Environmental Justice in New York's Million Trees Campaign

Jessica Debats

MIT Department of Urban Studies and Planning

11.308 Ecological Urbanism: Final Case Study

Professor Anne Spirn

December 18, 2014

Photo source: Jessica Debats, March 2013

Abstract

Trees filter and absorb air pollution and make streets measurably cooler. However, low-income minority neighborhoods tend to be tree-poor compared to their more affluent neighbors, and suffer higher rates of heat- and pollution-aggravated respiratory and cardiovascular illnesses. MillionTreesNYC (MTNYC), a public-private partnership led by the City of New York, is well on its way to having planted a million new trees by summer 2015. To maximize the public health benefits, the campaign committed not only to expanding New York's urban forest, but also to prioritizing neighborhoods with the greatest need for more trees.

This case study analyzes how MTNYC defines environmental justice as an urban forestry goal, as well as how it conceptualizes the role trees play in the urban ecosystem. Data sources include key planning documents, promotional materials, and interviews with a purposive sample of MTNYC planners. These sources indicate that MTNYC's environmental justice goals are primarily distributive rather than procedural, and based on trees' ability to protect local residents' respiratory health. Moreover, MTNYC consistently promotes trees as a form of natural infrastructure: just as the public sector provides street lights, roads, fire hydrants, utilities, and other infrastructure to keep the city running, MTNYC plants trees to support residents' health and well-being.

Introduction

In 2007, New York City was already home to approximately five million trees (MTNYC, 2014). However, many neighborhoods still had low tree stocking levels, the city as a whole was failing to meet federal air quality standards, and climate change was predicted to exacerbate the existing urban heat island effect (City of New York, 2007). To address these issues, the City launched MillionTreesNYC (MTNYC) as one of the 127 sustainability initiatives included in PlaNYC, Mayor Michael Bloomberg's blueprint for making NYC "greener and greater" by 2030 (City of New York, 2007; Layzer & Schulman, 2014; Rosan, 2012). MTNYC originally sought to plant one million new trees over a decade, finishing by 2017 (Layzer & Schulman, 2014; Loukaitou-Sideris & Ehrenfeucht, 2009). However, because the campaign was more successful than originally anticipated, its planners now expect to plant the one-millionth tree two years sooner, by summer 2015 (Layzer & Schulman, 2014; MTNYC planner, 2014).

But simply planting a million trees was never MTNYC's only goal. Instead, the campaign specifically committed to prioritizing neighborhoods with the greatest need for more trees (Layzer & Schulman, 2014; MTNYC, 2014; MTNYC planner, 2014). This commitment to distributive environmental justice is key, given that an extensive body of research demonstrates that tree cover in U.S. cities affects public health on a highly local, intra-urban scale. In addition to filtering and absorbing air pollution, trees make streets measurably cooler, an ecological service that is increasingly vital as heat waves become more severe and frequent under climate change (Akbari 2002; City of New York, 2007; Harlan et al., 2006; Konopacki & Akbari 2002; Lowry 1967; Patz et al. 2004; Peper et al., 2007; Pincetl et al., 2013; Rosenthal et al., 2008; Rosenthal et al., 2014; Spirn, 1984; Spirn, 1986). Despite these recognized benefits, however, low-income minority neighborhoods tend to be tree-poor and suffer higher rates of heat- and pollution-aggravated respiratory and cardiovascular illnesses when compared to their more affluent neighbors (Harlan et al., 2006; Klinenberg, 2002; Loukaitou-Sideris & Ehrenfeucht, 2009; Rosenthal et al., 2007; Rosenthal et al., 2014).

To assemble the funding, staffing, expertise, and volunteer base necessary to plant a million trees, the City designed MTNYC as a partnership between the public, private, and non-profit sectors. However, such public-private partnerships (PPPs) remain controversial. While they can expand the resources available to city-led initiatives, their reliance on the private sector may reduce their ability to pursue social equity (Bovaird, 2004; Daniels & Trebilcock, 1996; Klinenberg, 2002; Osborne & Gaebler, 1992; Sagalyn, 2001; Sagalyn, 2012; Stoker, 1998; Verkuil, 2007). As a first step towards addressing this issue, this case study analyzes how the planners at MTNYC define their environmental justice goals and conceptualize the role that trees play in the urban ecosystem, as well as the constraints and opportunities MTNYC encountered when planting trees in tree-poor neighborhoods. Data sources include key planning documents (such as PlaNYC, which initiated MTNYC), the MTNYC website and other promotional materials, as well as in-depth interviews with a purposive sample of the campaign's planners.

