

Assessment of Impact of Urbanization in High Mountain Urban Watersheds

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Abstract : Increases in urbanization during XX century, has produced changes in natural dynamics of the basins, which has resulted in increases in runoff volumes, peak flows and flow velocities, that in turn increases flood risk. Higher runoff volumes decrease sewerage networks hydraulic capacity and can cause its failure. This in turn generates increasingly recurrent floods causing mobility problems and general economic detriment in the cities. In Latin America, especially Colombia, this is a major problem because urban population at late XX century was more than 70% is in urban areas increasing approximately in 790% in 1940-1990 period. Besides, high slopes product of Andean topography and high precipitation typical of tropical climates increases velocities and volumes even more, causing stopping of cities during storms. Thus, it becomes very important to know hydrological behavior of Andean Urban Watersheds. This research aims to determine the impact of urbanization in high sloped urban watersheds in its hydrology. To this end, it will be used as study area experimental urban watershed named Palogrande-San Luis watershed, located in the city of Manizales, Colombia. Manizales is a city in central western Colombia, located in Colombian Central Mountain Range (part of Los Andes Mountains) with an abrupt topography (average altitude is 2.153 m). The climate in Manizales is quite uniform, but due to its high altitude it presents high precipitations (1.545 mm/year average) with high humidity (83% average). It was applied HEC-HMS Hydrologic model on the watershed. The inputs to the model were derived from Geographic Information Systems (GIS) theme layers of the Instituto de Estudios Ambientales -IDEA of Universidad Nacional de Colombia, Manizales (Institute of Environmental Studies) and aerial photography taken for the research in conjunction with available literature and look up tables. Rainfall data from a network of 4 rain gages and historical stream flow data were used to calibrate and validate runoff depth using the hydrologic model. Manual calibration was made, and the simulation results show that the model selected is able to characterize the runoff response of the watershed due to land use for urbanization in high mountain watersheds.

Keywords : Andean watersheds modelling, high mountain urban hydrology, urban planning, hydrologic modelling

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