EXPANDING GREEN ROOFS IN NEW YORK CITY: TOWARDS A LOCATION-SPECIFIC TAX INCENTIVE

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INTRODUCTION

Vegetated, or "green," roofs provide numerous social and environmental benefits to urban areas. Compared with conventional roofs, green roofs promote biodiversity,[1] reduce building energy

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1 *See infra* notes 76–81 and accompanying text.

use,[2] decrease noise,[3] and improve the productivity of solar photovoltaic installations.[4] They can also mitigate the urban heat island effect and reduce stormwater runoff, thereby diminishing flooding and pollution of local waterways. As the effects of climate change worsen, and extreme heat and rainfall events become more common,[5] these attributes will become all the more valuable. And with roofs typically occupying between 20 and 25 percent of urban surface area,[6] transforming this space could substantially impact the local environment.

Recognizing the societal benefits green roofs confer, in 2008, New York City Mayor Michael Bloomberg secured legislation from New York State offering a property tax abatement to individuals in New York City who install green roofs on their buildings.[7] The legislation was expected to spur a slew of new green roof development.[8] Unfortunately, however, only seven property owners have applied for the abatement in the eight years since the legislation was passed.[9] In a city with well over one million buildings,[10] this is

2 *See infra* notes 53–58 and accompanying text.

3 *See infra* notes 69–75 and accompanying text.

4 Vegetated roofs can improve the productivity of photovoltaic installations by helping to keep the equipment from overheating. *See* E. Skoplaki & J.A. Palyvos, *On the Temperature Dependence of Photovoltaic Module Electrical Performance: A Review of Efficiency/Power Correlations*, 83 SOLAR ENERGY 614, 621 (2009) ("Both the electrical efficiency and—hence—the power output of a PV module depends linearly on the operating temperature, decreasing with T_c.").

5 *See* Ulrich Cubash et al., *Introduction, in* INTERGOVERNMENTAL PANEL ON CLIMATE CHANGE, CLIMATE CHANGE 2013: THE PHYSICAL SCIENCE BASIS 119 (2013). *See generally* John Abraham, *Global Warming is Increasing Rainfall Rates*, THE GUARDIAN, Mar. 22, 2017.

6 *See* Akbari et al., *Analyzing the Land Cover of an Urban Environment Using High-Resolution Orthophotos*, 63 LANDSCAPE & URB. PLAN. 1 (2003).

7 *See Statement by Mayor Michael R. Bloomberg on the Close of a Productive Legislative Session in Albany That Delivered Real Results for New York City* (June 25, 2008), http://www1.nyc.gov/office-of-the-mayor/news/246-08/statement-mayor-michael-bloomberg-the-close-a-productive-legislative-session-albany.

8 *See* Ken Belson, *Green Roofs Offer More Than Color for the Skyline*, N.Y. TIMES, Aug. 27, 2008, at B6 (stating, "[t]he new one-year abatements, though, can cut as much as $100,000 a year from a building's taxes, and are expected to turn what has largely been a hidden luxury into a standard feature of a little-seen part of the city's landscape.").

9 Five of the applications were submitted for properties in Brooklyn, one application was a property in the Bronx, and one application was for a property in Manhattan. Data was requested from the New York City Department of Buildings via a Freedom of Information Act request in May 2017 (on file with the authors).

10 *See About*, N.Y.C. DEP'T OF BUILDINGS, http://www1.nyc.gov/site/buildings/about/about.page (last visited Mar. 2, 2018).

a paltry sum. Moreover, while the State has authorized up to $1 million in green roof tax abatements to be granted each year, total expenditure on the program has never reached anywhere near that sum.[11] And although a small number of property owners have chosen to install green roofs without applying for the tax abatement,[12] the vast majority of New York City's roughly forty square miles of rooftops[13] remain covered in blacktop. This Article therefore asks, how can this incentive program be reformed to encourage more property owners to turn their roofs green? With the legislation authorizing the abatement set to expire in 2019,[14] the time is ripe to consider how a successor program may be designed to be more effective.

As we will describe, the failure of the green roof tax abatement appears due, at least in part, to the fact that it is simply not large enough to offset the typical cost of installing a green roof.[15] This has led some advocates to call for substantial increases in the size of the subsidy,[16] and these calls may be justified given the diverse social benefits green roofs provide. Politically, however, securing a substantial increase may be impractical. Indeed, the last time the

11 *See infra* notes 133–132 and accompanying text.

12 The Audubon Society recently secured a $40,000 grant to count the green roofs in New York City and to create a database. *See* Ewa Kern-Jedrychowska, *Making NYC Bird Friendly: New Survey Will Count All Green Roofs in NYC*, DNAINFO (Apr. 19, 2017, 3:50 PM), https://www.dnainfo.com/new-york/20170419/jamaica/nyc-audubon-new-york-community-trust-green-roofs-online-database-habitat-migrating-birds. They are working with experts at The Nature Conservancy to create this inventory. As of December 2017, the team had identified 163 green roofs, which represents roughly 0.015 percent New York City's buildings. *See* Notes on The Audubon Society Working Group Meeting (Sept. 7, 2017) (on file with authors). While this list is unlikely to account for all green roofs installed in the City, it is indicative of the current rate of installation.

13 *See* Stuart Gaffin et al., *Development of a Green Roof Environmental Monitoring and Meteorological Network in New York City*, 9 SENSORS 2647, 2650 (2009).

14 *See* N.Y. REAL PROP. TAX LAW § 499-bbb(1)(c). The Department of Buildings stopped accepting new applications for qualifying green roofs in March of 2018. *Green Buildings & Energy Efficiency: Green Roof Tax Abatement*, N.Y.C. MAYOR'S OFFICE OF SUSTAINABILITY, http://www.nyc.gov/html/gbee/html/incentives/roof.shtml (last visited May 10, 2018). However, the abatement can be claimed through July of 2019.

15 *See infra* Part II. The abatement was initially $4.50 a square foot and was increased to $5.23 in 2013. *See* S.B. 4802, 2013-2014 Reg. Sess. (N.Y. 2013).

16 *See* R. CRAUDERUEFF ET AL., THE NEW YORK CITY GREEN ROOF TAX ABATEMENT: POLICY LESSONS 4 (2012), *presented at* Cities Alive: 10th Annual Green Roof & Wall Conference (Oct. 17–20, 2012).

abatement was up for review, advocates were only able to secure an increase of 73 cents per square foot, which is unlikely to motivate property owners to take action.[17] The political climate for securing local tax abatements may have become even more challenging since then.[18]

In this Article, we suggest a strategy to help get around the budgetary dispute. Specifically, we propose that New York City increase the size of the tax abatement offered to property owners in targeted areas where green roofs are deemed most advantageous—perhaps those neighborhoods that are most vulnerable to the effects of stormwater runoff—while decreasing, or even eliminating, the abatement offered to properties located elsewhere. Moving towards a location-specific subsidy of this sort would allow the City to increase the impact of the tax incentive without increasing the total funding allocated to the program. Not only would the higher rate likely encourage increased utilization of the funding that has already been allocated to the program, but the roofs that are subsidized would be located in areas where they confer greater societal value.[19]

The paper proceeds as follows. Part I reviews the benefits and costs associated with green roofs and explains why it is appropriate to incentivize green roof installations on private property. Part II details the origins of the green roof tax abatement and its

17 Despite advocating for increasing the tax incentive from $4.50 to at least $9 per square foot, green roof advocates were only able to secure a modest increase to $5.23 in the last round of legislation on the subject. *See* S.B. 4802 (N.Y. 2013). As discussed further in Part I(b), even simple green roofs cost approximately $20 to $25 per square foot to install on an existing conventional roof in New York City.

18 The passage of the federal tax reform bill in late 2017, which severely limited an individual's ability to deduct state and local taxes from their federal tax bill, may make State legislatures even more reluctant than usual to pass measures that would erode sources of State and local revenue. As the *New York Times* noted in describing the effect of the federal tax reform, "the cap on state and local tax deduction could pose a serious threat to state budgets, because it makes state taxes more expensive for residents. That could make it harder for states to raise taxes, particularly on wealthy residents, and could increase pressure to cut spending." Ben Casselman, *Democrats in High-Tax States Plot to Blunt Impact of New Tax Law*, N.Y. TIMES (Dec. 31, 2017), https://www.nytimes.com/2017/12/31/business/high-tax-states-law.html. Given that a reduction in tax revenue, also known as a "tax expenditure," is equivalent to an increase in spending from a budgetary standpoint, we can expect that the federal tax reform will cause State legislators to inspect proposals to reduce tax revenue with heightened scrutiny.

