**Spatio-temporal Quantification of Deforestation and Understanding its Impact on Basin Hydrology-An attempt to Ensure Long-term Sustainability**

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***ABSTRACT***

The anthropogenic activities are the major drivers for global Land Use and Land Cover Change (LULCC), which in-term influence the behavior of hydrological system. Understanding the repercussions of historical LULCC may facilitate in charting the sustainable path for future development and management endeavors. In the present study, LULC of the Tel Basin, India, was mapped and LULCC was quantified using remote sensing data. LULC mapped during years 1985, 1995, 2005, & 2015 was compared to understand the sptio-temporal dynamics of changes occurred during last thirty years. A noteworthy reduction of -8.20% in forest cover was observed, associated with increases of 7.82% and 0.32% in agricultural and settlement, respectively. To decipher the impact of these LULCCs, notably deforestation and urbanization, on the hydrological behavior of the basin the Variable Infiltration Capacity (VIC) model was setup using remote sensing derived topographical, LULC, vegetation parameters along with the in-situ datasets on soil & meteorology. The model was calibrated-validated using observed hydrological data and employed to quantify the impact of LULCC on runoff, evapotranspiration (ET), and baseflow in the Basin. The results indicated reduction in evapotranspiration by 1.63% (167.48mm) from 1985 to 2015, while runoff and baseflow exhibited increment of 1.15% (67.33mm) and 3.87% (108.25mm), respectively. These changes appear to be mainly driven by the transformation of 1,600 km2 of forest cover into agricultural and settlement land. The reduction of deep-rooted vegetative cover impels the reduction in permanent interception, ET and water holding capacity of the subsoil in the area, which further fuels the increase of surface runoff and baseflow from the basin. The pixel level analysis of LULCC and its impact on the hydrological behavior in the Tel Basin provides valuable inputs for the strategic management of water resources within the Basin, thereby contributing to informed decision-making for assuring long-term, environmental, socio-economic sustainability.

**Keywords:** LULC Change, Variable Infiltration Model, Tel Basin, hydrological modeling, sustainability