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Urban Green Campus as Atmospheric Carbon Sink: Dhanamanjuri University, Imphal, Manipur

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Abstract

Deforestation has led to a noticeable decline in forest areas, making the restoration of forest trees increasingly difficult at the current pace of degradation. Urban trees, however, continue to play a crucial role in our environment by producing oxygen and fixing CO2 from the atmosphere through carbon sequestration. This contribution to enhancing air quality is often overlooked. Unfortunately, the health of urban greenery is on the decline, yet the Dhanamanjuri University and surrounding campuses frequently stand out as exceptions. Their expansive grounds alongside dedicated administrative efforts, help maintain a vibrant green space. This study highlights the importance of exploring the diverse tree species found on campuses and understanding their role as carbon sinks through both carbon sequestration and oxygen generation. In this study examining 124 different tree species found in the Dhanamanjuri University campus, it is found that Eucalyptus mannifera has the highest carbon sequestration potential while Citrus lemon ranks the lowest.

Notably, Enterolobium cyclocarpum stands out as the most important tree for carbon sequestration on the Dhanamanjuri University campus in Imphal. Their abundance contributes significantly to CO2 fixation and oxygen production. Thus, the trees on the campus of Dhanamanjuri University in Imphal represent a significant asset to the urban landscape of the city.

Keywords: Urban Green Campus, Carbon Sequestration, Oxygen Production, Dhanamanjuri University, Manipur.

Introduction

Forests make up a sizable amount of the planet's land area and are essential for maintaining biodiversity, regulating the climate, and sustaining human lifestyles [1]. However, agricultural expansion and other causes are the main drivers of deforestation and forest degradation, which continue to occur at alarming rates, resulting in a loss of biodiversity and a large contribution to carbon emissions [2]. Because they naturally absorb and store carbon dioxide, they are essential in combating climate change and lowering the amount of greenhouse gasses in the atmosphere [2, 3]. Urban greenery simultaneously enhances the quality of the environment and boosts human health. Additionally, it lowers the temperature of the air, helps save energy in buildings, and enhances the quality of the air and water [4].The most often mentioned advantage of urban trees is their ability to produce oxygen, and there are studies that link this ability to human oxygen consumption [5]. Some have referred to urban parks as the "lungs of the metropolis." The species of trees, their number and age, the local climate, and the length of the growing season all affect how much carbon a forest can store [6]. The process of absorbing and storing carbon dioxide from the atmosphere is known as carbon sequestration, and it is essential for lowering atmospheric carbon dioxide levels and slowing down climate change [7]. It is acknowledged as a crucial technique for eliminating carbon from the atmosphere. Plants naturally absorb and store carbon dioxide through the process of photosynthesis, which sequesters the gas as sugars that add to the soil's organic matter [8]. This process aims to stabilize carbon in solid and dissolved forms to prevent it from entering the Earth's atmosphere [9]. Hence, estimation of this carbon content in trees becomes imperative to access the Carbon sequestration potential. The trees, as they grow sequester the CO2 in their body (trunk, branches and roots) and this results in an increase in their biomass, indicative of an increase in carbon sequestered by them [10]. A third of the world's terrestrial carbon stores are stored in grasslands, demonstrating the importance of grasses in carbon sequestration [11]. Grasslands are more climate change adaptable than forests because the majority of their carbon is stored underground in the soil and root systems [12].

The risks associated with global warming due to greenhouse gas emissions from human activities have heightened the necessity to identify ecosystems that possess significant carbon sink capacity. This approach serves as an alternative strategy for terrestrial carbon sequestration [13, 14]. The present study deals with the estimation of the total carbon stock of the difference trees species in Dhanamanjuri University campus by non-destructive method. Thus, the total carbon stock in the trees of Dhanamanjuri University campus was calculated.

