World Academy of Science, Engineering and Technology
International Journal of Mathematical and Computational Sciences
Vol:14, No:12, 2020

Urban Impervious and its Impact on Storm Water Drainage Systems

Authors : Ratul Das, Udit Narayan Das

Abstract : Surface imperviousness in urban area brings significant changes in storm water drainage systems and some recent studies reveals that the impervious surfaces that passes the storm water runoff directly to drainage systems through storm water collection systems, called directly connected impervious area (DCIA) is an effective parameter rather than total impervious areas (TIA) for computation of surface runoff. In the present study, extension of DCIA and TIA were computed for a small sub-urban area of Agartala, the capital of state Tripura. Total impervious surfaces covering the study area were identified on the existing storm water drainage map from landuse map of the study area in association with field assessments. Also, DCIA assessed through field survey were compared to DCIA computed by empirical relationships provided by other investigators. For the assessment of DCIA in the study area two methods were adopted. First, partitioning the study area into four drainage sub-zones based on average basin slope and laying of existing storm water drainage systems. In the second method, the entire study area was divided into small grids. Each grid or parcel comprised of 20m× 20m area. Total impervious surfaces were delineated from landuse map in association with on-site assessments for efficient determination of DCIA within each sub-area and grid. There was a wide variation in percent connectivity of TIA across each sub-drainage zone and grid. In the present study, total impervious area comprises 36.23% of the study area, in which 21.85% of the total study area is connected to storm water collection systems. Total pervious area (TPA) and others comprise 53.20% and 10.56% of the total area, respectively. TIA recorded by field assessment (36.23%) was considerably higher than that calculated from the available land use map (22%). From the analysis of recoded data, it is observed that the average percentage of connectivity (% DCIA with respect to TIA) is 60.31 %. The analysis also reveals that the observed DCIA lies below the line of optimal impervious surface connectivity for a sub-urban area provided by other investigators and which indicate the probable reason of water logging conditions in many parts of the study area during monsoon period.

Keywords : Drainage, imperviousness, runoff, storm water.
Conference Title : ICSRD 2020 : International Conference on Scientific Research and Development
Conference Location : Chicago, United States
Conference Dates : December 12-13, 2020