19 For an explanation of the economic efficiency of granular pricing, see FED. HIGHWAY ADMIN., ECONOMICS: PRICING, DEMAND, AND ECONOMIC EFFICIENCY 11–14 (2008).

disappointing performance to date. Part III argues that a location-specific tax incentive could more effectively stimulate green roof development. Part IV describes the City's limited authority over tax policy and presents legal pathways to implement our proposed reform.

Importantly, the proposal outlined here is but one piece of the puzzle; we do not believe that a location-specific tax incentive would, on its own, be enough to bring about an optimal number of green roofs. Instead, we hope that this proposal might be part of a bundle of policies—including expansion of an existing green roof grant program,[20] and new education and outreach initiatives—that aim to convert the City's roofs to more sustainable uses.

I. WHY INCENTIVIZE GREEN ROOFS?

Before assessing the case for incentivizing green roofs, it is important to define what we mean by this term. Broadly speaking, green roofs can be defined as any roof that is covered with vegetation. They typically consist of three layers: a vegetation layer, a substrate layer, and a drainage layer. Within these broad confines, the literature identifies two types of green roofs: extensive and intensive roofs.[21] Extensive roofs are lightweight, with a relatively thin soil layer (<15 cm), and are planted with drought-resistant plants, primarily sedum, to minimize weight, cost, and maintenance. Intensive roofs, by contrast, are heavier and are designed to support grasses, flowers, shrubs, trees, and even crops. Intensive roofs tend to be more expensive to install and maintain, especially when they require irrigation, but they can also more easily be used for garden amenity space. Due to the greater expense associated with intensive roofs, as well as the increased structural demands they impose on

20 New York City has a grant program for private property owners to install green infrastructure that captures at least one inch of stormwater runoff, including green roofs. For more information, see *Grant Program for Private Property Owners*, N.Y.C. DEP'T OF ENVTL. PROT., http://www.nyc.gov/html/dep/html/stormwater/nyc_green_infrastructure_grant_program.shtml (last visited Mar. 2, 2018). *See also infra* notes 111–113 and accompanying text.

21 For the purposes of this paper, we discuss extensive and intensive green roofs to highlight some of the tradeoffs involved at different ends of the design spectrum; however, in practice, there is a continuum between intensive and extensive green roofs and any given roof can involve elements from each category. *See, e.g.*, Envtl. Prot. Agency, *Green Roofs*, *in* REDUCING URBAN HEAT ISLANDS: COMPENDIUM OF STRATEGIES 14.

buildings, extensive roofs are more common.[22]

There is relatively little data on the prevalence of green roofs in New York City, but we know that they remain limited. One reason that there is no definitive data on the total number of green roofs in the City is that many types of green roofs may be legally installed without permits.[23] Thus, the New York City Department of Buildings is not notified each time a green roof is added. Additionally, City officials have not conducted a citywide green roof survey. A new initiative by The Nature Conservancy's New York City program and a consortium of other researchers[24] is working to make up for this shortfall by creating a comprehensive inventory of green roofs in the City. They are relying on a combination of City-maintained databases, word of mouth, and aerial imaging to identify vegetated roofs. So far, the researchers indicate that they have identified 163 such roofs, which amount to a total of 26.6 acres and approximately 0.015 percent of all buildings in the City. About half of these roofs are in Manhattan, as measured by both count and total acreage.[25] If these numbers are complete, it would mean that the four boroughs outside of Manhattan, which span nearly 180 thousand acres,[26] have fewer than fourteen acres of green roofs.

Green roofs provide numerous positive externalities, from increased biodiversity to reduced stormwater runoff. Critically, however, the scale of potential benefits that green roofs provide is not uniform throughout a city. Rather, the potential benefits vary depending on the characteristics of the district selected for placement. For example, green roofs will provide greater water

22 Kristin L. Getter & D. Bradley Rowe, *The Role of Extensive Green Roofs in Sustainable Development*, 41 HORTICULTURAL SCI. 1276, 1276 (2006).

23 According to the Department of Buildings website, permits are not required for green roofs four inches or less in depth. *See* N.Y.C. BUILDINGS, PROMULGATION DETAILS FOR 1 RCNY 44-01, *available at* https://www1.nyc.gov/assets/buildings/rules/1_RCNY_44-01_prom_details.pdf.

24 Researchers at The New School, Columbia University, and the Wildlife Conservation Society are also contributing to the effort. These researchers are also collaborating with the Green Roof Working Group, which is led by the New York City Audubon Society.

25 Information was reported to the authors by the directors of The Nature Conservancy's study and is current as of December 2017.

26 The four boroughs have a total land area of 279.82 square miles, which is approximately 179,085 acres. *Population and Geography*, BARUCH COLL., http://www.baruch.cuny.edu/nycdata/population-geography/pop-landarea.htm (last visited Oct. 1, 2017).

quality benefits in areas that face the most severe stormwater management challenges. In the Part below, we review the range of benefits green roofs offer to urban areas, highlighting the ways in which neighborhood variation may impact their social value.

To date, policymakers' efforts to expand green roofs in New York City and elsewhere have been primarily driven by a desire to leverage one particular benefit—stormwater runoff reduction.[27] As a case in point, in its first annual review of municipal tax expenditures after New York City's green roof tax abatement took effect, the City's Department of Finance succinctly defined the policy's purpose as being, "[t]o help control and capture stormwater in order to reduce the burden on the City's sewer system."[28] Given this emphasis, we review the relationship between green roofs and water quality in some depth before turning to examine the less commonly-cited, and less well-established, benefits. Following a discussion of the benefits associated with green roofs, we present available information on the relevant costs and why subsidization with a tax incentive appears to be an appropriate means of advancing the City's goal of increasing green roofs.

Importantly, we do not pretend to perform a comprehensive benefit-cost analysis of green roofs in New York City, which would require a tremendous amount of data collection that is outside the scope of this research. Furthermore, such analysis is not necessary to our argument because the City has already decided that green infrastructure, including green roofs, should be part of any cost-effective strategy to meet mandatory stormwater management goals for the control of Combined Sewage Overflows (CSOs), and has committed to increasing its development.[29] In light of this context,

27 *See* T.B. Carson et al., *Hydrological Performance of Extensive Green Roofs in New York City: Observations and Multi-year modeling of three full-scale systems*, 8 ENVTL. RES. LETTERS 1, 2 (2013).

28 N.Y.C. DEP'T OF FIN. OFFICE OF TAX POL'Y, 2011 N.Y.C. ANN. REP. ON TAX EXPENDITURES 43 (2011).

29 CSOs are point sources of pollution subject to the requirements of the Clean Water Act. In 2012, the New York State Department of Environmental Conservation and DEP entered an agreement to reduce CSOs, and thereby improve water quality. *See* Order on Consent, DEC Case No. CO2-20110512-25, 3–5 (Mar. 8, 2012) (discussing cost-effective green infrastructure technologies). Research from the Congressional Research Service also confirms that green infrastructure is cost-effective compared to gray infrastructure for stormwater management. *See* CLAUDIA COPELAND, CONG. RESEARCH SERV., R43131, GREEN INFRASTRUCTURE AND ISSUES IN MANAGING URBAN STORMWATER 3 (2016) ("It has been estimated that green infrastructure is 5%–30% less costly to construct and about 25% less

our purpose in the Part below is to review arguments that have led policymakers to want to subsidize green roofs in New York City and in many other jurisdictions throughout the United States and Europe. From there, in Part II, we discuss how New York City can reform its current subsidy to encourage greater utilization of the program's devoted funding and to deliver more value per dollar spent.

A. Water Quality Benefits

Stormwater runoff is a leading source of water pollution in cities throughout the United States.[30] In forested areas, as much as ninety-five percent of precipitation is absorbed by the ground.[31] In urban areas, by contrast, substantial portions of land are covered with hard surfaces—like pavement and buildings—that are impervious to rainfall. Manhattan is ninety-seven percent human-dedicated landscape,[32] and approximately seventy percent of the surface area in all of New York City is impervious.[33] Because these surfaces cannot absorb water, each time there is a significant rainfall event, water runs across the landscape towards the nearest sewer or open body of water. As it travels, the runoff picks up pollutants from the city streets including motor oil, trash, and other toxic contaminants, which are ultimately deposited in the nearby waterways.[34]

In New York City, the problems that stormwater runoff pose are exacerbated by the structure of its sewer system. As in many other older American cities, much of New York City collects stormwater and domestic sewage in a single-pipe combined sewer system.[35] During normal operations, the system transports the

costly over its life cycle than traditional infrastructure.").

