



Assessment of Carbon Sequestration in Selected Urban Gardens of Ahmedabad, Gujarat, India

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Abstract

As climate change increasingly affects urban areas, innovative local mitigation strategies are essential. Urban green spaces such as parks and gardens hold significant potential as carbon sinks by capturing and storing atmospheric carbon in vegetation and soil. This study evaluates the carbon sequestration capacity of selected urban gardens in Ahmedabad, Gujarat, aiming to quantify their role in climate change mitigation and guide urban ecological planning. Using GIS mapping, field-based vegetation surveys, and non-destructive biomass estimation methods, data were gathered from various public gardens larger than 0.5 hectares across the different zones of city. Above- and below-ground carbon stocks, primarily from trees, were calculated using standardized allometric equations. The study provides an evidence-based assessment of carbon storage in Ahmedabad's green spaces, supporting recommendations for sustainable planting, enhanced urban forest cover, and policy actions to strengthen climate resilience in Indian cities.

Keywords: Ahmedabad Gardens, Carbon sequestration, Trees

Introduction

Climate change is reshaping global priorities, with urban areas emerging as key contributors to CO₂ emissions. Forest conservation in developing regions offers a cost-effective path to emission reduction, especially as deforestation and degradation remain major challenges. Meanwhile, rapid urbanization is intensifying environmental and public health pressures, even in historically low-urbanized nations. Recognizing the role of green infrastructure, national frameworks now advocate for local greenery—down to household-level tree planting. Urban trees not only sequester carbon but also purify air and enhance livability. This study assesses the carbon storage potential of green spaces in Ahmedabad by mapping their distribution, evaluating species composition, and estimating carbon stocks.

Carbon sequestration refers to the process by which carbon dioxide (CO₂) is captured from the atmosphere and stored in natural reservoirs such as forests, soils, oceans, and vegetation. In ecological and climate contexts, it plays a vital role in mitigating global warming by reducing atmospheric greenhouse gas concentrations. Plants, especially trees, act as living carbon sinks—absorbing CO₂ through photosynthesis and storing it in their biomass and surrounding soil. The significance of carbon sequestration extends beyond climate regulation; it supports biodiversity, enhances soil health, and contributes to ecosystem resilience. As urbanization intensifies and emissions rise, integrating carbon-sequestering green spaces into city planning becomes essential. Understanding the carbon storage potential of different plant species and landscapes allows for targeted interventions that align ecological function with climate goals.

Ahmedabad, the largest city in Gujarat, is home to 214 public gardens that serve as vital ecological buffers in an increasingly urbanized landscape. These green spaces, managed by the Ahmedabad Municipal Corporation,

contribute significantly to improving air quality, reducing urban heat, and enhancing the city's aesthetic and recreational appeal. Beyond their visual charm, trees in these gardens play a crucial role in carbon sequestration, absorbing atmospheric CO₂ and helping mitigate climate change. By blending natural biodiversity with thoughtful design, Ahmedabad's gardens offer a model for sustainable urban living—where environmental function, cultural value, and public well-being converge.

Method and Methodology

Study Area

We conducted an intensive field survey within a selected 10 public gardens across different zones of Ahmedabad to assess urban tree diversity. Gardens were selected to represent varied ecological and planning contexts, and each site was geo-tagged using GPS tools for spatial accuracy, focusing exclusively on tree species to assess their carbon sequestration potential. For each tree, we measured girth at breast height (GBH) and total height using standardized methods, ensuring consistency across the dataset. All individuals of each species present in the study area were documented, allowing for species-level aggregation and minimizing sampling bias. The biometric data were digitized and processed using species-specific allometric equations sourced from validated literature, enabling accurate estimation of above-ground biomass and corresponding carbon stock. For each species, the average carbon sequestration value was calculated by aggregating individual tree estimates. These species-level averages formed the basis for comparative analysis, spatial mapping, and ecological interpretation of carbon density across the site. This design ensures both methodological rigor and ecological relevance, offering insights into the role of urban trees in climate mitigation.