The benefits of trees: cooler streets and cleaner air

Trees provide a vital ecological service for cities by reducing the urban heat island effect (Akbari 2002; Konopacki & Akbari 2002; Lowry 1967; Peper et al., 2007; Pincetl et al., 2013; Spirn, 1984). Urban areas with a high concentration of heat-retaining pavement and buildings have higher ambient temperatures (Lowry, 1967). In contrast, areas with a greater proportion of vegetation enjoy an "oasis effect," in which trees significantly reduce ambient temperatures via shade and evapotranspiration (Akbari, 2002; Konopacki & Akbari, 2002; Lowry 1967; Peper et al., 2007; Pincetl et al., 2013; Spirn, 1984). This function is particularly critical in New York, which is predicted to experience more frequent and severe heat waves under climate change (City of New York, 2007; Rosenthal et al., 2008). While the heat island metaphor generally refers to large-scale disparities between urban and rural areas, trees' effect on temperature is actually highly localized, with tree cover producing measurable temperature differences between neighborhoods (Rosenthal et al., 2014) and even streets (Harlan et al., 2006; Pincetl et al., 2013). Moreover, the proportion of vegetated versus impervious cover is a statistically significant neighborhood-level predictor of heat-related mortality in New York City (Rosenthal et al., 2014).

In addition, trees filter and absorb dust and pollutants (Spirn, 1984; Spirn, 1986). New York's current urban forest, for instance, removes an estimated 2,200 tons of air pollution each year (MTNYC, 2014). The empirical literature, however, has not yet conclusively demonstrated a connection between tree canopy and air quality on a scale as fine as the neighborhood or street. However, landscape architecture and traditional building methods have a long history of employing design measures, such as rows of trees, to provide cleaner air to local residents, suggesting that such a connection does exist (Spirn, 1984; Spirn, 1986). Moreover, local pollution mitigation strategies are vital for local public health: even when a city as a whole may be in compliance with air quality regulations, local ambient air pollution concentrations may exceed health standards, for example, near roads or industrial sites or in areas with poor air circulation (Spirn, 1986).

The pros and cons of a public-private partnership

The majority of the MTNYC's funding comes from the $400 million originally allocated by Mayor Bloomberg, mostly from capital bonds (Layzer & Schulman, 2014). Nevertheless, MTNYC was designed as public-private partnership (PPP), with the city government reaching out to and receiving funds, staffing, expertise, volunteer labor, and other resources from a variety of public agencies, non-profits, private companies, private property owners, and city residents (Layzer & Schulman, 2014; MTNYC, 2014; MTNYC planner, 2014). The lead public partner is the New York City Parks Department (NYC Parks) (Layzer & Schulman, 2014; MTNYC, 2014; MTNYC planner, 2014). Additional support, particularly in the form of forest management research and expertise, comes from the United States Forest Service (US Forest Service) (Layzer & Schulman, 2014; MTNYC, 2014; MTNYC planner, 2014). The other lead organization is the New

York Restoration Project (NYRP), a non-profit founded by Bette Midler with the goal of providing all New Yorkers with high-quality public space within walking distance (Layzer & Schulman, 2014; MTNYC, 2014; MTNYC planner, 2014). A variety of other community organizations also support MTNYC through volunteer coordination, local expertise, and other contributions (Layzer & Schulman, 2014; MTNYC, 2014; MTNYC planner, 2014). On the private sector side, Toyota, conEdison, and TD Bank have all signed on as corporate sponsors, contributing funds to the campaign (Layzer & Schulman, 2014; MTNYC, 2014). Similarly, private donors such as David Rockefeller and former Mayor Michael Bloomberg (via Bloomberg Philanthropies) have also contributed significant funds (Layzer & Schulman, 2014; MTNYC, 2014).

Such PPPs have become increasing popular in recent years. Due to shrinking municipal budgets, city governments increasingly lean on the private and non-profit sectors (Loukaitou-Sideris & Banerjee, 1998; Pincetl, 2003). The popularity of such arrangements stems primarily from their ability to leverage private resources and their promise to introduce market-based efficiency, innovation, and flexibility to the delivery of public goods (Bovaird, 2004; Daniels & Trebilcock, 1996; Osborne & Gaebler, 1992; Sagalyn, 2012; Stoker, 1998). However, because such collaborations draw heavily on private capital, they may be biased towards profitable investments at the expense of social equity (Bovaird, 2004; Daniels & Trebilcock, 1996; Sagalyn, 2001; Sagalyn, 2012; Stoker, 1998; Verkuil, 2007). For instance, privatizing social services has often made them less accessible to vulnerable individuals, who often lack the time, resources, and insider knowledge necessary to navigate the new system (Klinenberg, 2002). Moreover, without sufficient public oversight, relying on the private sector to deliver public goods may "outsource" political decisions about how to produce and distribute such goods, reducing political transparency and accountability, and even increasing the potential for corruption (Sagalyn, 2001; Verkuil, 2007).

According to the literature, the public sector is in danger of becoming the weaker partner because it cannot leave the project if the deal goes bad; a private company can pull up stakes and leave the city, but the City *is* the city, and has nowhere else to go (Loukaitou-Sideris & Banerjee, 1998; Sagalyn, 2001). That said, however, New York City is in an unusually strong position. As one of a handful of command centers for the global economy, New York is a unique and highly profitable environment for private companies, increasing the chances that MTNYC's corporate partners will remain committed to maintaining a good relationship with the City (Sassen, 1991). Moreover, unlike many PPPs, MTNYC draws most of its funding from public sources, such as municipal capital bonds and general funds (Layzer & Schulman, 2014). In addition, unlike most cities, New York has placed responsibility for municipal forestry - including trees planted in streets, parks, and forested areas – in the hands of a single public agency, NYC Parks (Layzer & Schulman, 2014; Loukaitou-Sideris & Ehrenfeucht, 2009). This arrangement helps ensure public oversight and control over planting strategies and priorities.

