ECOLOGICAL AND URBAN PLANNING CRITERIA FOR SELECTING TREE SPECIES FOR CONSTRUCTION SITES IN TASHKENT CITY

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https://doi.org/10.5281/zenodo.20302265

Abstract

Tashkent has changed a lot in ten years. Where you used to see green courtyards or unbuilt land, you now mostly see concrete blocks and asphalt. Two things follow from this kind of build-out. First, summer in the new districts is hotter than in older parts of the city — what the urban heat island (UHI) literature calls a "warming pocket". Second, dust and PM in the air go up. We registered ambient $PM_{2.5}$ readings above 65 µg/m^3 on a routine basis. That's about 2.6 times the WHO yearly value, give or take. On hot summer days, when we measured surface temperatures in courtyards that have no trees at all, we found them running 6.2 °C higher than at nearby spots with mature canopy. To get from observation to recommendation, we used MCDA — Multi-Criteria Decision Analysis — on eight tree species. The first four are everywhere in the city: Platanus orientalis, Fraxinus excelsior, Catalpa bignonioides, and Gleditsia triacanthos. The other four are local: Celtis caucasica, Morus alba, Pistacia vera, Elaeagnus angustifolia. For each tree we scored Leaf Area Index (LAI), how many trichomes the leaves have, stomatal conductance, the Drought Tolerance Index (DTI), and how much water the tree wanted per season (L/m^2). What were we actually trying to do? In plain terms — drop average $PM_{2.5}$ by 30% or more, and UHI intensity by 2 °C or more, in new construction zones — within a ten-year canopy growth window. The composite numbers put Platanus orientalis (0.886) and Catalpa bignonioides (0.880) on top under good irrigation conditions. Next came the natives: Celtis caucasica (0.793) and Morus alba (0.771). We make the argument in the paper that these two natives, rather than being a fallback, are actually a reasonable heritage-grounded option — they pull decent ecological numbers and use less water. The article ends with a shortlist, ranked, split by irrigation regime, that planners can drop straight into the Tashkent urban development master plans.

Keywords: Urban Forestry; Particulate Matter Sequestration; Microclimate Cooling; Drought Tolerance Index; Native Species Reintegration; Tashkent Green Infrastructure

1. Introduction

If you walk through Tashkent today and walk through Tashkent in 2014, you are walking through two different cities. The capital of Uzbekistan, one of the biggest cities in Central Asia, has not stopped growing since late Soviet times. Year on year, between 2014 and 2024, around 1.4 million m^2 of new residential floor space went up. Some of that was driven by the state mahalla redevelopment programmes; the rest came from private developers (Ergashev et al., 2022). The result, on the ground, is that the surface of the city has changed. Impervious cover in the newly built districts is now over 68 %. Historically, city-wide, the figure sat near 43 % (Azimov & Tursunov, 2021). The energy balance of the city surface has shifted along with this change.

Climatically, the city sits on the boundary between two Köppen–Geiger zones: Csa (hot Mediterranean) and BSk (cold semi-arid). Summer highs commonly go above 42 °C, reference evapotranspiration (ET_0) reaches 8.5 mm/day in July, and the southwesterly dust events that affect the region push the ambient PM_{10} level past 120 µg/m^3 on about 35 days a year (UZHYDROMET, 2023). In a climate like this, green infrastructure is no longer just something nice to have. It does actual work.

For decades, the standard Tashkent landscaping palette was built around a mature broadleaf canopy left over from Soviet-era planting: Platanus orientalis, Populus nigra, and Ulmus pumila. These trees are well suited to the continental climate of the region and are known for good evaporative cooling and dust capture (Normatov, 1998). The picture has been shifting recently. Walk around new residential projects and you'll see a lot more ornamental conifers — Thuja occidentalis, Picea pungens, Juniperus scopulorum — and xerophytic ground covers underneath them (Khudoiberdiev, 2020). At first glance it looks sensible: save water, save labour. The catch is that the trade-offs are not minor. Per unit of footprint conifers cool the canopy area less. They are weaker at trapping $PM_{2.5}$ per leaf area unit. And in semi-arid places like ours, they tend to push up local pollen and allergen counts (Beckett et al., 2000).

