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Identifying the potential impacts of climate change in streamflow in a humid tropical basin

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The ecological diversity of a river is maintained if the river regime resembles its pristine conditions. Climate change is considered as one of the driving factors which affect the hydrological processes of a region. The study considered the impact of climate change on streamflow in the humid tropical basin, Meenachil, Kerala, India. The study utilised Soil and Water Assessment Tool (SWAT) model for hydrological modelling of the basin. The model is calibrated and validated with observed flow data. The performance of the model is evaluated with Nash-Sutcliffe coefficient (NSE), coefficient of determination (R^2), percentage bias (PBIAS) and found good. The ensemble of National Aeronautics and Space Administration (NASA) Earth Exchange Global Daily Downscaled Projections (NEX-GDDP) data for RCP 4.5 is considered for future climate studies. The streamflow response of the basin to climate change is assessed with by considering the future periods into three scenarios as, S₁ (2025-2050), S₂ (2051-2075) and S₃ (2076-2099) for RCP 4.5. The period from 1990-2020 is taken as the baseline period, against which the comparison is made. The Flow duration curve is constructed for the historical and future predictions and high and low flow indices are determined to assess the climate change impact. The results showed a decline in low flow indices and rise in high flow indices. The outcomes of the study will be helpful in planning adaptation strategies for better water resources management in the basin.

Keywords: Climate change, streamflow, SWAT, flow indices.