EFFECT OF URBAN VEGETATION COVER ON CO_2 REDUCTION IN THE CITY

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Rising urban carbon dioxide levels have emerged as a critical issue due to their adverse effects on public health and the environment. Trees are a natural and sustainable solution to mitigate urban carbon dioxide (CO_2) concentrations, as they absorb CO_2 from the atmosphere through photosynthesis. However, the specific relationship between tree density and CO_2 concentration within cities is unclear. The main objectives of this research are to determine the relationship between tree density and CO_2 concentration reduction in cities and to identify the optimum tree density to reduce the CO_2 level in the city to obtain the required CO_2 level.

For this study, data were collected in the densely urbanized city of Colombo and various urban areas within the Hambantota district. Tree densities and CO_2 concentration reduction data were collected from 300 sample plots, each with a fixed size of 50m x 50m, near roads in selected urban areas. When calculating tree density, it is important to calculate canopy volumes of trees. It depends on canopy height, crown diameter and canopy shape. The tree density of the sample plot was calculated by dividing the total canopy volume by the area of the sample plot. A digital portable CO_2 meter was used to measure the CO_2 level. First the CO_2 concentration was measured at the centre of the road and then the CO_2 concentration was measured at the centre of the sample plot. The reduction in CO_2 level was calculated by the difference between these two readings.

By analysing tree densities and CO_2 concentration data collected through field data studies, a linear relationship was obtained between tree density and CO_2 concentration reduction in urban areas. The plotted line got a R^2 value of 0.8806 indicating a well-fitting model. Therefore, this linear plotted line can be described as a reasonable fitted line representing all collected data. Also, the data was classified based on the CO_2 concentration in the centre of the road and the behaviour of the CO_2 concentration reduction Vs tree density relationship was studied in each range. A linear relationship was obtained in each of those ranges. When all the collected data were classified as residential and non-residential based on the usage of the sample plots, the R^2 values obtained from those graphs were higher than the R^2 value of the graph drawn without classification. The R^2 value of the graph for non-residential areas has increased relative to the value of the graph for residential areas. Accordingly, classifying in this manner led to an increase in the accuracy of the relationship. Using these relationships, the optimum tree density required to obtain the required CO_2 reduction in urban areas can be identified. The results of this study will be valuable for policymakers and urban planners looking for ways to improve air quality and create more sustainable urban environments.

Keywords: Canopy volume, CO_2 concentration reduction, Urban air quality, Urban planning, Urban tree density

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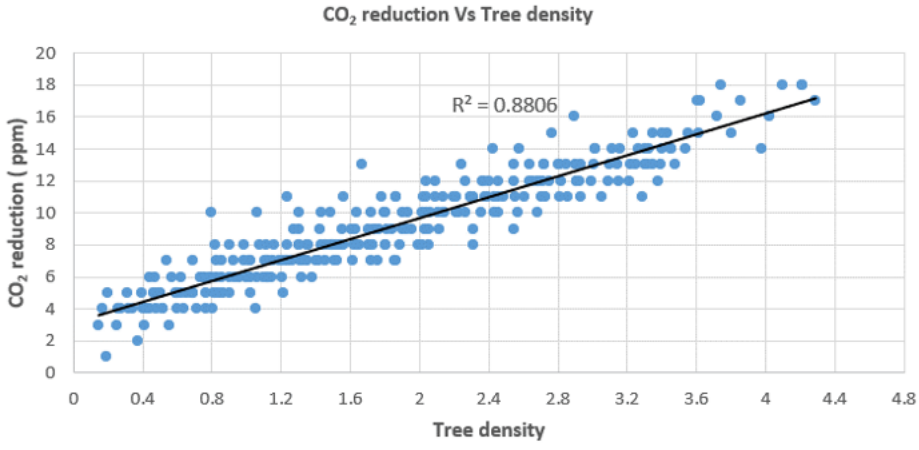
2. OBJECTIVES

- To determine the relationship between tree density and CO_2 concentration reduction in cities.
- To identify the optimum tree density to reduce the CO_2 level in the city to a required CO_2 level.

3. METHODOLOGY

1. **Study Area Selection**
2. **Tree Density Calculation**
3. **CO_2 Concentration Monitering**
4. **Data Analysis**
5. **Identifying Optimum Tree Density**

3. RESULTS



The relationship between CO_2 concentration reduction and tree density in urban areas.