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The Effect Of Flood Zones Of Maroon River On The Environment And Around The River

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Abstract

The human has always struggled with flood in various ways. But, this reality should be believed that, flood cannot be controlled completely, and only its damages can be reduced by flood management. Need for estimation and prediction of severe flood is one of the most important subjects in water engineering and dams' immunity throughout the world. The results showed that, for longer return periods, the flow discharge has increased and flood zones also have become more extent. Of course difference in flooding area expansion is mostly resulted from topographic traits of the valley path. Wherever the waterway' width increases, flood area also is increased and wherever the valley is narrow, the width of flooding area decreases proportionally, and depth of flooding area increases. By increasing return period also, the flood zone increases but, it is obvious that, 25 years old and older flood zones are hazardous for the region and may cause some risks for the environment, consequently, preservative and management measures are needed. Damages of flood are investigable in various economic, social and environmental sectors.

Keywords: Flood Zones, Environment, River.

Introduction

During the recent decades, damages and economic effects of atmospheric and climatic disasters have increased rapidly and still continue. The range of disasters and our global communication has grown so that, the disasters may have regional, national and even global consequences. The results of researches show that, global communities have become more sensitive recently against natural and climatic disasters. Flood and its resulting damages is one of the mentioned disasters which always affect Iran and the other geographical regions. Flood is the third dangerous natural disaster after drought and earthquake which can cause irreparable damages. Flood is a river flow that is generated by intense rainfalls, broken dams and rapid melting of ice and snow. Living in the flooding zones also can increase the flood area and flood hazard due to the increase of volume and reduction of concentration time in the river privacy [4]. Damages of flood are investigable in various economic, social and environmental sectors. Now, in many European countries, a flooding areas maphas been prepared by governmental and insurance organizations [2]. Also, UN has obliged its members to prepare the map of flood hazard area theoretically [3].

Locezy et al. (2009) evaluated a river in Hungary in terms of being talented for flood. In other word, they zoned morphometric or other traits of the river to identify the areas which lose their

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natural state such as dykes and helps flood' speed or reduction of concentration time are affected by the human activities. This research has been conducted assuming that, low slope instabilities within the channel help the channel stability.

Gichamo (2012) simulated the flood zone using thermal sensor of ASERGDEM satellite in a part of Nisza River in Hungary using HEC RAS and HEC-Geo RAS extension. The evidences show that, the use of considered satellite sensor gives acceptable results after evaluation by HEC RAS model.

Materials and methods

Study area

Maroon Watershed is inKohgiluyeh and Boyer-Ahmad Province. This river has coordinated of 440000 to 45500 and 3416000 to 3436000 by UTM. A 3 km reach of this river was selected.

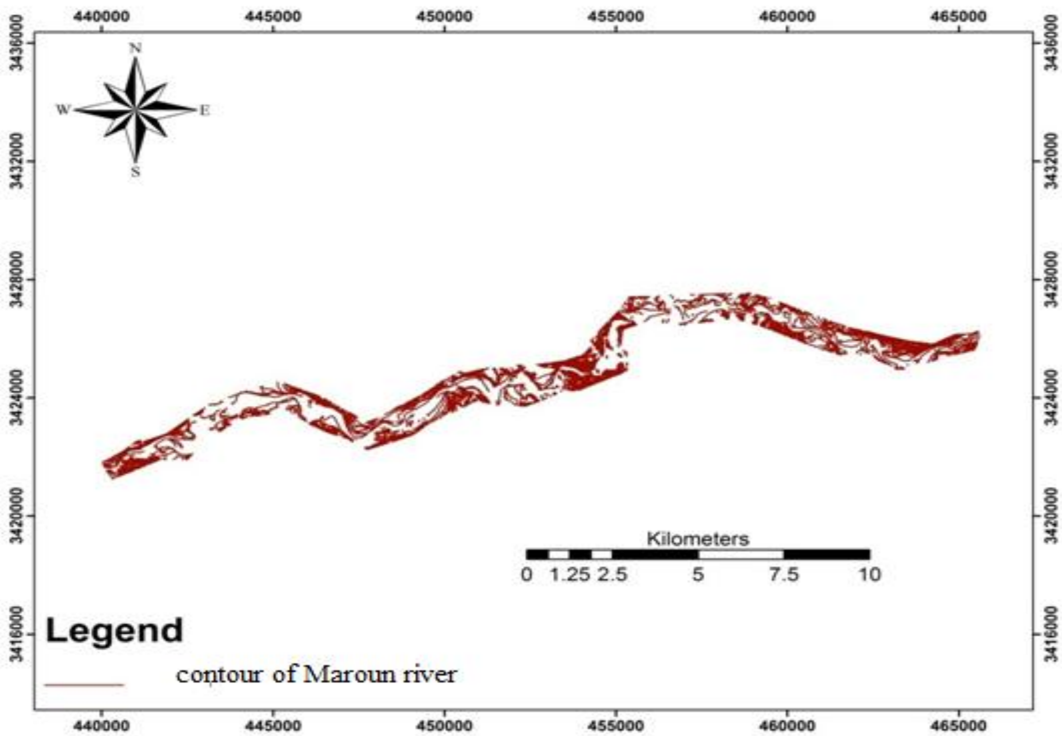

Fig.1. Study area

The required data

The required data are different dependent to the study objectives. In the present study, the following data and software were used:

- HEC RAS software (version 2 or higher)

- Arc GIS software

- Spatial analyst extension for query, map drawing and analysis of spatial data

- Data of the river hydrograph with return periods of 5, 25, 50 and 100 years

- Map of the river profile with scale of 1:10000 or larger.