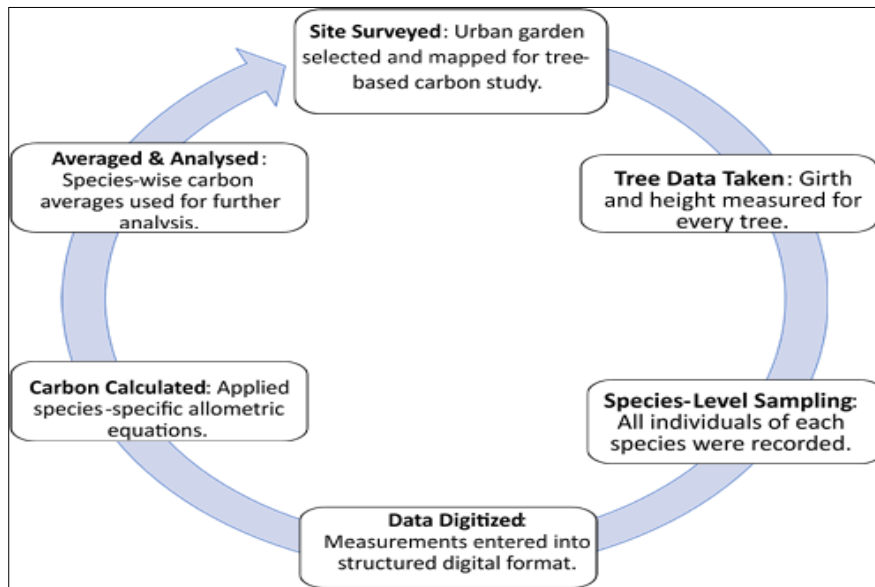
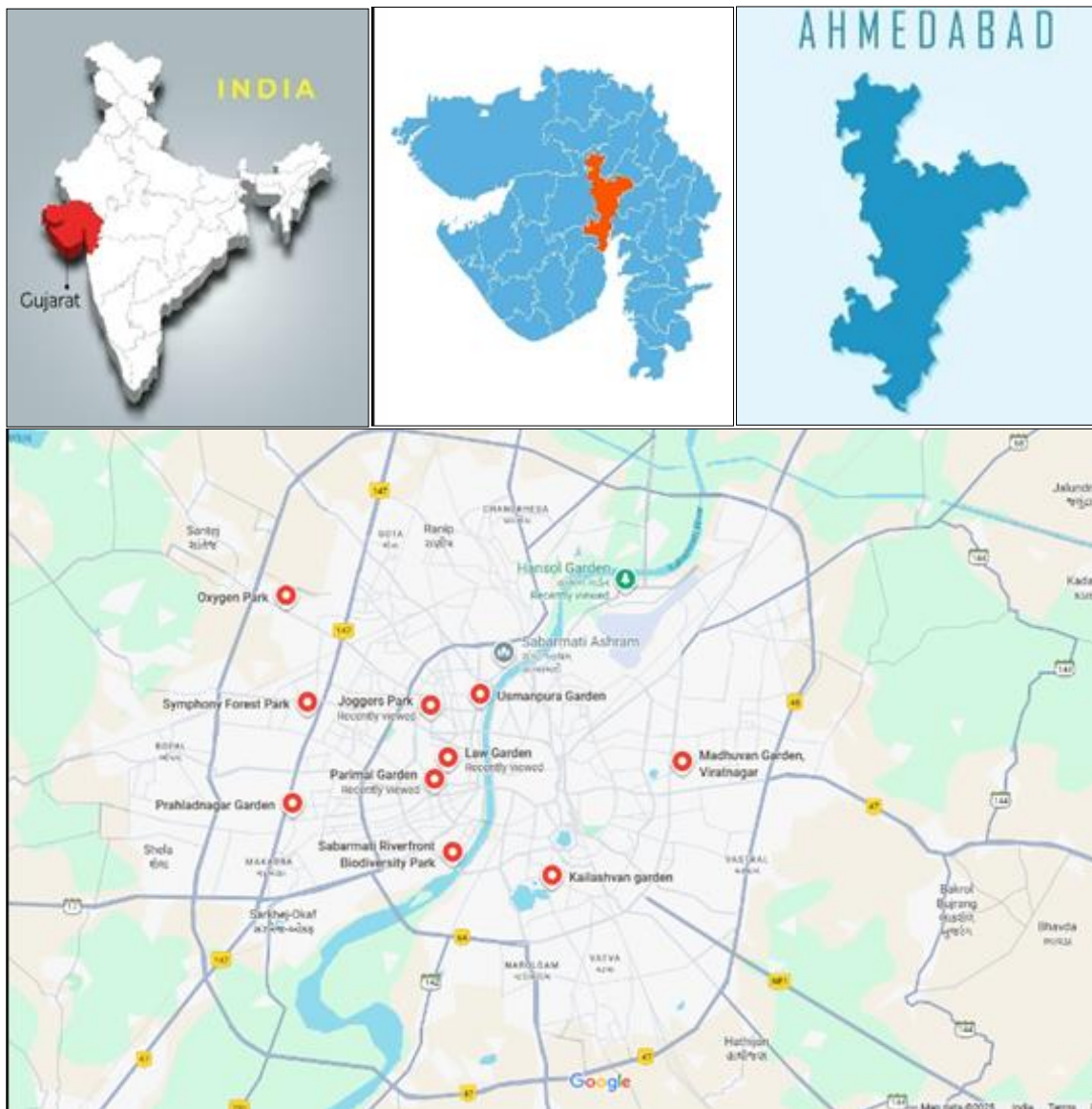


Fig 1: Research methodology



Map1: (a) Map of India (b) Map of Gujarat (c) Map of Ahmedabad (d) Study area
 Selected garden list are as follows: (Mapped as in Map 1.)

1. Parimal garden
2. Symphony Park
3. Usmanpura garden

4. Jogger’s Park
5. Oxygen Park
6. Law Garden
7. Madhuvan garden
8. Kailashvan garden
9. Riverfront biodiversity park
10. Prahladnagar garden

Methodology for Data Collection:

We used a non-destructive method to estimate carbon stock in ten urban gardens of Ahmedabad. For each tree, we recorded GPS location, girth at breast height (GBH at 1.3 m), and height. Forked trees below breast height were measured individually; leaning trees were measured on the lower side. Height was estimated by marking a reference point at 1.5 m and extrapolating.

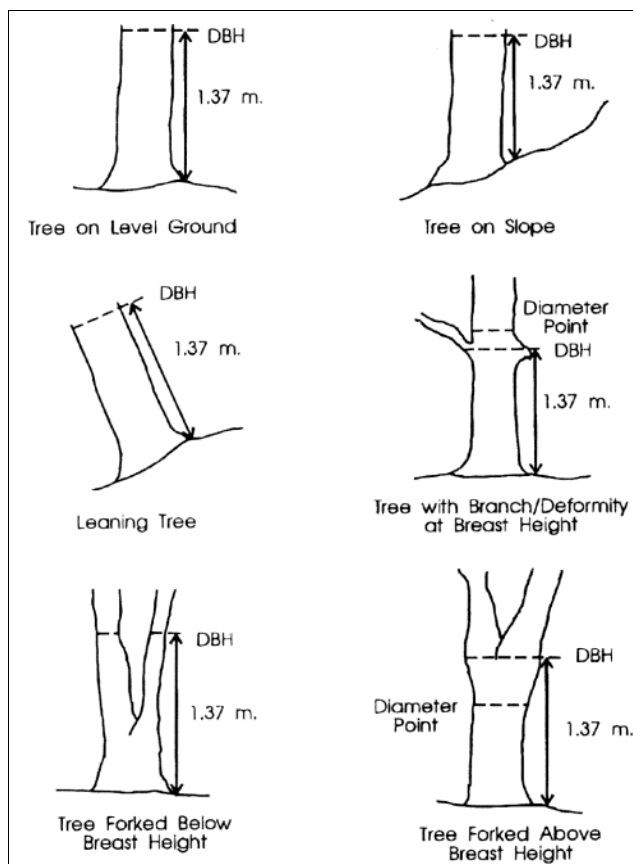


Fig 2: Different ways to measure the DBH on the field

Datasheet for field measurements

Field Measurements								
Tree ID	Botanical Name	Common name	Family	GBH	Height(H)	Canopy	Latitude	Longitude
1.								
2.								
3.								
4.								
5.								

