Chapter 2
Impact of Landuse/Landcover (LULC) Changes on the Hydrology of the Upper Indus Basin (Jhelum Basin) Under Changing Climate

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Abstract This study investigates the changes in the hydrological processes of the Jhelum Basin (Kashmir), India, under the changing landuse/landcover (LULC) and changing climate, using the semi-distributed Soil Water Assessment Tool (SWAT). LULC maps were generated for 1973, 1983, 1991, 2001, and 2013 using Landsat satellite data, and future projections for 2026, 2039, and 2052 developed using the model Conversion of Land Use and its Effects (CLUE) model. Climate data from the fifth generation European Center for Medium Range weather Forecast reanalysis data (ERA-5) dataset (2011–2052) was employed to evaluate potential climate impacts. The results indicate a general decline in river discharge, with few high peak flows observed during the years 1973 (34,561 cusecs), 1976 (33,614 cusecs), 1992 (36,688 cusecs), 2005 (32,150 cusecs), 2014 (49,543 cusecs), 2025 (32,439 cusecs), 2037 (32,000 cusecs), and 2050 (30,339 cusecs). The evapotranspiration revealed significant increase from average 3 mm/day to 4.3 mm/day from the year 1997 up to 2050. The results of the groundwater recharge of valley revealed insignificant decrease with average of 3982 cusecs from 1970 to 2025. Model simulations from 1970 to 2050 achieved a Nash-Sutcliffe efficiency (NSE) of 0.63 for the baseline period (1990–2011), indicating moderately good performance. The simulated result suggests that under changing climate and landuse, the discharge of river Jhelum would overall decrease with some high flood events, evapotranspiration would increase, and there would be insignificant decrease in groundwater discharge in Jhelum Basin under the changing climate till mid of the twenty-first century. The

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