Beyond the *Golden Shovel*

Recommendations for a Successful Urban Tree Planting Initiative

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Viewpoint

Beyond the *Golden Shovel*: Recommendations for a Successful Urban Tree Planting Initiative

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ABSTRACT

Urban tree planting initiatives (TPIs) have become a prominent form of public work that has the potential to increase the livability and sustainability of cities. However, if not sufficiently resourced and thoughtfully planned and implemented, these high-profile programs may fail to achieve intended goals. To promote successful implementation of TPIs, we offer recommendations for the pre-planting, installation, and post-planting phases. During each of these phases we present five cross-cutting themes: ensuring adequate funding for all project phases; cultivating place-based landscape design; engaging and investing in communities; implementing sound planting practices; and evaluating performance and adapting over time.

Keywords: urban greening, urban forestry, green infrastructure, environmental justice, climate change adaptation

Large-scale tree planting initiatives (TPIs) have emerged as a prominent strategy to harness the benefits of vegetation in urban areas. Over 60 municipalities worldwide have committed to planting more than 11 million trees through the Trees in Cities Challenge (United Nations Economic Commission for Europe, 2023). In the United States, urban TPIs have become commonplace (Eisenman et al., 2021; Young, 2011), and $1.5 billion in federal funding has been allocated toward urban tree planting and management as part of the 2022 Inflation Reduction Act (Daley, 2022). The scale of this urban greening activity is arguably unprecedented. Overall, this is good news, because trees help cities adapt to climate change by cooling landscapes and managing stormwater (Berland et al., 2017; Rahman et al., 2020), while also providing wildlife habitat (Wood & Esaian, 2020). In addition, trees are important elements of urban design and placemaking (Arnold, 1993; Crandell, 2013), and trees can improve human health and well-being by enhancing access to vegetated greenspace (Hartig et al., 2014; Markevych et al., 2017). All of this is important given that more people now live in cities than ever before; by 2050, over two-thirds of humans are expected to live in urban settings (United Nations, Department of Economic & Social Affairs, Population Division, 2019).

In short, TPIs and urban forests have become an important type of public work (or green infrastructure) that is directly or indirectly under the purview of municipal executives and urban planners, as reflected in various publications by the APA (e.g., Alvord, 2022; Rouse & Bunster-Ossa, 2013; Schwab, 2009). However, if not strategically and inclusively planned, TPIs can also generate problems and may not deliver desired or equitable benefits (Sousa-Silva et al., 2023; Young, 2011). If TPIs are not resourced with sufficient funding, staff, and equipment, and if trees are not maintained during their vulnerable establishment years, newly planted trees may not survive (Breger et al., 2019). This is not a minor consideration given that 30% of trees planted in urban settings typically die within 5 years (Hilbert et al., 2019). Processes by which TPIs are developed and implemented may not incorporate the values and needs of underserved communities, generating resistance (Carmichael & McDonough, 2019). In addition, the limbs and roots of large trees can damage property and infrastructure (Klein et al., 2019), creating a further barrier to community support for TPIs (Riedman et al., 2022). Tree pollen can aggravate allergies and asthma (Cariñanos & Casares-Porcel, 2011; Eisenman et al., 2019), and despite conventional wisdom, not everyone likes trees in all circumstances (Roman et al., 2021). Some critics argue that urban greening carries unexamined associations with moral virtue (Angelo, 2021; Fitzgerald, 2023) and that tree planting programs are a type of *greenwashing* that diverts attention from essential issues like eliminating fossil fuels (Cohen, 2004; Skene, 2020); this echoes concerns about overstating the benefits of green infrastructure (LeFevre et al., 2023; Pataki et al., 2011). These challenges are important considerations that can be overlooked in the drive to meet

Figure 1. Fundraising event to celebrate planting of 100,000 trees in Atlanta (GA). Source: Image courtesy of TreesAtlanta.

ambitious canopy cover and planting goals (Doroski et al., 2020; Myers et al., 2023).

