WAT-76 ORAL PRESENTATION · WATER TRACK · SURFACE WATER HYDROLOGY & BASIN MANAGEMENT

Development of a National-Scale SMHI HYPE Model for Water Resources Assessment in Sri Lanka under Data-Scarce Conditions

K. Gangabadage[1]*, H. Amaguchi[1] and Y. Imamura[1]

[1]*Tokyo Metropolitan University, Japan*

**Corresponding author: gangabadage-pabasara@ed.tmu.ac.jp*

DOI: https://doi.org/10.31705/ICEWSE.2026.68

Abstract

Sri Lanka exhibits pronounced spatial and temporal variability in water availability, resulting in contrasting hydrological risks ranging from recurrent floods in wet regions to water scarcity in seasonally dry regions. National-scale hydrological assessment is therefore important for integrated water resources management; however, its application remain constrained by the limited spatial coverage, accessibility, and continuity of in-situ hydro-meteorological observations. Although globally available Earth observation and reanalysis datasets offer a potential alternative, their suitability for hydrological modelling under Sri Lanka's contrasting hydroclimatic conditions require systematic evaluation. This study develops a national-scale semi-distributed hydrological modelling framework for Sri Lanka using the process-based SMHI HYPE model, integrating publicly available JAXA GSMaP precipitation, ERA5 reanalysis temperature, and SMAP L4 root-zone soil moisture, with in-situ observed streamflow. A pilot application is conducted in the upstream Kelani River Basin, selected for its relatively greater availability of hydrological observations, to evaluate the modelling framework prior to its broader national-scale application. Model calibration incorporates streamflow and root-zone soil moisture through a multi-variable calibration approach using Monte Carlo simulations, while multi-source validation considers streamflow, soil moisture, and reservoir storage variations. Initial pilot basin model application identified the need for further evaluation and local bias correction of public hydro-meteorological datasets before robust model calibration and national-scale implementation. These results guide the ongoing refinement of the modelling framework towards its application in data-scarce and poorly gauged regions of Sri Lanka.

Keywords: *HYPE model; national-scale hydrological modelling; poorly gauged basins; public datasets; Sri Lanka*