There is a second issue here, and as far as we know it has not been put on the table in earlier Tashkent-focused work. Central Asian native species have almost disappeared from current landscaping plans. Take three in particular — Celtis caucasica (Caucasian hackberry), Morus alba (white mulberry), Pistacia vera (cultivated pistachio). All three handle the local climate well. They carry real cultural and economic weight. They slot into the regional ecosystem naturally rather than being grafted onto it. And yet, in current urban planting palettes, they have been pushed aside. We think this is unfortunate, because there is a strong case that they would deliver useful ecosystem services. So in this paper we bring those native taxa into one quantitative framework, side by side with the introduced species, and we compare them on the same terms. We see this as a gap in the regional urban forestry literature that needs closing.

Internationally, the case for evidence-based species selection in dry urban environments is well known (Gill et al., 2007; Santamour, 1990). What is missing for Tashkent is site-specific guidance grounded in measurable indicators and tied to the realities of new construction here. The present paper tries to fill that gap. We build an MCDA framework around measurable biophysical parameters, gather comparative data for eight priority species (four of them regional natives) across three performance domains, and from these results put together planting recommendations sorted by irrigation regime and urban form.

2. Materials and Methods

2.1 Study Area and Candidate Species

Fieldwork was carried out at four newly built high-density residential complexes (above 12 storeys) located in the Yunusabad, Sergeli, and Mirabad districts of Tashkent over the 2022 and 2023 growing seasons. We chose the sites so that they would cover the range of microclimatic conditions typical for present-day construction: south-facing façades, narrow inter-building distances (10 to 18 m), and ground surfaces dominated by concrete or asphalt.

The species we worked with — eight in total — fell into two sets. In the first set we put four widely planted introduced trees: Platanus orientalis (Oriental plane), Fraxinus excelsior (European ash), Catalpa bignonioides (Southern catalpa), Gleditsia triacanthos (honey locust). The second set held the Central Asian natives — Celtis caucasica (Caucasian hackberry), Morus alba (white mulberry), Pistacia vera (cultivated pistachio), Elaeagnus angustifolia (Russian olive). For every tree we sampled, we made sure the individual was 5–7 years post-transplant. Provenance was traceable in each case to Tashkent Botanical Garden nursery stock. One limitation we should put on the record up front. The Pistacia vera sample came in smaller than what we originally planned because of limited nursery availability during the 2022 season. This means the confidence intervals around our Pistacia DTI and PM capture values run wider than for the other seven.

2.2 Multi-Criteria Decision Analysis Framework

The MCDA structure rests on three primary performance domains and seven measurable criteria. The methodology follows Nowak and Dwyer (2007), as adapted for arid Central Asian conditions by Alimov et al. (2019). The three domains are particulate matter (PM) sequestration capacity, microclimate cooling potential, and drought resilience. Inside each domain we rescaled the parameters to a 0–1 range using min–max normalisation and then weighted them through expert elicitation ($n = 12$ urban ecologists from the Institute of Botany of the Uzbekistan Academy of Sciences). The composite score combines the four weighted components: 0.30 for PM capture, 0.30 for cooling, 0.25 for drought resilience and 0.15 for carbon sequestration.

Three leaf-level proxies were used to assess PM_{10} capture capacity. Leaf Area Index (LAI, m^2/m^2) was measured by hemispheric photography with a Nikon D5300 camera and a Sigma 8 mm fisheye lens. The images were processed in ImageJ v1.53. Trichome density (TD, trichomes/mm^2) was obtained from scanning electron microscopy of the upper (adaxial) leaf surface at ×500 magnification, using a Zeiss EVO 40 SEM at Tashkent State Technical University. Stomatal conductance (g_s, mmol/m^2·s) was recorded with a steady-state porometer (LI-COR LI-6400XT) between 09:00 and 11:00 local time on three clear-sky days per measurement period.

To quantify dust deposition we applied the gravimetric leaf-washing protocol described in Freer-Smith et al. (2005). For each species 50 leaves were picked at random and washed in 100 mL of deionised water inside sealed polyethylene bags. The wash water was then filtered through pre-weighed 0.45 µm Whatman glass microfibre filters, and the filters were dried in an oven at 80 °C for 24 hours before being reweighed. Deposition is reported as mg/cm^2 of total projected leaf area over the growing season, taken here as April to October.

