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Investigating and Locating Human Activities in the Flood Area Using the HEC-RAS-6 Hydraulic Model A Case Study of the Pardisan Region of Qom

Abolfazl Faraji Monfared [1], Shahram Roostaei [*2], Davoud Mokhtari [3]

1-Ph.D Student of Geomorphology, Faculty of Planning and Environmental Sciences, Tabriz University, Tabriz, Iran
2-Professor of Geomorphology, Faculty of Planning and Environmental Sciences, Tabriz University, Tabriz, Iran
3-Professor of Geomorphology, Faculty of Planning and Environmental Sciences, Tabriz University, Tabriz, Iran

1-Introduction

There are different degrees of flooding, flood risks, and types of flooding on different alluvial fans, and engineering protection must be done for each unique set of alluvial fans (Jonathan et al., 2018). Flood propagation models are a useful tool for floodplain management. This ability to predict floods has been very useful in reducing the flood damage potential and preventing construction in the flood plain area (De Baldasar, 2012). HEC-RAS hydraulic model can be used to identify and investigate flood risk zoning. Pardisan town of Qom is expanding rapidly. The location of this area of Qom city in the area of flood and its vulnerability is necessary to conduct comprehensive studies. Having a slope, a favorable climate, access to transportation routes, and a smooth urban development space, it is important to pay attention to the future of this region in a logical and principled way. The purpose of this research is to answer whether the location of human phenomena in the study area is based on geographical features. To answer this question, it is necessary to evaluate the situation of Pardisan town in the Sialab region.

2-Methodology

In this research, it is considered desirable to carry out the necessary measures and mechanisms to improve the desired research environment. For this purpose, satellite images, reports, land use maps, and topography of the region are among the important sources used in this research. HEC-RAS-6 and ARC GIS software are the most important tools used in this research. The hydraulic model of HEC-RAS shows the flood reality better due to the one-dimensional and two-dimensional modeling mechanisms and the integration of these two models. Due to the lack of hydrometric stations in the study area, the SCS method has been used to analyze the required factors and parameters (Relation1).

* Corresponding Author: **E-mail:**roostaei@tabrizu.ac.ir

This method is usually developed in large natural basins with different areas and is widely used by hydrologists (Safavi, 2018).

(1) $$Q_p = \frac{0.2083AR}{t_p}$$

(2) $$T_p = \sqrt{T_c} + 0.6T_c$$

(3) $$Tc = 0.000142L^{0.8}(\frac{25400}{CN} - 228.6)^{0.7}S^{-0.5}$$

(4) $$R = \frac{(P - 0.2S)^2}{P + 0.8S}$$

(5) $$S = \frac{25400}{CN} - 254$$

(6) $$P_{6T} = \frac{P_{24T}}{1.48}$$

3- Results and Discussion

It is necessary to add human elements to the RAS field map to determine the flood trend concerning the alluvial fan system in the geographical space, as well as the sensitivity of each to the filling and deviation of the path. By locating the human phenomena in the Pardisan region, the problems in the flow path design and the performance of bridges and dams during the passage of the 100-year flood flow are identified. Monitoring measures are also effective for unloading the sediment load and the correct design of dams by the responsible organizations in stabilizing the routes. Also, embankments and sediment reservoirs have a positive role in stabilizing the flow and flow of debris, and mismanagement conditions can also be a factor in the formation of instability in an area. It is necessary to add human elements to the RAS field map to determine the flood trend in connection with the alluvial fans flood system in the geographical space, as well as the sensitivity of each one to the filling and deviation of the path. By placing human phenomena in the environment of the background map with the 100-year return period flood, it was found that the location of construction projects in different parts of the Pardisan region, especially along the streams, has caused a large change in the sedimentation of debris. In some aspects, with the strengthening of the nearby flow, it has become difficult to predict the flow in the lower parts of the alluvial fan. There are also problems in the flow path design at some points. Flow modeling shows well that after strengthening the flow at one level, the sedimentation process in the lower parts undergoes changes, leading to turbulence in the spatial landscape of the Pardisan

waterway network. In addition, bridges and dams cause hydraulic changes in the flow path by changing the volume and speed of the flow. Regulatory measures to unload the sediment load and the correct design of dams by the responsible organizations are effective in stabilizing the routes. Embankments and sediment reservoirs play a positive role in stabilizing the flow and flow of debris. The Pardisan region's embankments are one factor that can perform a good function in different conditions. In addition, the lack of coherent organizational supervision in the location of structures and the lack of supervision of sedimentation reservoirs has caused spatial anomalies in the location and development of human phenomena in the region.

4-Conclusions

Pardisan town of Qom has a high potential for floods due to its location on the alluvial fans. For this reason, we focused on flood zoning with a return period of 100 years with the Hec-ras-6 hydraulic model. In this research, an effort was made to locate all human phenomena by measuring them in the RAS field map to provide favorable results in flood simulation. By placing the phenomena in the geographical space of Pardisan, it was found that the location operation for establishing the Pardisan settlement was not done correctly. As a result, some areas have been damaged, and flood problems, including the upper part of Pardisan and agricultural lands. In general, the urban design and the investigation and modification of the next route are not compatible with the geographical characteristics of the region, and the perspective of instability has prevailed in the geographical space of the area.

Keywords: Human phenomena, Alluvial fan, Flood, HEC-RAS, Pardisan Qom.

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