Methodology

Study Area

Figure 1: Figure: DMU Campus (Green Shaded)

The green-shaded area in Fig. 1—a section of Imphal city in the Indian state of Manipur—is the study area. Imphal city lies 24°48'38.71" N, 93°56'18.99"E. and the Dhanamanjuri university campus is located at 24°49'16.40" N, 93°56'29.49"E. The University campus and other surrounding areas, which is an urban setup in the heart of Imphal is stretching a total area of 141 acres. Temperatures peak in June and July with daily averages being around 27.75°C (High) / 15.5°C(Low), and end in late September with the onset of the monsoon [15]. Imphal averages 933 mm of rainfall annually, with the majority occurring during the monsoon season, which spans from late May to mid-October [16]. The area inside the university campus was related and studied in present investigation.

Figure 2: Measuring Tree Height Using Clinometer

Figure 3: Measuring GBH Using Measuring Tape

Data Collection

Each tree's species was recognized, and the number of individuals was noted, in order to estimate its carbon supply. A clinometer, as depicted in Figure 2, and a measuring tape, as depicted in Figure 3, were used to determine the tree's height. Therefore, using formulae including the tree bio volume (TBV), total biomass (TB), percentage of carbon sequestered (Cs), carbon dioxide fixation (CF), net oxygen produced (OP), and wood density, the total carbon stock of the trees was determined using a non-destructive manner [17, 18]. The Indian Woods provided the precise tree density [19]. The Tree Bio-Volume (TBV) value is calculated by multiplying the tree's height and diameter by 0.4 and 0.6 gm/cm, which is the standard average density in cases when the species' density is unavailable [3]. The value of belowground biomass is calculated by multiplying the aboveground biomass by 0.26 while taking the root: shoot ratio into account [5]. Carbon is typically thought to make up around 50% of a plant's total biomass [8]. The Tree Bio-Volume (TBV) value is calculated by multiplying the tree's height and diameter by 0.4 and 0.6 gm/cm, which is the standard average density in cases when the species' density is unavailable [20]. The value of belowground biomass is calculated by multiplying the aboveground biomass by 0.26 while taking the root: shoot ratio into account [2]. Carbon is typically thought to make up around 50% of a plant's total biomass [21].

Results and Discussion

Field data of trees from the study areas is tabulated in the table 1 and 2 and it is revealed that there are 124 species including 2262 individuals have been recorded, and identified during the study. Carbon sequestration (CS), CO_2 Fixation (CF) and O_2 production (OP) were calculated for all the trees and multiplied by the total number of trees for each species grown within study area giving Megagram (Mg), 5890.15 Megagram (Mg) and 5235.69 Megagram (Mg) respectively. The field data of trees studied from surveying the campuses revealed that the Enterobium cyclocarpum trees species are dominant in having 236 trees followed by Lagerstroemia speciose (223), Mangifera indica (175), Delonix regia (160), Ficus benghalis(140). The highest carbon sequestration is done by Enterobium cyclocarpum(385.38Mg), followed by Mangifera indica(271.48Mg), Delonix regia (207.57 Mg), Lagerstroemia speciosa(185.45Mg), Ficus benghalis(179.93Mg). The highest CO_2 fixation and O_2 production is done by Enterobium cyclocarpum (CF=1156.14 Mg). OP=1027.68 Mg) followed by Mangifera indica (CF=814.44Mg, OP= 723.95 Mg), Delonix regia (CF= 622.70Mg, OP= 553.51 Mg), Lagerstroemia speciosa (CF=556.34Mg, Op=494.52Mg) and Ficus benghalis (CF=539.78Mg, OP=479.81Mg) respectively. However, it is found that the highest carbon sequestration potential per each tree species is done by Eucalyptus mannifera (3.18Mg) followed by Eucalyptus globulus (2.25Mg), Trichilia havanensis (2.09Mg), Dalbergia latifolia (1.91Mg) and Bambusa (1.85Mg) as shown in the table 3.