Finally, New York City is also somewhat unique in having street and tree ordinances that are supportive of tree planting (Layzer & Schulman, 2014; Loukaitou-Sideris & Ehrenfeucht, 2009). MTNYC "counts" trees planted on both public and private property towards its million-tree goal, with the city playing a more active role in former and collaborating with private property owners in the latter (Layzer & Schulman, 2014; MTNYC, 2014; MTNYC planner, 2014; NYRP, 2014). However, in many cities, even planting on public streets can be contentious, with adjacent property owners having a legal right to refuse new street trees (Layzer & Schulman, 2014; Loukaitou-Sideris & Ehrenfeucht, 2009). In New York, however, such permission is not required, putting NYC Parks in a much stronger negotiating position (Layzer & Schulman, 2014; Loukaitou-Sideris & Ehrenfeucht, 2009; MTNYC planner, 2014). For instance, MTNYC planners take adjacent property owners' preferences into account when possible to ensure that the City is a "good neighbor" (MTNYC planner, 2014). However, the City ultimately retains the right to plant public property such as streets as necessary, just as it has the right to place streetlights, fire hydrants, and other infrastructure where needed for the public good (MTNYC planner, 2014).

Procedural and distributive environmental justice

The planning literature defines environmental justice in terms of both procedural fairness and distributive equity (Pellow, 2000; Schlosberg, 2003; Shrader-Frechette, 2002). Deviations from the first goal result when the planning process fails to address diverse stakeholder needs and incorporate local knowledge via governance (Corburn, 2002; Corburn, 2005; Pellow, 2000; Shrader-Frechette, 2002). Historically, zoning and planning have concentrated noxious land uses and industries, along with their associated environmental burdens, in poor and minority communities (Maantay, 2001). This history of predominantly white officials making planning decisions that harm the health of non-white populations has been termed "environmental racism" (Bullard, 2000; Cole, 2001).

Distributive inequity derives from class- and race-based inequality, with environmental impacts and amenities being unevenly distributed across space according to the race and class of the local inhabitants (Bullard, 2000; Maantay, 2001; O'Neill et al., 2007; Soja, 2010). For instance, social and economic inequalities disproportionately concentrate pollution sources and their associated health impacts in low-income urban communities and among African-Americans and people of Hispanic or Latino origin (Bullard, 2000; Cole, 2001; Corburn, 2002; Corburn, 2005; Maantay, 2001; Mohai, Pellow, & Roberts, 2009; O'Neill et al., 2007; Pastor, Jr., Sadd, & Morello-Frosch, 2005; Pellow, 2000; Ringquist, 2005; Schlosberg, 2003; Shrader-Frechette, 2002; Sze et al., 2009; Wernette & Nieves, 1992). Recently, studies of environmental justice have begun to reveal the extent to which these neighborhoods also lack amenities, such as parks and trees, which contribute to environmental quality and protect public health (Danford et al., 2014; Loukaitou-Sideris & Ehrenfeucht, 2009; Loukaitou-Sideris & Stieglitz, 2002). More broadly, resilience to climate change impacts,

including extreme heat, is unevenly distributed across urban areas, reducing the resilience of the city as a whole (Vale, 2014; Vale et al., 2014). Ultimately, procedural and distributional inequities are linked because the former produces land-use decisions that unevenly concentrate environmental amenities and impacts across the social and spatial landscape.

The health benefits of trees remain unequally distributed, since tree cover is typically lower in low-income neighborhoods with high proportions of non-white residents, particularly African-Americans and people of Hispanic or Latino origin (Harlan et al., 2006; Loukaitou-Sideris & Ehrenfeucht, 2009; Loukaitou-Sideris & Stieglitz, 2002; Rosenthal et al., 2014). These same areas are hit harder by heat waves and have higher rates of heat-aggravated respiratory and cardiovascular conditions (Harlan et al., 2006; Klinenberg, 2002; Patz et al., 2004; Rosenthal et al., 2007; Rosenthal et al., 2008; Rosenthal et al., 2014). Therefore, on the local, intra-urban scale, tree cover disparity is a significant environmental justice issue because it contributes to uneven resilience in the face of pollution, the urban heat island effect, and climate change (Vale, 2014; Vale et al., 2014).

How MTNYC conceptualizes environmental justice

MTNYC incorporates elements of both procedural and distributive environmental justice, although its emphasis is primarily on the latter. To promote procedural equity, the City worked to incorporate environmental justice advocates and community organizations into the process of drafting of the PlaNYC initiatives, including the million trees campaign (Layzer & Schulman, 2014; Rosan, 2012). These efforts included conferring with community groups, holding town hall meetings, soliciting feedback via email and other mediums, and inviting representatives of environmental justice and community advocacy groups to join decision-making bodies and planning committees (Layzer & Schulman, 2014; Rosan, 2012). However, local environmental justice advocates remain divided over whether the City achieved meaningful rather than symbolic participation (Rosan, 2012).