Calculations of total carbon sequestration value:

Field measurements were taken in-situ and converted to biomass and carbon stock using species-specific allometric equations. Random sampling was applied to assess above-ground vegetation (Hangarge *et al.*, 2012). The methodology is summarized in Fig. 3.

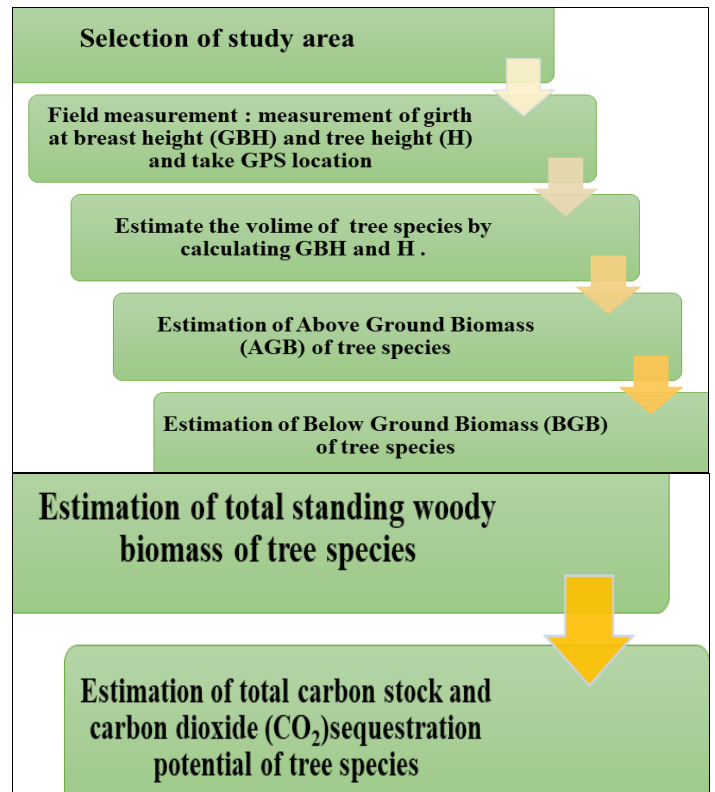


Fig3: Outline of methodology of carbon sequestration value through allometric equations

Carbon stock measurement

Here, above-ground tree biomass and belowground tree biomass are measured. The following parameters were measured for estimating the above-ground biomass (AGB) and below-ground biomass (BGB).

a. Estimation of Above ground biomass (AGB)

The wood densities were obtained from the wood density database of the World Agroforestry Centre (Brown *et al.*, 1989; Ravindranath and Ostwald, 2007; Hangarge *et al.*, 2012; Suganthi *et al.*, 2017) or from the available literature. Where the wood density of a tree species was unavailable, the standard average value of 0.6 g/cm³ was taken (Warran, *et al.*, 2001). In this study, above-ground biomass (AGB) was estimated in R Studio software by installing the biomass package. AGB was estimated in metric tonnes per tree.

$$\text{Above Ground Biomass} = \text{Volume of the tree (m}^3\text{)} \times \text{Wood density (kg/m}^3\text{)}$$

$$(\text{AGB}) (\text{ kg/tree or ton/tree}) = \pi r^2 H (\text{ m}^3) \times \text{Wood density (kg/m}^3\text{)}$$

$$= (\text{GBH})^2 / 4\pi \times H \times \text{Wood density (kg/m}^3\text{)}$$

Where,

$$r = \text{radius of the tree} = \text{GBH} / 2\pi$$

$$H = \text{height of the tree}$$

b. Estimation of Below Ground Biomass (BGB)

Below-ground biomass (BGB) includes live root biomass, excluding fine roots. MacDicken (1997); Kumar Phani *et al.* (2009) and Hangarge *et al.* (2012) in their study suggested that below-ground biomass (BGB) incorporates with all living biomass of root systems barring fine roots having < 2 mm distance across.

$$\text{Below Ground Biomass (BGB) (kg/tree or ton/tree)} = 0.26 \times \text{Above Ground Biomass (AGB)}$$

c. Estimation of Total Biomass (TB)

However, Hangarge *et al.* (2012) and Nguyen (2012) proposed that the total biomass of tree species is calculated by the sum of aboveground biomass (AGB) and below ground biomass (BGB) of tree species. The Total Biomass of tree species is calculated by the following equation.

$$\text{Total Biomass (TB) (kg/tree or ton/tree)} = \text{Above Ground Biomass} + \text{Below Ground Biomass}$$

d. Estimation of Total Carbon Stock (TCS)

Yeboah in the year 2011 stated that the carbon concentration in the tropical forest may vary with tree species. He added further into it that to convert total biomass into carbon stock concentration of tree species and to estimate it the specific wood density for each tree species are to be known. However, Pearson *et al.* (2005); Lewis *et al.* (2009) and Sheikh *et al.* (2011) suggested in their studies that generally, the carbon concentration of each tree species is

approximately 50% in dry wood and it is widely accepted as a constant factor for conversion of biomass to carbon stock.