Table 1: Field Data of Tree Species Studied in Dhanamanjuri University

SCIENTIFIC NAME	Total no. of trees	Avg. Height(m)	Avg. Diameter(m)
Enterobium cyclocarpum	236	12	0.9
Mangifera indica	175	17	0.6
Delonix regia	160	14	0.6
Lagerstroemia speciosa	223	11	0.5
Ficus benghalis	140	17	0.5
Eucalyptus globulus	56	22	0.67
Roystonea regia	59	15	0.6
Lagerstroemia parviflora	48	21	0.3
Bischofia polycarpa	33	15	0.6
Melaleuca citrina	112	6	0.4
Artocarpus heterophyllus	28	20	0.4
Ficus religiosa	21	16	0.6
Acacia auriculiformis	28	15	0.4
Kigelia africana	24	12	0.6
Trichilia havanensis	12	23	0.6
Bischofia javanica	33	7	0.4
Tamarindus indica	10	16	0.5
Bambusa	6	25	0.5
Spathodea campanulata	42	17	0.1
Magnolia kobus	15	11	0.42
Ziziphus mauritiana	89	8	0.1
Eucalyptus mannifera	3	35	0.6
Cinnamomum camphora	24	13	0.2
Parkia speciosa	8	21	0.34
Gmelina arborea	10	11	0.5
Litsea monopetala	47	9	0.13
Syzygium cumini	23	11	0.2
Quercus griffithii	13	15	0.2
Dalbergia latifolia	3	21	0.6
Mimusops elongi	88	4	0.1
Platanus occidentalis	4	21	0.4
Tipuana tipu	8	13	0.3
Premna mucronata	19	8	0.2
Tectona grandis	4	25	0.3
Oroxylum indicum	7	14	0.3
Elaeocarpus floribundus	3	20	0.4
Dillenia indica	9	13	0.2
Araucaria columnaris	17	9	0.14
Grevilla robusta	7	11	0.3
Artabotrys hexapetalus	22	5	0.2
Hesperocyparis lusitanica	50	5	0.08
Citrus lemon	15	7	0.2
Neolamarckia cadamba	2	15	0.64
Ficus elastica	20	5	0.2
Monoon longifolium	19	5	0.18
Albizia procera	5	11	0.3

Ficus racemosa	4	9	0.43
Celtis senensis	3	13	0.4
Phoenix dactylifera	8	16	0.12
Citrus maxima	17	8	0.11
Casuarina equisetifolia	3	15	0.3
Tabebuia rosea	8	8	0.2
Duabanga grandiflora	3	15	0.3
Terminalia chebula	7	9	0.2
Bixa orellana	3	14	0.3
Phyllanthus emblica	29	4	0.11
Nyctanthes arbor-tristis	3	11	0.4
Callistemon lanceolatus	6	10	0.2
Madhuca longifolia	1	15	0.8
Crateva religiosa	3	18	0.2
Phoebe hainesiana	3	18	0.2
Dysoxylum procerum	3	11	0.3
Aquilaria malaccensis	12	7	0.1
Bauhinea purpurea	9	3	0.28
Sapindus saporaria	1	21	0.4
Magnolia champaca	3	9	0.3
Albizia stipulata	4	10	0.2
Flacourtia jangomas	2	10	0.4
Ficus carica	2	11	0.34
Terminalia arjuna	1	11	0.6
Areca catechu	2	25	0.13
Sesbania grandiflora	2	16	0.2
Mesua ferrea	3	11	0.2
Cedrela toona	4	8	0.2
Psidium guajava	5	6	0.2
Artocarpus lakoocha	2	10	0.3
Philenoptera violacea	1	19	0.31
Anthocephalus cadamba	7	8	0.1
Lithocarpus pachyphyllus	1	18	0.3
Leucaena leucocephalla	4	6	0.2
Zanthoxylum budrunga	1	8	0.6
Cassia fistula	7	8	0.09
Magnolia grandiflora	1	15	0.3
Cordia dodecantra	6	8	0.08
Artabotrys odoratissimus	2	10	0.2
Prunus lusitanica	2	9	0.2
Averrhoa carambola	1	9	0.4
Melaleuca bracteata	3	10	0.12
Celtis australis	3	11	0.1
Xylosma longifolia	1	8	0.4
Araucaria hunsteinii	2	8	0.2
Senna siamea	4	8	0.1
Malus sylvestris	1	11	0.3
Cinnamomum zeylanicum	4	8	0.1

