

# DEVELOPMENT OF WATER MANAGEMENT TOOL USING WEAP MODEL—CASE STUDY OF DEDURU OYA RESERVOIR, SRI LANKA

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## Abstract:

DeduruOya basin which has an area of 2620 km<sup>2</sup> is the sixth largest river basin in Sri Lanka flows through Matale, Kurunegala and Puttalam districts. Rainfall in the basin has a significant temporal and spatial variation thus the DeduruOya carry flash floods during rainy season and very low flows during dry season. The DeduruOya reservoir under construction at the upstream of the existing RidiBedi Ela anicut will be useful to regulate discharge of the DeduruOya for better utilizing the basin water resources especially for irrigation. The multi-purpose DeduruOya reservoir project with a reservoir of a capacity of 75 Million Cubic Meters (MCM) augments water resources in 136 existing tank based irrigation systems in the DeduruOya Left Bank through a Left Bank (LB) canal and also diverts water to the Iginimitiya tank in the MeeOya basin through a Right Bank (RB) transbasin canal.

Hydrological modeling is a commonly used tool by water resource planners to simulate the hydrological response in a basin due to precipitation for the purpose of management of basin water. With the increasing demand for limited water resources in every basin, careful management of water resources becomes more important.

This study develops a model for water management in LB canal development area and for the assessment of diversion requirements from the DeduruOya reservoir through the LB Canal to supplement LB irrigation demand.

Hydrological Engineering Center-Hydrological Modeling System (HEC-HMS) version 3.0.1 is used for runoff simulations and it is case study of continuous rainfall-runoff modeling in part of the DeduruOya basin with intra-basin diversions and storage irrigation systems. Long term daily rainfall data at several rain gauging stations, evaporation, land use and soil data in the river basin, daily river runoff at a stream gauging station, intra-basin diversions from the river into a storage reservoir, irrigation releases from the reservoir and drainage flow returned to the river from irrigation systems were used to set up the HEC-HMS model. Five-layer soil moisture accounting loss method, Clark unit hydrograph transformation

method, and recession base flow method of the HEC-HMS model were used. Temporally varying irrigation water uses, storages and losses in the basin were taken into account in the analysis.

CROPWAT model is used to estimate crop water requirements. Water Evaluation And Planning (WEAP) model is used for water balance simulations in DeduruOya LB canal development area and to calculate water requirements from LB canal for the period of recent 10 years.

The results depict the capability of HEC-HMS to reproduce stream flows in the basin to a high accuracy with averaged computed Nash Sutcliffe efficiencies of 0.80.

The simulation carried out for past ten years using WEAP reveals that the annual water diversion requirement from the LB canal for 100% cropping intensity in the proposed 3000 ha irrigable area in LB canal development area varies from 26 MCM to 41 MCM. Also DeduruOya reservoir project which has planned to operate LB canal irrigation management incorporating the existing small irrigation tanks will be able to supply the water demand for LB development area for paddy cultivation without failure. The irrigation water management model is a useful tool for planning of water management in the DeduruOya reservoir project

**Keywords:** Irrigation Water Requirement, DeduruOya Project, Hydrological Modeling, WEAP, HEC-HMS, Irrigation, Magalla tank

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