

Surface Water Flow of Urban Areas and Sustainable Urban Planning

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Abstract : Urban planning is associated with land transformation from natural areas to modified and developed ones which leads to modification of natural environment. The basic knowledge of relationship between both should be ascertained before proceeding for the development of natural areas. Changes on land surface due to build up pavements, roads and similar land cover, affect surface water flow. There is a gap between urban planning and basic knowledge of hydrological processes which should be known to the planners. The paper aims to identify these variations in surface flow due to urbanization for a temporal scale of 40 years using Storm Water Management Mode (SWMM) and again correlating these findings with the urban planning guidelines in study area along with geological background to find out the suitable combinations of land cover, soil and guidelines. For the purpose of identifying the changes in surface flows, 19 catchments were identified with different geology and growth in 40 years facing different ground water levels fluctuations. The increasing built up, varying surface runoff are studied using Arc GIS and SWMM modeling, regression analysis for runoff. Resulting runoff for various land covers and soil groups with varying built up conditions were observed. The modeling procedures also included observations for varying precipitation and constant built up in all catchments. All these observations were combined for individual catchment and single regression curve was obtained for runoff. Thus, it was observed that alluvial with suitable land cover was better for infiltration and least generation of runoff but excess built up could not be sustained on alluvial soil. Similarly, basalt had least recharge and most runoff demanding maximum vegetation over it. Sandstone resulted in good recharging if planned with more open spaces and natural soils with intermittent vegetation. Hence, these observations made a keystone base for planners while planning various land uses on different soils. This paper contributes and provides a solution to basic knowledge gap, which urban planners face during development of natural surfaces.

Keywords : runoff, built up, roughness, recharge, temporal changes

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