Populus deltoides	2	12	0.12
Nerium oleander	1	10	0.3
Elaeagnus pyriformis	5	9	0.06
Pyrus communis	1	8	0.3
Populus alba	1	11	0.2
Toona ciliata	3	6	0.1
Alstonia scholaris	1	8	0.2
Syzygium jambos	3	5	0.1
Mussaenda erythrophylla	1	8	0.2
Eugenia praecox	10	7	0.02
Euphorbia cotinifolia	7	3	0.06
Myena spinosa	2	7	0.1
Ficus retusa	1	4	0.32
Calliandra surinamensis	2	7	0.09
Pongamia pinnata	1	6	0.2
Pterocarpus indicus	1	2	0.6
Azadirachta indica	1	7	0.17
Psidum gnajaba	1	8	0.1
Melia azedarach	4	4	0.05
Alnus japonica	1	7	0.1
Inga laurina	1	5	0.14
Olea europaea	2	5	0.07
Lithocarpus dealbata	3	11	0.02
Emblica phyllanthus	3	5	0.02
Intsia bijuga	2	8	0.02
Hibiscus sp.	4	7	0.01
Genipa americana	2	7	0.02
Erythrina variegata	2	6	0.02
Alnus incana	2	6	0.02
Terminalia catappa	4	5	0.01
Allamanda cathartica	1	3	0.01
TOTAL	2262		

Table 2: Tree Species with their Total Carbon Sequestration (Cs), Total CO2 Fixation (CF) and Total O2 Production (OP)

SCIENTIFIC NAME	TBV (m3)	BIOMASS			Cs/tree (Mg)	Total Cs (Mg)	Total CF (Mg)	Net Op (Mg)
		AGB (kg)	BGB (kg)	TB (kg)				
Enterobium cyclocarpum	4.32	2592	673.92	3265.92	3.18	385.38	1156.14	1027.68
Mangifera indica	4.1	2462.4	640.22	3102.62	2.25	271.48	814.44	723.95
Delonix regia	3.43	2059.2	535.39	2594.59	2.09	207.57	622.7	553.51
Lagerstroemia speciosa	2.2	1320	343.2	1663.2	1.91	185.45	556.34	494.52
Ficus benghalis	3.4	2040	530.4	2570.4	1.85	179.93	539.78	479.81
Eucalyptus globulus	5.95	3569.76	928.14	4497.9	1.81	125.94	377.82	335.84
Roystonea regia	3.6	2160	561.6	2721.6	1.63	80.29	240.86	214.1
Lagerstroemia parviflora	2.46	1476	383.76	1859.76	1.55	44.63	133.9	119.02
Bischofia polycarpa	3.53	2116.8	550.37	2667.17	1.45	44.01	132.02	117.36

