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Assessment of Grey Water Footprint: Kalu Ela Sub Basin of Kelani River

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Abstract

Deterioration of water quality of inland water resources is most attended environmental problem due to rapid urbanization and industrialization. Kelani River is the main source for domestic and industrial water supply to Colombo district. Therefore, a special attention has been paid on pollution prevention and the present study focuses on estimating the Grey Water Footprint of the Kalu Ela sub basin of lower reach of Kelani river. Water of Kalu Ela sub basin flows through an outfall to Old Dutch canal to Kelani River. The Kalu-Ela basin located between Ja-Ela basin to the north and the Kelani Ganaga to the south and it covers 58Km² area out of divisional sectorial Mahara, Wattala, Jaela, Kelaniya, and Biyagama where highly urbanized and industrial DSs in the country.

The Grey Water Footprint (GWF) is generally use as an assessing tool to present extent of pollution of a river basin based on natural background concentrations and existing ambient water quality standards. The GWF is estimated by using concentration of pollutants with run off the water body. The total basin was separated into five sub basins and flow rate of sub basins were evaluated by using the Hydrological Modeling System (HEC-HMS) while six water quality parameters were selected for estimating the highest concentration of pollutants. Actual flow rate was recorded by calibration and validation of the Modeling system using area, soil type, land use pattern, ground cover and precipitation data of each sub basins.

Chemical Oxygen Demand (COD) was recorded as the highest concentration in all basins and ranged in between 269.88mg/L to 56mg/L. COD at the outfall of Kalu Ela sub basin was measured as 56mg/L while the average flow rate of the sub basins was 2.967m³/s. Accordingly, GWF was given as 11.077m³/s at the outfall of Kalu Ela sub basin which is based on recorded highest concentration of pollutant ie. COD. Resulted GWF reveals that the need of clean water is 11.077m³/s to assimilate the pollutant load in Kalu Ela basin. This implies that the Kalu Ela sub basin is in the critical condition at present. It is envisaged that releasing by-products and hazardous chemicals from industries which are situated in the Kalu Ela sub basin accelerate the pollution rate. Further, agricultural runoff, domestic and municipal effluent, and the nutrient rich marshy itself are other contributing factors. If the present pollution status is continued, it would create adverse impacts on human health and influence the socio-economic development of the whole country due to growing demand on the clean water resources. Hence, GWF is recommended as an assessing tool on pollution rate estimation and engineering applications are much important to control the pollution rate to accomplish the national needs.

Keywords: Grey Water Footprint, Kalu Ela sub basin, Pollutant Load, HEC-HMS, Kelani River