Carbon Balance and Management

RESEARCH

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Estimation of aboveground and belowground carbon stocks in urban freshwater wetlands of Sri Lanka

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Abstract

Background: The occurrence of climate change at an unprecedented scale has resulted in alterations of ecosystems around the world. Numerous studies have reported on the potential to slow down climate change through the sequestration of carbon in soil and trees. Freshwater wetlands hold significant potential for climate change mitigation owing to their large capacity to sequester atmospheric carbon dioxide (CO_2). Wetlands among all terrestrial ecosystems have the highest carbon density and are found to store up to three to five times more carbon than terrestrial forests. The current study was undertaken to quantify carbon stocks of two carbon pools: aboveground biomass (AGB) and belowground biomass (BGB). Chosen study sites; Kolonnawa wetland and Thalawathugoda wetland park are distributed within the Colombo wetland complex. Colombo was recognized as one of the 18 global Ramsar wetland cities in 2018. A combination of field measurements and allometric tree biomass regression models was used in the study. Stratification of the project area was performed using the normalized difference vegetation index (NDVI).

Results: The AGB carbon stock, across strata, is estimated to be in the range of 13.79 ± 3.65–66.49 ± 6.70 tC/ha and 8.13 ± 2.42–52.63 ± 10.00 tC/ha at Kolonnawa wetland and Thalawathugoda wetland park, respectively. The BGB carbon stock is estimated to be in the range of 2.47 ± 0.61–10.12 ± 0.89 tC/ha and 1.56 ± 0.41–8.17 ± 1.39 tC/ha at Kolonnawa wetland and Thalawathugoda wetland park, respectively. The total AGB carbon stock of Kolonnawa wetland was estimated at 19,803 ± 1566 tCO_2eq and that of Thalawathugoda wetland park was estimated at 4180 ± 729 tCO_2eq.

Conclusions: In conclusion, the study reveals that tropical freshwater wetlands contain considerable potential as carbon reservoirs. The study suggests the use of tropical freshwater wetlands in carbon sequestration enhancement plans in the tropics. The study also shows that *Annona glabra*, an invasive alien species (IAS), has the potential to enhance the net sink of AGB carbon in these non-mangrove wetlands. However, further studies are essential to confirm if enhanced carbon sequestration by *Annona glabra* is among the unexplored and unreported benefits of the species.

Keywords: Freshwater wetlands, Aboveground and belowground biomass, Tropical carbon stocks

Background

The occurrence of climate change at an unprecedented scale is indicated by many studies and global assessments. IPCC [1] indicates that global warming is likely to reach 1.5 °C above pre-industrial levels between 2030 and 2052 if existing trends are to persist. Further, the

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