

**STREAMFLOW VARIABILITY UNDER CLIMATE
CHANGE SCENARIOS IN KELANI RIVER BASIN,
SRI LANKA**

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ABSTRACT

Streamflow Variability under Climate Change Scenarios in Kelani River Basin, Sri Lanka

In recent years, the downstream floodplain of the Kelani River Basin has been suffering from frequent floods. With the current climate change trend, flood-related damages are expected to amplify in future. Therefore, understanding how such extreme events behave in the future is quite essential for the basin planners and managers. Using the output from three global climate models (CNRM-CM6-1, MRI-ESM2-0, EC-Earth3-CC, and their ensemble) from the Sixth Phase of Coupled Model Intercomparison Project (CMIP6), variation of streamflow was evaluated from historical (1985-2014) to mid-century (2030-2059) and late-century (2070-2100) periods under Shared Socioeconomic Pathways (SSPs 2-4.5 and 5-8.5). Bias-corrected precipitation and temperature through linear scaling and power transformation, respectively were fed into the HEC-HMS model to project future river discharge. Based on the ensemble model, changes in average annual discharge indicates an increasing trend in future periods under both scenarios considered. Significantly high changes were projected in the late century (25-40 m³/s) compared to the mid-century (15-25 m³/s) under both scenarios. Projected changes in monthly streamflow indicate an increasing trend for wet months (June-December) while a decreasing trend for dry months (January-May). Further, the highest changes in streamflow were identified in the monthly changes (-5 to 60 and -5 to 100 m³/s under SSP2-4.5 and SSP5-8.5, respectively). Comparison of seasonal changes shows the highest increase for Southwest Monsoon (40-60 m³/s under both scenarios and future periods) while the highest decrease for First-Inter monsoon (<-10 m³/s under both scenarios and future periods). Moreover, changes in high, median, and low flows (5%, 50%, and 95% percentiles of flow duration curve, respectively) indicate significant changes in high flows compared to the median and low flows. The findings of this study suggest a significant increase in high flows during the Southwest Monsoon that can further threaten the basin with the devastating floods. The results provide important insight for planners and other stakeholders dealing with water resources management in the basin.

Keywords: Streamflow Changes, Climate Change Impact, Shared Socioeconomic Pathway

DEDICATION

My work is dedicated to my dear

Mother and Uncles

Whose affection, love, encouragement, and financial support of each day and night allowed me to accomplish my dreaming master's degree. With my best wishes, I hope a successful and happy life for you all

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LIST OF ABBREVIATIONS

AR	Assessment Report
CDS	Climate Data Store
CMIP	Coupled Model Intercomparison Project
CMhyd	Climate Model for Hydrologic Modelling
ESGF	Earth System Grid Federation
GCM	Global Climate Model
IAM	Integrated Assessment Model
IAV	Impact Adaption Vulnerability
IPCC	Intergovernmental Panel on Climate Change
KRB	Kelani River Basin
RCM	Regional Climate Model
RCP	Representative Concentration Pathway
SSP	Shared Socioeconomic Pathway
WGCM	Working Group of Coupled Modelling
WRCP	World Climate Research Program