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Urban Tree Consultants

# Why one mature tree out-values 100 newly planted seedlings

# How to manage that tree appropriately

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Consulting Arborist

# Annual Ecosystem Value: The Numbers

100 Seedlings

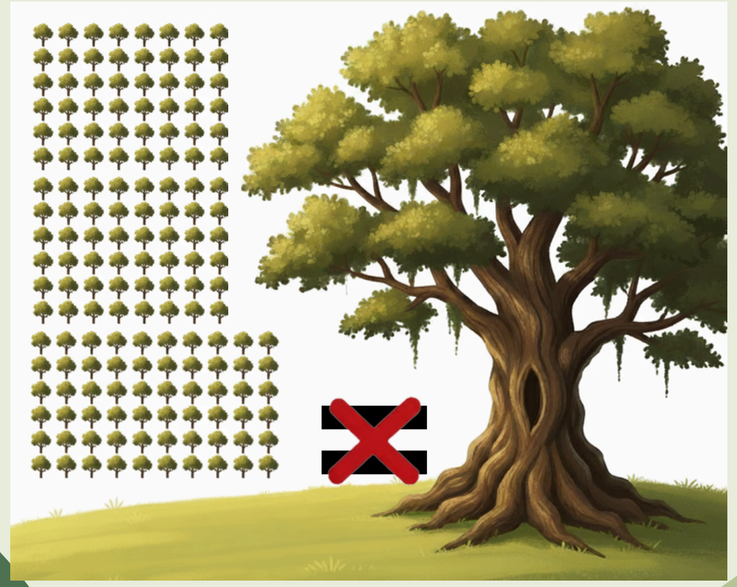
₹1-3

ecosystem services per year

One Mature Tree

₹52,305 – ₹153,514

ecosystem services per year



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## 100 seedlings vs One mature tree

# Where the Values Come From

| Benefits | 100 seedlings | One mature tree | Notes (see calculations later) |
|---|---|---|---|
| Carbon Sequestration | <100kgs (<₹90) | 500kgs - 2ts (₹450–1,800)<br>+ 5 – 20× more/year (₹5-25/year) | A mature tree can store 10–25 kg $CO_2$/year compared to 1–3 kg for 100 seedlings |
| Air Pollution Removal | ~0 | ₹50k-150k+/year | $PM_{10}$, $PM_{2.5}$, $NO_2$, $SO_2$, $O_3$, CO Depending on location (~50k for Chennai, ~150k for Delhi) |
| Cooling & Energy Savings | ~0 | ₹500–₹1,000+/year | Mature tree canopies reduces surface temperatures by 20 –25°C, cutting AC usage 15–20% or by 80–125 kWh/year |
| Stormwater Management | ~0 | ₹1,800–₹2,500/year | Interception of 20k–25k litres/year due to canopy size and root infiltration capacity, reduces flooding and runoff |
| Totals | ₹1–₹3/year | ₹52,305–₹153,514/year | Ratio of 100 seedling compared to 1 mature tree: ~17,000–153,000× |