Melaleuca citrina	0.96	576	149.76	725.76	1.43	40.64	121.93	108.38
Artocarpus heterophyllus	3.2	1920	499.2	2419.2	1.36	33.87	101.61	90.32
Ficus religiosa	3.84	2304	599.04	2903.04	1.33	30.48	91.45	81.29
Acacia auriculiformis	2.4	1440	374.4	1814.4	1.3	25.4	76.2	67.74
Kigelia africana	2.78	1670.4	434.3	2104.7	1.29	25.26	75.77	67.35
Trichilia havanensis	5.52	3312	861.12	4173.12	1.29	25.04	75.12	66.77
Bischofia javanica	1.15	691.2	179.71	870.91	1.27	14.37	43.11	38.32
Tamarindus indica	3.2	1920	499.2	2419.2	1.21	12.1	36.29	32.26
Bambusa	4.9	2940	764.4	3704.4	1.21	11.11	33.34	29.64
Spathodea campanulata	0.69	412.8	107.33	520.13	1.21	10.92	32.77	29.13
Magnolia kobus	1.85	1108.8	288.29	1397.09	1.13	10.48	31.43	27.94
Ziziphus mauritiana	0.3	180	46.8	226.8	1.05	10.09	30.28	26.91
Eucalyptus mannifera	8.4	5040	1310.4	6350.4	1.05	9.53	28.58	25.4
Cinnamomum camphora	1	600	156	756	1.02	9.07	27.22	24.19
Parkia speciosa	2.79	1672.8	434.93	2107.73	0.93	8.43	25.29	22.48
Gmelina arborea	2.2	1320	343.2	1663.2	0.91	8.32	24.95	22.18
Litsea monopetala	0.47	280.8	73.01	353.81	0.87	8.31	24.94	22.17
Syzygium cumini	0.9	537.6	139.78	677.38	0.83	7.79	23.37	20.77
Quercus griffithii	1.2	720	187.2	907.2	0.83	5.9	17.69	15.72
Dalbergia latifolia	5.04	3024	786.24	3810.24	0.79	5.72	17.15	15.24
Mimusops elongi	0.16	93.6	24.34	117.94	0.76	5.19	15.57	13.84
Platanus occidentalis	3.36	2016	524.16	2540.16	0.74	5.08	15.24	13.55
Tipuana tipu	1.61	964.8	250.85	1215.65	0.7	4.86	14.59	12.97
Premna mucronata	0.64	384	99.84	483.84	0.69	4.6	13.79	12.26
Tectona grandis	3	1800	468	2268	0.68	4.54	13.61	12.1
Oroxylum indicum	1.68	1008	262.08	1270.08	0.66	4.45	13.34	11.85
Elaeocarpus floribundus	3.2	1920	499.2	2419.2	0.64	3.63	10.89	9.68
Dillenia indica	1	600	156	756	0.64	3.4	10.21	9.07
Araucaria columnaris	0.52	312.48	81.24	393.72	0.64	3.35	10.04	8.92
Grevilla robusta	1.26	756	196.56	952.56	0.61	3.33	10	8.89
Artabotrys hexapetalus	0.4	240	62.4	302.4	0.6	3.33	9.98	8.87
Hesperocyparis lusitanica	0.16	96	24.96	120.96	0.57	3.02	9.07	8.06
Citrus lemon	0.52	312	81.12	393.12	0.57	2.95	8.85	7.86
Neolamarckia cadamba	3.79	2273.28	591.05	2864.33	0.57	2.86	8.59	7.64
Ficus elastica	0.37	220.8	57.41	278.21	0.54	2.78	8.35	7.42
Monoon longifolium	0.37	220.32	57.28	277.6	0.54	2.64	7.91	7.03
Albizia procera	1.32	792	205.92	997.92	0.5	2.49	7.48	6.65
Ficus racemosa	1.6	959.76	249.54	1209.3	0.5	2.42	7.26	6.45
Celtis senensis	2.02	1209.6	314.5	1524.1	0.49	2.29	6.86	6.1
Phoenix dactylifera	0.75	449.28	116.81	566.09	0.48	2.26	6.79	6.04
Citrus maxima	0.33	198	51.48	249.48	0.48	2.12	6.36	5.65
Casuarina equisetifolia	1.84	1101.6	286.42	1388.02	0.48	2.08	6.25	5.55
Tabebuia rosea	0.67	403.2	104.83	508.03	0.48	2.03	6.1	5.42
Duabanga grandiflora	1.74	1044	271.44	1315.44	0.46	1.97	5.92	5.26
Terminalia chebula	0.74	446.4	116.06	562.46	0.45	1.97	5.91	5.25
Bixa orellana	1.7	1022.4	265.82	1288.22	0.44	1.93	5.8	5.15
Phyllanthus emblica	0.18	105.6	27.46	133.06	0.43	1.93	5.79	5.14
Nyctanthes arbor-tristis	1.68	1008	262.08	1270.08	0.42	1.91	5.72	5.08
Callistemon lanceolatus	0.82	494.4	128.54	622.94	0.38	1.87	5.61	4.98

