

Abstract:

Sistan River due to placed in the down stream of extensive Hirmand basin have potential for deposition of fine sediments especially when flood happen. The long period of the draught occurred in this region, at one hand, and the raise of the river bed due to sedimentation at the other hand have deformed the morphology of the Sistan river reducing the capacity of the river for carrying out the floods. So river hydraulic studies should be combined with the study of depositional processes and investigate the interactions of increasing levels of river bottom with water surface rising. In this study, the HEC-RAS model version 4.1 was used. This model is able to calculate the annual sediment discharge and hydraulic calculations under the mobile bed conditions. Modeling the quasi unsteady flooding was done for 2006-7. The calibration of flow and sediment transport equations for selecting the best equation of models was performed. Modeling in mobile bed condition and in terms of both gates open and operational condition for Zhak dam was performed. The best equation for sediment transport, Toffaleti relationship with Ruby fall velocity method was determined. The maximum deposition in Nyatak spillway was about 0.95 meters and maximum erosion was 0.8 meter in downstream of Zahak dam. Finally, floodplain maps were produced by using ARC-GIS. In operational conditions, most of the deposition occurs between Zahak dam and Nyatak spillway. The cumulative value of sedimentation is 5456733.5 tons and that is approximately 1.5-fold in comparison with open gate condition. Floodplain zone when the gates of Zahak dam are 100 percent open was 529.3 hectares with maximum discharge of 600 cubic meter per second and in terms of operational condition is 535.81 hectares with maximum discharge of 780 cubic meter per second. The results of the study show that the combined HEC-RAS mathematical model and GIS is an efficient tool in the determination of Sistan river bed changes.

Keywords: river, sediment, floodplain, HEC-RAS, Arc-GIS, Sistan



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**Floodplain determination in mobile bed
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HEC-RAS model**

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