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Introduction
The United Nations predicts that urban areas will absorb the majority of the world’s projected population growth of up to 3.2 billion people by 2100. By 2030, one out of three people will live in cities with at least half a million inhabitants. The role of urban trees and forests in future urbanization and municipal-scale climate adaptation strategies will affect not only the well-being of urban residents but also the health of the global climate. Urban designs that work with rather than against environmental conditions and that integrate equitable green infrastructure will be crucial in this endeavor.

Although many studies have explored the various potential benefits of urban trees—including filtering air, reducing noise and stormwater runoff, providing shade, sequestering carbon, and improving psychological and physical health and well-being—the heterogeneity and complexity of these processes and their contexts ultimately determine trees' environmental and social impacts. Histories of urban tree planting can shed light on these complexities and their political contexts and contingencies in time and place, and they can further our understanding of trees’ various impacts, perceptions, and roles in society and the environment, offering guidance for future tree-planting initiatives.

Throughout human history, trees have variously been considered as aesthetic, sacred, and divine objects and living beings; symbols and metaphors; creators of space; territorial markers; instruments of emancipation and empowerment; sanitizers; air conditioners; nuisances; upholders of moral values; economic engines; scientific instruments; and ecological habitats. Since systematic tree planting in cities and along streets began in early modern times, trees have played important roles for urban living. Particularly during health, climate, and political crises, people have appreciated urban trees’ relatively permanent yet changeable and ephemeral character to discover often unforeseen benefits. Crises have provided opportunities to reconsider the values and meanings of urban trees, which can also be considered as stand-ins for non-human urban nature more generally.

Health Crises: Trees as Palliative
The current coronavirus disease 2019 (COVID-19) pandemic has led many cities to issue stay-at-home directives that restrict movement to the bare necessities, such as grocery shopping, doctor’s visits, and getting fresh air. In the northern hemisphere on these increasingly mild and sunny days of spring, urbanites have been flocking to parks and plazas for this latter purpose, so much so that it has sometimes been hard to maintain social-distancing rules. Yet, not everybody has a park or even a tree-lined street nearby. In many ways, therefore, the COVID-19 pandemic is revealing the uneven distribution of access to urban nature and by extension health care.

Besides urban parks of various sizes, tree-lined streets are a vital public infrastructure that is not always evenly distributed. For example, although urban forests have been shown to reduce heat-related illnesses for city dwellers, scientists have also revealed the unevenness of canopy cover in many cities, which is often related to citizens’ ethnicity and socioeconomic status. Similar observations have been made throughout history.

Trees’ health benefits have been observed since antiquity. Their palliative role in cities was explicitly noted in the 17th century, when London’s industries were enveloping the city in dense smoke and causing bad odor and respiratory diseases. To improve the air quality, British polymath John Evelyn suggested planting fragrant and aromatic trees in odiferous shelter belts surrounding London. Building upon 17th- and 18th-century ideas for densely planted inner-urban squares, 19th-century park designers, public health officials, and physicians considered park construction and tree planting to be a public health measure with beneficial psychological and physical effects. In 1829, British landscape gardener John Claudius Loudon explicitly advised that open and tree-covered land and parks—“breathing places”—be distributed equitably throughout the city of London.

Landscape architects, physicians, and public health officials realized trees’ role in producing a healthy climate in addition to valuing their aesthetic and ornamental effects in cities. American landscape architect Frederick Law Olmsted claimed that foliage and sunlight disinfected air. And in the words of 19th-century New York physician Stephen Smith, “trees in a crowded city [were] a self-acting sanitarium.” Smith posited that the cooling function of urban trees in the summer rendered them a potential means of decreasing children’s mortality from diarrheal diseases.

Before the advent of the germ theory in the 1880s, prominent American physicians such as Smith and John H. Rauch considered vegetation, particularly trees,
of central importance in combatting cholera, yellow fever, and malaria (“malaria” in Italian means “bad air”) epidemics. The assumption was that tree canopies could physically hinder miasma—poisonous gases causing disease—from spreading.

Other crisis events also highlighted the palliative function of urban trees. For example, in the ruined and rubble-strewn German cities after the Second World War, not only were street tree planting and the afforestation of areas cleared of rubble considered a necessary part of the cities’ reconstruction, but planting trees to filter and manage dust from rubble areas and ruined grounds was also considered an important public health measure. Rubble dust was thought to be a cause and vector of several respiratory and infectious diseases. Given its effects on the urban microclimate and its potential to obfuscate the atmosphere, dust could also negatively affect the human psyche, a concern of particular relevance amid postwar hardships.9

**Climate Crisis: Trees as Climate Control**

Although urban trees’ role in producing a healthy microclimate has long been acknowledged, their role as carbon sinks and as mitigators of global climate change has recently played an important role in instigating the various Million Tree campaigns, for example, in 2006 in Los Angeles and in 2007 in New York City. However, despite these initiatives, even in the last decade many urban forests throughout the United States have suffered a loss of canopy cover as a result of disinvestment and neoliberal urban development practices.10

It is clear that urban tree-planting campaigns can be beneficial in multiple ways, which include raising environmental and community awareness.11 To be effective in the long term, however, these initiatives will require governmental support and sustained and careful management. Ultimately it is local governmental entities that, when supported adequately, can provide the continuous and comprehensive support for evenly distributed urban tree cover to combat the urban heat-island effect and CO2 emissions.12,13