In contrast, MTNYC's commitment to distributive environmental justice is a major element of its program goals and planting strategies. MTNYC's lead non-profit partner, the New York Restoration Project (NYRP), committed to putting "special focus on communities of need" (NYRP, 2014). However, MTNYC's primary and most specific means of pursuing distributive environmental justice is NYC Parks' prioritization of the Trees for Public Health (TPH) neighborhoods (MTNYC, 2014; MTNYC planner, 2014). NYC Parks identified six neighborhoods as having the greatest need for trees (MTNYC, 2014). These are:

- Hunts Point, Bronx
- Morrisania, Bronx
- East New York, Brooklyn
- East Harlem, Manhattan
- Rockaways, Queens
- Stapleton, Staten Island

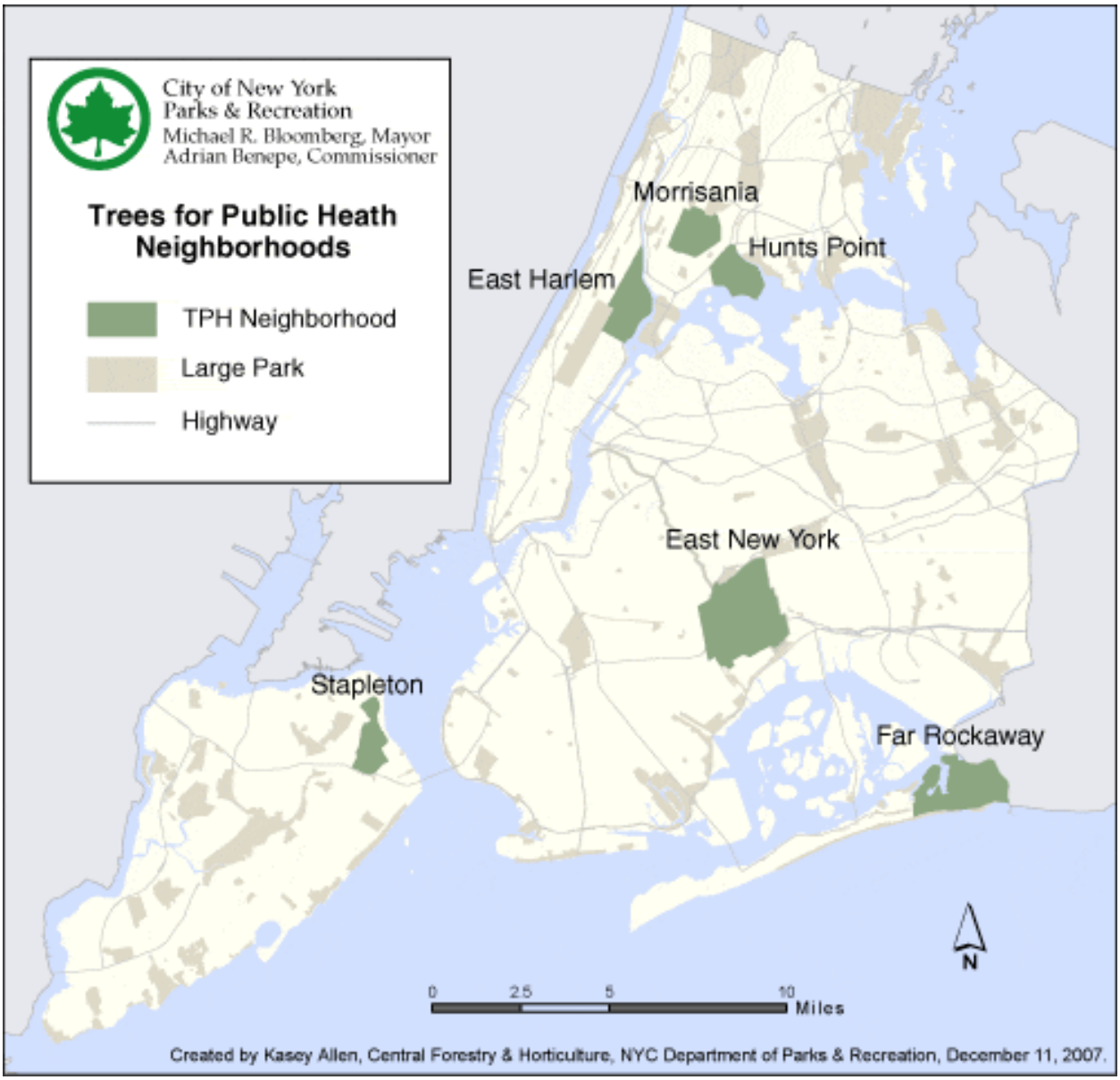

Image source: MillionTreesNYC. (2014). Trees for Public Health Neighborhoods. Retrieved from http://www.milliontreesnyc.org/html/million_trees/neighborhoods.shtml

