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A Study on Soil Quality Parameters of Two Urban Wetlands in Colombo District, Sri Lanka

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Abstract

The biological productivity of urban wetlands and quality of their ecosystem services depends on the health of its soil characteristics. Soil characteristics influence vegetation growth, pollutant buffering potential and watershed protection through regulation and infiltration. Assessment of soil characteristics is therefore required for effective management of urban wetlands, particularly of those undergoing restoration. However, in Sri Lanka, limited studies have focused on soil health in urban wetlands. The study evaluated the soil characteristics of two wetlands in the Colombo district: the Green Isle urban wetland (part of the Bellanwila-Attidiya sanctuary), a site currently undergoing restoration, and the Beddagana urban wetland, a successfully restored site (part of the Colombo Ramsar wetland complex). The main objective was to compare the soil characteristics in two urban wetland sites that differed in restoration status. Soil samples were taken at depths of 0-40 cm from the surface, with five replicates collected from each of the four plots at Green Isle and five plots (25 m^2 area each) at Beddagana wetland sites. Eleven soil parameters; temperature, moisture, pH value, electrical conductivity, bulk density, organic matter, nitrate, phosphorus, potassium, texture, and color were determined through field and laboratory investigations over a 3-month period (December 2022 – February 2023). Data analysis using two-way ANOVA (R version 4.2.3) revealed significant differences in soil temperature, pH, electrical conductivity, nitrate, and phosphorus content between the two urban wetland sites over the period. The principal component analysis identified electrical conductivity, soil temperature, and soil nutrients as key factors distinguishing the soil samples of the two sites, along with the difference in soil pH value. The Beddagana urban wetland had a loamy soil, and the Green Isle site had a higher clay content. On the Simple Additive Soil Quality Index (SQI), the Beddagana site exhibited higher soil quality (SQI=5.67) compared to the Green Isle site (SQI=4.96). The significantly higher value for conductivity and nitrate of the Green Isle site could be due to waste disposal from surrounding urban areas while the higher temperature would be a result of the lower vegetation cover in comparison to the Baddegana site. In conclusion, the SQI indicates that the restored Beddagana urban wetland has higher soil quality than the Green Isle urban wetland, which is still undergoing restoration. This validates its use in further studies to assess restoration status of urban tropical wetlands. The study shows the importance of assessing specific soil characteristics such as electrical conductivity when restoring degraded urban wetlands and the role of soil properties in understanding disturbances.

Keywords: *Urban wetlands, Soil quality parameters, Restored wetlands, Soil nutrients*

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