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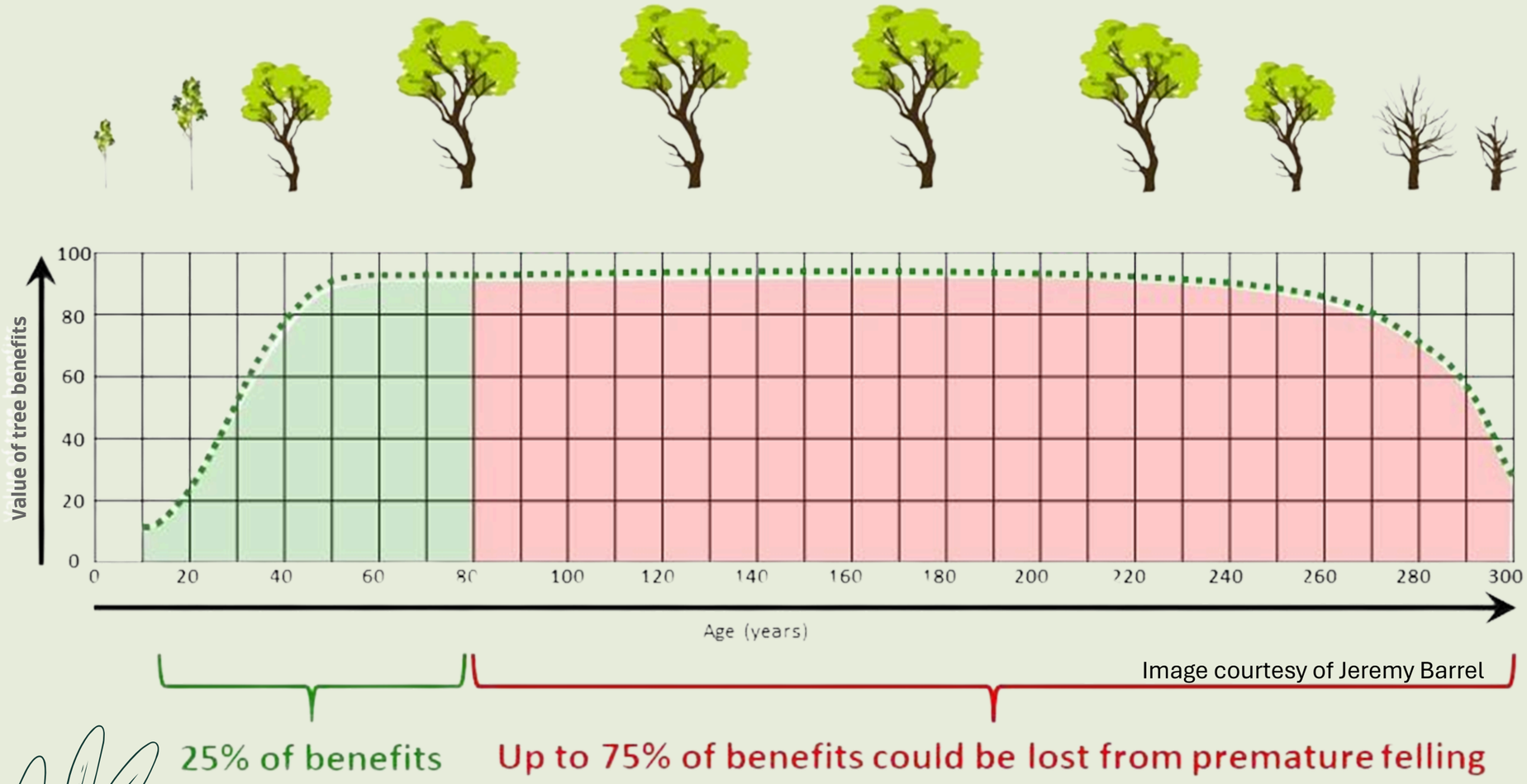
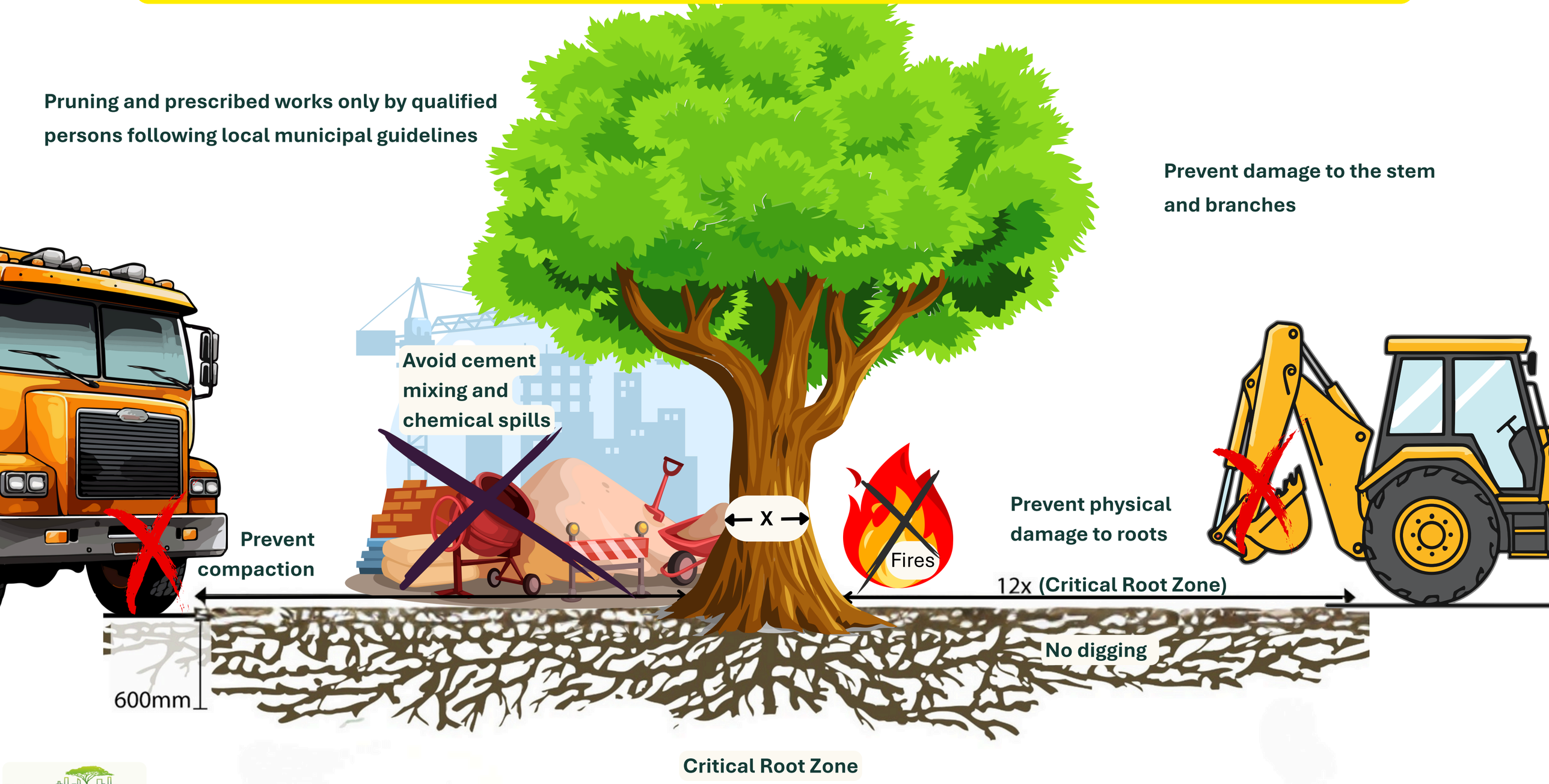
# The Time Reality: Maturation Gap