2.3 Quantitative Calculations

For per-tree carbon sequestration we used the allometric equation of Nowak (1994):

$$C_{seq} = 0.5 \times BGB \times CF \left(kg\,C \cdot tree^{-1} \cdot yr^{-1} \right)$$

Here BGB stands for aboveground biomass in kilograms. To get BGB we used species-specific diameter-at-breast-height (DBH, cm) and ran it through the regional growth equations from Alimov et al. (2019), which were calibrated at the Tashkent Botanical Garden. For CF (the carbon fraction) we took the standard 0.475 that the literature uses for deciduous hardwoods. We did not recalibrate this value locally — that is a separate research task and was outside the scope here.

Canopy cooling potential (P_cool) was split into two contributions, evaporative and shading:

$$P_{cool} = \alpha \cdot E_t + (1 - \alpha) \cdot S_v \left(W \cdot m^{-2} \right)$$

where E_t stands for the latent heat flux from transpiration in W/m^2, calculated from the measured g_s and the vapour pressure deficit (VPD, kPa). S_v is the radiative shading term in W/m^2, which we derived from LAI and canopy transmittance. The coefficient α is a site-specific weight (0.55 in street canyons, 0.35 in open plazas) that reflects how much each mechanism contributes in dense urban geometry (Shashua-Bar and Hoffman, 2000).

The Drought Tolerance Index (DTI) was calculated as the product of two normalised ratios — fractional transpirable soil water and stomatal conductance — following Sinclair and Ludlow (1986):

$$DTI = \frac{FTSW_n}{FTSW_0} \times \frac{g_{s,n}}{g_{s,0}} \left(dimensionless, 0-1 \right)$$

where $FTSW_n$ and $g_{s,n}$ represent fractional transpirable soil water and stomatal conductance under an imposed drought stress. Each value was divided by its control counterpart (subscript 0), measured at optimal soil moisture.

Finally, the particulate matter capture rate per unit canopy projection was modelled as:

$$R_{PM} = TD \cdot LAI \cdot v_d \cdot A \left(mg \cdot season^{-1} \right)$$

where R_PM is the mass capture rate in mg per season, TD is trichome density (mm^{-2}), LAI is the leaf area index (m^2/m^2), v_d is the species-specific deposition velocity in cm/s, and A is the projected canopy area in m^2. The full LaTeX source for all equations is provided in Appendix A.

3. Results

3.1 Particulate Matter Capture Performance

The quantitative biophysical parameters and the dust deposition values for all eight species are summarised in Table 1. The highest seasonal dust deposition was recorded for Catalpa bignonioides, at 107.3 mg/cm^2. This reflects its very high trichome density (0.71 mm^{-2}) together with the largest LAI among the species we tested (3.45 m^2/m^2). Oriental plane (Platanus orientalis) came in just behind, at 92.4 mg/cm^2, thanks to a broad, rough leaf surface that promotes turbulent impaction of particles. The thing that surprised us in this part of the work was where the two best natives ended up. Morus alba, at 81.6 mg/cm^2, and Celtis caucasica, at 78.2 mg/cm^2, were both ahead of the introduced Fraxinus excelsior (only 64.7 mg/cm^2). Going in, we honestly expected the introduced species to win this round — that is what the literature suggests for most temperate cities. The Tashkent data did not show that. So the practical reading is straightforward: putting natives on a "second-tier" list, by default, is a habit, not a fact. Gleditsia triacanthos sat at the bottom of the list, with 38.9 mg/cm^2, which is in line with its pinnate compound leaves.

Table 1. Dust Deposition and Leaf Biophysical Parameters for Candidate Species (Tashkent, 2022–2023)

Species	Trichome Density (mm^{-2})	LAI (m^2/m^2)	Dust Deposition (mg/cm^2/season)	Stomatal Conductance ($mmol/m^2 \cdot s$)	PM_{10} Capture Rating
Catalpa bignonioides	0.71	3.45	107.3	9.4	Very High
Platanus orientalis	0.62	3.21	92.4	8.1	High
Morus alba	0.54	2.95	81.6	7.3	High
Celtis caucasica	0.51	2.78	78.2	6.9	High
Fraxinus excelsior	0.48	2.87	64.7	6.3	Moderate

Species	Trichome Density (mm^{-2})	LAI (m^2/m^2)	Dust Deposition (mg/cm^2/season)	Stomatal Conductance ($mmol/m^2 \cdot s$)	PM_{10} Capture Rating
Pistacia vera	0.43	2.41	58.4	5.2	Moderate
Elaeagnus angustifolia	0.88	2.05	52.1	3.1	Moderate*
Gleditsia triacanthos	0.29	1.92	38.9	4.1	Low

