STUDY ON CLIMATE ELASTICITY OF RUNOFF IN KALU AND KELANI RIVER BASINS IN THE WET ZONE OF SRI LANKA

W.M.R.T.Y. Wijekoon [1,*], R.L.H.L. Rajapakse [1]

[1] Department of Civil Engineering, University of Moratuwa, Moratuwa

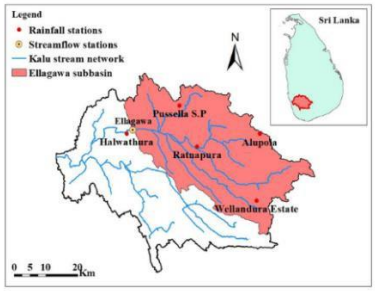
It is crucial to assess the impacts due to climate change on the hydrological cycle for the characterization of basin hydrology and water resource management. Climate elasticity can be used as an indicator to quantify the sensitivity of streamflow to climate change. This study estimates the climate elasticity of runoff concerning precipitation and evaporation, in the Kalu river and Kelani river basins in the wet zone of Sri Lanka. The Ellagawa subbasin of the Kalu river and the Hanwella subbasin of the Kelani river were selected for the assessment. The non- parametric estimator was selected based on the simplicity to assess the climate elasticity of runoff in the selected wet zone basins under current climate scenarios. At the same time, the climate elasticity under synthetic climate change scenarios was assessed using a hydrological model. The HEC-HMS rainfall-runoff model was selected based on the accessibility, flexibility, reliability, and data requirements to simulate streamflow. The rainfall elasticity and evaporation elasticity were estimated for prevailing climate conditions. According to the results, the increase in runoff due to the increase in precipitation under current climate scenarios is small compared to the reduction of runoff due to increased evaporation as a result of increased temperature, whereas according to the model results, climate change results in causing -41% to 31% change in runoff in the Kalu river basin and -49% to 23% change in runoff in the Kelani river basin based on two scenarios, respectively, under synthetic climate change scenarios that were developed for the period of 2016-2035 considering the predicted precipitation and evaporation changes comparative to the baseline period of 1986-2005. According to the results, these crucial river basins are vulnerable to water scarcity and/or a surplus of water as well in the future. Therefore, the findings of this research are very important to plan proactive solutions in advance to manage the basin water resources efficiently.

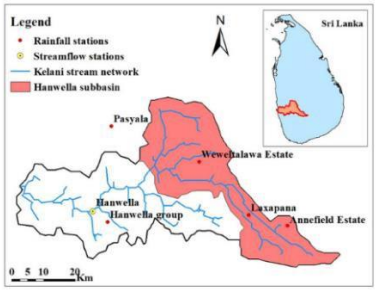
Keywords: Climate change, HEC-HMS modelling, Non-Parametric estimator, Syntheticclimate change scenarios, Wet zone basins

*Correspondence: tharindiyasara09@gmail.com

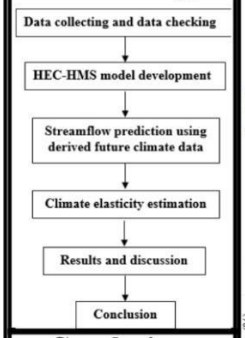
STUDY ON CLIMATE ELASTICITY OF RUNOFF IN KALU AND KELANI RIVER BASINS IN THE WET ZONE OF SRI LANKA

Study Areas





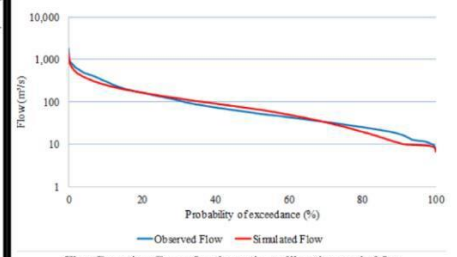
Methodology



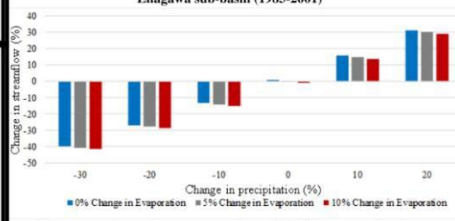
Conclusions

According to the model results, climate change results in causing -41% to 31% change in runoff in the Kalu river basin and -49% to 23% change in runoff in the Kelani river basin under synthetic climate change scenarios that were developed for the period of 2016-2035.

Results and Analysis



Flow Duration Curve for the entire calibration period for Ellagawa sub-basin (1985-2001)



Percentage change in mean annual runoff in Ellagawa station due to precipitation and evaporation changes

Hence, in the future, both the Kalu river and Kelani river may experience both surplus and scarcity of water.