**A seedling needs 20–100 years to replace one mature tree's ecosystem services**

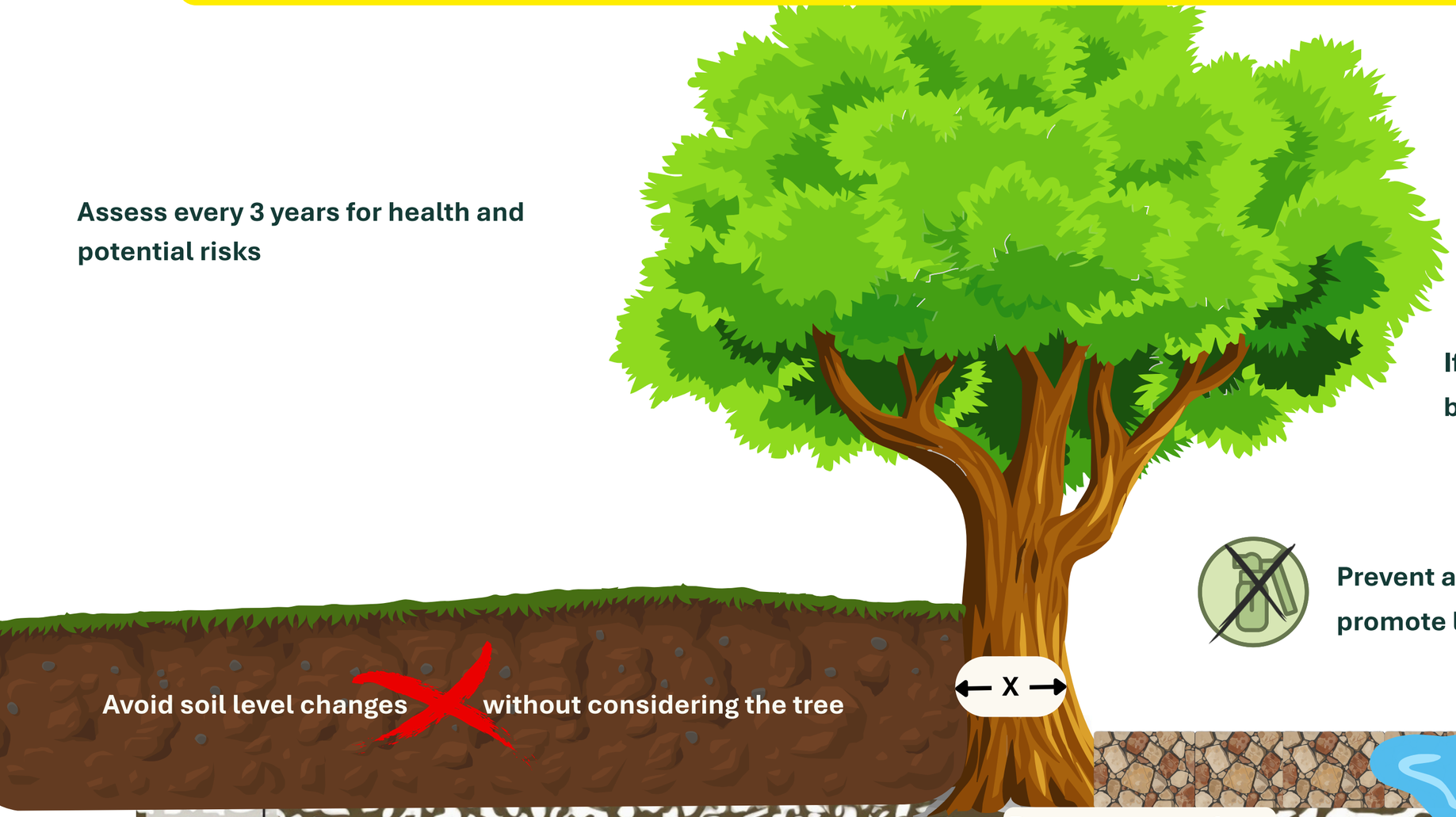
# Managing trees properly includes understanding their basic needs and functions



