

RUNOFF MODEL DEVELOPMENT FOR NILAMBE CATCHMENT IN SRI LANKA USING HEC-HMS

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Assessment of catchment runoff plays a vital role in catchment management. Hydrologic models are used as tools to simulate hydrologic processes and estimate catchment runoff parameters. But it is a challenging task to calibrate such models to represent real situation due to the limited data availability. In this study, Hydrologic Modeling System (HEC-HMS), developed by the Hydrologic Engineering Center, USA has been used to set up run off simulation model for the Nilambe catchment of the Mahaweli River located upstream of Polgolla reservoir in Sri Lanka. The Nilambe catchment was selected due to its importance to hydropower generation by Nilambe Hydropower Plant installed utilizing the runoff of the catchment.

The Nilambe catchment was divided into 17 sub-catchments considering the hill-slopes and stream network. Clark unit hydrograph was selected as transport method with relevant time of concentration values for sub-catchments. Initial and constant loss method was used for flow calculation and constant loss value and imperviousness were used as calibration parameters. Recession base flow method with ratio to peak threshold method was selected to calculate base flow.

The model was calibrated for a period of one year from 01 April 1992 to 30 March 1993. The validation of the model was carried out for the period from 01 November 1993 to 31 October 1994. Calibrated model suggests a constant loss rate of 5 mm/h and percentage imperviousness of 28% for the initial and constant loss method. The recession constant of 0.98 and the peak to ratio of 0.18 of the threshold method was used. The calibrated model is a useful tool for water resources development planning in the Nilambe catchment or similar hilly catchment in the Mahaweli basin.

The model was used to generate daily runoff of the Nilambe catchment for 20 years period from 1976 to 1996, and the flow duration curve was developed. It is found that the energy output from the Nilambe hydropower plant can be increased by about 18% with a Plant factor of 30% by increasing the design discharge to 6.3 m³/s from present 3.6 m³/s.