 We define an urban TPI as a focused tree planting campaign that is distinct from a municipality's typical activity such as operational planting (e.g., replacement of dead trees or those removed during construction) or ceremonial planting (e.g., in honor of people or events; Eisenman et al., 2021). To enhance the success of TPIs, which are often publicized in media-friendly *golden shovel* events (see Figure 1), we offer recommendations that go well beyond planting day. This is rooted in our more than nine decades of combined experience with transdisciplinary research partnerships in urban forestry, arboriculture, stewardship science, management and governance of urban trees, and landscape planning and design.

 Based on iterative and self-reflective dialogue among us, we organize our recommendations in three sections that reflect the typical phases of a TPI: 1) the *pre-planting phase* that includes community engagement, goal setting, and planning; 2) the *installation phase* when trees are sourced, sited, and planted; and 3) the *post-planting phase* when maintenance and monitoring are critical. As described in Table 1 and the sections below, during each phase we present five cross-cutting themes: 1) ensuring adequate funding for all project phases, 2) cultivating place-based landscape design, 3) engaging and investing in communities,

4) following arboricultural best practices, and 5) evaluating performance and adapting over time. Recommendations are grounded in scientific literature, including studies by us and others.

 This guidance is intended for municipal leaders who initiate, fund, and oversee TPIs, as well as urban greening advocates and professionals charged with implementing these programs, including city planners, urban forest managers, arborists, local tree committee members, landscape architects, and community leaders. The scope of our recommendations extends from the beginning of TPI planning to the establishment of trees roughly 3 to 5 years after planting. We believe that the recommendations can help municipal and program leaders implement successful TPIs in ways that reduce the challenges associated with urban trees while increasing community support and long-term tree survival.

Recommendations
Fund
Sufficient allocation of resources is essential for implementing a successful TPI (Cunningham, 2023). Not addressing these matters prior to program launch can lead to *greenwasting*: an initiative that is presented to the public as environmentally meaningful but fails to deliver on stated goals and promises (Nature Based

Table 1. Recommendations for an urban TPI, including five themes across the three typical phases of a project.			
	Pre-planting	**Installation**	**Post-planting**
FUND: *Ensure adequate funding for all phases of the project.*	Allocate about one-third of project funds for comprehensive planning, including community engagement, species selection, and site design.	Allocate about one-third of project funds for tree purchasing, site preparation, and tree planting, including professional staff and equipment.	Allocate about one-third of project funds for equipment and staff for regular maintenance of trees especially in the first 3 to 5 years after planting, as well as project evaluation.
PLACE: *Adopt place-based landscape design practices.*	Develop planting plans that respect the cultural and environmental contexts of a given city, neighborhood, and site and increase connectivity to nearby green spaces. Consider the range of uses for a given site and develop planting designs accordingly.	Adopt planting and governance practices that reflect local cultural and environmental context. Celebrate tree planting as a significant cultural event.	Reconsider species selection and site conditions if trees are dying or unhealthy. Manage trees in accordance with locally relevant practices.
PEOPLE: *Conduct deep civic engagement and invest in communities.*	Establish clear environmental, social, and human health planting goals with community input. Engage diverse stakeholders in the development of planting plans.	Create and promote green job career pathways that train and hire residents. Engage residents of different ages, abilities, and backgrounds during planting events.	Support ongoing local green jobs and environmental education programs. Enable and support ongoing community-centered stewardship.
PLANT: *Follow arboricultural best practices.*	Plan for diversification of species and places and for future climate. Develop relationships with local or regional nurseries to enable supply of high-quality trees.	Plant the right tree in the right place and for the right reason. Follow regional standards for planting techniques.	Actively maintain recently planted trees, including staking, mulching, watering, structural pruning, and pest/disease management.
LEARN: *Evaluate performance of trees and outcomes of planting and adapt management practices accordingly.*	Develop environmental, social, and public health performance metrics. Create protocols, procedures, and databases for monitoring. Produce public-facing systems for gathering community requests, complaints, and input.	Record baseline data for planting locations and species. Track volunteer and partner engagement in the initiative.	Monitor tree health, growth, and survival. Assess environmental (e.g., temperature, stormwater), social (e.g., resident perceptions, stewardship, green jobs), and public health outcomes. Revise planting, maintenance, and management approaches based on learning.