Madhuca longifolia	4.8	2880	748.8	3628.8	0.38	1.81	5.44	4.84
Crateva religiosa	1.44	864	224.64	1088.64	0.36	1.63	4.9	4.35
Phoebe hainesiana	1.44	864	224.64	1088.64	0.34	1.63	4.9	4.35
Dysoxylum procerum	1.26	756	196.56	952.56	0.34	1.43	4.29	3.81
Aquilaria malaccensis	0.29	172.8	44.93	217.73	0.32	1.31	3.92	3.48
Bauhinea purpurea	0.38	228.48	59.4	287.88	0.32	1.3	3.89	3.45
Sapindus saporaria	3.41	2044.8	531.65	2576.45	0.31	1.29	3.86	3.44
Magnolia champaca	1.12	669.6	174.1	843.7	0.31	1.27	3.8	3.37
Albizia stipulata	0.83	499.2	129.79	628.99	0.3	1.26	3.77	3.35
Flacourtia jangomas	1.52	912	237.12	1149.12	0.28	1.15	3.45	3.06
Ficus carica	1.5	897.6	233.38	1130.98	0.28	1.13	3.39	3.02
Terminalia arjuna	2.69	1612.8	419.33	2032.13	0.28	1.02	3.05	2.71
Areca catechu	1.3	780	202.8	982.8	0.26	0.98	2.95	2.62
Sesbania grandiflora	1.28	768	199.68	967.68	0.25	0.97	2.9	2.58
Mesua ferrea	0.84	504	131.04	635.04	0.25	0.95	2.86	2.54
Cedrela toona	0.62	374.4	97.34	471.74	0.24	0.94	2.83	2.52
Psidium guajava	0.5	297.6	77.38	374.98	0.24	0.94	2.81	2.5
Artocarpus lakoocha	1.21	727.2	189.07	916.27	0.24	0.92	2.75	2.44
Philenoptera violacea	2.31	1383.84	359.8	1743.64	0.24	0.87	2.62	2.32
Anthocephalus cadamba	0.3	180	46.8	226.8	0.22	0.79	2.38	2.12
Lithocarpus pachyphyllus	2.1	1260	327.6	1587.6	0.2	0.79	2.38	2.12
Leucaena leucocephalla	0.51	307.2	79.87	387.07	0.2	0.77	2.32	2.06
Zanthoxylum budrunga	1.97	1180.8	307.01	1487.81	0.19	0.74	2.23	1.98
Cassia fistula	0.28	168.48	43.8	212.28	0.19	0.74	2.23	1.98
Magnolia grandiflora	1.8	1080	280.8	1360.8	0.19	0.68	2.04	1.81
Cordia dodecantra	0.27	161.28	41.93	203.21	0.19	0.61	1.83	1.63
Artabotrys odoratissimus	0.8	480	124.8	604.8	0.18	0.6	1.81	1.61
Prunus lusitanica	0.75	451.2	117.31	568.51	0.18	0.57	1.71	1.52
Averrhoa carambola	1.5	902.4	234.62	1137.02	0.18	0.57	1.71	1.52
Melaleuca bracteata	0.49	296.64	77.13	373.77	0.17	0.56	1.68	1.5
Celtis australis	0.46	273.6	71.14	344.74	0.17	0.52	1.55	1.38
Xylosma longifolia	1.33	796.8	207.17	1003.97	0.15	0.5	1.51	1.34
Araucaria hunsteinii	0.64	384	99.84	483.84	0.14	0.48	1.45	1.29
Senna siamea	0.32	189.6	49.3	238.9	0.14	0.48	1.43	1.27
Malus sylvestris	1.26	756	196.56	952.56	0.14	0.48	1.43	1.27
Cinnamomum zeylanicum	0.31	187.2	48.67	235.87	0.12	0.47	1.42	1.26
Populus deltoides	0.58	345.6	89.86	435.46	0.12	0.44	1.31	1.16
Nerium oleander	1.14	684	177.84	861.84	0.12	0.43	1.29	1.15
Elaeagnus pyriformis	0.22	132.48	34.44	166.92	0.12	0.42	1.25	1.11
Pyrus communis	0.91	547.2	142.27	689.47	0.11	0.34	1.03	0.92
Populus alba	0.84	504	131.04	635.04	0.11	0.32	0.95	0.85
Toona ciliata	0.25	148.8	38.69	187.49	0.11	0.28	0.84	0.75
Alstonia scholaris	0.66	398.4	103.58	501.98	0.11	0.25	0.75	0.67
Syzygium jambos	0.21	127.2	33.07	160.27	0.11	0.24	0.72	0.64
Mussaenda erythrophylla	0.62	374.4	97.34	471.74	0.11	0.24	0.71	0.63
Eugenia praecox	0.06	34.56	8.99	43.55	0.1	0.22	0.65	0.58
Euphorbia cotinifolia	0.08	48.96	12.73	61.69	0.1	0.22	0.65	0.58
Myena spinosa	0.27	163.2	42.43	205.63	0.1	0.21	0.62	0.55
Ficus retusa	0.51	307.2	79.87	387.07	0.09	0.19	0.58	0.52

