

Seyed Hossein Hosseiny, "A Citywide Scale Runoff Modeling Framework for Stormwater Management"

Estimating urban runoff is a crucial aspect of managing water and mitigating the impacts of urban growth and watershed development. This work presents a fully automated framework for runoff estimation in urban areas, tested on Philadelphia, Pennsylvania, a major urban area. A one-meter resolution DEM was used in conjunction with a model developed in ArcGIS Pro to create subbasins. Building footprints were extruded from the base DEM, while inlets were lowered to correctly generate flow direction lines. Once the subbasins were delineated, the 24-hour storm data with a 10-year return period suggested by the National Resources Conservation Service (NRCS) for the Philadelphia area was used to estimate the runoff. One-meter land cover data was used to estimate the pervious and impervious areas and generate runoff coefficients for each subbasin. The peak runoff discharge and runoff depth for each subbasin were then estimated by the rational and modified rational methods. The runoff depths were also estimated by the NRCS method and compared with the modified rational method results. The inundation depths from both models were used to generate probability, impact and risk of inundation maps of Philadelphia, and to assess the impact of green stormwater infrastructure on flooding. The outcome of this research provides a clear picture of locations at risk of excessive precipitation, a valuable resource for stormwater management agencies. Such information can be used in conjunction with other inputs to identify potential vulnerabilities in neighborhoods, stormwater infrastructures impact or needs, and infrastructures at risk of flood inundation.