30 *See* ENVTL. PROT. AGENCY, PRELIMINARY DATA SUMMARY OF URBAN STORM WATER MANAGEMENT PRACTICES 4-1 (1999).

31 *See* Getter & Rowe, *supra* note 22, at 1276.

32 These landscapes include buildings (34 percent); sidewalks, courtyards, gardens, and parking lots (27 percent); and roads (24 percent). Only 3 percent remains in its natural form. *See* Eric W. Sanderson & Marianne Brown, *Mannahattan: An Ecological First Look at the Manhattan Landscape Prior to Henry Hudson*, 14 NE. NATURALIST 545, 553 (2007).

33 *See Stormwater*, N.Y.C. DEP'T OF ENVTL. PROT., http://www.nyc.gov/html/dep/html/stormwater/index.shtml (last visited Oct. 8, 2017).

34 *See* Envtl. Def. Ctr., Inc., v. EPA, 344 F.3d 832, 840 (9th Cir. 2003).

35 Approximately 60 percent of New York City is covered by a combined sewer system. N.Y.C. DEP'T OF ENVTL. PROT., STATE OF THE SEWERS 2016: PERFORMANCE METRICS 4 (2016).

combined waste to a waste-water treatment plant, where it is cleaned before being returned to waterways. But during even brief spurts of heavy rainfall, water volumes quickly overwhelm the pipes' capacity and must be discharged at outlets that are scattered throughout the system.[36] These discharge events are known as CSOs.[37]

CSOs are very common[38] in New York City, occurring about once per week on average.[39] Even weather events that bring just one-twentieth of an inch of rain can trigger overflows.[40] Annually, these events discharge billions of gallons of raw sewage into the City's waters,[41] significantly degrading local water quality. In fact, CSOs are the single largest contributor of pathogens in the New York Harbor region.[42]

Green roofs help decrease CSOs, and stormwater runoff more generally, by storing a portion of the rainfall that hits a building's surface until it is gradually released into the atmosphere via evaporation and transpiration.[43] The precise amount of rainfall that green roofs absorb depends on factors including substrate depth, type of vegetation, and local climate; studies have therefore found wide variation in retention capabilities. Nonetheless, researchers

36 *See* Anthony DePalma, *When It Rains, Sewage Often Pours into Harbor*, N.Y. TIMES (Aug. 11, 2007), https://www.nytimes.com/2007/08/11/nyregion/11drain.html ("as little as a tenth of an inch of rain coming very quickly can overload that system."); NYC DEP'T OF ENVTL. PROT., *Combined Sewer Overflows (CSOs)*, http://www.nyc.gov/html/dep/html/stormwater/combined_sewer_overflow.shtml (last visited May 29, 2018) (explaining that CSOs are "a mix of excess stormwater and untreated wastewater discharge[d] directly into the City's waterways at certain outfalls.").

37 *See id.*

38 Notably, however, for as common as CSOs are, they are not entirely unregulated. To the contrary, the federal Clean Water Act obligates municipalities to control CSOs in a manner consistent with policy guidelines established by the Environmental Protection Agency. *See* 33 U.S.C. § 1342(q) (2016).

39 *See Combined Sewage Overflows*, RIVERKEEPER, https://www.riverkeeper.org/campaigns/stop-polluters/sewage-contamination/cso/ (last visited May 29, 2018).

40 *See* Zoe Schlanger, *If it's Raining, NYC's Raw Sewage is Probably Pouring into the Waterways*, NEWSWEEK (July 23, 2014), http://www.newsweek.com/it-raining-nycs-raw-sewage-probably-pouring-waterways-260784.

41 *See* NAT. RES. DEF. COUNCIL & N.Y.U. STERN CTR. FOR SUSTAINABLE BUS., CATALYZING GREEN INFRASTRUCTURE ON PRIVATE PROPERTY: RECOMMENDATIONS FOR GREEN, EQUITABLE, AND SUSTAINABLE NEW YORK CITY 7 (2017) [hereinafter NRDC & NYU STERN].

42 *See* N.Y.C. DEP'T. OF ENVTL. PROT., 2005 NEW YORK HARBOR WATER QUALITY REPORT 9 (2005).

43 *See* Getter & Rowe, *supra* note 22, at 1278.

regularly report that green roofs reduce annual runoff from a building by roughly fifty percent.[44]

Although these site-specific figures are impressive, it appears that there must be a significant concentration of green roofs in a given neighborhood for them to materially reduce runoff in the area, in part because streets, sidewalks, and parking lots cover nearly two-thirds of the City's landscape. For instance, a study that modeled the impact of stormwater reduction in New York City predicted that fifty percent of buildings would need to be covered with green roofs to reduce runoff by ten percent.[45]

Given the expense of retrofitting buildings with green roofs, which we discuss further below, it is probably unrealistic to expect that New York City would achieve a fifty percent proliferation of green roofs citywide. However, it could potentially achieve this goal, or something approaching it, in targeted areas. Moreover, some areas of New York City are far more vulnerable to the impacts of stormwater runoff than others, which gives policymakers grounds to focus their efforts towards these neighborhoods. Many of these areas are in Brooklyn, the Bronx, and Queens—as opposed to Manhattan—which tend to be more in need of infrastructure investment generally.[46]

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44 *See, e.g.*, Jeroen Mentens et al., *Green Roofs as a Tool for Solving the Rainwater Runoff Problem in the Urbanized 21st Century?*, 77 LANDSCAPE & URB. PLAN. 217, 222 (estimating annual runoff reduction of 54 percent from a single building); Nicholaus D. VanWoert et al., *Green Roof Stormwater Retention*, 34 J. ENVTL. QUALITY 1036, 1042 (2005) (finding green roofs retained 48% more rainwater during medium storm events than gravel roofs). A recent study that specifically examined extensive green roofs in New York City found that the roofs retained as much as 61 percent of annual rainfall. Carson et al., *supra* note 27, at 1.

45 *See* KENNETH ACKS ET AL., COLUMBIA UNIV. CTR. FOR CLIMATE SYS. RES. & NAT'L AIR & SPACE ADMIN. GODDARD INST. FOR SPACE STUDIES, GREEN ROOFS IN THE NEW YORK METROPOLITAN REGION v (Cynthia Rosenzweig et al. eds.). Another study, which modeled the stormwater impacts of expanding green roofs in Brussels, found that installing extensive green roofs on ten percent of buildings in the City center would reduce the area's annual stormwater runoff by 2.7 percent. Mentens, *supra* note 44.

46 As explained by the 2015 Report Card for New York's Infrastructure, much of New York City and New York State are in need of major infrastructure investments. The 2015 Infrastructure Report Card found that New York's overall infrastructure rating was a C-. *See* AM. SOC'Y OF CIVIL ENG'R, 2015 REPORT CARD FOR NEW YORK'S INFRASTRUCTURE 3 (2015). Still, the need for investment is not uniform throughout the City. For example, while the report noted the dire need for investments to New York City's subway system, the subway stations in Queens were in the worst state of repair. *See id.* at 71 (when comparing the ten stations in

A large part of the reason that not all areas of New York City are equally vulnerable to stormwater runoff is because only approximately half of the land area in the City is served by a combined sewer system.[47] In most of the remainder of the City, domestic sewage and stormwater are channeled into separate sewer systems, with domestic sewage being directed to wastewater treatment plants and stormwater being directed to local bodies of water, such as bays and rivers.[48] Although stormwater runoff poses a threat to water quality throughout the City, it poses unique hazards to human health and the environment in combined sewer areas because of its potential to cause discharges of raw sewage.[49] Below, we have copied a map of Department of Environmental Protection's

worst repair between boroughs, Queens had the station in the worst condition in the entire system, as well as the worst average score). *See also* Robert D. Yaro, President, Regional Plan Ass'n, Testimony before the New York City Council (Nov. 3, 2014), http://www.rpa.org/article/addressing-new-york-citys-urgent-capital-investment-needs (suggesting investments could "prioritize failing infrastructure in many of the city's poorest communities," such as the "failing storm water management systems in southeast Queens, where frequent street and basement flooding across this largely low- and moderate-income area undercuts property values and public health"). Additionally, public transportation options reaching the Bronx, Brooklyn, Queens, and Staten Island are insufficient to accommodate commuters. *See* CTR. FOR AN URBAN FUTURE, AN UNHEALTHY COMMUTE: THE TRANSIT CHALLENGES FACING NEW YORK CITY'S HEALTHCARE SECTOR 3 (2018) (finding healthcare workers, who increasingly work in the outer boroughs, face the longest median commuting time—51.2 minutes—of any private sector industry in the City).

