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Assessment of Soil Carbon Stocks in Selected Freshwater Urban Wetlands in Colombo District, Sri Lanka

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Abstract

Wetlands have a high potential to sequester atmospheric carbon and can play an important role in climate change mitigation. Vegetation parameters and climatic conditions have a direct influence on the capacity of carbon stock in wetlands and the carbon sequestering process is linked to the productivity and decomposition rate. The current study assessed the carbon stock capacity of two wetlands in the Colombo district. These were the Green Isle urban wetland (part of the Bellanwila-Attidiya sanctuary), which is a wetland undergoing restoration and the Beddagana urban wetland, a successfully restored wetland of the Colombo Ramsar wetland complex. The current study had two main objectives: firstly, to assess and compare the soil carbon stock capacity in two urban wetland areas (one successfully restored, the other undergoing restoration). Secondly, to compare the carbon stock capacity of freshwater urban wetlands in the Colombo district with that of other tropical ecosystems. The study was conducted from December 2022 to February 2023. Soil samples were collected at depths of 0-20 cm and 20-40 cm from the soil surface and obtained from four plots in Green Isle and five in Beddagana. The loss of ignition method was used to calculate soil organic carbon (SOC) concentration. Soil organic matter (SOM), soil bulk density, and soil depth were determined for calculating carbon stock. The estimated average carbon stock up to a depth of 40 cm in the Green Isle urban wetland was 245±5 C/ha. Regarding Beddagana urban wetland, three ecosystem types were identified: shrubland, marshland, and woodland. The average carbon stock up to 40 cm depth in the three ecosystems was 315±5 t C/ha, 493±6 t C/ha, and 513±3 t C/ha respectively. The overall average carbon stock up to 40 cm depth in the Beddagana urban wetland was estimated at 441±4 t C/ha. The study revealed that the soil organic carbon stock capacity of the restored urban wetland surpasses that of the wetland currently undergoing restoration. Comparison with studies on other tropical terrestrial ecosystems showed that the urban wetlands under study held relatively higher carbon reservoirs. The vegetation cover and human disturbance on the soil influenced the diversity seen within the two sites and between them. The study highlights that within the Colombo district, restored freshwater urban wetlands in particular are important for climate change mitigation as they have a higher soil organic carbon stock capacity.

***Keywords**:* Urban wetlands, Climate change, Mitigation, Carbon stock, Carbon sequestration