According to MTNYC planners, these areas receive priority for street tree planting to ensure that MTNYC serves areas of greatest need first (MTNYC planner, 2014). The official, published criteria by which NYC Parks identified these areas are high incidence of asthma among young people and low street tree stocking levels (MTNYC, 2014). NYC Parks selected these two criteria because they indicate a need for more trees to mitigate air pollution and the urban heat island, both of which are risk factors for respiratory illnesses (MTNYC planner, 2014). In addition to quantifying tree canopy coverage through remote sensing, MTNYC planners use their on-the-ground knowledge of the local built environment to prioritize areas where the program can make the most visual and physical impact by planting more trees where previously there were none (MTNYC planner, 2014). Thus, MTNYC conceptualizes its distributive environmental justice goals via both formal, technical means and intuitive, local knowledge (albeit both provided by experts rather than local residents).

MTNYC also referenced several supplementary criteria to verify whether the program was working with the best possible list of TPH neighborhoods for remediating environmental injustices (MTNYC planner, 2014). MTNYC planners are well aware that poverty and communities of color are closely correlated with a host of environmental issues, including poor air quality and a lack of vegetation (MTNYC planner, 2014). Consequently, while income and race were not included in the official, published criteria, planners knew that the end result would be the same: neighborhoods that struggle with poverty and inequality would be prioritized for tree planting efforts (MTNYC planner, 2014).

In addition, NYC Parks sought to identify at least one neighborhood in each of the five boroughs in order to demonstrate MTNYC's commitment to serving all areas of the city (MTNYC planner, 2014). In the Bronx, one additional neighborhood was identified, bringing the total to six: Hunts Point (MTNYC planner, 2014). As described by MTNYC planners, this neighborhood needed to be on the list to ensure that the City responded to local community needs (MTNYC planner, 2014). Beginning in the mid-2000s, residents in this South Bronx neighborhood formed a civic coalition called Greening for Breathing in order to call for the City to plant more vegetation to mitigate high levels of air pollution from local industrial activity (MTNYC planner, 2014). By identifying Hunts Point as a TPH neighborhood, NYC Parks sought to demonstrate its commitment to meeting the needs highlighted by these local activists (MTNYC planner, 2014).

Trees as infrastructure

NYC Parks, the lead public agency in charge of street tree planting, has adopted a block planting strategy that treats trees as a form of public infrastructure (MTNYC, 2014; MTNYC planner, 2014). While Parks still responds to residents' individual requests for new trees, the ultimate goal is to plant street trees in

every available spot, block by block, across the city (MTNYC, 2014; MTNYC planner, 2014). The theory behind this new approach is that trees are comparable to streetlights, fire hydrants, utilities, and other public infrastructure that must be provided citywide (MTNYC planner, 2014). Like other infrastructure, street trees are located on public property in the public right of way. Consequently, the City has the right to site them wherever necessary for the public good (MTNYC planner, 2014). One co-benefit of treating these trees as citywide public infrastructure is that MTNYC planners expect it to reduce the risk of gentrification: if trees are provided equally across the city, then there will be fewer differences to raise or lower rents, at least as far as trees are concerned (MTNYC planner, 2014). Similarly, local businesses will have less reason to fear that new street tree plantings will impact their visibility and competitiveness in relation to other businesses (MTNYC planner, 2014). Instead, all businesses will have an equal chance of having trees out front, just as they have an equal chance of having a stop sign or fire hydrant (MTNYC planner, 2014).