47 *See* NAT. RES. DEF. COUNCIL, NEW YORK, NEW YORK: A CASE STUDY OF HOW GREEN INFRASTRUCTURE IS HELPING MANAGE URBAN STORMWATER CHALLENGES. This represents approximately two-thirds of the total sewered areas. *See* NYC DEP'T. OF ENVTL. PROT., *Types of Drainage Areas in New York City*, http://www.nyc.gov/html/dep/html/stormwater/sewer_system_types.shtml (last visited Oct. 6, 2017). For a map of the City's sewers *see*, N.Y.C. DEP'T OF ENVTL. PROT., NYC SEWER SYSTEMS, *available at* http://www.nyc.gov/html/dep/pdf/green_infrastructure/sewer_drainage_area_types_map.pdf.

48 *See* N.Y.C. DEP'T. OF ENVTL. PROT., *supra* note 47. A small portion of the City, like certain parks, are unsewered, meaning that the water is either absorbed *in situ* or runs into local waterways. *Id.*

49 *See* ENVTL. PROT. AGENCY, KEEPING RAW SEWAGE & CONTAMINATED STORMWATER OUT OF THE PUBLIC'S WATER (2011); Ashley Claro et al., Leveraging the Multiple Benefits of Green Infrastructure 7 (2013) (Capstone Paper, Columbia University), *available at* http://sustainability.ei.columbia.edu/files/2014/02/Leveraging-CoBenefits-of-Green-Infrastructure-Fall-2013smallpdf-com.pdf; N.Y.C. DEP'T OF ENVTL. PROT., IMPROVING NEW YORK CITY'S WATERWAYS: REDUCING THE IMPACTS OF COMBINED SEWER OVERFLOWS 5 (2017) (explaining that in the easily overwhelmed combined sewer areas CSOs have a "negative effect on water quality and can hinder recreational uses in local waterbodies.").

(DEP's) priority areas for green infrastructure, which reflects the agency's assessment of those areas that are most severely affected by CSOs.[50]

50 In identifying Priority CSO Areas, DEP "looks closely at the annual CSO volume, frequency of CSO events, as well as outfalls that may be affected by Waterbody/Watershed Facility Plans (WWFPs) or other system improvements in the future. DEP also notes outfalls in close proximity to existing and future public access locations." N.Y.C. DEP'T OF ENVTL. PROT., N.Y.C. GREEN INFRASTRUCTURE: 2013 ANNUAL REPORT 9 (2013). *See also* http://www.nyc.gov/html/dep/pdf/green_infrastructure/cso_outfalls_map.pdf (mapping CSO outfalls throughout the New York City waterfront).

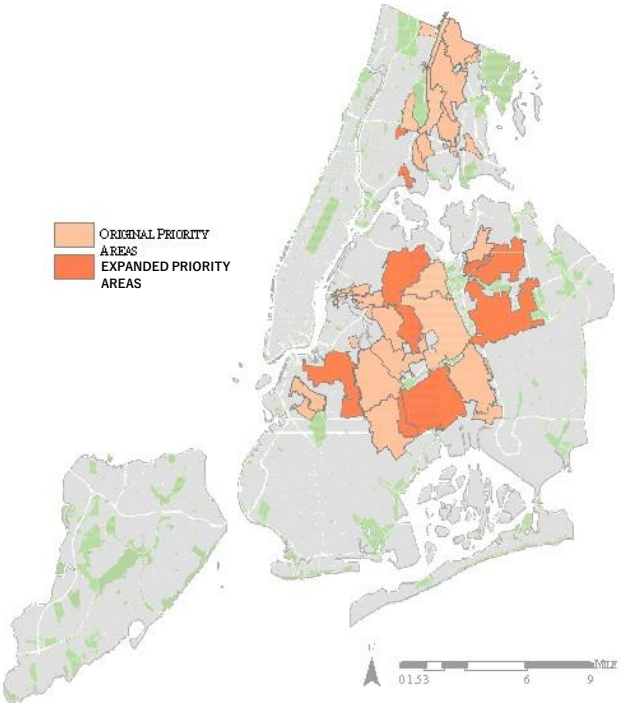

Figure 1: Original and Expanded Priority CSO Tributary Areas.

As this map indicates,[51] the New York City DEP has long recognized the variable impact that stormwater has in different neighborhoods, and has prioritized building green infrastructure, which includes green roofs, in areas that it deems most likely to suffer the most severe water quality challenges.[52] Unfortunately, however, the tax abatement program has never taken a similarly targeted approach.

B. Non-Water Quality Benefits

Although water quality improvements have been the primary

51 DEP is expanding the priority areas based on the factors described in note 50 to "ensure sufficient green infrastructure implementation toward the [2012 CSO Order on Consent] milestones." *Id.*

52 Priority areas in New York City include the following watersheds: the Bronx River, Flushing Bay, Flushing Creek, Gowanus Canal, Hutchinson River, Jamaica Bay and Tributaries, Newtown Creek, and Westchester Creek. None of these areas meet water quality standards, and each of these areas is at least partially served by a combined sewer system. *See* N.Y.C. DEP'T OF ENVTL. PROT., GREEN INFRASTRUCTURE CONTINGENCY PLAN 1 (June 27, 2016).

motivation behind policymakers' push to expand green roofs, they are far from the only associated benefit. To the contrary, available studies indicate that green roofs provide numerous environmental co-benefits that would not be supplied if the City addressed stormwater exclusively through the deployment of "gray" infrastructure such as waste-water treatment facilities. We review some of the identified co-benefits below.

One of the most commonly cited benefits of green roofs is that they can reduce building energy consumption, thereby advancing climate change mitigation goals.[53] Green roofs decrease building energy consumption in both hot and cold weather. During hot summer months, the natural cooling process of transpiration lowers surface temperatures, which reduces the transfer of heat from the roof to the building interior, thereby diminishing cooling needs.[54] In cold weather, green roofs add an extra layer of insulation, which helps the building maintain warmer internal temperatures, thereby reducing heating demand.[55] The benefits tend to be the greatest in summer, when green roofs reduce the heat transfer from the roof to the building interior by as much as 84 percent compared to conventional roofs.[56] However, the insulation provided by a green roof is still valuable in winter, when it can reduce building heat loss via the roof by an estimated 34 percent.[57] Reducing building energy consumption is particularly important in New York City given that approximately 75 percent of the City's greenhouse gas emissions are due to building energy consumption, and nearly half of energy consumed in buildings is used for heating and cooling.[58] The

53 *See, e.g.*, Omidreza Saadatian et al., *A Review of Energy Aspects of Green Roofs*, 23 RENEWABLE & SUSTAINABLE ENERGY REVS. 155 (2013) (reviewing the research on green roofs and building energy consumption).

54 *See id. See also* Takakura et al., *Cooling Effect of Greenery Cover Over a Building*, 31 ENERGY & BUILDINGS 1 (2000).

55 *See Using Green Roofs to Reduce Heat Islands*, ENVTL. PROT. AGENCY, https://www.epa.gov/heat-islands/using-green-roofs-reduce-heat-islands (last updated June 9, 2017); *Insulation*, DEP'T OF ENERGY, https://energy.gov/energysaver/insulation (last visited Mar. 2, 2018) (explaining how insulation provides resistance to heat flow).

56 *See* U.S. GEN. SERVS. ADMIN., THE BENEFITS AND CHALLENGES OF GREEN ROOFS ON PUBLIC AND COMMERCIAL BUILDINGS 39 (2011).

57 *See id.*

58 In New York City in 2011, nine percent of building energy consumption was attributable to cooling, and thirty-two percent to heating, totaling forty-one percent of total building energy consumption. *See* JEFFREY BRYANT & ANDREA MOORE, NYCEDE, ECONOMIC SNAPSHOT: A SUMMARY OF NEW YORK CITY'S

expansion of green roofs would therefore further the City's efforts to reduce greenhouse gas emissions by 80 percent below 2005 levels by 2050.[59]

Green roofs can also help reduce the urban heat island effect,[60] which results from the high concentration of impervious surfaces in cities.[61] Paved surfaces and dark rooftops absorb radiation,[62] creating an oven-like effect during hot summer months that raises ambient temperatures in the surrounding areas. Due to this phenomenon, the daily minimum temperature is an average of seven degrees Fahrenheit warmer in New York City than in surrounding suburban areas during the summer.[63] Adding more vegetation to the City, such as green roofs, is the most promising way to mitigate this phenomenon.[64] In fact, the temperatures on green roofs in the City are far cooler than their conventional counterparts, as much as seventy-two degrees Fahrenheit, on summer days.[65] Modeling

ECONOMY (2013).