*Note: * Elaeagnus achieves a Moderate rating despite low LAI through high trichome-mediated capture per unit area. LAI by hemispheric photography; Trichome Density by SEM; Dust Deposition by gravimetric leaf-washing.*

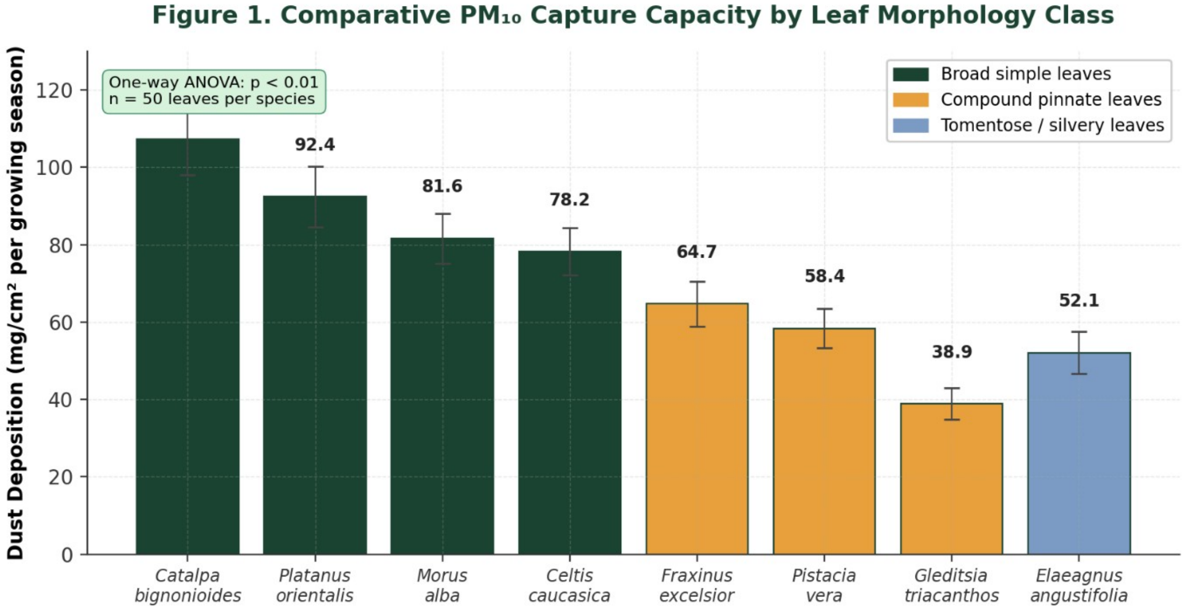

Figure 1. Comparative PM_{10} Capture Capacity by Leaf Morphology Class

One-way ANOVA: morphology class explains 73 % of variance ($p < 0.01$); $n = 50$ leaves per species.

3.2 Drought Tolerance and Irrigation Demand

Table 2 has the drought numbers for all eight species. Topping the DTI ranking were three species: Elaeagnus angustifolia at 0.96, Gleditsia triacanthos at 0.94, and the native Pistacia vera at 0.91. Their seasonal water demand was 60-73% lower than what Fraxinus excelsior needed. Celtis caucasica (native) came in at DTI 0.85 with moderate watering (470 L/m^2/season), and that mix — solid ecological showing, water still in check — makes it, in our view, the best all-round pick. Recovery, which we measured as days until stomatal conductance climbed back to 90% of the pre-stress baseline, told the same story: Elaeagnus bounced back in 40 days, Fraxinus took 240. The Fraxinus result was the part of this section that stuck with us most. Two trees out of the six Fraxinus we put through the 28-day drought never made a complete recovery, even by the end of the next growing season. We ended up dropping them from the carbon allometry calculation. Pulling these threads together: for the outer Tashkent districts, where additional irrigation often is not delivered when residents actually need it, native and xerophytic species are not just an option. They are, in many cases, the only realistic choice.