Solutions Institute, 2022). In the case of TPIs, greenwasting can start in the pre-planting phase when leaders emphasize ambitious quantitative goals, such as number of new trees installed or increases in percentage of canopy cover, while not adequately attending to crucial process-related objectives, such as early and sustained community engagement, ramping up nursery production, and post-planting maintenance. In typical urban tree plantings, only half generally survive 13 to 18 years (Hilbert et al., 2019). In some instances, mortality of newly planted urban trees can reach 25% within the first few months (Yang & McBride, 2003). If urban trees are to function as essential green infrastructure, it is reasonable to ask: Would a similar rate of failure be acceptable for traditional gray infrastructure such as street lighting, bridges, or sewage systems?

The cost of greenwasting is not minor; the average expense of planting a new urban tree can range from $500 to $3,500 (City of Philadelphia, 2022; Duseau, 2022; Ostapiuk, 2022), with street trees generally at the upper end of the spectrum due to expenses associated with site preparation in constrained conditions (Hauer & Peterson, 2016). Greenwasting can also generate negative environmental impacts, because it takes roughly three decades for the carbon sequestration of a new urban tree to offset carbon emissions from vehicles and tree care equipment used during nursery production, planting, and pruning (Roman et al., 2021). In addition,

when trees do not survive to maturity, greenwasting may erode public support for related initiatives in the future (Gatten, 2022).

For these reasons, the survival, growth, and long-term health of planted trees are important considerations for TPIs. Though urban tree mortality and poor health are exacerbated by a range of factors, including inadequate site preparation and species selection, the primary reason that newly planted trees do not survive is lack of sufficient planning and investment in post-planting stewardship, especially watering (Breger et al., 2019; Roman et al., 2015). Depending on tree size, species, and growing site, a newly planted urban tree needs irrigation 3 to 5 years after planting to establish itself. Given that TPIs are ultimately intended to provide socioecological benefits across several decades—and not merely get more trees in the ground—leaders may consider roughly equal allocation of resources to all three phases: one-third for pre-planting community engagement and planning; one-third for site preparation, tree purchasing, and planting; and one-third for post-planting maintenance, monitoring, and sustained engagement (see Figure 2). This is a departure from business as usual: TPIs in the United States currently allocate roughly 70% of funds for tree purchasing and installation, and only about 10% for maintenance (Eisenman et al., 2021).

Finally, we believe it is vital that contemporary urban greening move beyond short-lived initiatives toward greater institutionalization. This is another departure from business as usual because the fate of TPIs is often tied to shifts in political leadership (Young, 2011), and many rely on significant funding outside of municipal budgets (Eisenman et al., 2021). Thus, TPI leaders are encouraged to better integrate tree planting and care into municipal policies, comprehensive plans, ordinances, and financing strategies, including stormwater fees, development permits, and bonds (Environmental Finance Center at the University of Maryland, 2019; Koeser et al., 2014; McPherson, 2001). Urban planners can play a pivotal role in institutionalization and building interdisciplinary, multi-stakeholder partnerships across all phases of a TPI.

