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[Back](#)**OPTIMIZATION FOR CARBON FOOTPRINT IN AN INSTITUTIONAL CAMPUS**

Prajakta Baste and Ar. Hemant Thakare

Abstract

Development of environmentally sustainable cities is the need of today's fast urbanizing India. By 2050 nearly half the Indian population will be living in urban areas. Urban activities have increased the atmospheric Carbon Dioxide (CO₂), and will continue to increase. Indian cities are major producers of CO₂, but are not planned for enough Carbon Storage to compensate their own Carbon Footprints. It is imperative to maintain the "balance" between the Carbon emission and Sequestration to achieve environmental sustainability. Any process that removes CO₂ from the atmosphere and deposits it in a reservoir of any particular type (plant material, wood, soil, etc) is termed as "Carbon Sequestration". The Trees make the withdrawal of CO₂ from the atmosphere with the process of photosynthesis and store it in the form of growing plant material. Around 5%-21% of total photosynthetically fixed Carbon is transferred into the rhizosphere through root exudates. This study constitutes an estimation of standing biomass in the form of Plants and Trees, and the Carbon Sequestration by them at the institutional campus "Udhaji Maratha Boarding Campus, Nasik". Objective is to find their value in environmental optimization w.r.t. CO₂ footprint of the campus. This study tries to estimate (i) CO₂ Sequestration by existing plant material, (ii) required Sequestration as per the current Carbon footprint of the users. Further this research projects the Carbon Sequestration in the future by the current vegetation after its 100% growth.

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Optimization for Carbon Footprint in an Institutional Campus

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ABSTRACT

Development of environmentally sustainable cities is the need of today's fast urbanizing India. By 2050 nearly half the Indian population will be living in urban areas. Urban activities have increased the atmospheric Carbon Dioxide (CO₂), and will continue to increase. Indian cities are major producers of CO₂, but are not planned for enough Carbon Storage to compensate their own Carbon Footprints. It is imperative to maintain the "balance" between the Carbon emission and Sequestration to achieve environmental sustainability. Any process that removes CO₂ from the atmosphere and deposits it in a reservoir of any particular type (plant material, wood, soil, etc) is termed as 'Carbon Sequestration'. The Trees make the withdrawal of CO₂ from the atmosphere with the process of photosynthesis and store it in the form of growing plant material. Around 5%-21% of total photosynthetically fixed Carbon is transferred into the rhizosphere through root exudates. This study constitutes an estimation of standing biomass in the form of Plants and Trees, and the Carbon Sequestration by them at the institutional campus - 'Udhaji Maratha Boarding Campus, Nasik'. Objective is to find their value in environmental optimization w.r.t. CO₂ footprint of the campus. This study tries to estimate (i) CO₂ Sequestration by existing plant material, (ii) required Sequestration as per the current Carbon footprint of the users. Further this research projects the Carbon Sequestration in the future by the current vegetation after its 100% growth.

Key words : Carbon sequestration, Urban ecosystem, Standing biomass

Introduction

Carbon emissions have serious effects on the natural environment as well as on human health; by displacing oxygen in the atmosphere (Manisalidis I.). Tropical deforestation and activities like burning petroleum products for vehicular transportation; besides burning of the fossil fuels such as coal, oil, and natural gas; have caused a substantial increase in the concentration of atmospheric CO₂ over the last 2 centuries. Global CO₂ emissions increased by 63% from 1990 (22,200 Mt CO₂) to 2017 (36,200 Mt CO₂) with an average annual increase of 1.8% (Harald, 2021). This has caused global warming and high air

pollution levels. Even the oceans are becoming acidic, since high atmospheric CO₂ gets absorbed by the seawater.

Carbon Sequestration is a natural or artificial process by which CO₂ is removed from the atmosphere and held in solid or liquid form. Carbon is stored in various natural storages like oceans, fossil fuel deposits, soil (forestland, grassland, & agricultural land), terrestrial system (rocks, sediments, wetlands, & forests), and the atmosphere. Tree biomass (tree trunks, branches, foliage, and roots) is the terrestrial Carbon storage (Akhlaq, 2012).

Plants and Trees store Carbon for as long as they live, in the form of the live biomass. Carbon Seques-