e. Estimation of Carbon Dioxide (CO₂) Sequestration Potential

Sheikh *et al.* (2011); Hangarge *et al.* (2012) and Nguyen (2012) estimated that the weight of carbon dioxide sequestered i.e. carbon dioxide (CO₂) is composed of one molecule of carbon (C) and two molecules of oxygen (O) and the atomic weight of carbon (C) is 12 g/mol and the atomic weight of oxygen (O) is 16 g/mol. Hence, the total weight of carbon dioxide (CO₂) is calculated (1 x atomic weight of carbon (C) + (2 x atomic weight of oxygen (O)) = 44 g/mol, while the ratio of carbon dioxide (CO₂) to carbon (C) is considered as 44/12 = 3.67. Therefore, they multiplied the weight of carbon in the tree species by a factor of 3.67 for determining the weight of carbon dioxide (CO₂) sequestered in tree species.

$$\text{Total Carbon Dioxide (CO}_2\text{) Sequestration (TCS) (kg/tree or ton/tree)} = 3.67 \times \text{Total Carbon Stock}$$

Observation

The below mentioned table is reflecting the list of the plants observed during the field study.

Sr. No.	Scientific Name	Family	Average of Girth (cm)	Average of Height(cm)	Average of Total Carbon Sequestration
1	<i>Acacia auriculiformis</i> A Cunn ex Benth	Fabaceae	44.60875	652.78	6928.647536
2	<i>Acacia nilotica</i> (L.) Delile	Fabaceae	66.04	914.4	20105.02965
3	<i>Adansonia digitata</i> L.	Malvaceae	45.72	670.56	5598.869016
4	<i>Adenanthera pavonina</i> L.	Fabaceae	70.104	914.4	20598.18256
5	<i>Aegle marmelos</i> (L.) Correa	Rutaceae	51.5112	538.48	7735.205148
6	<i>Ailanthus excelsus</i> Roxb.	Simaroubaceae	160.401	1310.64	58860.82513
7	<i>Albizia lebeck</i> (L.) Benth.	Fabaceae	89.19410526	921.5226947	18935.30596
8	<i>Albizia procera</i> (Roxb.) Benth.	Fabaceae	168.91	1219.2	41369.42106
9	<i>Albizia saman</i> (Jacq.) Merr.	Fabaceae	63.5	914.4	10603.91859
10	<i>Alstonia scholaris</i> (L.) R.Br.	Apocynaceae	66.08639024	647.5760976	6606.301697
11	<i>Annona cherimola</i> Mill.	Annonaceae	38.1	609.6	6532.013852
12	<i>Annona squamosa</i> L.	Annonaceae	39.878	420.624	3410.644376
13	<i>Anogeissus acuminata</i> Wall. ex Bedd.	Combretaceae	38.1	609.6	8907.291616
14	<i>Anogeissus pendula</i> Edgew.	Combretaceae	44.02666667	863.6	10768.39715
15	<i>Azadirachta indica</i> A. Juss.	Meliaceae	101.4304538	833.4358992	24512.43512
16	<i>Bauhinia blakeana</i> Dunn	Fabaceae	23.495	464.82	3251.868368
17	<i>Bauhinia divaricata</i> L.	Fabaceae	37.1475	579.12	6287.063332
18	<i>Bauhinia purpurea</i> L.	Fabaceae	30.75529412	435.3111765	3985.276596
19	<i>Bauhinia tomentosa</i> L.	Fabaceae	36.195	548.64	3877.853029
20	<i>Bombax ceiba</i> L.	Malvaceae	50.8	826.008	7014.986997
21	<i>Bridelia micrantha</i> (Hochst.) Baill.	Phyllanthaceae	39.624	647.7	7311.613947
22	<i>Butea monosperma</i> (Lam.) Taub.	Fabaceae	50.42923077	513.4707692	5500.787329
23	<i>Calliandra surinamensis</i> Benth.	Fabaceae	52.451	533.4	4619.066938
24	<i>Callistemon citrinus</i> (Curtis) Skeels	Myrtaceae	58.42	746.76	13724.29837
25	<i>Callistemon lanceolatus</i> Sweet	Myrtaceae	49.25875	409.2575	13579.82902
26	<i>Callistemon viminalis</i> (Sol. ex Gaertn.) G. Don	Myrtaceae	89.535	967.74	26174.71265
27	<i>Calophyllum inophyllum</i> L.	Calophyllaceae	32.325	270.51	2017.538846
28	<i>Carica papaya</i> L.	Caricaceae	68.58	365.76	3664.714265
29	<i>Caryota mitis</i> Lour.	Arecaceae	72.53111111	768.7733333	9205.992221
30	<i>Caryota urens</i> L.	Arecaceae	55.88	1066.8	13064.0277
31	<i>Cassia biflora</i> L.	Fabaceae	38.1	335.28	3732.579344
32	<i>Cassia fistula</i> L.	Fabaceae	59.57428571	605.0038095	8999.898747
33	<i>Cassia javanica</i> Vell.	Fabaceae	110.2148333	810.26	23303.63571
34	<i>Cassia roxburghii</i> DC.	Fabaceae	52	457.2	6078.46672
35	<i>Cassia siamea</i> Lam.	Fabaceae	50.17058824	532.5035294	8015.371908
36	<i>Casuarina equisetifolia</i> L.	Casuarinaceae	50.50366667	788.19375	12748.14286
37	<i>Ceiba pentandra</i> (L.) Gaertn.	Malvaceae	63.3168	775.335	5855.291428
38	<i>Ceiba speciosa</i> (A St.-Hil) Ravenna	Malvaceae	60.96	396.24	4852.353147
39	<i>Citharexylum spinosum</i> L.	Verbenaceae	17.31333333	233.68	2864.046605
40	<i>Citrus limon</i> (L.) Burm.f.	Rutaceae	30.48	163.4066667	1146.071521
41	<i>Citrus maxima</i> (Burm.) Merr.	Rutaceae	112.649	960.12	31404.5653
42	<i>Cocos nucifera</i> L.	Arecaceae	83.39666667	1158.24	18521.51114
43	<i>Conocarpus erectus</i> L.	Combretaceae	37.7444	588.5329412	8355.827969

