

Roof Top Urban Forests: A novel technique for reduction of carbon foot print in the Atmopshere

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Abstract: With ever increasing industrialization and rapid urbanization, atmospheric pollution has become a daunting problem in cities like delhi. Clean energy has been a solution to it. The paper suggests a solution called urban forests. These urban forests are grown on building terraces in bonsai fashion. A plant consumes 26 pounds of carbon dioxide in a year. The paper calculates the atmospheric reduction in carbondioxide over the land space of delhi.

Keywords: carbondioxide, air pollution, nature closed cycle.

Introduction:

In the era of creating urban forests to reduce pollution, bonsai plants over terrace an excellent option to reduce carbon-di-oxide in the atmosphere. This would be helpful especially in cities like delhi. Delhi ncr is spread in an area of 58,332 km²[1].

Literature survey: jack et al researched on pollution by light and deduced that artificial lighting adversely affects human health. After serious analysis, jack emphasised the need for stringent laws against light pollution[2]. Jiuli et al investigated pollution intensity using Resource-economy-pollution dynamical system(REP) and stressed the need for a detailed study of consumption, recycling and other factors of economy to make energy policies[3]. Asa et al did a case study on Stockholm county in Sweden and illustrated the incorporation of an ecosystem perspective in urban planning may facilitate a sustainable development of urban agricultural landscape of Stockholm[4]. Deng et al said that China's urbanization mainly depends on the transfer of vacant lands to SEZ. This paper emphasises the need to understand differences in control policies and their overlapping effect and to choose rational planning systems, preventing wasteful urban construction caused by planning failure[5].

Methodology: Roof top bonsai plants would create an urban forest over the entire area of 58,332 km², thereby reducing a lot of pollution. Excluding delhi roads, let the area be approximated to 50,000km². Every sapling grows into a tree and in this process, it accumulates the carbondioxide in its trunk. This consumption of carbondioxide and production of oxygen starts once leaves sprout from the branches of the sapling. The plants listed out in table 1 are easily available in any nursery for a nominal cost ranging from rs200 to rs 500. To plant 15,00,000 plants over entire delhi requires sometime and the cost involved could be borne by the urban local bodies. Some of the plants which reduce pollution are as listed below in table 1.

s.no	Plant name	Scientific name
1	Areca Palm	Chrysalidocarpus lutescens
2	Lady Palm	Rhapis excels

3	Bamboo Palm	<i>Chamaedorea seifrizii</i>
4	Rubber Plant	<i>Ficus robusta</i>
5	English Ivy	<i>Hedera helix</i>
6	Dwarf Date Palm	<i>Phoenix roebelenii</i>
7	Boston Fern	<i>Nephrolepis exaltata</i> “ <i>Bostoniensis</i> ”
8	Peace Lily	<i>Spathiphyllum</i>
9	Golden Pothos	<i>Epipremnum aureum</i>
10	Pot Mum	<i>Chrysanthemum morifolium</i>
11	Gerbera Daisy	<i>Gerbera jamesonii</i>
12	Dragon Tree	<i>Dracaena marginata</i>
13	Syngonium	<i>Syngonium podophyllum</i>
14	Dumb Cane	<i>Dieffenbachia</i> “ <i>Exotica Compacta</i> ”
15	Weeping Fig	<i>Ficus benjamina</i>
16	Schefflera / Umbrella Plant	<i>Schefflera arboricola</i>
17	Heart-Leaf Philodendron	<i>Philodendron Oxycardium</i>
18	Snake plant / Mother-in-Law’s Tongue	
19	Elephant Ear Philodendron	<i>Philodendron domesticum</i> / <i>tuxla</i>
20	Dwarf Banana	
21	Dendrobium Orchid	<i>Dendrobium</i>
22	Spider Plant	<i>Chlorophytum comosum</i>
23	Chinese Evergreen	<i>Aglaonema crispum</i> “ <i>Silver Queen</i> ”
24	Anthurium	<i>Anthurium andraeanum</i>
25	Croton	<i>Codiaeum variegatum pictum</i>

Table 1: Scientific names of pollution reducing plants[8]

In the last century, carbon concentrations have increased to over 39 percent and this is an alarming rate. On an average, a tree could absorb 48 pounds of carbon dioxide per year [6]. During photosynthesis, the green leaves of plants convert carbon dioxide into sugar, starch and cellulose, with the help of a substance called

chlorophyll. Plants take water from the ground, chlorophyll absorbs sunlight and these three substances combine into sugars. These sugars are converted into Adenosine Triphosphate (ATP), which is used for the growth of the plant. And these plants release oxygen into atmosphere. This is nature’s closed cycle [7].

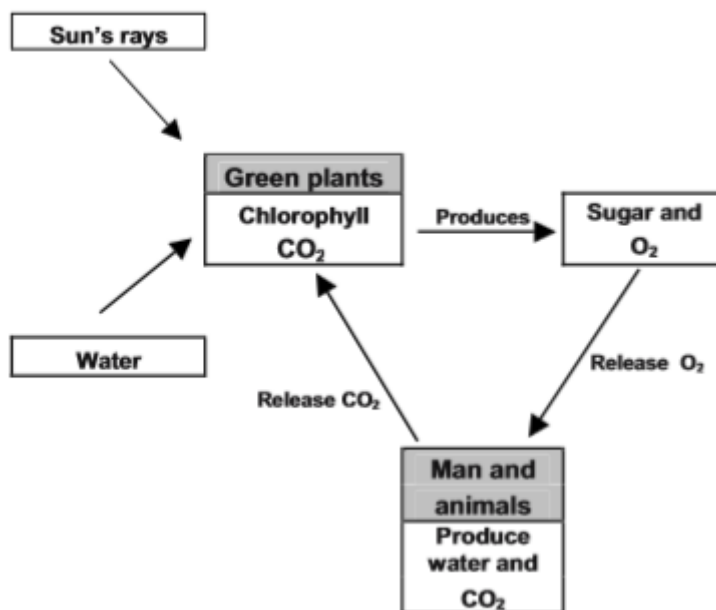


Fig 1: photosynthesis process in plants[3]

Indicators	Quantity
Delhi ncr area	58,332 km ² .(approximate to 50,000km ²)
Space for a bonsai plant	10 m ² (approximate)
Number of bonsai plants in delhi	(50,000*1000/10)*0.3=15,00,000 plants
Carbon dioxide consumed by each plant	26 pounds per year
Total amount of carbon reduction	1.5*10 ⁶ * 26 = 39*10 ⁶ pounds
Total amount of carbon reduction (kilograms)	39*10 ⁶ * 0.45 =17.55 *10 ⁶ kilograms
Cost of plants	15,00,000*(500+200)/2=525*10 ⁶ INR

Table 2: indicators of pollution reduction in delhi ncr

Conclusion: Delhi ncr has been one of the most polluted cities of the globe. Although, CNG vehicles reduced pollution to much extent still pollution is a pressing problem to delhi government. One solution to this impounding problem is an urban forest. This urban forest requires a lot of space. Delhi ncr is spread over 50,000km² excluding roads. Growing roof top bonsai plants on the terrace of apartment buildings is a viable solution to the problem of pollution. Leaving space for other equipments like solar water heaters and walkways, if each bonsai plant needs 10m² space and plantation is done in 30 percent of terrace space, this would reduce carbondioxide levels by 17.55 kilo tons a year.

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