

**ASSESSMENT OF HYDROLOGIC PERFORMANCE IN UNDULATING
CATCHMENT: CASE STUDY OF THE UPPER MAHAWELI CATCHMENT, SRI
LANKA**

W. M. N. B. K. Weerakoon^{a*}, G. Naveendrakumar^a, A. E. S. Patrick^a, and M. E.
Sutharsan^b

^aDepartment of Bioscience, Faculty of Applied Sciences, Vavuniya University of Sri Lanka,
Vavuniya, Sri Lanka.

^bNational Water Supply and Drainage Board, Northern Province, Vavuniya.

*nuwanbkumara96@gmail.com

Abstract

Hydrological performance of Upper Mahaweli Undulating Catchment (UMUC) has been studied to a lesser extent in Sri Lanka. This study focused on long term (2005–2024) hydrological and climatic data of three sub-catchments: Peradeniya, Nawalapitiya and Thaldena. Here, Peradeniya catchment showed the greatest variability in water levels (1–4 m) and discharge rates (9–244 m³ s⁻¹). Maximum flow values greater than 240 m³ s⁻¹ are observed. Nawalapitiya catchment area shows moderate water levels and discharge patterns (0.4–2 m, 1–62 m³ s⁻¹). It faces the challenges of a semi-urban, agricultural and mountainous geographical location. Thaldena catchment area showed the most stable water levels and discharges (0.1–1.2 m, 1–61 m³ s⁻¹). Although, UMUC cover different climatic zones, it shows the early signs of risk such as subtle increase in maximum flows in recent years. Pearson correlation analysis showed a positive relationship between water levels and discharge in Peradeniya ($r = 0.992$) and Nawalapitiya ($r = 0.903$). However, for the Thaldena catchment, the correlations with other catchments were weak or negative and different from the other two sub-catchments, may be due to different climatic zone. The runoff-rainfall ratio values were at a median level in Peradeniya (67%) and the lowest in Thaldena (19%) during the period of 2010–2020, suggesting the efficiency of reverse flow and infiltration capacity. Nawalapitiya catchment showed a most high runoff-rainfall ratio (82%) during 2010–2016 period. Comparing three sub catchments, Peradeniya showed high variability, strong water level–discharge links, rapid runoff, and high flood risk from urbanization. Nawalapitiya has moderate, stable flows and moderate flood risk. Thaldena remains stable with low runoff, weak correlations, low flood risk, and high groundwater recharge potential.

Keywords: *Upper Mahaweli, Sub-Catchments, Water Level, Discharge, Runoff–Rainfall Ratio.*