, shifting of bars etc. The characteristics of the river is influenced by the changes in the geometry and the overall resistance to flow. Keeping this in mind, the sediment rating curve of the Ganges has been developed by partitioning the data into three segments viz. the rising limb, flood season and the falling limb. It was found that sediment rating curve improves significantly when it is developed by partitioning the data into rising, flood and falling limbs.

REFERENCES

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