

The essentialism of the Flood Plain analysis and flood monstrosity subject to loss in the catchment of Yamuna River through hydrodynamic modeling

*Jatin Anand¹, A K Gosain², R Khosa²

1. Research Scholar, Indian Institute of Technology Delhi, New Delhi, India, 2. Professor, Indian Institute of Technology Delhi, New Delhi, India

The anthropogenic activities inside and in the proximity of the floodplain diminish the river margins and the consequence of which is the increased flows in the river. The encroachment of riverbed promotes waterlogging and flooding in urban areas, thus causing loss of property, human life etc. This necessitates a comprehensive study of the flood plain and changes taking place in its proximity in order to carry out any further activities with certainty. In this study, the simulations are carried out using two-dimensional model in the Yamuna River with focus on the Delhi region, India. Present study demonstrates the hydrodynamic calibration and validation of iRIC (International River Interface Cooperative) model, to reproduce the flow in the Yamuna River for different return period. The iRIC model was employed effectively for the expanse of 47 km flood plain of the Yamuna River in the Delhi region from Palla in the upstream to Jaitpur in the downstream. Simulated flood flows were used to evaluate floods of once in 10, 20, 25 and 30 years return periods using standard flood frequency analysis methods on the rainfall data for the extent of 1951 to 2013. The simulation result obtained from the model were compared and validated with the stage values at various gauge locations existing inside the realm of interest. Stage discharge relationship is set up by adopting the optimum value for Manning's roughness coefficient at various gauge stations. The model validation results indicated that the model was able to mimic the flood depth in Yamuna River. The understanding of the extent of the flood and the areas affected is gained by assessing the simulations. Simulation results revealed that the encroachment of flood plain have increased the severity of the floods, and any further encroachment of the flood plain needs to properly examined and weighed before being implemented. The model also offers a potential platform for future evaluation of any other alternatives considered either to further encroach or restore the Yamuna floodplains.

Keywords: Flood, iRIC (International River Interface Cooperative), Yamuna River, Hydrodynamic Model, Water level