Flood plain analysis for Petriș, Troaș and Monoroștia watersheds, the Arad department, Romania

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The present study sets out to determine the flood plains corresponding to flood discharges having 10, 50 and 100 year recurrence intervals on the Monoroștia, Petriș and Troaș Rivers, located in Western Romania, the Arad department.

The data of the study area is first collected and pre-processed in ArcGIS. It consists of land use data, soil data, the DEM, stream gauges' and meteorological stations' locations, on the basis of which the watersheds' hydrologic parameters' are computed using the Geospatial Hydrologic Modelling Extension (HEC Geo-HMS). HEC Geo-HMS functions as an interface between ArcGIS and HEC-HMS (Hydrologic Engineering Centre-Hydrologic Modelling System) and converts the data collected and generated in ArcGIS to data useable by HEC-HMS.

The basin model component in HEC-HMS represents the physical watershed. It facilitates the effective rainfall computation on the basis of the input hyetograph, passing the results to a transform function that converts the excess precipitation into runoff at the subwatersheds' outlet. This enables the estimation and creation of hydrographs for the ungauged watersheds. In the present study, the results are achieved through the SCS CN loss method and the SCS Unit hydrograph transform method.

The simulations use rainfall data that is registered at the stations situated in the catchments' vicinity, data that spans over two decades (1989-2009) and which allows the rainfall hyetographs to be determined for the above mentioned return periods. The model will be calibrated against measured streamflow data from the gauging stations on the main rivers, leading to the adjustment of watershed parameters, such as the CN parameter.

As the flood discharges for 10, 50 and 100 year return periods have been determined, the profile of the water surface elevation along the channel will be computed through a steady flow analysis, with HEC-RAS (Hydrologic Engineering Centre- River Analysis System). For each of the flood frequencies, a water surface TIN is generated and intersected with the DEM in order to create the flood plain polygons. The final result consists of the flood plain delineation and the water inundation depths for the 10, 50 and 100 year return period flood events. These could be further employed in a risk assessment.

Key words : flood plain analysis, frequency analysis, HEC-HMS, HEC-RAS.