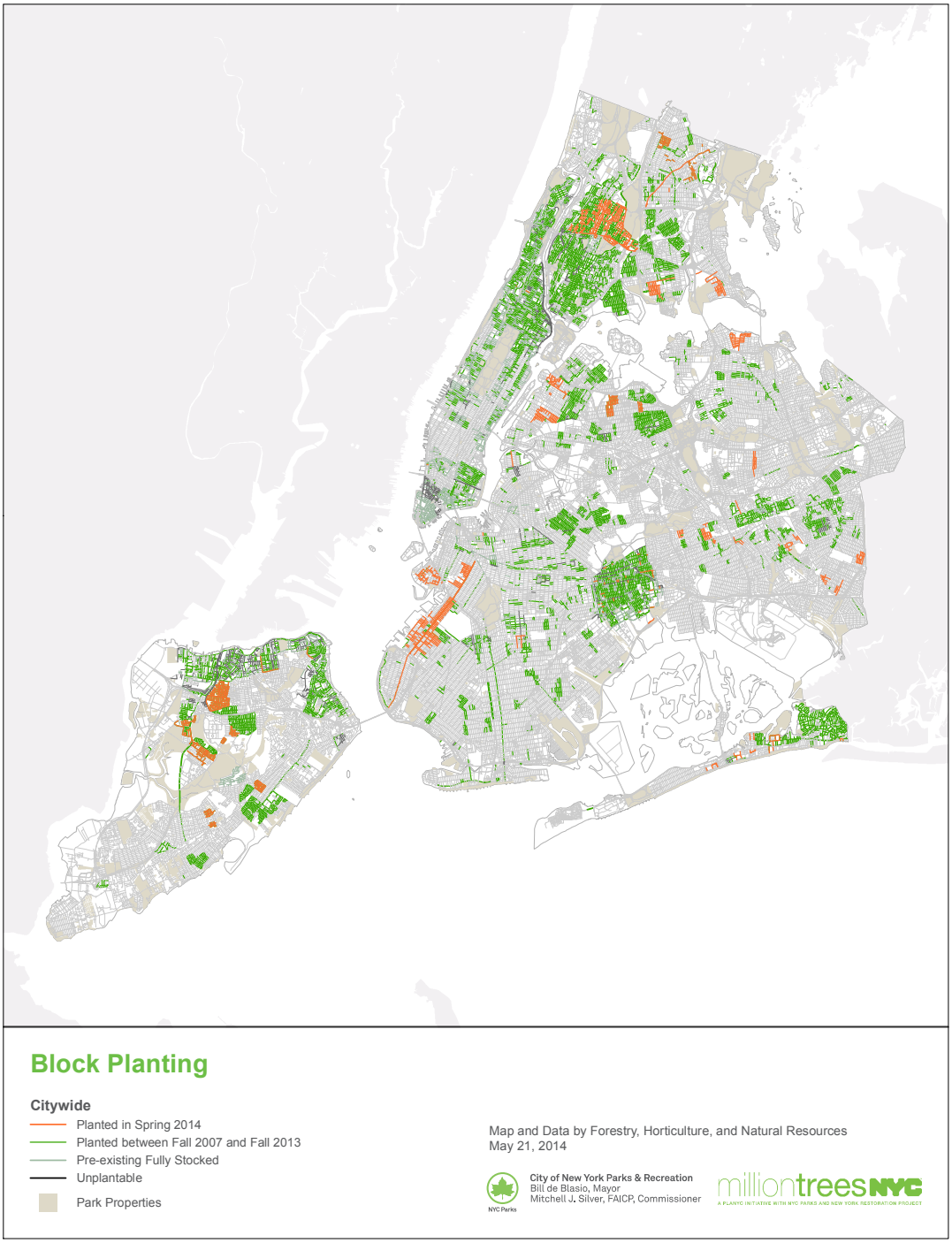

Image source: MillionTreesNYC. (2014). Spring 2014 Citywide Street Tree Block Planting Map. Retrieved from http://www.milliontreesnyc.org/html/about/getting_parks.shtml#block

This approach also compensates for the drawbacks of the 311 system, which was previously the City's primary means of deciding where to plant new street trees (MTNYC planner, 2014). Prior to the start

of MTNYC, city planners had assumed that a formal request for a tree by an adjacent resident was the best means of locating new plantings (MTNYC planner, 2014). If a resident cared enough to ask for a tree, the theory went, then that resident would be likely to provide enough care and maintenance to ensure the new tree's survival (MTNYC planner, 2014). However, when MTNYC planners examined the location of 311 requests in more detail, they found that far fewer requests originated from low-income neighborhoods than more affluent ones (Lu et al., 2014; MTNYC planner, 2014). MTNYC planners speculate that differences in the frequency of 311 requests stem from a communication breakdown between the City and low-income New Yorkers, who may be unaware that they can request infrastructural repairs and improvements (MTNYC planner, 2014). MTNYC addresses this problem in several ways. First, while residents can still make 311 requests for new trees, these requests are no longer the only means by which trees are cited (Layzer & Schulman, 2014; MTNYC planner, 2014). Instead, MTNYC conducts its own analysis to prioritize areas of greatest need, and pursues a policy of fully stocking every available space with street trees across the city (Layzer & Schulman, 2014; MTNYC planner, 2014).

Directions for future research

MTNYC has a clear set of environmental justice goals based on an understanding of trees as natural infrastructure necessary to public health, which must be equitably distributed throughout the city. However, further analysis will be needed to determine whether MTNYC achieved these goals over the course of the campaign. To address this need, my dissertation will examine the extent to which MTNYC prioritized tree-poor areas for new tree plantings, as well as the extent to which these areas saw their tree canopy expand relative to that of the rest of the city (Debats, 2014). I will then attempt to explain the degree of success or failure that was achieved. For instance, street standards and historical development patterns shape the proportion of space that is public versus private property, affecting the availability of tree planting sites (Debats, 2014). Moreover, according to MTNYC planners, low-income areas' historical lack of trees can be traced to their high proportion of industrial land uses, which by their nature are less vegetated (MTNYC planner, 2014). These areas are also difficult to plant because they have more overhead wires, more driveways, narrower sidewalks, and more hollow sidewalks (where basement storage extends under the street), all of which consume space that might otherwise have been planted (MTNYC planner, 2014). In addition, a higher degree of residential segregation may result in slower diffusion of environmental benefits, while a more integrated neighborhood may reduce the likelihood that people will be concentrated away from trees and other amenities. Conversely, planting trees may increase a neighborhood's desirability, increasing rent and driving out the original residents. To address these issues, I will examine the distribution of trees pre- and post-MTNYC, as well as longer-term changes in the urban landscape that shaped what was possible with the million trees campaign.