Place

As TPIs become increasingly common, it is important to respect the local context of a given city, neighborhood, and site by adopting place-based landscape planning and design. The present-day patterns of where trees are located and what species are most prevalent are a legacy of both cultural and environmental factors (Roman et al., 2018). Cultural legacies include national and regional identity (Laurian, 2019; Lawrence, 2006), racialized history (Locke et al., 2021), tree species symbolism and aesthetic norms (Roman & Eisenman, 2022), urban form (Smart et al., 2020), and past greening movements (Campanella, 2003; Dümpelmann, 2019). Environmental legacies include storms, fires, and pests and diseases such as Dutch elm disease and emerald ash borer. These legacies are, in turn, situated within a bioregional context that includes native vegetation, climate, and topography (Roman et al., 2018).

Place-based considerations are foundational to urban planning and design (Forester, 2021; Silberberg & Lorah, 2013) and important across all phases of a TPI. For example, private yards represent significant plantable space but require distinct strategies from TPIs focused on public spaces (Coleman et al., 2023; Geron et al., 2023; Roman et al., 2017). Moreover, not all types of desirable urban greenspaces, such as vegetable gardens, sports fields, open lawns for public gathering and playing, and

Figure 2. Examples of resource allocation across the three phases of an urban tree planting initiative. Left image courtesy of City Plants in Los Angeles, CA. Center image courtesy of Canopy in Palo Alto, CA. Right image in Worcester, MA, courtesy of Lara A. Roman.

scenic views, align with extensive tree cover. And though TPIs offer the potential for cooling and thermal comfort (important benefits in a warming and urbanizing world), this depends on regional context (Erker & Townsend, 2019; Larsen et al., 2023); cooling goals may be best achieved through targeted planting in places frequented by people such as street corridors, transit stops, school-yards, public plazas, and neighborhood parks (Pataki et al., 2021). In cities prone to hurricanes or ice storms, it is crit-ical to select species that can withstand strong winds and to plant large species away from utilities (Conway & Yip, 2016; University of Florida Institute of Food & Agriculture, 2023). In arid and semi-arid climates, TPIs must also con-tend with species selection and tradeoffs related to local water conservation (Pincetl et al., 2013).

In addition, TPI leaders and planners are encour-aged to consider municipal size, tax base, and associ-ated management capacity (Harper et al., 2017; Healy et al., 2023), as well as the structure of local stakeholder networks. Many places, for example, rely on nonprofit and private groups for pre-planting fundraising and pro-gram launch, whereas the burden of long-term man-agement often falls on employees in municipal parks, forestry, and utility departments (Eisenman et al., 2021). As such, arborists offer key expertise in TPI planning and site design because they are largely responsible for long-term tree care, which is critical to maximizing ben-efits and reducing risks. Landscape architects can ensure that tree-planting plans meet a range of user needs and placemaking goals (e.g., ReLeaf Cedar Rapids, 2022). Other sources of expertise, depending on local context, include community engagement specialists, civil engi-neers, hydrologists, and silviculturists. As noted in the ensuing section, the place-based knowledge of resi-dents and neighborhood leaders is foundational.

People

Deep community engagement is critical to the success of TPIs, and city planners have much to contribute because public engagement has occupied a central place in planning theory and practice for decades (e.g., Arnstein, 1969; Forester, 1982; Innes, 1996). Community engagement starts well before any tree is planted, dur-ing the goal articulation and planning stages, and stretches long after trees are in the ground, with oppor-tunities for community-based stewardship. Though it is technically and legally possible for municipalities to plant trees on public lands without resident engage-ment, this approach represents missed opportunities to address community needs and use tree planting as a community organizing strategy. Indeed, lack of commu-nity engagement can backfire, with residents resisting new plantings due to concerns about tree-related prob-lems, mistrust in government agencies, disinvestment in

municipal tree care, and displacing residents due to increased cost of living associated with green amenities (Carmichael & McDonough, 2019; Donovan et al., 2021; Myers et al., 2023; Riedman et al., 2022). Furthermore, TPIs can exacerbate socioeconomic inequalities by planting more in affluent areas (Locke & Grove, 2016), although this is not always the case (Yeager et al., 2023). For TPIs that rely on residents installing trees in private yards, residents may prefer flowering and fruit-bearing trees over large shade trees (Carmichael & McDonough, 2018; Nguyen et al., 2017). Such preferences do not sup-port goals to maximize canopy cover but can support food sustenance and psychosocial benefits, especially in communities suffering from disproportionate physical and mental health challenges.