59 *See generally New York City's Roadmap to 80 x 50*, CITY OF NEW YORK, https://www1.nyc.gov/assets/sustainability/downloads/pdf/publications/New%20York%20City's%20Roadmap%20to%2080%20x%2050_Final.pdf (last visited May 22, 2018).

60 The heat island effect refers to the fact that urban areas are generally warmer than neighboring suburban or rural areas. Cities tend to be warmer because of the lack of vegetation and large quantity of paved surfaces like roads, sidewalks, and buildings. Vegetated areas provide multiple cooling benefits. One benefit is that vegetation creates shade. Another benefit is that both soils and plants retain water, and the processes of evaporation and transpiration cool the surrounding environment. *See, e.g.*, WILLIAM D. SOLECKI ET AL., *Potential Impact of Green Roofs on Urban Heat Island Effect*, *in* GREEN ROOFS IN THE NEW YORK METROPOLITAN REGION, *supra* note 45, at 15; EPA, *Urban Heat Island Basics*, *in* REDUCING URBAN HEAT ISLANDS: COMPENDIUM OF STRATEGIES 7 (draft. 2008), https://www.epa.gov/heat-islands/heat-island-compendium [hereinafter *Heat Island Basics*].

61 Proposed strategies for mitigating the urban heat island effect largely center around increasing trees and vegetation, but also include cool roofs and pavements. *See Heat Island Basics*, *supra* note 60, at 16.

62 *See id.* at 9.

63 *See* N.Y. STATE ENERGY RES. & DEV. AUTH., MITIGATING NEW YORK CITY'S HEAT ISLAND WITH URBAN FORESTRY, LIVING ROOFS, AND LIGHT SURFACES 6 (Oct. 2006) [hereinafter MITIGATING NEW YORK CITY'S HEAT ISLAND].

64 *See id.* at S - 6 (finding that "vegetation plays a more important role than albedo or other features of the urban physical geography (e.g. building heights, road density) in determining heat island potential in New York City.").

65 In 2003 studies conducted in New York City, researchers found differences of 72 degrees, or more, between temperatures at the roof membrane on green roofs and conventional roofs. Conventional roof temperatures broke 140 degrees regularly in July. *See* ACKS, *supra* note 45, at iv.

demonstrates that if fifty percent of New York City buildings installed green roofs, the entire City's surface temperature could be cooled by more than one degree Fahrenheit, which would significantly reduce energy demand.[66] Again, this concentration of green roofs is unlikely to be achieved anytime soon, but as with stormwater runoff, there are areas of the City that are more severely affected by the urban heat island effect than others[67] and policymakers could target their efforts accordingly. Moreover, many of the areas that are most susceptible to the dangers of extreme heat are the same areas in Brooklyn, the Bronx, and Queens that are most vulnerable to stormwater impacts.[68]

Although still an emerging area of research,[69] initial studies have demonstrated that green roofs can help reduce noise pollution as well.[70] Here, too, the benefits vary considerably by location. The noise insulating properties of green roofs are especially beneficial in crowded urban environments, like New York City, where noise complaints are skyrocketing.[71] Green roofs shield buildings from

66 Estimates of the surface cooling impact with 50 percent green roof coverage ranged from .1 to 1.4 degrees. *See id.* at v. For every degree of temperature increase, peak energy demand increases by between 1.5 and 2 percent. *See Heat Island Basics*, *supra* note 60, at 13.

67 *See* CITY OF NEW YORK, COOL NEIGHBORHOODS NYC: A COMPREHENSIVE APPROACH TO KEEP COMMUNITIES SAFE IN EXTREME HEAT, 7 (2017) (stating that "[v]ariation in NYC's densely built environment—including the distribution of our sparse vegetation, building typologies, and surface materials—results in disparate neighborhood-level heat risks.").

68 *See id*. at 9, fig.3. There is substantial overlap when comparing the areas susceptible to extreme heat with the priority CSO areas above in Figure 1. *See also supra* notes 50 to 51 and accompanying text (discussing priority CSO areas).

69 *See* Laurent Galbrun & Léa Scerri, *Sound Insulation of Lightweight Extensive Green Roofs*, 116 BUILDING & ENV'T 130, 130 (2017).

70 *See id.* at 138. *See also* Timothy Van Renterghem & Dick Botteldooren, *Reducing the Acoustical Façade Load from Road Traffic with Green Roofs*, 44 BUILDING & ENV'T 1081 (2009); Hong Seok Yang et al., *Acoustic Effects of Green Roof Systems on a Low-Profiled Structure at Street Level*, 50 BUILDING & ENV'T 44 (2012).

71 In 2016, approximately 420,000 noise complaints were made to New York City's 311 hotline. This is over double the number of noise complaints lodged in 2011. *See* Winnie Hu, *New York Becomes the City That Never Shuts Up*, N.Y. TIMES (July 19, 2017), https://www.nytimes.com/2017/07/19/nyregion/new-york-becomes-the-city-that-never-shuts-up.html. Noise pollution is associated with negative health outcomes including the release of stress hormones, cardiovascular risks, and sleep disturbances. *See, e.g.*, Demian Halperin, *Environmental Noise and Sleep Disturbances: A Threat to Health?*, 7 SLEEP SCI. 209 (2014); H. Ising & B. Kruppa, *Health Effects Caused by Noise: Evidence in the Literature from the Past 25 Years*, 6 NOISE & HEALTH 5 (2004).

noise pollution, including car traffic noises,[72] airplanes,[73] and elevated transit,[74] and they do not have to be intensive to provide noise mitigation. Even lightweight extensive green roofs provide appreciable sound insulation benefits.[75]

Green roofs also provide biodiversity benefits. For example, a 2014 literature survey found that studies firmly establish that even extensive green roofs support generalist species, such as insects, spiders, and soil-dwelling arthropods.[76] Green roofs also create habitat for bees, which is especially valuable given bees' crucial ecosystem role as pollinators.[77] Also, at least some vertebrates, like birds[78] and bats,[79] are more active above green roofs than conventional roofs. Basel, Switzerland found the green roof biodiversity research compelling enough to mandate a green roof

72 The noise reduction benefits for heavy vehicles, especially with increasing speeds, were lower. *See* Van Renterghem & Botteldooren, *supra* note 70, at 1086–87.

73 One study calculated that green roofs had a $0.43 per square foot value in terms of noise mitigation costs for airports. *See* U.S. GEN. SERVS. ADMIN., *supra* note 56, at 48–49.

74 *See id.* at 48.

75 The authors of one small-scale study found that varying substrate depth did not significantly affect sound insulation. In fact, adding a cavity, which is a space between layers which may be filled with insulating material, to the roof was the "most effective solution for improving the sound insulation of a lightweight extensive green roof." Galbrun & Scerri, *supra* note 69, at 138. Another study reports that green roofs just two to six inches thick have been shown to decrease the noise level of a roof by 8 decibels. *See* U.S. GEN. SERVS. ADMIN., *supra* note 56, at 48.

76 *See* Nicholas S. G. Williams et al., *Do Green Roofs Help Urban Biodiversity Conservation?*, 51 J. APPLIED ECOLOGY 1643, 1643–44 (2014). The survey concluded that there is currently not enough evidence to determine whether green roofs provide benefits for all rare taxa, especially vertebrates, and advocated for more research on green roof conservation benefits. *See id.* at 1646–48.

77 *See* Sheila R. Colla et al., *Can Green Roofs Provide Habitat for Urban Bees (Hymenoptera: Apidae)?*, 2 CITIES & ENV'T 1 (2009).

78 *See* R. Fernandez-Canero & P. Gonzalez-Redondo, *Green Roofs as a Habitat for Birds: A Review*, 9 J. ANIMAL & VETERINARY ADVANCES 2041, 2045 (2010) (reviewing the literature on green roofs as habitats for birds and finding that "investigations have demonstrated that generic green roofs provide habitat for more common bird species while roofs specifically designed to mimic habitats within the urban area will benefit uncommon [sic] and frequently endangered" birds).

