

Application of morphometric ranking approach (MRA) using geospatial techniques for flash flood susceptibility modeling in district Khyber, Pakistan

Aftab Shahid^{1*}, Abid Sarwar¹, Shazia Gulzar¹, Abdul Majid¹, Muhammad Ismail Khan¹, Palwasha Sanam¹, Muhammad Ali², M. Shah Fahad³,

¹*GIS Lab, Directorate General Soil & Water Conservation, Peshawar, Pakistan.*

²*National Centre of Excellence in Geology, University of Peshawar, Pakistan.*

³*Department of Geomatics (GIS/RS), University of Peshawar, Pakistan*

*access2aftab@gmail.com

Every year, severe and extreme meteorological disasters occur which brings an enormous amount of human and material losses all around the world. Among these meteorological disaster, flash flood which is a hydro meteorological phenomenon is of serious concern because of its deadliest nature in term of not only the number of people affected worldwide but also the fatalities it causes globally. In this study, Geographical Information System (GIS) and Remote Sensing Techniques (RS) were used to identify the susceptible zones for flash flooding in district Khyber, Pakistan. For the flash flood's susceptible zones identification, geo morphometric ranking model was used. Various casual factors were considered including; topography, river pattern and flow accumulation. ASTER digital elevation model (DEM) was used for calculating the required causative factors. Forty four different sub-basins were delineated in the Bara river and Landikotal main stream basins. A total of twenty two morphometric parameters were studied included; Sub-Basin Area (A), stream order, stream length, stream number, bifurcation ratio, basin length, basin area, basin perimeter, circularity ratio, shape factor, elongation ratio, compactness coefficient, stream frequency, drainage density, Length of overland flow, basin relief, relief ratio, ruggedness number, hypsometric integral, basin slope, drainage texture, gradient, geometric number. The morphometric ranking approach (MRA) score was determined with a range of 1 to 5. Rank 5 represents high risk for flash flooding while rank 1 exhibits low risk. The results of the morphometric ranking approach were categorized into five flood susceptibility classes; very low, low, moderate, high and very high. Due to its precise and accurate results, it proves that the geomorphometric ranking model is the most applicable model in the study region. The total population of district khyber is 986973 and area is 2576 km² with a population density of 383 persons per square km. The population along Bara river and Landikotal main stream is highly susceptible to flash flooding in district khyber.

Keywords: Flash flood; geo morphometric; Geographical Information System; Remote Sensing; sub-basin; susceptibility