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Fhood Mapping Using Hydraulic Modeling of Rivers (Case Study: Manshad Watershed, Yazd Province)

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Introduction

One of the critical stages in the management of rivers, is flood zoning. One of the newest methods to delineate flood mapping, was done by geographic information system and combining it with hydraulic models. Zoning maps of the flood could be used to determine the buffer of the bed and rivers, economic feasibility study of development plans, forecasting and flood warning, rescue operations and flood insurance. HEC-RAS software can be used for routing of rivers respectively. This application will enable users to perform hydraulic calculations or simulating river flow in steady and unsteady conditions. The aim of this study was to flood risk mapping delineate in Manshad watershed (one of the Miankouh sub basin in the

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province of Yazd) that in comparison with other neighboring sub basin with more flooding potential.

Materials and Methods

In the study Floodplainsns of any river, the first step is providing digital map of the area for river simulation and surrounding lands. Step 2, geometry river simulating by HEC-GeoRAS extension in ArcGIS and creating the necessary information layers. Step 3, transferring data produced to HEC-RAS software. Step 4, complete geometry and bringing them into the river model. In stage 5, the output is returned to the ArcGIS and flood zones are displayed with different return periods. The results of the simulation of river cross sections, longitudinal profile, view three-dimensional flow hydraulic parameter table along the river cross sections and diagrams hydraulic parameters, the HEC-RAS software Output can be displayed. In the event that this information is transferred in ArcGIS environment, using GIS analysis functions such as the ability to view the final results for the Flooded for return period different level, height and water depth anywhere in the floodplain provides.

Determination of momentary Maximum discharge with different return period:

SMADA software using Pearson Type III distribution was identified as the most suitable.

Land use map Extraction for the study area

land use types were identified based on visual interpretation of satellite images of Google Earth and field operations. Then, in the GIS, area per units was determined.

Calculation of water surface profile

The HEC-RAS software using stepwise relationship between energy and the use of the standard water surface profile is calculated. Subcritical flow during the first

solution in the downstream section starts. The water level was determined in the downstream section of the boundary. Therefore, the aim was to determine the water level in the upstream cross section.

Determine the flood zone

Flood zones is calculated for water surface elevation by HEC-RAS model and is shown in cross section. The levels of water is prepared in each cross section by the preprocessor macros in HEC-GeoRAS, and is prepared a TIN file as base of geometric characteristics. In general, the river bed and floods buffers are designed with different return period.

Mapping of the flood plain zone

At this stage, the water levels was determined for each cross-section on river plan. Then, according to the slope of the river at any reach, the water level was determined and was transferred on maps. Finally, with regard to the level of the flood water level of the river flow zones were determined with different return periods. Then the flood zones of flood were drawn with different return periods and the area of each Zones was calculated using the software.

Discussion

In most sections of the river, the river flooded because of water passing through the spillway is an overflow height is more than compensated for this deficiency occurs in the upstream and increases the surrounding Flooding area. However, in these areas, houses, roads, facilities and farms located near the river and up the river, inflicted much damage to the treated areas. Flood discharge and flood zones were increased by inappropriate location of land use such as moving forward of agricultural land toward river buffer.

According to investigations, longer return periods produce higher discharges and inundation flood zones have more expansion. Between the factors the topographical characteristics is more important. Wherever the waterways increased width increased flood level and the water level had a broader expansion. On the contrary, wherever with narrow valley flood levels reduced to the width and depth of flooding has increased in parallel. In fact, low flood level was occurred in many sectors because of steep topography in buffer of the main river.

The results of the study is Correspond with the results of other researchers, including the Tate and Etal (2002), Sadeqi, Jalali Rad (2004), Hossein Zadeh (1384), Vahabi (1376) and Safari (1380).

Conclusion

Manshad is in mountainous watershed and areas of agricultural lands and orchards are at risk of flooding in high return periods due to the steep slopes of the riverbank. Thus, farmlands and garden forwarding toward the river buffer, causing increased damage and inundation zones were increased. The flood zone area in this study is calculated 9.8 km2 that the largest area related to agriculture and horticulture land uses. Rising the water levels as much as 5 m, are affected 96.1 hectares of land by the flooding.