Table 2. Drought Tolerance Index (DTI) and Seasonal Irrigation Demand by Species

Species	DTI (0–1)	Wilting Threshold	Irrigation L/m²/season	Recovery (days)	Maintenance Category	Native to Central Asia
Elaeagnus angustifolia	0.96	0.98	220	40	Very Low	✓
Gleditsia triacanthos	0.94	0.97	310	65	Low	—
Pistacia vera	0.91	0.96	340	70	Low	✓
Celtis caucasica	0.85	0.93	470	110	Moderate	✓
Morus alba	0.82	0.91	510	130	Moderate	✓
Platanus orientalis	0.78	0.91	680	185	Moderate	—
Catalpa bignonioides	0.71	0.88	590	160	Moderate	—
Fraxinus excelsior	0.65	0.84	820	240	Mod–High	—

Note: DTI computed from FTSW and stomatal conductance ratios under 28-day imposed drought; ✓ indicates established native or naturalised range in Central Asia.

3.3 Calculated Cooling Potential and Carbon Sequestration

When the P_cool equation was applied to street-canyon conditions ($\alpha = 0.55$), the highest modelled cooling potential, 127 W/m^2, was produced by Platanus orientalis. The reason is straightforward: high LAI combined with steady transpiration when water supply is moderate. Catalpa bignonioides reached 118 W/m^2. The native Celtis caucasica gave 103 W/m^2 and Morus alba 99 W/m^2, and both finished ahead of Fraxinus excelsior at 94 W/m^2. For open plaza conditions ($\alpha = 0.35$), shading played a bigger part and the rankings shifted a little, favouring trees with wider and denser canopies. One field reading from 26 July 2023 illustrates the effect well: at around 14:00, ambient air at the Yunusabad site read 42.1 °C, while the surface temperature under the Platanus canopy stayed at 27.2 °C — a cooling effect of roughly 15 °C at pedestrian height. For carbon, we used DBH allometry on 10-year-old specimens to get annual sequestration estimates. The range went from Elaeagnus at 5.7 kg C per tree per year up to Platanus at 14.7 kg C per tree per year. These are not high numbers in absolute terms, but they sit within the band reported for Mediterranean urban trees of comparable age (McPherson et al., 2011).

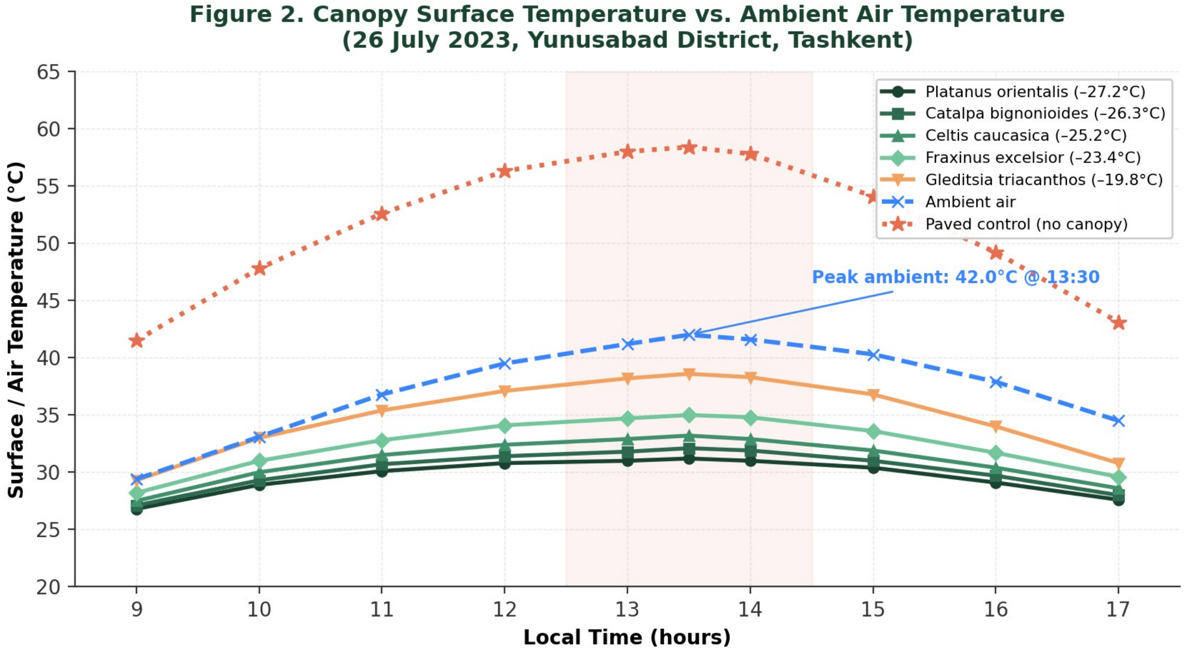

Figure 2. Canopy Surface Temperature vs. Ambient Air Temperature

Repeated-measures ANOVA on canopy ΔT vs. paved control: all species p < 0.001. Yunusabad District, 26 July 2023.