Although the systematic planting of trees along streets began in the second half of the 19th century, it was first suggested as a means of mitigating global climate change in the 1950s. At the 1958 National Conference on Air Pollution in Washington, DC, Chauncey D. Leake, president of the American Association for the Advancement of Science, proposed tree planting as one possible measure to mitigate warming caused by CO2 emissions. “Maybe 10 trees planted for every automobile, with 100 for every truck, would help,” Leake suggested; he further surmised that, beyond the potential reduction of air pollution, cities could “certainly benefit from such tree planting.”9,14 Leake’s proposal came only some months after meteorologist Charles David Keeling had begun to measure atmospheric CO2 at Hawaii’s Mauna Loa Observatory in the spring of 1958, after which he ultimately confirmed that CO2 levels were rising steadily and were associated with emissions from the burning of fossil fuels.15

Despite the mounting scientific evidence since then, policies and action are still necessary to address climate change. Since the end of the Cold War, the 1992 Earth Summit in Rio de Janeiro and the resulting Climate Change Convention, Kyoto Protocol, and Paris Agreement have signaled international recognition of human-caused climate change. Although we have seen progress in international and national climate commitments, these still largely need to be acted upon and translated into measures undertaken at local levels.

Tree planting is only one of many measures needed to make a change. However, its effectiveness should be evaluated not only in terms of the immediate CO2 sequestration and urban heat-island mitigation it achieves but also in terms of the empathy it can induce among citizens toward urban nature and the environment more generally.

**Political Crises: Trees as a Civil Right and Resource**

Urban tree planting has provided a means and method for disenfranchised groups to (re)claim their right to the city both physically and symbolically. In the early 20th-century United States, despite a preference among experts for municipal ownership and management of street trees, limited budgets and public disinterest often required citizens to take street tree planting into their own hands. In fact, even since then, street tree planting and care in United States cities has been undertaken mostly in public-private partnership. In early 20th-century New York City, the private Tree Planting Association pushed for the greening of the city’s streets, an opportunity that did not go unnoticed by female New York philanthropists, social reformers, and activists. They quickly began to embrace street trees as a means and symbol of empowerment, emancipation, and even resistance. Initiating planting campaigns, they transgressed the separation of private and public spheres and the binary of male-coded architecture and female-coded nature.9

In the 1960s, decades after the first wave feminism in the late 19th and early 20th centuries, African American grassroots activists in Harlem and Bedford-Stuyvesant began to plant street trees during the civil rights movement in an effort to improve inner-city life and reclaim their right to the city. They transformed tree-planting and conservation activities into a means of empowerment and emancipation. “Plant-ins” became a way to build community and a civil right used against ghettoization. Inspired by this “tree roots” initiative, the city began a tree-matching program: it complemented six trees for every four trees that a block association planted.9

Street tree planting has even contributed to events relevant on a global scale. In Berlin, street trees provided citizens with firewood during and after the Second World War, when the Western Allies’ order to fell street trees for use as firewood during the Berlin Blockade (1948–1949) also incited one of the first ideological battles of the Cold War. In socialist East Germany, during the Cold War, grassroots street-tree-planting initiatives gathered together like-minded people in environmental groups. These groups played an important role in the formation of opposition against the German Democratic Republic’s dictatorship, and they ultimately contributed to its fall 30 years ago.9

At various times of political crises, urban trees have not only inspired and brought people together but also provided citizens with a valuable natural resource as lumber, oil, and fruit supply. The coal shortage that hit New York city in 1917 upon the United States’ entry into the First World War turned street
and park trees into a welcome timber resource. As a means of achieving autarky and securing survival in Germany during both world wars, the seeds and blossoms of urban trees were collected for the production of oil and infusions, and mountain ash berries were enlisted as vitamin C providers. During the 1973 oil embargo by the Arab oil-producing countries, a concurrent wave of Dutch elm disease ravaged urban trees in Chicago, leading the urban foresters and city officials to consider street trees as a potential timber resource. Although never realized, plans were drawn up to turn the urban forest into the city’s wood fuel supply.

The use of trees as a material natural resource in times of war and scarcity further demonstrates the advantage of their municipal governance. City governments can provide and ensure equal access to the urban forest without compromise and can protect citizens through laws, ordinances, and codes against environmental gentrification. As the American entomologists Ephraim Porter Felt and Stanley Willard Bromley noted in 1930, street trees are an unalienable right. “The right to shade trees” was, they believed, implicit in the equal opportunities for the pursuit of happiness laid out in the Declaration of Independence.16

Conclusion

As these historical examples show, street trees and the urban forest are more than luxurious afterthoughts. Especially in times of crisis, we are reminded that they are a public service and infrastructure, a common good, and part of a larger environmental system including us humans. Increasing urbanization throughout the world will therefore require us to build with trees and non-human nature more generally. Past and ongoing health, climate, and political crises reveal trees’ beneficial roles as palliatives, carbon sinks, climate mitigators, and natural resources, as well as a basic civil right. The protection of this basic civil right to trees and urban nature requires us to reconsider the essential role that municipal governments can play in its equitable provision, a question that many governments already engaged in the 19th century.

Over time, much sophisticated thought, experiment, and observation have gone into the design, cultivation, planting, care, production, and management of urban trees—from developing tree master plans and constructing underground irrigation systems to developing soil substrates and cultivars suited to urban stressors. Valuing trees goes hand in hand with valuing those who handle, work with, and study them. Careers in urban forestry and arboriculture, as well as training in these fields, need to be valued and compensated accordingly. Our current times of accelerated urbanization and climate change require the application and expansion of historical, scientific, and practical tree knowledge to inform new urban design paradigms that can accommodate the urban life forms we need without compromising the needs of urban trees.

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