

FLOW MODELLING IN NILLAMBE OYA, SRI LANKA

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ABSTRACT

Flooding and flow changes in rivers and streams due to anthropogenic activities are the major problems worldwide as well as in Sri Lanka. To address these issues, proper monitoring of flow patterns and prediction of flow changes are necessary; However, daily monitoring and data collection is greatly time consuming and costly. Therefore, development and application of models for accurate simulation of flow variations will be a vital requirement for the management of these ecosystems. In order to address these concerns, a study was done with the objective of calibrating and validating a model based on climatic, landuse and flow data and to determine whether the calibrated model could be applied to predict flow variations.

HEC-HMS 3.5 model which was developed by the United States Army Corps of Engineers was used to simulate flow variation of the Nillambe Oya catchment which is located within the central highlands of the mid and upcountry wet zone. During the period from May 2013 to September 2013, flow was measured in nine selected days. Rainfall data, other meteorological data and flow data for eight years (October 1991 to September 1999) were obtained from the Environment and Forest Division of the Mahaweli Authority and the Meteorology Department of Sri Lanka. Daily flow data for five years (October 1991 to September 1996) were used to calibrate the model and another set of flow data for five years (October 1994 to September 1999) were used to validate the model. The flow values that were measured in situ during May 2013 to September 2013 were statistically tested with flow values simulated by the model.

Obtained residual plots and calculated percentage residuals of the calibration and validation produced results with high R squared values (above 0.65) and residual percentages within $\pm 1SD$ and $\pm 2SD$ above 85% and 95%, respectively. The properly calibrated and validated HEC-HMS 3.5 computer model can be reliably used to simulate flows of Nillambe Oya. Snyder unit hydrograph method, as the transformation method, simulates flows reliably in the study catchment, along with initial loss method. Therefore, HEC-HMS 3.5 model can reliably be used to estimate flow volumes that are available to Hydropower generation, drinking water supply and agricultural purposes while maintaining ecological harmony with the riverine ecosystem.

Key words: Calibration, catchment, flow, HEC-HMS, modelling, validation