

Spatial Variation of the Quality of Surface Water over Different Land Use Types in Upper Mahaweli Catchment

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The Mahaweli, Sri Lanka's longest river, is used extensively for supplying domestic water. However, its water is polluted in many places at different scales. We monitored the quality of water and suspended load of three micro-catchments of the Ma Oya (ca. 1 km²), six-sub catchments (ca. 50-100 km²) of Upper Mahaweli Catchment, and the Mahaweli River at Gatambe on monthly basis over a hydrological year (October 2018 to September 2019). Land use maps of these catchments were developed in the ArcGIS platform to examine the effect of land use on the quality of water. The mean and standard deviation of measured parameters were as follows: temperature (27.2± 3.8 °C), pH (7.3± 0.6), Electrical Conductivity (102.2± 74.9 µS/cm), alkalinity (49.7± 48.3 mg/L), hardness (53.1± 42.6 mg/L), Nitrate (1.6± 1.5 mg/L), Phosphate (0.1±0.16 mg/L), Sulphate (3.3± 4.7 mg/L), Fluoride (0.1± 0.06 mg/L), Chloride (6.7± 4.2 mg/L), Calcium (7.7± 8.0 mg/L), Sodium (3.1± 3.1 mg/L), Magnesium (1.5± 1.6 mg/L), Iron (168.8± 172.3 µg/L), Aluminum (42.3±60.0 µg/L) and Phosphorus (1.7± 2.0 mg/L). The catchments were categorized based on the land use as a percentage: (i) forest (ii) tea (iii) crops (seasonal crops, paddy, agricultural farms, pepper, chena, and coconut cultivation), and (iv) home gardens. Nitrate, Phosphate, and Sulphate concentrations of surface water showed a positive correlation (0.50, 0.61, and 0.79, respectively) with land use cover of crops. Nitrate concentration also showed a positive correlation (0.51) with land use cover of home gardens. The suspended load concentration positively correlated with Nitrate (0.48) and Sulphate (0.84). Alkalinity, Hardness, pH, EC, Total Dissolved Solids and, K, Mg, Na, Ca, Al, Fe, F⁻ and Cl⁻ concentrations also demonstrated positive relationships with crops. Therefore, this study reveals that land use cover of crops and sediment delivery from the catchments play a major role in polluting the Mahaweli river.

Keywords: Water quality, Land use types, Spatial variation

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