Bibliography

Akbari, H. (2002). Shade trees reduce building energy use and CO_2 emissions from power plants. *Environmental Pollution*, *116, Supplement 1*, S119–S126.

Bovaird, T. (2004). Public–private partnerships: from contested concepts to prevalent practice. *International Review of Administrative Sciences*, *70*(2), 199–215.

Bullard, R. D. (2000). Race, Class, and the Politics of Place. In *Dumping in Dixie: Race, Class, and Environmental Quality* (3rd ed., pp. 21–36). Boulder, CO: Westview Press.

City of New York. (2007). PlaNYC: A Greener, Greater New York.

Cole, L. W. (2001). *From the Ground up: Environmental Racism and the Rise of the Environmental Justice Movement*. New York: New York University Press.

Corburn, J. (2002). Environmental justice, local knowledge, and risk: the discourse of a community-based cumulative exposure assessment. *Environmental Management*, *29*(4), 451–466.

Corburn, J. (2005). *Street Science: Community Knowledge and Environmental Health Justice*. Cambridge, MA: MIT Press.

Danford, R. S., Cheng, C., Strohbach, M. W., Ryan, R., Nicolson, C., & Warren, P. S. (2014). What Does It Take to Achieve Equitable Urban Tree Canopy Distribution? A Boston Case Study. *Cities and the Environment*, *7*(1), Article 2.

Daniels, R., & Trebilcock, M. (1996). Private Provision of Public Infrastructure: An Organizational Analysis of the Next Privatization Frontier. *University of Toronto Law Journal*, *46*(3), 375–426.

Debats, J. (2014). *Seeing the City for the Trees: Public Space, Climate Adaptation, and Environmental Justice in LA and New York's "Million Trees" Campaigns* (Dissertation proposal). Massachusetts Institute of Technology Department of Urban Studies and Planning.

Harlan, S. L., Brazel, A. J., Prashad, L., Stefanov, W. L., & Larsen, L. (2006). Neighborhood microclimates and vulnerability to heat stress. *Social Science & Medicine*, *63*(11), 2847–2863.

Klinenberg, E. (2002). *Heat Wave: A Social Autopsy of Disaster in Chicago*. Chicago: University of Chicago Press.

Konopacki, S., & Akbari, H. (2002). Energy savings for heat-island reduction strategies in Chicago and Houston (including updates for Baton Rouge, Sacramento, and Salt Lake City). Retrieved from http://escholarship.org/uc/item/2rv7n2gn

Layzer, J. A., & Schulman, A. (2014). *Green Infrastructure: Tree Planting Scan* (Working Paper). MIT Department of Urban Studies and Planning.

Loukaitou-Sideris, A., & Banerjee, T. (1998). *Urban Design Downtown: Poetics and Politics of Form*. Berkeley: University of California Press.

Loukaitou-Sideris, A., & Ehrenfeucht, R. (2009). *Sidewalks: Conflict and Negotiation Over Public Space*. Cambridge, MA: MIT Press.

Loukaitou-Sideris, A., & Stieglitz, O. (2002). Children in Los Angeles Parks: A Study of Equity, Quality and Children's Satisfaction with Neighbourhood Parks. *The Town Planning Review*, *73*(4), 467–488.

Lowry, W. P. (1967). The Climate of Cities. *Scientific American*, *217*, 15–23.

Lu, J., Monaco, M., Newman, A., Rae, R. A., Campbell, L. K., Falxa-Raymond, N., & Svendsen, E. S. (2014). *MillionTreesNYC: The Integration of Research and Practice*. MillionTreesNYC. Retrieved from http://www.milliontreesnyc.org/downloads/pdf/MTNYC_Research_Spreads.pdf

Maantay, J. (2001). Zoning, equity, and public health. *American Journal of Public Health*, *91*(7), 1033–1041.

MillionTreesNYC. (2014). MillionTreesNYC. Retrieved from http://www.milliontreesnyc.org

MillionTreesNYC planner. (2014). Personal interview.

Mohai, P., Pellow, D., & Roberts, J. T. (2009). Environmental Justice. *Annual Review of Environment and Resources*, *34*(1), 405–430.

MTNYC Research Publication Cover Letter.pdf. (n.d.).

MTNYC_Research_Spreads.pdf. (n.d.).

New York Restoration Project. (2014). Mission & History. Retrieved from https://www.nyrp.org/about/who-we-are/history/

O'Neill, M. S., McMichael, A. J., Schwartz, J., & Wartenberg, D. (2007). Poverty, Environment, and Health: The Role of Environmental Epidemiology and Environmental Epidemiologists. *Epidemiology*, *18*(6).

Osborne, D., & Gaebler, T. (1992). *Reinventing Government: How the Entrepreneurial Spirit is Transforming the Public Sector*. Reading, MA: Addison-Wesley.

Pastor, Jr., M., Sadd, J. L., & Morello-Frosch, R. (2005). Environmental inequity in metropolitan Los Angeles. In R. D. Bullard (Ed.), *The Quest for Environmental Justice: Human Rights and the Politics of Pollution* (1st ed., pp. 108–124). San Francisco: Sierra Club Books.

