International Conference "Water, Environment, Energy and Society" (WEES–2009)
New Delhi, 12–16 January 2009

Mathematical Model of River Mandarmani, Purba Midnapore— A Case Study

Dyuti Prasad Dolai and Shyamal Kumar Roy
River Research Institute, West Bengal
11A, Mirza Galib Street, Kolkata - 700 087, INDIA
E-mail: srishyamalroy@gmail.com

ABSTRACT

Jalda Kuthi is a traditional fish landing centre situated on the bank of Mandarmani River at the confluence of Bay of Bengal in Purba Midnapur District of West Bengal. Due to siltation at the confluence of the river, the fishing vessels cannot enter during the low tide condition from the sea.

To tackle the aforesaid problem, River Research Institute conducted the Hydrological observation and survey work at Jalda Kuthi on Mandarmani River.

There were three Nos. of sites altogether. Site No. 1 is situated on the main canal just about 70 metres below the confluence point of the River Mandarmani & Jalda Khal. The other two sites viz. Site No. 2 and Site No. 3 are situated on the Jalda Khal at about 30 metres above the confluence point and on the Mandarmani Canal at about 30 metres above the confluence point.

The observation work were mainly on the measurement of the velocity through each canal. For this purpose, Gauge and Velocity observations were taken from 7 A.M. to 7 P.M. on and from 18-06-2005 to 23-06-2005 including both the days simultaneously on each of the sites. Measurement of Cross-Section at each velocity point were performed to calculate the discharge of the river individually as well as simultaneously.

With the help of all these observational data we are going to approach to frame a mathematical model which may represent the total phenomenon of the effected zone.

In the mathematical model, the rivers under investigation is replaced by a schematized channel on the basis of survey data. On the schematized channel, the known gauge-discharge relationship at different points of the channel is used to prove the model. To calculate the gauge-discharge relationship at different points of the model, the flow is assumed to be one dimensional, the x-axis coinciding with the axis of the flow. The equation of motion to be suitably modified by replacing the usual flow variable by total discharge Q, area of section A and gauge h. This flow equation is then integrated numerically by the finite difference method. As the calculated gauge-discharge relationship agrees with the observed gauge-discharge relationship, the model is proved for the said reach and condition.