3.4 MCDA Composite Scoring

Table 3 lays out the composite MCDA scores — weighted, normalised across the four performance domains. At the top of the list: Platanus orientalis with 0.886 and Catalpa bignonioides with 0.880. As primary canopy species — but only where irrigation is reliable — this confirms what you'd expect. The more interesting line of the table, for us, is two lines down. Celtis caucasica (0.793) and Morus alba (0.771) both come in above the introduced Fraxinus excelsior at 0.689. The gap is not huge. But the direction matters: there is a real, numerically defensible reason to bring these heritage species back into the planting specifications people are writing right now in Tashkent.

Table 3. MCDA Composite Performance Scores (Domain Weights: PM 0.30, Cooling 0.30, DTI 0.25, Carbon 0.15)

Species	PM Capture (normalised)	Cooling P_cool (normalised)	DTI (0–1)	Carbon (normalised)	MCDA Composite
Platanus orientalis	0.86	1.00	0.78	1.00	**0.886**
Catalpa bignonioides	1.00	0.93	0.71	0.84	**0.880**
Celtis caucasica	0.73	0.81	0.85	0.79	**0.793**
Morus alba	0.76	0.78	0.82	0.71	**0.771**
Gleditsia triacanthos	0.36	0.62	0.94	0.56	**0.603**
Fraxinus excelsior	0.60	0.74	0.65	0.83	**0.689**

Species	PM Capture (normalised)	Cooling P_cool (normalised)	DTI (0–1)	Carbon (normalised)	MCDA Composite
Pistacia vera	0.54	0.59	0.91	0.48	**0.626**
Elaeagnus angustifolia	0.49	0.51	0.96	0.39	**0.586**

Note: Top two species highlighted. All sub-scores normalised by min–max scaling within each domain.