44	<i>Cordia dichotoma</i> G. Forst.	Boraginaceae	72.25659259	606.0251852	10179.33491
45	<i>Cordia myxa</i> Forssk.	Boraginaceae	55.15428571	326.5714286	3487.679319
46	<i>Cordia rothii</i> Roem. & Schult.	Boraginaceae	13.5	243.84	661.283742
47	<i>Cordia sebestena</i> L.	Boraginaceae	39.33644444	410.6803704	4722.390695
48	<i>Couroupita guianensis</i> Aubl.	Lecythidaceae	102.9546667	680.72	19325.52381
49	<i>Dalbergia latifolia</i> Roxb.	Fabaceae	47.3964	585.5546667	9461.887555
50	<i>Dalbergia sissoo</i> Roxb.	Fabaceae	47.74	704.215	10300.19045
51	<i>Delonix regia</i> (Boj ex Hook.) Raf.	Fabaceae	76.591568	895.66496	16712.57595
52	<i>Diospyros virginiana</i> L.	Ebenaceae	40.64	609.6	6153.100494
53	<i>Erythrina variegata</i> L.	Fabaceae	62.33342105	660.9347368	4057.940138
54	<i>Eucalyptus globulus</i> L.	Myrtaceae	98.49152381	1119.777143	44565.36807
55	<i>Fernandoa adenophylla</i> (Wall. ex G. Don) Steenis	Bignoniaceae	73.23666667	386.5033333	8005.251608
56	<i>Ficus benghalensis</i> L.	Moraceae	133.162129	790.5135484	47312.33757
57	<i>Ficus racemosa</i> L.	Moraceae	78.89427586	910.1958621	11078.32419
58	<i>Ficus religiosa</i> L.	Moraceae	110.7553778	916.7706667	17521.59906
59	<i>Ficus rumphii</i> Blume.	Moraceae	131.7625	352.1075	9494.21851
60	<i>Ficus virens</i> Aiton	Moraceae	50.8	762	4524.338599
61	<i>Gliricidia sepium</i> (Jacq.) Kunth	Fabaceae	76.454	800.1	18685.51841
62	<i>Gmelina arborea</i> Roxb.	Lamiaceae	50.8	914.4	9670.773755
63	<i>Grevillea robusta</i> A. Cunn. ex R.Br.	Proteaceae	34.188	508	6059.941869
64	<i>Guarea guidonia</i> (L.) Sleumer	Meliaceae	30.48	548.64	3176.085696
65	<i>Guazuma ulmifolia</i> Lam.	Malvaceae	50.8	457.2	4496.061482
66	<i>Hibiscus tiliaceus</i> L.	Malvaceae	35.13666667	381	2926.681531
67	<i>Holoptelea integrifolia</i> (Roxb.) Planch.	Ulmaceae	66.90165714	733.2617143	14541.28981
68	<i>Homolepis cedron</i> (Sw.) Chase	Poaceae	30.48	762	4241.567436
69	<i>Ixora coccinea</i> Comm.ex Lam.	Rubiaceae	38.1	782.32	7319.343025
70	<i>Ixora notoniana</i> Wall. ex G. Don	Rubiaceae	30.42355556	480.9066667	4641.556671
71	<i>Khaya senegalensis</i> A. Juss.	Meliaceae	47.93225806	797.396129	8588.216285
72	<i>Kigelia pinnata</i> (Jacq.) DC	Bignoniaceae	119.7535294	871.3694118	24309.58733
73	<i>Lagerstroemia speciosa</i> (L.) Pers.	Lythraceae	33.19857143	478.9714286	3943.713025
74	<i>Leucaena leucocephala</i> (Lam.) de Wit	Fabaceae	41.86767123	899.3687671	8928.616545
75	<i>Livistona carinensis</i> (Chiov.) J. Dransf. & N.W. Uhl	Arecaceae	42.25636364	537.5563636	5164.60963
76	<i>Livistona chinensis</i> (Jacq.) R.Br. ex Mart.	Arecaceae	52.34666667	689.864	8278.822688
77	<i>Madhuca indica</i> J.F. Gmel.	Sapotaceae	43.18	1005.84	13800.36381
78	<i>Madhuca longifolia</i> (Koenig) J.F. Macbride	Sapotaceae	37.25333333	640.08	6940.146896
79	<i>Mangifera indica</i> L.	Anacardiaceae	66.18111111	615.1315556	9367.636785
80	<i>Manilkara hexandra</i> Dubard	Sapotaceae	42.06863158	450.7831579	6600.92236
81	<i>Manilkara zapota</i> (L.) P. Royen	Sapotaceae	29.63333333	386.08	3741.439507
82	<i>Markhamia lutea</i> (Benth.) K. Schum.	Bignoniaceae	30.48	975.36	7057.968214
83	<i>Melaleuca bracteata</i> F. Muell.	Myrtaceae	11	274.32	723.6269904
84	<i>Melaleuca viminalis</i> (Sol. ex Gaertn.) Byrnes	Myrtaceae	49.98582609	553.9408696	9200.693319
85	<i>Melia azedarach</i> L.	Meliaceae	101.6	914.4	20359.52369
86	<i>Melia dubia</i> Cav.	Meliaceae	71.2	853.44	9342.581083
87	<i>Millingtonia hortensis</i> L.f.	Bignoniaceae	61.5244375	871.5375	9318.347406
88	<i>Mimusops elengi</i> L.	Sapotaceae	68.09579104	668.5507463	16939.29651
89	<i>Mitragyna parvifolia</i> (Roxb.) Korth.	Rubiaceae	80.01	934.72	16446.10654
90	<i>Moringa oleifera</i> Lam.	Moringaceae	55.88	762	9331.44836
91	<i>Morus alba</i> L.	Moraceae	40.78111111	455.5066667	3557.575413
92	<i>Muntingia calabura</i> L.	Muntingiaceae	35.13666667	458.8933333	2436.591978
93	<i>Murraya koenigii</i> (L.) Spreng.	Rutaceae	45.72	670.56	7166.55234
94	<i>Neolamarckia cadamba</i> (Roxb.) Bosser	Rubiaceae	38.74666667	457.2	3641.0362
95	<i>Nyctanthes arbor-tristis</i> L.	Oleaceae	42.09142857	360.3171429	3684.589038
96	<i>Peltophorum dubium</i> (Spreng.) Taub.	Fabaceae	249.0046667	1097.28	164086.6386
97	<i>Peltophorum pterocarpum</i> (DC.) Backer ex K. Heyne	Fabaceae	84.94638095	668.0780571	15321.69438
98	<i>Persea indica</i> (L.) Spreng.	Lauraceae	25.4	411.48	1985.05356
99	<i>Phoenix dactylifera</i> L.	Arecaceae	119.0413333	963.168	26080.54985
100	<i>Phoenix reclinata</i> Jacq.	Arecaceae	81.56222222	433.4933333	9437.770317
101	<i>Phyllanthus emblica</i> L.	Phyllanthaceae	71.12	1021.08	22725.47001
102	<i>Pithecellobium dulce</i> (Roxb.) Benth.	Fabaceae	63.5	708.3972414	9729.668162
103	<i>Plumeria alba</i> L.	Apocynaceae	47.45681081	396.7891892	4305.7007
104	<i>Plumeria obtusa</i> L.	Apocynaceae	20	182.88	801.556051
105	<i>Plumeria rubra</i> L.	Apocynaceae	41.91	426.72	5121.692679
106	<i>Polyalthia longifolia</i> (Sonn.) Benth. & Hook.f. ex Thwaites	Annonaceae	58.15756144	594.9909187	7973.153656
107	<i>Pongamia pinnata</i> (L.) Pierre	Fabaceae	97.17796	730.9104	23141.0416
108	<i>Prosopis cineraria</i> (L.) Druce	Fabaceae	88.85647059	851.6470588	27045.37344
109	<i>Prunus avium</i> (L.) L.	Rosaceae	38.1	457.2	3372.046112
110	<i>Psidium guajava</i> L.	Myrtaceae	36.83	365.76	4182.185492
111	<i>Pterospermum acerifolium</i> (L.) Willd.	Malvaceae	42.26228571	457.2	4389.946594
112	<i>Putranjiva roxburghii</i> Wall.	Putranjivaceae	54.72065	464.7565	6631.773908
113	<i>Ravenala madagascariensis</i> Sonn.	Zingiberaceae	49.276	759.968	2056.877435
114	<i>Roystonea regia</i> (Kunth) O. F. Cook	Arecaceae	90.84849315	1008.797534	20698.89041
115	<i>Salvadora persica</i> var. <i>wightiana</i> (Planch. Ex Thwaites) Verdc.	Salvadoraceae	111.6644444	633.3066667	18381.46693