79 *See* K.L. Parkins & J.A. Clark, *Green Roofs Provide Habitat for Urban Bats*, 4 GLOBAL ECOLOGY & CONSERVATION 349, 352 (2015) (comparing bat activity over green roofs and conventional roofs in New York City); Huma Pearce & Charlotte L. Walters, *Do Green Roofs Provide Habitat for Bats in Urban Areas?*, 14 ACTA CHIROPTEROLOGICA 469 (2012).

program as part of the city's biodiversity strategy.[80] Importantly, however, the magnitude of biodiversity benefits a given green roof offers depends on a number of factors, including proximity to other green spaces,[81] and varies from species to species. Here too, location impacts the environmental value conferred by a green roof.

Finally, green roofs can be used to promote environmental justice[82] if they are deployed in areas that lack access to green space, or that bear a disproportionate number of environmental disamenities, such as noxious land uses[83] or noisy airports.[84] Green

80 *See* GAIL LAWLOR ET AL., CAN. MORTG. & HOUS. CORP., GREEN ROOFS: A RESOURCE MANUAL FOR MUNICIPAL POLICY MAKERS 65-66 (2006) (reviewing green roof programs in a variety of cities). Research examining the potential of this Basel program noted that green roofs have largely been built with thin substrates, due to cost considerations, which has left their potential habitat value largely underutilized. Carefully planning rooftop habitats has the potential to improve their biodiversity value for rare species. *See* Stephan Brenneisen, *Space for Urban Wildlife: Designing Green Roofs as Habitats in Switzerland*, 4 URB. HABITATS 27.

81 Depending on where green roofs are located, they may provide an isolated habitat, or may be accessible from neighboring habitats either on roofs or at ground-level. *See* S. Braaker et al., *Habitat Connectivity Shapes Urban Arthropod Communities: The Key Role of Green Roofs*, 95 ECOLOGY 1010, 1010 (2014) (finding that "community composition of high-mobility arthropod groups (bees and weevils) were mainly shaped by habitat connectivity, while low-mobility arthropod groups (carabids and spiders) were more influenced by local environmental conditions.").

82 Environmental Justice is "the fair treatment and meaningful involvement of all people regardless of race, color, culture, national origin, income, and educational levels with respect to the development, implementation, and enforcement of protective environmental laws, regulations, and policies." EPA, ENVIRONMENTAL JUSTICE, https://www.epa.gov/environmentaljustice (last visited May 25, 2018). There have been, for example, proposals to add green roofs to older public housing buildings to improve energy efficiency. *See* George Theodore Phillips, "*Greening Up" Public Housing*, CITY ATLAS (Nov. 15, 2012), http://newyork.thecityatlas.org/lifestyle/environmentally-retrofitting-public-housing/.

83 *See* Juliana Maantay, *Asthma and Air Pollution in the Bronx: Methodological and Data Considerations in Using GIS for Environmental Justice and Health Research*, 13 HEALTH & PLACE 32 (2007) (finding "that people living near . . . noxious land uses [in the Bronx] were up to 66 percent more likely to be hospitalized for asthma, and were 30 percent more likely to be poor and 13 percent more likely to be a minority.").

84 *See, e.g.*, Lisa Goines & Louis Hagler, *Noise Pollution: A Modern Plague*, 100 S. MED. J. 287, 291 (2007) ("[c]ognitive and language development and reading achievement are diminished" for children with homes or schools near airports and highways). Environmental justice advocates persuasively argue that it is not just environmental degradation that is a matter for environmental justice, but also the distribution of environmental benefits. Colin Crawford, *Environmental Benefits and the Notion of Positive Environmental Justice*, 32 U.

roofs can ameliorate some respiratory illnesses, like asthma, by removing air pollutants.[85] The benefits of urban heat island mitigation may also be of greater value in less affluent areas with limited access to air conditioning and less energy security.[86] Looking at maps of the combined sewer areas alongside areas of environmental justice concern suggests substantial overlap in parts of the Bronx, Brooklyn, and Queens.[87] These environmental justice, or distributional concerns, suggest yet another reason why the value of green roofs varies by location and a uniform subsidy rate may be inappropriate.

C. Why a Tax Incentive is Appropriate

The numerous benefits that green roofs offer come with a price tag, because even relatively simple extensive green roofs typically cost significantly more to construct than conventional roofs.[88] Maintenance costs are generally higher as well.[89] And if a property owner is retrofitting a building to add a green roof, as opposed to incorporating it into the initial building plans, the price difference may be even larger. In New York City, the average cost of retrofitting a building to add an extensive roof is estimated to be between $20 and $25 per square foot.[90]

This brings us to the central argument in favor of subsidizing

PA. J. INT'L L. 911, 914 (2011).

85 *See, e.g.*, Jun Yang et al., *Quantifying Air Pollution Removal by Green Roofs in Chicago*, 42 ATMOSPHERIC ENV'T 7266 (2008) (finding that green roofs remove O_3, NO_2, PM_{10}, and SO_2.).

86 *See, e.g.*, MITIGATING NEW YORK CITY'S HEAT ISLAND, *supra* note 63, at 1–2 (discussing Crown Heights and Fordham as low-income neighborhoods with large minority populations selected for the mitigation study to address environmental equity concerns in the context of heat island hot spots).

87 For a map of areas where at least 51.1 percent of the population identifies as minorities in New York City, see N.Y. STATE DEP'T OF ENVTL. CONSERVATION, POTENTIAL ENVIRONMENTAL JUSTICE AREAS IN NEW YORK COUNTY (MANHATTAN), NEW YORK. This map can be compared with the map "NYC Sewer Systems" available at http://www.nyc.gov/html/dep/pdf/ green_infrastructure/sewer_drainage_area _types_map.pdf.

88 *See* Timothy Carter & Laurie Fowler, *Establishing Green Roof Infrastructure Through Environmental Policy Instruments*, 42 ENVTL. MGMT. 151, 152 (2008). *See also* Michael Blackhurst et al., *Cost Effectiveness of Green Roofs*, 16 J. ARCHIT. ENG. 136, 139 (2010).

89 *See* U.S. GEN. SERVS. ADMIN., *supra* note 56, at 68.

90 Interviews with Robert Crauderueff of Craudereuff & Associates, and Marni Majorelle of Alive Structures, both of whom develop green roofs in New York City, (Aug., 2017).

green roofs: green roofs may be cost-effective from the public's perspective, but they probably are not cost-effective from the perspective of the private building owner. The reason for this discrepancy is that a large portion of the benefits that green roofs provide—water quality improvements, biodiversity enhancements, urban heat island reductions—accrue to the public at large, while the costs are born entirely by the property owner installing the green roof.[91]

To be sure, vegetated roofs provide certain benefits over a building's lifetime that help offset the added installation and maintenance costs. Take the United States Postal Service's Morgan Processing and Distribution Center in New York City, which houses a 2.5-acre green roof, and reports that its heating and cooling costs have declined by over $1 million per year since installing the roof and implementing other energy saving enhancements.[92] Green roofs may also extend the life of a roofing membrane, thereby delaying the need for costly replacement.[93] And, perhaps the most immediately apparent benefit is that owners of buildings with green roofs can tout an additional amenity and market the building as "green."[94] Those individuals who have installed green roofs without taking advantage of an incentive payment may believe that the value of the private benefits exceeds the costs. But the fact that relatively few property owners have decided to take this path suggests that

91 *See, e.g.*, Carter & Fowler, *supra* note 88, at 152. *See also* Blackhurst et al., *supra* note 88, at 136.

92 Initially, the roof was only estimated to save $30,000 per year, but the actual savings far exceeded expectations. *See Green Roof: Morgan Processing and Distribution Center*, U.S. POSTAL SERV. (Nov. 2011), https://about.usps.com/what-we-are-doing/green/factsheets/green-roof-111118.pdf. *See also* Jennifer Lee, *Postal Service Unveils Large 'Green' Roof*, N.Y. TIMES (July 22, 2009), https://cityroom.blogs.nytimes.com/2009/07/22/postal-service-unveils-large-green-roof.

93 *See* Erica Oberndorfer et al., *Green Roofs as Urban Ecosystems: Ecological Structures, Functions, and Services*, 57 BIOSCIENCE 823, 828 (2007). Estimates suggest that green roofs have at least twice the lifespan of a conventional roof. U.S. GEN. SERVICES ADMIN., *supra* note 56, at 64. Thus, while green roofs may require more regular maintenance, they do not need to be replaced as frequently as conventional roofs.