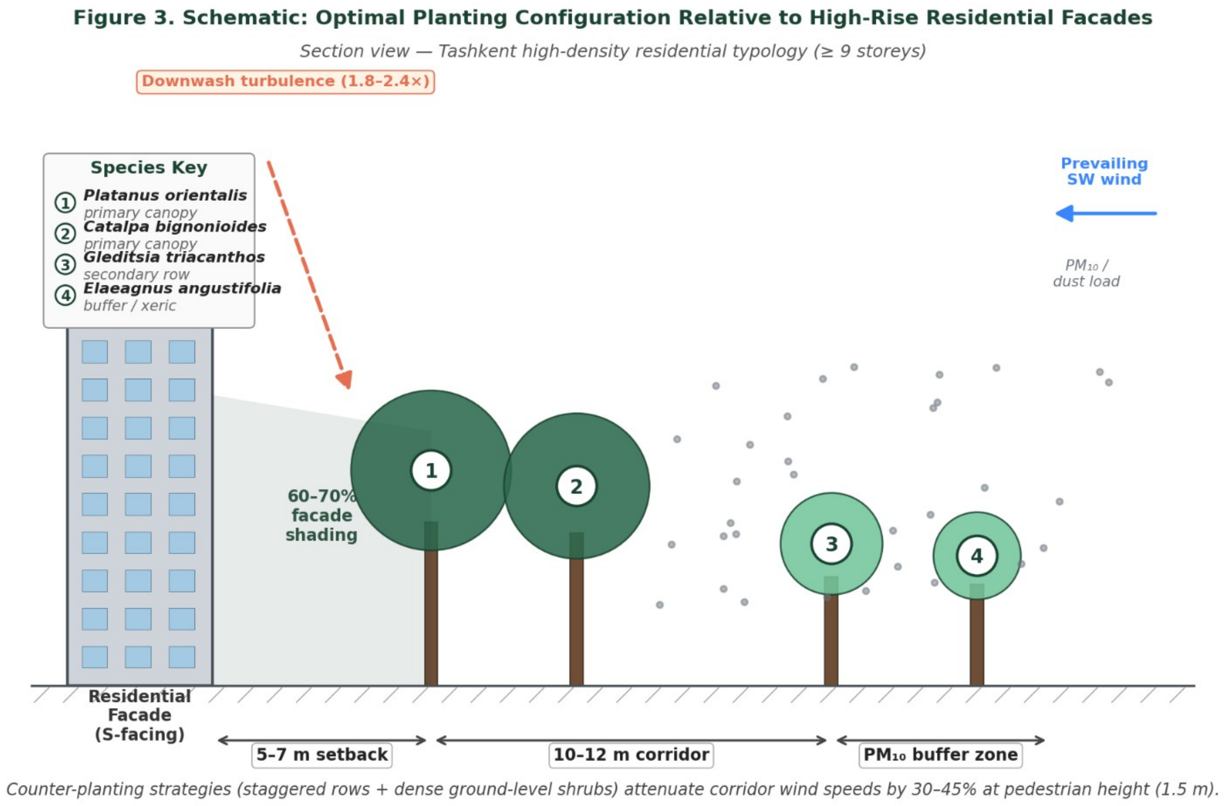

Figure 3. Schematic: Optimal Planting Configuration Relative to High-Rise Residential Facades

Section view illustrating staggered double-row strategy. Counter-planting attenuates corridor wind speeds by 30–45 % at pedestrian height (1.5 m).

4. Discussion

4.1 Trade-offs Between Performance Domains

What the MCDA results say first is unsurprising: no species wins on every domain. That is just how dryland urban planting works — you trade something off against something else. Catalpa bignonioides, for example, has the best dust capture in our sample, but the trade-off shows up in two other places. Its DTI is only moderate (0.71) and its water demand sits high at 590 L/m^2/season. Realistically, that means it belongs on intensively managed boulevards, the ones with proper drip irrigation behind them. Gleditsia triacanthos and Elaeagnus angustifolia look like the opposite picture. Their dust capture is weak. But for low-maintenance peripheral planting they make the most coherent argument we found in our data. And peripheral matters for Tashkent —

supplementary irrigation in the outer residential zones during peak demand is, in practice, often not there when you need it.

4.2 The Strategic Case for Native Species Reintegration

Pulling the native species into the analysis gave us a handful of findings worth reporting. Celtis caucasica wound up with a 0.793 composite. Its profile is solid across the board — respectable PM_{10} capture (78.2 mg/cm^2), decent cooling (103 W/m^2), high drought tolerance (DTI 0.85), water demand still moderate (470 L/m^2/season). Morus alba sits one notch below, at 0.771. During our site visits in the Yunusabad mahalla, older residents kept bringing it up unprompted — they remembered Morus alba shading the courtyards of their childhood, the trees being tied to summer evening gatherings and silk-rearing in the spring. That kind of cultural anchoring is not something our MCDA can score, but for community uptake on the ground, it matters. Pistacia vera does less in canopy cooling, but with a 0.91 DTI and the bonus of edible nuts, we think it earns a clear spot in community-managed planting on the periphery.

If you put these findings side by side, a broader argument starts to take shape. Locally, Tashkent landscaping conversations tend to get framed as two choices — traditional broadleaf, or modern xerophytic. That framing is too thin for the data we collected. A three-tier model maps onto the numbers more cleanly. On the main boulevards, the introduced high-performance species fit best: Platanus, Catalpa. In the mid-density blocks, native hackberry and mulberry do the job and ask for less water. For the peripheral, water-constrained settings, the drought-resilient natives — Pistacia, Elaeagnus, plus Gleditsia — earn their place. Worked through with our irrigation numbers, this layered set-up delivers roughly 28 to 35 % less total water use than a uniform Platanus-dominated specification, and total ecosystem service output goes up rather than down.