116	<i>Samanea saman</i> (Jacq.) Merr.	Fabaceae	63.16666667	616.3733333	6894.643747
117	<i>Sapindus emarginatus</i> Vahl	Sapindaceae	45.72	762	6107.857108
118	<i>Sapindus mukorossi</i> Gaertn.	Sapindaceae	77.47	777.24	11342.37548
119	<i>Sapindus trifoliatu</i> L.	Sapindaceae	23.4	304.8	1667.236586
120	<i>Saraca indica</i> L.	Fabaceae	40.64	396.24	3812.509326
121	<i>Senegalia catechu</i> (L. f.) P.J.H. Hurter & Mabb.	Fabaceae	162.56	1209.04	101017.1701
122	<i>Senna siamea</i> (Lam.) H.S. Irwin & Barneby	Fabaceae	84.98541176	955.7870588	24279.39735
123	<i>Spathodea campanulata</i> P. Beauv.	Bignoniaceae	73.61230769	876.8861538	6557.756133
124	<i>Sterculia foetida</i> L.	Malvaceae	32.8	554.736	3254.540221
125	<i>Swietenia macrophylla</i> King	Meliaceae	39.575	990.6	8580.288847
126	<i>Swietenia mahagoni</i> (L.) Jacq.	Meliaceae	24.55018182	404.5527273	2548.696278
127	<i>Syzygium cumini</i> (L.) Skeels	Myrtaceae	54.87102041	607.837551	9814.372309
128	<i>Syzygium jambos</i> (L.) Alston	Myrtaceae	22.86	406.4	2474.247671
129	<i>Tabebuia argentea</i> (Bureau & K. Schum.) Britton	Bignoniaceae	15	182.88	851.6533041
130	<i>Tabebuia heterophylla</i> (D.C) Britton	Bignoniaceae	26.875	308.61	2529.131995
131	<i>Tabebuia rosea</i> (Bertol.) DC.	Bignoniaceae	69.66857143	989.8742857	14300.38402
132	<i>Tamarindus indica</i> L.	Fabaceae	44.81585185	522.6755556	7834.079808
133	<i>Tecoma stans</i> (L.) Juss. ex Kunth	Bignoniaceae	48.04833333	548.64	5367.279434
134	<i>Tectona grandis</i> L.f.	Lamiaceae	53.46095238	732.0038095	12278.73179
135	<i>Terminalia Arjuna</i> (Roxb. ex DC.) Wight & Arn	Combretaceae	64.30818182	726.6709091	17330.94172
136	<i>Terminalia bellirica</i> (Gaertn.) Roxb.	Combretaceae	53.4	835.152	13643.04062
137	<i>Terminalia catappa</i> L.	Combretaceae	37.39950617	551.5876543	4099.763393
138	<i>Terminalia mantaly</i> H. Perrier	Combretaceae	36.068	408.432	3014.05782
139	<i>Terminalia oblonga</i> (Ruiz & Pav.) Steud.	Combretaceae	50.8	670.56	9953.544917
140	<i>Thespesia populnea</i> Sol. ex Correa	Malvaceae	48.26	541.02	6069.117459
141	<i>Triplaris americana</i> L.	Polygonaceae	23.42444444	352.2133333	1678.52962
142	<i>Vitex negundo</i> L.	Lamiaceae	28.96347059	395.3435294	2863.785739
143	<i>Ziziphus jujuba</i> Mill.	Rhamnaceae	15	182.88	781.5171497

