

Simulation of the water behaviour at the Karaj dam break using numerical methods in GIS environment

Authors:

Gudarz Rashno¹,
Mostafa Ghiyasvand¹,
Ali Akbar Matkan²,
Babak Mirbagheri² and
Hamid Salehi Shahrabi¹

Institution:

1. M.Sc of RS and GIS, RS and GIS Department, Shahid Beheshti University, Tehran, Iran.

2. Faculty Member of RS and GIS Department, Shahid Beheshti University, Tehran, Iran.

Corresponding author:

Gudarz Rashno

ABSTRACT:

Dam failure, estimating water velocity and height of wave caused as well as damage caused by the possible failure of dams, have long been of interest to researchers. In order to estimate these parameters, simulation of the failure of the dam is to be studied. The simulation is done by solving the shallow water equations using numerical methods. The method used in this research is HLL, which is written for the first time in. NET programming environment with software components of Arc Objects and its output is analyzed in a GIS environment. Spatial data used in this research includes DEM of Karaj dam reservoir and downstream areas, and also descriptive data on the Manning roughness coefficient, and water level. In this study, a failure of Karaj dam is simulated and downstream areas are zoned in terms of risk of flooding in two scenarios at the same level with the dry and wet bed. The results showed that in the wet downstream bed scenario with a 1770 meter level, the villages Khouzankala and Adrian have been flooded for 11 minutes and 39 seconds. Whereas, in the dry downstream bed scenario with the water level of 1770 m this time reaches 12 minutes and 30 seconds; and it represents more rapid flood for wet bed.

Keywords:

GIS, Dam failure, Numerical modeling, Finite Volume Method, Approximate Riemann Solver, Karaj dam.