Analysis of Urban Flooding in Wazirabad Catchment of Kabul City with Help of Geo-SWMM

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Abstract : Like many megacities around the world, Kabul is facing severe problems due to the rising frequency of urban flooding. Since 2001, Kabul is experiencing rapid population growth because of the repatriation of refugees and internal migration. Due to unplanned development, green areas inside city and hilly areas within and around the city are converted into new housing towns that had increased runoff. Trenches along the roadside comprise the unplanned drainage network of the city that drains the combined sewer flow. In rainy season overflow occurs, and after streets become dry, the dust particles contaminate the air which is a major cause of air pollution in Kabul city. In this study, a stormwater management model is introduced as a basis for a systematic approach to urban drainage planning in Kabul. For this purpose, Kabul city is delineated into 8 watersheds with the help of one-meter resolution LIDAR DEM. Storm, water management model, is developed for Wazirabad catchment by using available data and literature values. Due to lack of long term metrological data, the model is only run for hourly rainfall data of a rain event that occurred in April 2016. The rain event from 1st to 3rd April with maximum intensity of 3mm/hr caused huge flooding in Wazirabad Catchment of Kabul City. Model-estimated flooding at some points of the catchment as an actual measurement of flooding was not possible; results were compared with information obtained from local people, Kabul Municipality and Capital Region Independent Development Authority. The model helped to identify areas where flooding occurred because of less capacity of drainage system and areas where the main reason for flooding is due to blockage in the drainage canals. The model was used for further analysis to find a sustainable solution to the problem. The option to construct new canals was analyzed, and two new canals were proposed that will reduce the flooding frequency in Wazirabad catchment of Kabul city. By developing the methodology to develop a stormwater management model from digital data and information, the study had fulfilled the primary objective, and similar methodology can be used for other catchments of Kabul city to prepare an emergency and long-term plan for drainage system of Kabul city.

Keywords : urban hydrology, storm water management, modeling, SWMM, GEO-SWMM, GIS, identification of flood vulnerable areas, urban flooding analysis, sustainable urban drainage

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