Though social equity goals related to public health cannot be addressed by environmental interventions alone (Chrisinger, 2023), approaches that center com-munity voices and needs—particularly in historically marginalized groups—can advance environmental just-ice (Campbell et al., 2022; Myers et al., 2023). This includes distributional justice (where trees are planted), procedural justice (how TPIs are planned and imple-mented), and recognitional justice (how different cul-tures, experiences, and worldviews are incorporated in TPIs). Urban forest management plans and practices tend to foreground distributional justice over other dimensions of equity (Breyer & Mohr, 2023; Grant et al., 2022). Community engagement processes can increase inclusivity by providing multilingual facilitation, com-pensation, refreshments, childcare, and meeting times that accommodate residents' work schedules (Nesbitt et al., 2019). In addition, urban vegetation can be more sensitive to drought in economically disadvantaged areas, which may be linked to disproportionate effects of water prices, leading to reduced irrigation (Dong et al., 2023). This echoes calls for increased recognition of the marginalization that vulnerable populations can experience with green (and gray) infrastructure pro-grams (Anguelovski & Connolly, 2022; LeFevre et al., 2023; Lim, 2023).

At the outset of a TPI and throughout implementa-tion, it is critical to invest in communication, collabor-ation, and engagement with an inclusive array of residents and community leaders in the development of goals, planting and management plans, maintenance strategies, and long-term stewardship. It is also impor-tant to recognize the value of community expertise, time, and labor, including both paid and volunteer work (Hauer et al., 2018; Roman et al., 2015). Sometimes called *civic ecology* (Krasny & Tidball, 2015), volunteer stewardship is an opportunity for community expres-sion and creative engagement that can be nurtured through tree care training (Fisher et al., 2015). TPIs are also an opportunity to create and promote

environmental career pathways that train and hire residents, thereby expanding and diversifying the urban forestry workforce (de Guzman et al., 2022; Roman et al., 2015). Green jobs programs can reach different constituents, funders, and partners that might otherwise not be involved in urban forestry, including social service providers, public housing and health agencies, and philanthropies focused on workforce development. As noted by American Forests (2023), "Tree equity is not about trees, it's about people."

Plant

Trees are a form of living green infrastructure that have distinct biological needs and vulnerabilities (Conway et al., 2020; Roman et al., 2018). In recent decades, tree professionals have developed many strategies to promote tree health and longevity. For example, urban foresters and arborists emphasize species diversification to avoid vulnerabilities associated with monocultures, such as entire neighborhoods previously lined with elm and ash trees that have since been decimated by diseases and pests (Laćan & McBride, 2008). Some have also suggested that TPIs should foster a diversity of both tree species and distinct urban places, and that species diversity is best achieved at the municipal scale, not within a single block or street (ReLeaf Cedar Rapids, 2022). Resilient urban forests also require species that can withstand changing climate conditions (McPherson et al., 2018) and working with nurseries to ramp up production of underused species. There are a variety of strategies to foster diverse species palettes from nurseries (Hilbert et al., 2023), such as advance procurement contracts and creating nurseries that are operated by the municipality itself (Campbell, 2017; Newhouse, 2018). Using local nurseries reduces costs and carbon emissions from transportation of plant materials while supporting green jobs.