94 On the effect of green marketing instruments on property values, see Franz Fuerst & Patrick McAllister, *Green Noise or Green Value? Measuring the Effects of Environmental Certification on Office Values*, 39 REAL ESTATE ECON. 45 (2011). Notably, not all types of property owners will be motivated to market their buildings as such because not all types of purchasers or renters will be able to pay a premium for "green" properties. For instance, residents of public housing are unlikely to be able to discriminate between properties based on this criteria.

most believe that the private costs outweigh the benefits.[95]

This intuition finds support in the relevant academic literature. For instance, a 2010 study that quantified the costs and benefits of green roofs found that when private costs and benefits were considered alone, the costs outweighed the benefits.[96] However, when public benefits were considered together with private benefits, the calculus appeared quite different; under that scenario, green roofs were found to be cost-effective in both multifamily and commercial buildings.[97] The United States General Services Administration (GSA) issued a report in 2011 that reached a similar conclusion, finding that the public benefits of green roofs generally outweigh total costs over a roof's expected lifetime.[98] A study commissioned by the Washington, D.C. Department of Energy & Environment echoed this finding, determining that green roofs installed in the District have a benefit-to-cost ratio of nearly 2.0 when societal benefits are included, which slightly exceeded the benefit-to-cost ratio for rooftop solar photovoltaic installations.[99]

Problematically, however, because property owners enjoy only a tiny fraction of the public benefits green roofs offer, they are unlikely to consider them in deciding whether to install the roof. As a result, without some sort of policy intervention, we can expect a suboptimal degree of investment in green roofs. This is a classic

95 It is of course conceivable that property owners are merely misinformed about the private costs and benefits of green roofs and that the slow rate of adoption could be remedied with educational campaigns. During the course of research for this project, we had a conversation with one government official (who wished to remain anonymous) who believed this to be the case. Nevertheless, even assuming property owners are aware of the long-term benefits, there is still the discounting problem; specifically, is difficult to persuade owners to pay a lot today for benefits that will gradually accrue for decades into the future.

96 *See* Michael Blackhurst et al., *Cost-Effectiveness of Green Roofs*, 16 J. ARCHITECTURAL ENG'G 136 (2010).

97 *See id.*

98 *See* U.S. GEN. SERVICES ADMIN., *supra* note 56. Notably, the two studies described here only account for a partial list the public benefits that green roofs are believed to offer. For instance, neither study assigns value to the aesthetic benefits green roofs offer or their potential to reduce noise pollution, and only the GSA study assigns a value to the biodiversity benefits. These benefits are extremely difficult to appraise, so their exclusion is understandable. Still, without assigning any value to them, it seems likely that the studies understate the net benefits green roofs provide.

99 *See* GREG KATS & KEITH GLASSBROOK, ACHIEVING URBAN RESILIENCE: WASHINGTON DC 129 Tbl.12.2 (2016). Rooftop solar installations were found to have a benefit-to-cost ratio of 1.8. *Id.*

example of the market inefficiencies caused by what economists refer to as "positive externalities," whereby an action produces third-party benefits for which the actor is not compensated.[100]

The British economist Arthur Pigou noted long ago that subsidies can be used to help actors internalize the external benefits of their actions, thereby correcting the market defects associated with externalities.[101] As Lily Batchelder *et al.* writes, "Pigouvian subsidies correct for positive externalities by subsidizing the desired behavior so that the market price reflects the social value of the good, which is defined as its private value to consumers plus the value of the positive externalities it generates."[102] New York City's green roof tax abatement is an example of a Pigouvian subsidy: it attempts to subsidize the cost of installing a green roof to reflect its social value, or a portion thereof.

Notably, New York City could advance a similar objective by making use of a Pigouvian tax, instead of a subsidy. Various jurisdictions outside of New York City have used this type of incentive to encourage green infrastructure, including green roofs.[103] Under this approach, property owners are charged a so-called "stormwater utility fee" that reflects the approximate amount of runoff generated onsite. The size of the stormwater fee is often commensurate with the amount of impervious surface on the property, and owners can reduce their fees by replacing impervious surfaces with green infrastructure.[104] A properly sized tax should provide the needed incentive to install green infrastructure, and would be an improvement over the New York City DEP's current

100 *See* JONATHAN GRUBER, PUBLIC FINANCE AND PUBLIC POLICY 122 (2005) (describing positive externalities).

101 *See* ARTHUR PIGOU, THE ECONOMICS OF WELFARE (1920).

102 Lily L. Batchelder et al., *Efficiency and Tax Incentives: The Case for Refundable Tax Credits*, 59 STAN. L. REV. 23, 44 (2006).

103 There are roughly 1,600 jurisdictions in the United States that charge stormwater utility fees, but New York City is not among them. *See* C. WARREN CAMPBELL ET AL., W. KY UNIV. STORMWATER UTIL. SURVEY 2 (June 2016). For a novel discussion of stormwater utilities fees and whether they should be considered fees or taxes, see Erin Adele Scharff, *Pigouvian User Fees*, NEB. L. REV. 33-35 (forthcoming).

104 *See* JUSTIN GUNDLACH, SABIN CTR. FOR CLIMATE CHANGE LAW, COLUM. L. SCH. PUTTING GREEN INFRASTRUCTURE ON PRIVATE PROPERTY IN NEW YORK CITY, 13 (2017). Philadelphia has developed a stormwater program of this sort. *See Non-Residential Stormwater Billing*, CITY OF PHILADELPHIA, http://www.phila.gov/water/wu/stormwater/Pages/NonResidentialStormwaterBilling.aspx (last visited May 23, 2018).

funding arrangement, under which a fee is assessed on the amount of waste water produced, bearing no relation to the amount of stormwater actually produced.[105]

From an efficiency standpoint, it may not matter whether New York City uses a Pigouvian tax or subsidy to incentivize green roofs.[106] Politically, however, there appears to be a difference. In fact, advocates have unsuccessfully tried for years to persuade New York City's DEP to introduce a stormwater charge.[107] The optics make it a tough sell. As Justin Gundlach has noted, it may not be politically advantageous for the Mayor or a member of City Council "[to] list 'Established Stormwater Fee' on a mailer during election season."[108] Indeed, in Maryland, a law mandating that large municipalities implement stormwater charges was dubbed a "rain tax" during an election season and was swiftly repealed.[109]

Before concluding the case for offering a tax incentive for green roofs, it is important to note that there are other policy tools that the City could use to promote the development of green roofs. For example, some cities, including Toronto, San Francisco, and Copenhagen, have enacted various types of mandates that require new buildings to incorporate green roofs on their properties.[110]

105 *See* Guglielmo Mattioli, *Stormwater is New Challenge to City's Clean Water Plans*, CITY LIMITS (July 12, 2016), https://citylimits.org/2016/07/12/stormwater-is-new-challenge-to-citys-clean-water-plans/.

106 Deciding whether to use a Pigouvian tax or subsidy depends on how policymakers approach a problem, as both can be used to correct inaccurate price signals. In the context of roofs, policymakers could tax conventional roofs to internalize the additional stormwater costs they impose on society. Policymakers can also subsidize green roofs to account for the social value of their benefits. *See* PAUL KRUGMAN & ROBIN WELLS, ECONOMICS AND MICROECONOMICS ch. 16 (3 ed. 2012) (explaining externalities and how Pigouvian taxes and subsidies can be used to reach efficient outcomes).

107 *See, e.g.*, Mattioli, *supra* note 105 ("For years advocates have asked the city to restructure the billing system to reflect more closely what people are actually consuming, wasting and producing in terms of water runoff."). Note that DEP would need to be careful to design any stormwater charge as a fee, rather than a tax, in order to avoid triggering an obligation to receive State authorization. *See infra* Part IV for a discussion of municipalities' limited ability to impose new taxes without State approval.

108 Gundlach, *supra* note 104, at 25.

109 *See* Rona Kobell, *Stormwater Rules Help Create a Growing Number of Jobs*, MARYLANDREPORTER.COM (July 27, 2017), http://marylandreporter.com/2017/07/27/stormwater-rules-help-create-a-growing-number-of-jobs/.

