Technical Analysis

1. Core Data and Assumptions

1.1 City Geometry and Canopy Baseline

- City land area: **111,831 ha**
- Current canopy: **23,708 ha** (≈21.2%)
- Target canopy (40%): **44,732 ha**
- **Canopy gap:** 21,024 ha
- 5,000,000 trees → 23,708 ha canopy
  → **0.004742 ha/tree** average canopy

1.2 Survival Definition

Survival = trees alive after **5–7 years**, i.e., past the establishment mortality window and likely to mature.

1.3 Planting Types and Survival Rates (mid-case)

- Street trees: **25%** (Option A only)
- Free Trees: **65%**
- Traditional forest (spaced): **55%**
- Miyawaki – parks: **60%**
- Miyawaki – remediated industrial land: **80%**

1.4 Per-Tree Canopy Multipliers

Relative to 0.004742 ha/tree:

- Free Trees: ×1.5 → **0.007113 ha**
- Traditional forest: ×2.0 → **0.009484 ha**
- Miyawaki (parks): ×0.5 → **0.002371 ha**
- Miyawaki (remediated): ×0.6 → **0.002845 ha**

- Street trees (Option A only): ×0.8 → **0.003794 ha**

2. Option B (Five-Year Surge): Planting → Survivors → Canopy

2.1 Survivors

Each category plants **250,000** trees (25% of 1,000,000):

Planting Type	Survival Rate	Survivors
Free Trees	65%	**162,500**
Traditional Forest	55%	**137,500**
Miyawaki – Parks	60%	**150,000**
Miyawaki – Remediated	80%	**200,000**

Total survivors: 650,000 trees

2.2 Canopy Area Added

Type	Survivors	Canopy per Tree (ha)	Canopy Added (ha)
Free Trees	162,500	0.007113	**1,155.9**
Traditional Forest	137,500	0.009484	**1,304.1**
Miyawaki – Parks	150,000	0.002371	**355.7**
Miyawaki – Remediated	200,000	0.002845	**569.0**

Total canopy added: 3,384.6 ha
→ ≈3.03% of city area

2.3 Gap Closure

3,384.6 ha ÷ 21,024 ha = **16.1% of the canopy gap closed**

2.4 Annualized Values (during surge)

- Survivors/year: **130,000**
- Canopy added/year: **676.9 ha**
  → **≈0.606% of city area/year**

3. Timeframes to Reach 40% Canopy

3.1 Option C — Sustained Surge (200k trees/year indefinitely)

- Annual canopy gain: **676.9 ha/year**
- Years required:
  21,024 ha ÷ 676.9 ≈ **31.05 years**

Result:
≈31 years to reach 40% canopy.

3.2 Option B → Return to Baseline (20k/year)

After the 5-year surge:

- Remaining gap: 21,024 – 3,384.6 = **17,639.4 ha**
- Baseline canopy gain: **≈75.75 ha/year**

Years required after surge:
17,639.4 ÷ 75.75 ≈ **233 years**

Total from program start = **≈238 years**

Result:
A single surge accelerates progress but still leaves **centuries** of work if followed by the current baseline program.

4. Option A — Current City Plan (20,000 trees/year)

4.1 Annual Survivors

- Street: 1,500
- Free Trees: 3,250

- Traditional: 4,950
  Total: 9,700 survivors/year

4.2 Annual Canopy Added

- Street: **5.69 ha/yr**
- Free: **23.12 ha/yr**
- Traditional: **46.95 ha/yr**
  Total: 75.75 ha/year

4.3 25-Year Projection

- Survivors: **242,500**
- Canopy added: **1,893.8 ha**
- City area %: **≈1.69%**

4.4 Time to 40% at Baseline Pace

21,024 ha ÷ 75.75 ha/year ≈ **277–278 years**

5. Summary of Key Outputs

Metric	Value
Trees planted in surge	**1,000,000**
Established survivors	**650,000**
Canopy added (surge)	**3,385 ha**
% of city area added	**≈3.03%**
% of canopy gap closed	**≈16.1%**
Time to 40% (sustained surge)	**≈31 years**
Time to 40% (current plan only)	**≈277–278 years**