# Managing trees properly includes understanding their basic needs and functions

Assess every 3 years for health and potential risks

If possible, avoid sweeping leaves away or better yet, maintain a mulch ring



Prevent application of pesticides that promote lawn growth but damage trees

Avoid soil level changes without considering the tree

X

Prevent water stagnation

Remove pavers from the base of the tree

Carry out soil health or visual tests if evidence of compaction, chemical contamination or water stagnation is observed.

Critical Root Zone (12*X)

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# A good representation of effects of trees

## Many of the values cannot be quantified

**Climate**
Micro-Climate
Temperature
Wind Control
Wind Erosion

**Pollution**
Air Quality
Oxygen
Pollutants
Global Climate Change
Noise
Barriers & Baffles
Stress, Tension & Insomnia

**Biodiversity**
Fauna
Habitat
Food
Corridors
Flora
Lichens & Moss
Epiphytes

**Water & Soil**
Hydrology
Water Quality Improvement
Rain
Storm Water Management
Erosion Control
Soil Improvement
Rock Fall Protection
Gullies Control

**Value**
Property
Patrimony
Returns
Savings
Durability
Road protection
Urban Infrastructure

**Work**
Productivity
Creativity
Business
Image
Income
Behavior
Jobs
Heritage
History
Remarkable Trees
Cultural
Tradition
Spirituality

**Community**
Livable Cities
Social Cohesion
Community Activities
Social Bonds
Social Identity
Active Living
Place Attachment & Meaning
Economic Stability
Education
Learning
Concentration
Creativity

**Social**
Visual
Urban Architecture
Screening
Unity And Harmony
Urban Landscape
Vibrant Sidewalks
Character And Identity
Sense Of Place

**Locomotion**
Pedestrians
Agreeable Walking Environment
Safer Walking Environment
Cycling
Speed
Calming Effect
Careful Driving

**Public Health**
Healing
Therapy
Longevity
Physiological
Psychological
Wellness
Mental Health
Stress
Physical Activity
Public Safety
Safe Streets
Sense Of Safety
Violence
Risk

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# Let’s work together to make this happen

Island Lescure

**Personal contact**

**Website**
https://www.treescapes.in/

# Calculation Notes

Carbon Sequestration

- ₹900/tonne $CO_2$ (midpoint between ₹200–400 voluntary market and ₹800–1,000 CCTS)
- Annual: 5–15 kg $CO_2$/year per mature tree; Stock: 500–2,000 kg over lifetime
- Source: Costmos (2025); S&P Global (2024)

Air Pollution Removal

- ₹50,000/year (Chennai, lower pollution) to ₹150,000/year (Delhi, higher pollution)
- Source: i-Tree Eco District Park Hauz Khas study: ₹148.6k/tree/year average across 3,707 trees; scaled by local PM/$NO_2$/$SO_2$/$O_3$ concentrations