- Roughness coefficient data in the left and right beach and the flow line

Estimation of the flow resistance is one of the most important and effective subjects in river civil projects. Often to describe flow resistance or roughness coefficient of a waterway or floodplains,Manning roughness coefficient (n) is used. Robert Manning presented an equation in 1889 which was changed after a while.

At first, this equation had been presented as a complicated form that was converted to the following equation after simplification:

$$V = CR^{\frac{2}{3}}S^{\frac{1}{2}}$$

Equation (3-1)

Where:

V: mean velocity

R: Hydraulic radius

S: slope of flow bed

Manning equation is widely used in laminar flow in open channels due to being simple and its acceptable results. Determination of roughness coefficient is the biggest problem in the use of Manning equation; since, there is no accurate method to determine this coefficient.

The use of tables is the most common way to determine Manning roughness coefficient. These tables have been produced based on field experiences and measurements (in constructed channels or natural rivers) and with regard to the used materials in the channel structure or bed materials and the body of natural rivers. In alluvial rivers and channels which have been formed by Non-cohesive materials (gravel, sand, etc.), n value can be stated as a function of diameter of the particles forming the channel wall. By placing d=d50(50% of the particles weight have an equal or greaterdiameterthan d50), in Strickler equation by ft. or cm in the following equation, n can be estimated.

$$n = 0.018 d_{50}^{\frac{1}{6}}$$

Equation (1)

But, usually by washing the fine grains of the bed, d_{25} (25% weight of the particles have a diameter greater than d_{25}) takes a higher role. Therefore, by placing $d=d_{25}$ by ft., in the equation, so, n=0.031 or by cm so, n=0.017 and a more appropriate estimation will be achieved. The most important factors on roughness coefficient include: particle size, bed form, vegetation cover of the bed, a maze of rivers and existent barriers in the river path such as bridge truss (Yung, 1996). Roughness coefficient in the studied reach was obtained using various empirical and mathematical methods through sampling, field visiting the images of alluvial materials and river edge, resulted from field operations.

Cowen approach

In 1956, Cowen proposed the following equation considering all factors affecting Manning roughness coefficient (Schneider and Acement, 1985):

$$n = (n_b + n_1 + n_2 + n_3 + n_4)m$$

Equation (2)

Where:

n: Manning roughness coefficient

n_b: Basic roughness coefficient for direct reach with smooth surface

n_1: Correction coefficient for bed surface roughness

n_2: Correction coefficient for shape and size variationsof the cross section

n_3: Correction coefficient for the existence of barriers in the channel path

n_4: Correction coefficient for vegetation cover

m: Coefficient of curvature and the maze' effects

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HEC RAS software

Ability of this software to model various structures and ability of flow analysis at unsteady state and also, strong graphic of this software, have made this software as one of the most applicable software of water engineering.

HEC RAS software is one of model series of Hydrologic Engineering Center which is usable for flow routing in rive. This model is so simple and applicable. It conducts routing in the river for both steady and unsteady flow. Channel branching also can be described in this model. In addition, existence of any type of water hydraulic structures such as bridge, dam, culvert, etc. can be defined and added to the model; so, their effect can be observed in the routing.

Discussion and conclusion

The results indicated that, for longer return periods, the flow discharge has increased and flood zones also has become more extent.Of course difference in flooding area expansion is mostly resulted from topographic traits of the valley path. Wherever the waterway' width increases, flood area also is increased and wherever the valley is narrow, the width of flooding area decreases proportionally, and depth of flooding area increases.

Water velocity in river is higher than floodplains that is obvious in the figures above; since, the created flow resistance is higher due to higher roughness coefficient resulted from vegetation cover, larger rocks and etc. therefore, the water velocity is decreased. Where the cross section is narrower or is triangular, the water level comes up more and consequently, the velocity also increases. Inversely, where the cross section and floodplain are wider, the water level has a less depth, consequently, water velocity also is lower.

Therefore it is concluded that, in flood and damage occurrence, the region topography, extent of floodplains, roughness coefficient of floor and floodplain, shape of cross section, etc. are very effective in addition to the flood bigness(return period). Hence, in the regions with high roughness or narrow river, some strategies must be considered to prevent damaging the environment.

Conclusion

In this section, the results of HEC-GeoRAS extension performance in simulating the river bed and performance of HEC-RAS model in simulation of flood zone in the studied watershed, have been evaluated.

Prediction of the river hydraulic behavior against probable floods is so important to reduce damages to croplands and cities or constructing installations around the river. Moreover, any kind of engineering action that is applied on the river such as limitation of the river cross sections, construction of transverse structures (dams, bridges), local organizing of river, materials removal, etc. needs an accurate understanding of their interactions on the river hydraulic behavior. Hence, flow simulation in river is considered and emphasized as the initial tool for the studies of river engineering.

HEC-GeoRAS was used for the river simulation and also, Tin map was prepared using Digital Elevation Map (DEM) in the software environment.

Generation of these maps showed that, to provide geometry of the river bed, HEC-GeoRAS software needs only Digital Elevation Map DEM which is created by topography map of the region. Also, the results indicated that, the model can have an appropriate simulation of flood zone in floodplainsusing applying discharge-stage which is consistent with Shokuhi [2] and Khoram [1] and Miri (2010).Hence, in the regions with high roughness or narrow river, some strategies must be considered to prevent damaging the environment.

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