

***INTEGRATED ASSESSMENT OF ECOSYSTEM CARBON STOCKS AND VULNERABILITY OF
THE URBAN FOREST OF THE UNIVERSITY OF THE PHILIPPINES DILIMAN***

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ABSTRACT

Urban forests are comprised of trees and associated woody vegetation found in cities, including roadside trees, institutional landscapes, parks, and remnant forest patches. They provide important ecological functions, particularly carbon storage, microclimate regulation, and the maintenance of urban environmental quality. However, urbanization, land-use change, and environmental stressors threaten the persistence of these ecosystems and the carbon stocks they contain. Despite their ecological importance, information on the spatial distribution of carbon stocks and their relative vulnerability remains limited, particularly in tropical urban environments. Thus, this study will assess the trees and soil carbon stocks and relative vulnerability of the urban forest of the University of the Philippines Diliman (UP Diliman). A stratified random sampling design will be used to inventory trees with a diameter at breast height (DBH) of at least 5 cm in 200 plots measuring 30 × 30 m, while soil organic carbon (SOC) will be assessed in a subset of approximately 75 plots at 0–30 cm soil depth. Aboveground biomass carbon, belowground biomass carbon, and SOC will be quantified and integrated to estimate ecosystem carbon stocks, with equivalent soil mass accounting, uncertainty propagation, and sensitivity analyses used to evaluate the effects of methodological assumptions on the estimates. Geographic information systems (GIS), remote sensing, and spatial statistical techniques, including Global Moran's I and Local Indicators of Spatial Association (LISA), will be used to examine carbon distribution and spatial clustering. A Carbon Stock Vulnerability Index (CSVI) will be developed using the Exposure–Sensitivity–Adaptive Capacity framework to assess relative vulnerability based on selected environmental and structural indicators. Carbon density and vulnerability rankings will then be integrated into a spatial management prioritization framework to identify areas for carbon conservation, active restoration, and environmental monitoring. The study is expected to provide a spatially explicit assessment of tree and soil carbon stocks and their relative vulnerability across the UP Diliman campus, supporting evidence-based urban forest management and contributing a methodological framework for assessing carbon conservation priorities in tropical urban areas.

Keywords: *Urban forest, ecosystem carbon stocks, soil organic carbon, carbon stock vulnerability, spatial analysis*