Data Analysis

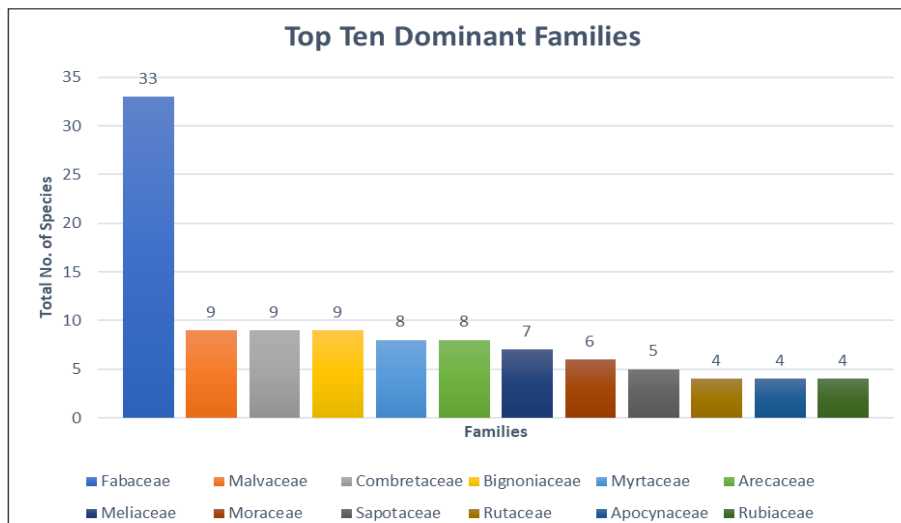


Fig 4: Representing the dominant families of the observed plants

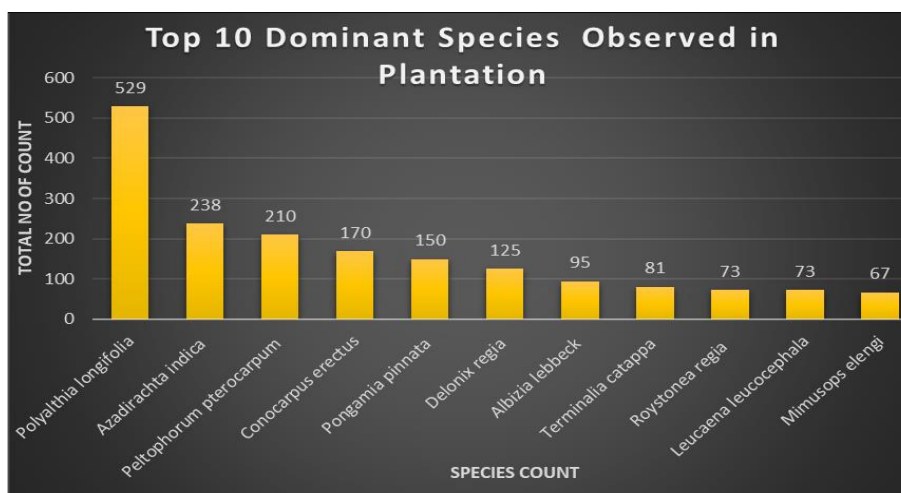


Fig 5: Representing the dominant species observed from the studied plants

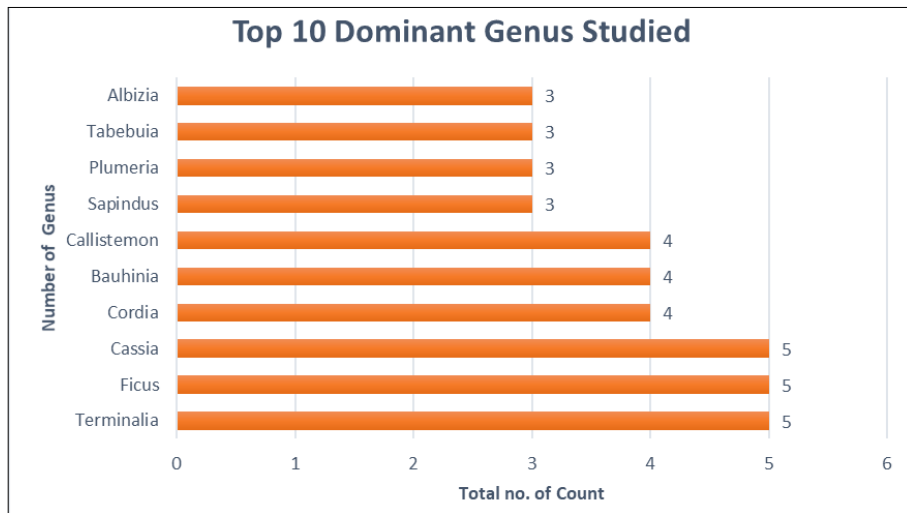


Fig 6: Representing the dominant genus observed from the studied plants

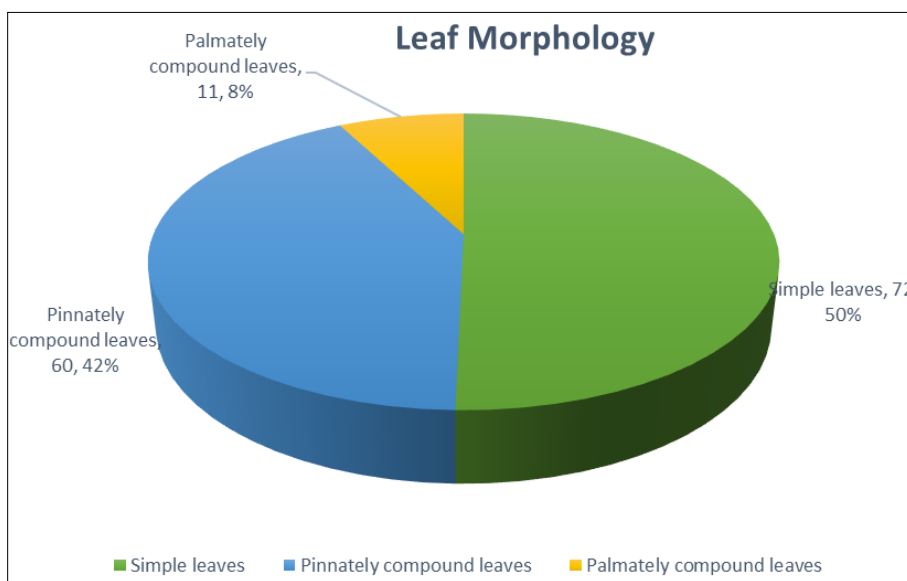


Fig 7: Representing the different leaf morphology observed from the studied plants

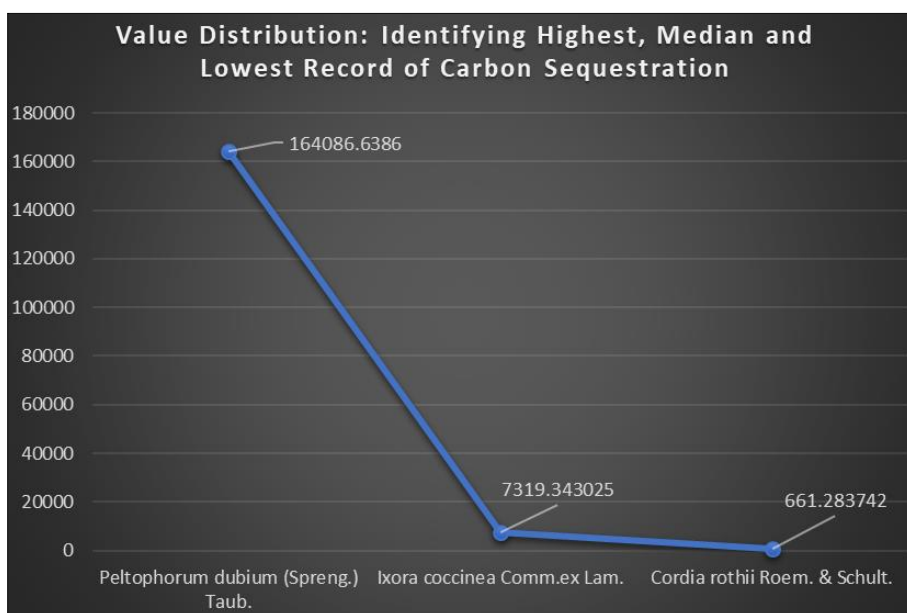


Fig 8: Representing the Highest, Median and Lowest Record of Carbon Sequestration

Result and Conclusion

During the course of the survey, a total of 3405 plant species were recorded out of which 143 unique species record were made across 10 urban gardens which constituted 38 botanical families, with Fabaceae emerging as the most dominant, comprising 33 species. Among individual species, *Polyalthia longifolia* (Sonn.) Benth. & Hook.f. ex-Thwaites was abundant, with 529 individuals, followed by *Azadirachta indica* A. Juss. and *Peltophorum pterocarpum* (DC.) Backer ex K. Heyne. Genera such as *Terminalia*, *Ficus*, and *Cassia* were most frequently represented. Leaf morphology revealed a clear preference for simple leaves (72), pinnately compound (60) and palmately compound (11) leaves were less common. In terms of ecological contribution, *Peltophorum dubium* (Spreng.) Taub demonstrated high carbon sequestration capacity, with a recorded value of 164,086.6 units.

Discussion

The carbon sequestration potential of Ahmedabad's urban gardens is shaped by a complex interplay of botanical traits, ecological strategy, and physiological performance.

Leaf morphology plays a foundational role, species with simple leaves exhibit higher photosynthetic efficiency due to their streamlined structure and optimal surface area to volume ratios. Compound leaves, while less frequent, contribute to canopy diversity and microclimatic regulation but often show lower net carbon assimilation per unit area. Species selection in urban environments must be intentional, favouring those with expansive growth forms, perennial lifespans, and high biomass productivity.

Genera such as *Ficus*, *Terminalia*, and *Cassia* exemplify these traits, offering sustained carbon capture through dense wood anatomy and broad canopy coverage. However, the prevalence of single-variety plantings and limited native representation suggests a need for greater ecological awareness.

In sum, enhancing carbon sequestration in urban gardens requires a shift toward ecologically informed planting prioritizing native, physiologically resilient, and structurally robust species with efficient leaf architecture and high net primary productivity. This approach not only maximizes sequestration capacity but also aligns with broader goals of climate resilience and urban ecological integrity.

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