

## URBAN TREES AS CARBON SINKS: LINKING ABOVE GROUND BIOMASS TO SOIL ORGANIC CARBON AND ATMOSPHERIC CO<sub>2</sub> REDUCTION IN KOLKATA

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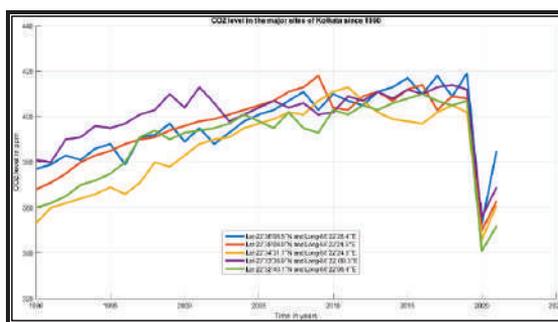
### ABSTRACT

The February 2024 study evaluates the carbon sequestration potential of 17 dominant urban tree species across five sites in Kolkata, focusing on Above Ground Stem Biomass (AGSB), Above Ground Stem Carbon (AGSC), Soil Organic Carbon (SOC), and near-surface atmospheric CO<sub>2</sub>. *Eucalyptus globulus* exhibited the highest AGBS (5885.60 t ha<sup>-1</sup>) and AGSC (2648.52 t ha<sup>-1</sup>), while *Alstonia scholaris* showed the lowest AGBS (133.46 t ha<sup>-1</sup>) and AGSC (59.52 t ha<sup>-1</sup>). SOC ranged from 0.47% to 1.43%, linked to biomass decomposition and litter deposition. Atmospheric CO<sub>2</sub> levels were inversely related to vegetation density, ranging from 421 ppm (Moulali) to 405 ppm (Park Circus). ANOVA confirmed significant spatial variations among the sites.

**Keywords:** Urban trees, Above Ground Stem Biomass, Soil Organic Carbon, Atmospheric CO<sub>2</sub>, Carbon sequestration, Kolkata

### 1. INTRODUCTION

Kolkata, renowned for its cultural heritage and proximity to the River Ganges, is one of India's most densely populated cities, with a 2025 population of 15.9 million and a density of 24,000 persons per square kilometer (<https://worldpopulationreview.com/cities/india/kolkata> [1]). The city's rapid urban growth, driven by affordable living conditions and efficient transportation, has attracted people from across the Indian subcontinent, resulting in a steady population rise since 1950. However, this urban expansion, combined with industrial emissions from surrounding factories, has significantly increased greenhouse gas (GHG) levels, particularly carbon dioxide (CO<sub>2</sub>), a major contributor to global warming (Agarwal et al. [2]). A study spanning 1990–2021 revealed a near-linear rise in CO<sub>2</sub> levels, with a notable decline in 2020 due to reduced anthropogenic activities during the COVID-19 lockdown (Mitra et al. [3]; Saha et al. [4]) (Fig. 1).



**Fig. 1: Temporal trend of near-surface atmospheric carbon dioxide level (ppm) throughout Kolkata**

According to researchers, Trees play a vital role in mitigating climate change by absorbing and storing atmospheric carbon. It is estimated that 90% of bound carbon on Earth is contained within forests, including soils, litter, and tree biomass. Trees can store approximately 14.97 kg of carbon per