[ENV11]
Sediment transport modeling and flood risk mapping in geographic information system (GIS)

Shanker Kumar Sinnakaudan, Aminuddin Ab. Ghani, Mohd. Sanusi F. Ahamad, Nor Azazi Zakaria

River Engineering and Urban Drainage Research Center (REDAC), Universiti Sains Malaysia Engineering Campus, 14300 Nibong Tebal, Penang, Malaysia
E-mail: drsshan@yahoo.com

Most computer models used in the flood risk analysis of rivers have inadequate functions in its spatial analytical capabilities and without sediment transport simulation capacity or suitable equations to represents correctly in-situ hydraulic processes. As a result, the current research presents the development of a new total bed material load equation using multiple linear regression analyses that is applicable for rivers in Malaysia. It was developed and embedded as a modified version of HEC-6 model and named SEDFlood model. The model is best suited for rivers having uniform sediment size distribution with a d_{50} value within the range 0.37 mm and 4.0 mm and performs better than the commonly used Yang, Graf and Ackers-White total bed material load equations. A user-friendly, menu-driven GUI for two and three-dimensional (2D & 3D) digital floodplain delineation was developed through ArcView GIS and SEDFlood tight coupling procedure. It is capable to produce quick analysis (snapshots) at any desired discharge time steps in flood risk mapping procedure. Field measurements were carried out to validate the hydraulic setting and the accuracy of model outputs. The feasibility of simulating a flood event along a river channel and floodplain was tested for Pari River catchment's area located in Perak, Malaysia. Flood risk analysis were conducted for the design flood events for 10, 50, 100-year Average Recurrence Interval (ARI). The design rainfall duration of 30, 60 and 120 minutes for the present and future land use conditions (year 2020) were considered in the simulation scenarios. The result of this research indicates that GIS is an effective environment for floodplain analysis and its integration with hydraulic model is not only feasible but also mutually beneficial for both GIS users and hydraulic modelers.