Calliandra surinamensis	0.26	153.36	39.87	193.23	0.08	0.19	0.58	0.52
Pongamia pinnata	0.48	288	74.88	362.88	0.08	0.18	0.54	0.48
Pterocarpus indicus	0.48	288	74.88	362.88	0.07	0.18	0.54	0.48
Azadirachta indica	0.46	277.44	72.13	349.57	0.06	0.17	0.52	0.47
Psidum gnajaba	0.33	196.8	51.17	247.97	0.06	0.12	0.37	0.33
Melia azedarach	0.08	45.6	11.86	57.46	0.05	0.11	0.34	0.31
Alnus japonica	0.28	170.4	44.3	214.7	0.03	0.11	0.32	0.29
Inga laurina	0.28	168	43.68	211.68	0.03	0.11	0.32	0.28
Olea europaea	0.14	82.32	21.4	103.72	0.03	0.1	0.31	0.28
Lithocarpus dealbata	0.08	50.4	13.1	63.5	0.02	0.1	0.29	0.25
Emblica phyllanthus	0.04	24	6.24	30.24	0.02	0.05	0.14	0.12
Intsia bijuga	0.06	36	9.36	45.36	0.02	0.05	0.14	0.12
Hibiscus sp.	0.03	17.04	4.43	21.47	0.02	0.04	0.13	0.11
Genipa americana	0.05	31.68	8.24	39.92	0.02	0.04	0.12	0.11
Erythrina variegata	0.05	28.8	7.49	36.29	0.02	0.04	0.11	0.1
Alnus incana	0.04	26.4	6.86	33.26	0.01	0.03	0.1	0.09
Terminalia catappa	0.02	12	3.12	15.12	0.01	0.03	0.09	0.08
Allamanda cathartica	0.01	8.16	2.12	10.28	0.01	0.01	0.02	0.01
TOTAL						1963.4	5890.15	5235.69

Table 3: Top Ten Tree Species on the Basis of Carbon Sequestration Potential.

SCIENTIFIC NAME	Total no. of trees	Avg. Height(m)	Avg. Diameter(m)	Cs/tree (Mg)
Eucalyptus mannifera	3	35	0.6	3.18
Eucalyptus globulus	56	22	0.67	2.25
Trichilia havanensis	12	23	0.6	2.09
Dalbergia latifolia	3	21	0.6	1.91
Bambusa	6	25	0.5	1.85
Madhuca longifolia	1	15	0.8	1.81
Enterobium cyclocarpum	236	12	0.9	1.63
Mangifera indica	175	17	0.6	1.55
Ficus religiosa	21	16	0.6	1.45
Neolamarckia cadamba	2	15	0.64	1.43

Conclusion

The findings of the study clearly show that green spaces, such as university campuses located in urban areas, can play a very important role in improving air quality and reducing the impact of climate change. These green campuses help the environment by storing carbon, absorbing carbon dioxide from the air, and releasing oxygen, which is essential for all living beings. One such example is Dhanamanjuri University, which is situated in the heart of Imphal city, Manipur. The trees on this campus have made a significant contribution by fixing about 5890.15 Megagrams (Mg) of carbon dioxide and producing around 5235.69 Mg of oxygen. These figures highlight the important role the campus trees play in maintaining a cleaner and healthier atmosphere in the city. Therefore, the green cover of Dhanamanjuri University is not just a part of the landscape but a valuable environmental asset that supports the urban ecosystem and helps make Imphal a more sustainable city.

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