

**Estimation of runoff parameters by using Arc-GIS, HEC-RAS-GEORAS, and ground measurements of Teri-Toy River, Karak, NW, Pakistan**

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River discharge estimation is an important parameter in hydrologic analysis and estimation of water resources, due to uneven distribution of gauge networks a severe challenge has been faced in its assessments, data sharing limitations, and to tackle these hardships, innovative and modern techniques has been established i.e., satellite and remote sensing data approaches. This study aims to estimate the river discharge by integrating remote sensing and ground measurements, achieving higher spatial and temporal resolutions. This study utilized remote sensing data including Digital elevation model, soil map, land use and land cover map, and ground measurements (gauge data) to estimate river discharge, velocity, and depth. It is interpreted that the peak flow velocity was recognized as 1.8 m/s and spatial distribution of velocity along the Teri-toye River is varied from 0.3 m/s to 1.3 m/s Maximum depth interpreted around 100 m in the upstream section and found decreasing upto few centimeters in downstream direction. River discharge decreases (from 2.26 to 0.28 m<sup>3</sup>/s) towards downstream due to factors like water distribution in tributaries, infiltration, evaporation, and agricultural use. The novelty of this study is estimating river discharge with limited measurements, paving the way for assessing river properties over larger areas. Future research should assess the developed method (HEC-RAS-GEO-RAS) in estimating various properties of rivers under different hydrometeorological conditions.