THESIS

FLOODPLAIN DELINEATION USING GIS BASED RIVER ANALYSIS SYSTEM

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ABSTRACT

Floodplain is an area adjacent to the main river channel and becomes inundated frequently when the water in the main river channel reaches to its bankful discharge capacity. Floodplain is very fertile to agriculture; therefore, these areas have been widely developed for agriculture and settlement purposes. As a result, floods have caused enormous damages to life, property and agriculture many times in the past. The river Indus doesn't flow in a single main channel. At some places it is divided into two channels and water flows even in the low flow season. Consequently, the areas in between these channels have also been developed for agriculture.

Now some of the adjacent areas of the river are saved from flooding by constructing flood protective bunds. Sometimes, breach in these flood protective bunds causes inundation to the area adjacent with the river.

In the present study, frequency analysis results show the recurrence interval of up to 500 years return period by using the Normal, Log-Pearson Type III and the Extreme Gumble's Distributions. Result of frequency analysis shows that the flood of 1958 has return period of 70 years if we use the data of peak discharges up to 1998. If 10 years up to 2008 is included then the flood of 1958 has recurrence interval of about 70 years by using the Gumble Distribution. Return period of 50 year is used to delineate the floodplain extents. Also, the impact of dry period on the recurrence interval of these particular events is studied. Secondly, the hydraulic model results from the geometric data extracted from the Digital Elevation Model (DEM) of 90 and 30 meter resolution

shows that the 30 m resolution DEM has decreased the inundation area by about 20%. By using 30 m DEM more values are extracted along the cross-section of the river thus represents more accurate terrain representation. Therefore, the use of 30 m DEM has increased the accuracy of the results. ASTER DEM also provides the variation of elevation within the main channel thus representing the elevation values in the main channel of the river. Therefore, it is better to use ASTER DEM for such kind of work than SRTM DEM.

To model a reach according to the existing situation, it is necessary to use the latest DEM to extract the geometry of the river. Advances in the technology have sufficiently facilitated solving the problems in the field of water resources. The use of these technologies has saved time and economy. It was difficult, time consuming and cumbersome task if manually done. HEC-RAS results with the use of ARC-GIS have facilitated in determining the area below, equal and above the inundated area. The area and volume of inundation can easily be calculated by using the ARC-GIS.