Patz, J. A., Kinney, P. L., Bell, M. L., Ellis, H., Goldberg, R., Hogrefe, C., … Ziska, L. (2004). *Heat Advisory: How Global Warming Causes More Bad Air Days*. Natural Resources Defense Council. Retrieved from http://www.nrdc.org/globalWarming/heatadvisory/contents.asp

Pellow, D. N. (2000). Environmental Inequality Formation: Toward a Theory of Environmental Injustice. *American Behavioral Scientist*, *43*(4), 581–601.

Peper, P. J., McPherson, G. E., Simpson, J. R., Gardner, S. L., Vargas, K. E., & Xiao, Q. (2007). *New York City, New York: Municipal Forest Resource Analysis* (Technical Report to Fiona Watt, Chief Forestry and Horticulture, Department of Parks and Recreation, New York City). Center for Urban Forest Research, USDA Forest Service, Pacific Southwest Research Station. Retrieved from http://www.fs.fed.us/psw/programs/cufr/products/2/psw_cufr687_NYC_MFRA.pdf

Pincetl, S., Gillespie, T., Pataki, D. E., Saatchi, S., & Saphores, J.-D. (2013). Urban tree planting programs, function or fashion? Los Angeles and urban tree planting campaigns. *GeoJournal*, *78*(3), 475–493.

Ringquist, E. J. (2005). Assessing evidence of environmental inequities: A meta-analysis. *Journal of Policy Analysis and Management*, *24*(2), 223–247.

Rosan, C. D. (2012). Can PlaNYC make New York City "greener and greater" for everyone?: sustainability planning and the promise of environmental justice. *Local Environment*, *17*(9), 959–976.

Rosenthal, J. K., Crauderueff, R., & Carter, M. (2008). *Urban Heat Island Mitigation Can Improve New York City's Environment: Research on the Impacts of Mitigation Strategies*. Sustainable South Bronx.

Rosenthal, J. K., Kinney, P. L., & Metzger, K. B. (2014). Intra-urban vulnerability to heat-related mortality in New York City, 1997–2006. *Health & Place*, *30*, 45–60.

Rosenthal, J. K., Sclar, E. D., Kinney, P. L., Knowlton, K., Crauderueff, R., & Brandt-Rauf, P. W. (2007). Links between the built environment, climate and population health: interdisciplinary environmental change research in New York City. *Annals of the Academy of Medicine, Singapore*, *36*(10), 834–846.

Sagalyn, L. B. (2001). *Times Square Roulette: Remaking the City Icon*. Cambridge, MA: MIT Press.

Sagalyn, L. B. (2012). Public-Private Engagement: Promise and Practice. In B. Sanyal, L. J. Vale, & C. Rosan (Eds.), *Planning Ideas That Matter: Livability, Territoriality, Governance, and Reflective Practice*. Cambridge, MA: MIT Press.

Sassen, S. (1991). *The Global City: New York, London, Tokyo*. Princeton, N.J: Princeton University Press.

Schlosberg, D. (2003). The Justice of Environmental Justice: Reconciling Equity, Recognition, and Participation in a Political Movement. In A. Light & A. De-Shalit (Eds.), *Moral and Political Reasoning in Environmental Practice* (pp. 78–106). Cambridge, MA: MIT Press.

Shrader-Frechette, K. S. (2002). Taking Action: Public Responsibility for Environmental Justice. In *Environmental Justice: Creating Equality, Reclaiming Democracy*. Oxford ; New York: Oxford University Press.

Soja, E. W. (2010). *Seeking Spatial Justice*. Minneapolis: University of Minnesota Press.

Spirn, A. W. (1984). *The Granite Garden: Urban Nature and Human Design*. New York: Basic Books.

Spirn, A. W. (1986). *Air Quality at Street Level: Strategies for Better Urban Design*. Boston, MA: Boston Redevelopment Authority.

Stoker, G. (1998). Governance as theory: five propositions. *International Social Science Journal*, *50*(155), 17–28.

Sze, J., Gambirazzio, G., Karner, A., Niemeier, D., Rowan, D., & London, J. (2009). Best in show? Climate and environmental justice policy in California. *Environmental Justice*, *2*(4), 179–184.

Vale, L. J. (2014). The politics of resilient cities: whose resilience and whose city? *Building Research & Information*, *42*(2), 191–201.

Vale, L. J., Shamsuddin, S., Gray, A., & Bertumen, K. (2014). What Affordable Housing Should Afford: Housing for Resilient Cities. *Cityscape: A Journal of Policy Development and Research*, *16*(2), 21–50.

Verkuil, P. R. (2007). *Outsourcing Sovereignty: Why Privatization of Government Functions Threatens Democracy and What We Can Do About It*. New York: Cambridge University Press.

Wernette, D. R., & Nieves, L. A. (1992). Breathing polluted air: Minorities are disproportionately exposed. *EPA (Environmental Protection Agency) Journal*, 16–17.