

## ***Assessing Flood Prediction Models for the Kalu Ganga Basin using Hec-Hms***

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Rainfall-runoff modeling is a crucial tool for authorities managing flood-prone rivers. In Sri Lanka, flooding ranks among the costliest disasters in terms of property loss and human casualties. The country has 103 significant river basins. 17 associated with flooding issues. Among these, the Kalu Ganga is particularly prone to frequent flooding. The HEC-HMS (Hydrologic Engineering Center's Hydrologic Modelling system) has been successfully used to assess the behavior of rivers in numerous river basins worldwide, including those in Sri Lanka. Therefore, developing an HEC HMS model for the Kalu Ganga basin is an efficient strategy to predict floods and mitigate their damage. The HEC-HMS (Version 4.10) proves invaluable for simulating and analyzing rainfall-runoff dynamics. Event-based hydrological modeling reveals how a basin responds to individual rainfall events, which is crucial for flood prediction. This study evaluates six combinations of rainfall-runoff models using various hydrological approaches to determine the most effective model for catchment up to Ellagawa. The study considers criteria such as rainfall type (Event based), spatial process (Semi-lumped), model type (Empirical), and relevant parameters (Fitted parameters) based on acquired data to select model combinations. Event-based rainfall data from four gauging stations in the Rathnapura district and discharge data from the Ellagawa gauging station for the period of 2018-2021 are for Calibration and Validation. The initial parameters are optimized revealing that each model combination performs differently for each event. Among the selected combinations, the Initial Constant method paired with the Clark Unit hydrograph, the Recession base flow method with Lag, and the Muskingum method exhibit excellent performance. The model evaluation shows a Nash Sutcliff efficiency value of 0.98, RMSE of 0.1, and a Percent bias of 0.16. Visual assessments and statistical indicators demonstrate that the developed model reasonably predicts floods in the basin. Consequently, as we got in the evaluation part, it can serve as a valuable tool for flood prediction, providing forecasts for flood peaks and their timing with a reasonable degree of accuracy.

**Keywords:** HEC-HMS, Rainfall-Runoff Model, Event-Based Rainfall, Calibration and Validation