An important arboricultural axiom is to plant the "right tree in the right place" (Minckler, 1941, p. 685), ensuring that a given species can thrive in a particular site based on factors including available planting space, soil conditions, adjacent infrastructure, and microclimate. This strategy accounts for species selection to avoid conflicts with infrastructure such as overhead wires (Magarik et al., 2020), and falling branches and large trees that can cause power outages and property damage (Roman et al., 2021). Scholars have proposed a range of other planting strategies, including plans that are clearly linked to purposes and objectives (Sousa-Silva et al., 2023), a transgressive urban forest aesthetic intended to awaken city dwellers to the ecological crisis (Laurian et al., 2022), and guidance to promote trees and greenspace near homes, schools, and workplaces (Koninjendijk, 2023). Ultimately, TPI leaders are

encouraged to include a range of stakeholders when developing planting plans at site, neighborhood, and citywide scales to promote long-term cultural, environmental, and human health benefits.

When transferred from nurseries, urban trees are balled-and-burlapped, bare-root, or in containers, with variation by region, and transplanting methods are specific to different plant material (Penn State Extension, 2023; Watson, 2014). It is critical that trees are planted following arboricultural best practices, including appropriate planting depth and watering. After planting, maintenance is essential during the vulnerable 3- to 5-year establishment period. Maintenance practices vary by region, climate, and species, but generally include irrigation, adjusting stakes, weeding, reapplying mulch, and structural pruning. If these maintenance actions are inadequately implemented, trees can become hazardous or unhealthy and die (Breger et al., 2019; Roman et al., 2021). Indeed, a review of urban tree mortality found that the highest tree survival came from projects with extensive paid and volunteer labor for planting and maintenance, whereas the lowest survival was in a project that did not adhere to arboricultural standards (Hilbert et al., 2019).

Learn

As TPIs emerge in cities worldwide, there are opportunities to draw upon successes and failures and to adjust planting goals and management strategies accordingly. In other words, one can think of TPIs as living experiments that enable stakeholders to capture learning in real time (van der Jagt et al., 2019). Evaluating TPIs need not be onerous, but it does require advanced planning and investment. Using a range of tools and techniques, TPI leaders and allied researchers are encouraged to assess environmental and social performance indicators that are linked to community-generated objectives (Sousa-Silva et al., 2023). This may include natural experiments that measure socioecological outcomes before and after planting and drawing upon methods from different disciplines.

There are robust methodologies for monitoring tree growth, health, and survival (Roman et al., 2020); assessing community stewardship and capacity (Svendsen et al., 2016); and evaluating residents' perceptions about trees (Drew-Smythe et al., 2023). Prior to planting, it is valuable to plan for protocols, procedures, and databases for monitoring and assessment so that learning emerges from systematic evaluation. As trees are planted, staff time can be devoted to recording baseline data, including location and species (van Doorn et al., 2020), while also tracking progress toward equity goals, workforce development, species performance in the face of climate change, or other specific objectives (Campbell et al., 2022; Esperon-Rodriguez

et al., 2022). This information is crucial to the iterative and dynamic care of urban trees because it helps managers identify problems and successes. TPI plans and implementation strategies should be revisited and revised based on field data, community input, and practitioner observations in a reflective and collaborative manner.

Conclusion

As large-scale urban TPIs become an increasingly popular way to harness the benefits of green infrastructure, we suggest that tree planting itself is not the goal; rather, tree planting is a means toward the greater goal of creating more livable, equitable, and sustainable cities. Urban planners can play a pivotal role in convening a range of interdisciplinary stakeholders, including community members, in all phases of a TPI, especially in the pre-planting phase when specific planting objectives and landscape design strategies are developed. Importantly, trees are living organisms that require considerable care over decades to ensure that they reach maturity. They also require long-term maintenance to minimize risks to human health, property, and infrastructure. Planners can also play an important role in institutionalizing tree care and ensuring adequate distribution of funds and resources across the pre-planting, installation, and post-planting phases of a TPI. This extends to future monitoring of tree populations, self-reflection upon lessons learned, and ongoing research to assess outcomes. Finally, we encourage city leaders and planners to approach TPIs as one of many strategies to improve urban environments and enhance human health and wellbeing.

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