Cooling & Energy Savings

- 80–125 kWh/year per mature shade tree × ₹7–10/kWh (Tamil Nadu residential tariff)
- Source: McPherson (1993, 2003); Nowak (2017); Hand et al. (2019)

Stormwater Management

- 20,000–25,000 litres intercepted/year @ ₹90–100/$m^3$ avoided municipal treatment cost
- PPP-scaled i-Tree default of US$2.3/$m^3$ (~₹230/$m^3$ base, conservatively ₹90–100/$m^3$ for India)
- Source: Xiao et al. (2000); i-Tree Eco framework; Tamil Nadu rainfall data

# References


1: Carbon sequestration

- Nowak, D. J. 1994. Atmospheric carbon dioxide reduction by urban trees. J. Environ. Manage. 37, 207–217.
- Rahman, M. A. et al. 2019. What we know and don't know about the carbon storage and sequestration of urban trees. TDAG / Forest Research.
- Forest Research. 2019. Ecosystem services delivery by large stature urban trees.
- Jaspreet, J. 2020s. Carbon Storage and Sequestration Potential of Trees. PhD thesis using i-Tree Eco.
- India's carbon price references:
  - Voluntary market: About US$2.35/$tCO_2$ (~₹200/$tCO_2$) in 2024–25.
  - Planned compliance market (CCTS): Government and industry targeting ~US$10/$tCO_2e$ (~₹800–900/$tCO_2$) as an initial domestic price.

2: Pollution reduction

- Global Pollution Removal Standards
  - Nowak, D. J., Hirabayashi, S., Bodine, A., & Hoehn, R. 2014. Tree and forest effects on air quality and human health in the United States. Environmental Pollution 193:119–129.
  - Nowak, D. J. 2020. Urban trees, air quality, and human health. In Air Pollution and Trees (Chapter 2).
- India-Specific i-Tree Eco (Delhi): K, Shivani. Evaluating Air Pollutant Removal Efficiency of Trees in District Park, Hauz Khas Using the i-Tree Eco Model for Improved Air Quality. [46 tree species; ₹551M annual value across 3,707 trees]
- Comparative Air Quality & Scaling (Chennai vs Delhi)
  - Greenpeace India. 2024. PM 2.5 Levels in 10 Southern Cities. [$PM_{2.5}$: Chennai 49 μg/$m^3$ vs Delhi 143 μg/$m^3$; scaling factor 35–50%]
  - Central Pollution Control Board (CPCB). Chennai Air Quality Data & NCAP Performance Assessment. [2024-2025 official monitoring]
- i-Tree Methodology: USDA Forest Service. 2021. Understanding i-Tree: 2021 Summary of Programs and Outputs. GTR-NRS-200.

3: Energy savings

- McPherson, E. G. 2003. Potential energy savings in buildings by an urban tree planting programme in California. Urban Forestry & Urban Greening 2(2):73–86.
- McPherson, E. G. 1993. Energy conservation potential of urban tree planting. Journal of Arboriculture 19(6):321–331.
- Nowak, D. J. 2017. Residential building energy conservation and avoided power plant emissions from urban trees. Urban Forestry & Urban Greening 21:158–165.
- Hand, K. L., Doick, K. J., Moss, J., et al. 2019. Ecosystem services delivery by large stature urban trees. Forest Research.
- **₹ Conversion**: ₹7-10/kWh (Tamil Nadu Electricity Board, 2025) × 80-150 kWh/tree/year = **₹1,000-2,000/tree/year**

4: Stormwater valuation and PPP scaling

- i-Tree Eco and avoided runoff valuation (2.3 USD/$m^3$ default):
  - Nowak, D. J. et al. 2021. Understanding i-Tree: 2021 Summary of Programs and Methods. USDA Forest Service, NRS-GTR-200.
  - i-Tree Support Forum. 2024. "Valuing Avoided Runoff in i-Tree."
  - i-Tree Eco Precipitation Interception Model Descriptions.
- PPP / cost-of-living scaling for India:
  - World Bank. PPP conversion factor, GDP (LCU per international $), India.
  - Big Mac Index – India vs United States, 2025.
- Reference for the interception × PPP-scaled value calculation: Xiao, Q. et al. 2000. "Rainfall interception by Santa Monica's municipal urban forest." Journal of Arboriculture 26(6): 306–311 (basis for ~6–7 $m^3$ per tree per year, scaled to 20–25 $m^3$ under Tamil Nadu rainfall).