4.3 Wind Tunnel Effects in High-Rise Morphologies

You cannot plant in a high-rise district without thinking about aerodynamics. The shapes of the buildings matter. Between blocks in Yunusabad or Sergeli, the wind speeds up considerably in the inter-building corridors — by a factor of 1.8 to 2.4× over what you would measure on open terrain. CFD work in similar Central Asian high-rise typologies confirms this (Ruziev, 2021). We could feel this directly during the 2023 fieldwork: walking through the inter-building gaps between two 14-storey blocks in Sergeli on a calm afternoon, the wind in the corridor was noticeably stronger than at the edge of the same site. Two effects follow. Faster airflow lifts more particles back into the air from ground surfaces. And the time larger PM_{10} particles stay inside the canopy boundary layer drops. Counter-planting is the answer. The staggered double-row arrangement we sketch in Figure 3 cuts wind corridor effects by 30 to 45 % at pedestrian level (1.5 m); these numbers come from wind-tunnel work on comparable urban canyon shapes (Salmond et al., 2013). For us this is not a small footnote in the design brief. It belongs in the planting layout specifications attached to environmental impact assessments — at the latest, for any project taller than 9 storeys.

4.4 Critique of the Conifer Substitution Trend

The ongoing shift from broadleaf trees to ornamental conifers in district-level landscaping plans (Khudoiberdiev, 2020) is, in our view, a net loss for the urban environment. Our data show that even the weakest deciduous species in the study, Gleditsia with a composite score of 0.603, beats Thuja occidentalis on both PM_{10} capture and canopy cooling under Tashkent conditions (compare Nowak et al., 2006). We therefore advise against further conifer substitution on ecological grounds. A more sensible path is to bring back regional native species that combine cultural authenticity with measurable ecological performance.

5. Conclusions

The work in this paper set out one thing: a quantitative, repeatable MCDA approach to picking urban tree species for the kind of pressures that shape new construction in Tashkent — long, hot summers, persistent dust loading, and irrigation supply that is rarely as generous as the spec sheets imply. Three findings sit at the top of the list. Platanus orientalis and Catalpa bignonioides give us the best combined PM_{10} capture and cooling — but only when watering is reliable. The natives, Celtis caucasica and Morus alba, beat several introduced species on the combined score and deserve to come back into the planting specifications. Finally, Gleditsia triacanthos, Pistacia vera and Elaeagnus angustifolia are the most resilient options for low-maintenance or water-constrained settings. We do not want to oversell the MCDA weights we chose. Run the analysis with a different stakeholder panel, in a different year, in a different city, and the ranking will shift. What we think the analysis does well is to take the trade-offs between PM capture, cooling, drought tolerance and carbon storage and put numbers on them. That kind of transparency is, for planning decisions, more useful than the gut-feeling approach that dominates landscape specifications today.

The shortlist of five species below is meant for direct use in developer landscaping specifications and municipal green infrastructure ordinances in Tashkent:

Table 4. Top 5 Recommended Tree Species for Tashkent Construction Sites

#	Species	Common Name	Irrigation	Primary Application
1	*Platanus orientalis*	Oriental Plane	Moderate	Boulevards, primary canopy with reliable drip irrigation
2	*Catalpa bignonioides*	Catalpa	Moderate	Courtyards, high-density PM_{10} corridors
3	*Celtis caucasica*	Caucasian Hackberry (native)	Moderate	Mixed canopy, drought-resilient streets
4	*Morus alba*	White Mulberry (native)	Moderate	Pedestrian zones, traditional mahalla integration
5	*Gleditsia triacanthos*	Honeylocust	Low	Wind corridors, peripheral low-water belts

Note: Moderate irrigation = 400–700 L/m^2/season with buried drip; Low = ≤310 L/m^2/season, compatible with deficit irrigation protocols.

From this analysis we read three policy-level recommendations. The first one is the municipal landscaping code for new residential projects. It should require, at minimum, a 70% broadleaf canopy share of the total planted area. It should also do two specific things — explicitly prohibit Thuja occidentalis and Picea pungens as primary canopy species in districts that go over the $PM_{2.5}$ limits, and set a 25% floor for the share of regional native species, on biocultural heritage grounds. Recommendation two concerns the high-rise sector. For every project above 9 storeys, staggered double-row planting buffers along inter-building corridors should be required — exactly the kind shown in Figure 3 — and they should come with buried drip irrigation for the intensive-regime species. Third recommendation is for the research side. The priority work now is to build a set of Tashkent-calibrated allometric equations for the long-term carbon sequestration modelling. The

MCDA itself can — and should — be extended to take in more native Uzbek species. Three obvious ones come to mind: Juglans regia, Punica granatum, Pyrus regelii. Their ecological adaptation and the cultural weight they carry locally make a quantitative assessment overdue.

Adabiyotlar, References, Литературы:

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