110 *See* TORONTO MUN. CODE CH. 492, Art. II: Requirement for Green Roofs; CITY OF COPENHAGEN, GREEN ROOFS COPENHAGEN 11; Jackie Snow, *Green Roofs Take Root Around the World*, NAT'L GEOGRAPHIC (Oct. 27, 2016),

Mandates offer an attractive means of expanding green roof development, but they also, perhaps unfairly, force private property owners to shoulder all the costs of providing what is largely a societal benefit. At the other end of the spectrum, the New York City DEP currently administers a grant program that offers to pay the full cost[111] of installing green roofs that applicants develop, which, as noted above, typically cost $20 to $25 per square foot on existing buildings.[112] This grant program—and how to improve it—has received the lion's share of attention from parties interested in expanding green infrastructure in New York City.[113] However, while the grant program is important, it is an expensive way for the City to promote green roofs because it requires the public to shoulder nearly all of the cost burden.[114] At $20 to $25 per square foot, the tax abatement could more than triple in value and still be less expensive for the City on a per square foot basis than the grant program.

The grant program is also an imperfect substitute for a tax incentive because the two programs target distinct constituencies. Specifically, the grant program appears to be primarily suited for non-profit institutions. To apply for grant funding, building owners must complete a laborious application process and sign a restrictive covenant guaranteeing long-term stewardship of the green infrastructure asset, which limits their ability to subsequently transfer the property or refinance it.[115] Large non-profit institutions, including hospitals and universities, which have been the primary

https://news.nationalgeographic.com/2016/10/san-francisco-green-roof-law/.

111 Notably, while the grant can, in theory, pay the full cost of the project, there are often matching funds involved. For example, in 2014, grant recipients contributed almost $1 million to the $3 million received from DEP in grants. *See Community-Based Environmental Projects Receive More Than $3 Million from the Department of Environmental Protection*, N.Y.C. DEP'T OF ENVTL. PROT. (Feb. 12, 2015), http://www.nyc.gov/html/dep/html/press_releases/15-008pr.shtml. Applicants would also still have to pay maintenance costs associated with the roofs.

112 *See supra* note 90 with accompanying text.

113 *See, e.g.*, NRDC & NYU STERN, *supra* note 41.

114 As of 2016, DEP's Green Infrastructure Grant Program had contributed to thirty-four green roof projects on private property. DEP anticipated that 15 more green roofs would be installed through the program during 2017. N.Y.C. DEP'T OF ENVTL. PROT., NYC GREEN INFRASTRUCTURE: 2016 ANNUAL REPORT 13 (2017). As of the time of this writing, final numbers for 2017 had not yet been released.

115 The Declaration of Restrictive Covenant can be found on the New York City Government website. *See Declaration of Restrictive Covenant*, N.Y.C. DEP'T OF DESIGN AND CONSTR., http://www.nyc.gov/html/dep/pdf/green_infrastructure/declaration-of-restrictive-covenant.pdf (last visited Mar. 3, 2018).

type of property owners that have taken advantage of the grant program so far, are more likely to have staff resources available to complete these applications than owners of residential or small commercial properties. These types of institutions may also plan to occupy a property for a longer time period, making the restrictions on sale less of a concern. It is therefore unsurprising that the overwhelming majority of buildings that have received grant funding thus far are non-profit institutions such as hospitals, universities, and religious organizations.[116] The tax abatement, by contrast, is only valuable to property owners with tax liability, such as private homes and commercial enterprises, and these are the only types of owners that have taken advantage of it thus far.[117] In short, the grant program and tax incentive program appeal to different groups and each has a role to play in a comprehensive strategy to transform the City's roofs.

II. THE DEFICIENCIES OF THE CURRENT GREEN ROOF TAX ABATEMENT

Despite the great potential of using a tax incentive to promote green roof development, New York City's current incentive program has been woefully ineffective. The tax incentive was developed at the urging of community stakeholders and environmental groups who were eager to find ways to improve New York City's water quality. A coalition known as Storm Water Infrastructure Matters (S.W.I.M.), with members including Natural Resources Defense Council, Riverkeeper, the Newtown Creek Alliance, and the Bronx River Alliance, was particularly influential in pressing for the incentive.[118] Rather than investing more resources into traditional gray infrastructure, S.W.I.M. promoted green infrastructure as a cost-effective means to reduce stormwater runoff, and thus decrease the twenty-seven billion gallons of

116 *See* N.Y.C. DEP'T OF ENVTL. PROT. NYC GREEN INFRASTRUCTURE: 2016 ANNUAL REPORT, Exhibit H (2016).

117 Of the properties that have applied for the abatement, six were private buildings with property tax liability. The applicants included four single family homes, a six-story co-op, and a former industrial space turned venue. The applicant without property tax liability is part of an educational institution, the Pratt Institute. *See* N.Y.C. DEP'T OF BUILDINGS, GREEN ROOF TAX ABATEMENT PROGRAM SUMMARY (2017) (obtained by authors via a Freedom of Information Law request made in May 2017) (data on file with the authors).

118 *See* Crauderueff, *supra* note 16, at 2–3.

combined sewage effluent that overflows into New York Harbor annually.[119]

In 2008, after careful consideration, the S.W.I.M. coalition recommended a tax incentive of $6.75 per square foot for green roofs, which was calculated to be about one-third of installation costs at that time.[120] However, instead of adopting S.W.I.M.'s proposal, the City backed its own bill with an incentive of just $4.50 per square foot.[121] The City's bill also included a complex definition of a green roof[122] and an arduous administrative process that significantly increased the cost of applying for the abatement. Unfortunately, with time running out in the legislative session, S.W.I.M. faced the difficult choice of backing the City's bill, flaws and all, or potentially losing the incentive program entirely in the next session.[123] Ultimately, S.W.I.M. chose to support the bill. In August 2008, Governor David Paterson signed into law a bill granting a one-time tax abatement for the construction of green roofs.[124] The bill provided an abatement of $4.50 per square foot for green roofs that covered at least fifty percent of the rooftop, with a limit of the lesser of $100,000 per installation or the total tax liability in the year in which the abatement was claimed.[125] But, within a short time, the incentive's inadequacies became painfully apparent; in the first three years after the program took effect, only four building owners utilized the tax incentive.[126]

S.W.I.M. regrouped in 2012, making another push to increase the tax incentive and to reduce the administrative hurdles. Although S.W.I.M. made persuasive arguments for the need to increase the tax incentive substantially, they could only secure an inconsequential bump up to $5.23 per square foot.[127] At this value,

119 *See id.*

120 S.W.I.M.'s proposal informed New York State Assembly Bill A 11226. *See id.* at 3.

121 The City proposed S.B. 7553 in the New York State Senate. *See id.* at 2–3.

122 *See id.* at 5.

123 *See id.* at 3.

124 For more information about the history and rationale of the green roof abatement, see THE N.Y.C. COUNCIL, REPORT OF THE INFRASTRUCTURE DIVISION (Oct. 10, 2010), http://legistar.council.nyc.gov/View.ashx?M=F&ID=1060150&GUID=72C29195-9FEB-4B6A-AA61-F1DDE3A55AD4.

125 The abatement was set to sunset in March of 2013. *See id.* at 12–13.

126 *See* Crauderueff, *supra* note 16, at 1.

127 *See* S.B. 4802, 2013-2014 Reg. Sess. (N.Y. 2013). Advocates were also able to secure an increase in the total size of the abatement that an individual

the incentive program is simply not worth enough to justify the administrative costs it imposes. For instance, S.W.I.M.'s analysis in 2012 estimated that applying for the permit required to qualify for an abatement added about $5,000 in professional fees to a project's costs.[128] This estimate was echoed in a conversation with an active green roof developer during the writing of this Article in 2017.[129] Assuming these assessments are accurate, building owners who install a green roof system that is less than one thousand square feet can actually *lose* money by applying for the abatement. Even with streamlining of the application process, S.W.I.M. estimates that the abatement would need to be worth at least $7.21 for roofs that are ten thousand square feet and larger and $9.09 for roofs that are one thousand square feet or smaller to effectively spur property owners into action.[130]

Given this dynamic, it is perhaps unsurprising that the number of properties applying for the abatement has remained disappointingly low since the 2013 amendments took effect. As of 2017, a total of seven property owners had participated in the tax incentive program.[131] Moreover, while the 2013 amendments set a cap on aggregate expenditure for the green roof tax abatement program at $1 million per year from fiscal year 2015 onwards, the total expenditure has never reached anywhere near that sum. In fact, in fiscal years 2015 and 2016 zero property owners took advantage of the abatement.[132] In fiscal year 2017, only two property owners

property owner could claim to the lesser of $200,000 or the total tax liability of the property in the year in which the abatement is claimed. As with the initial pilot program, the 2013 legislation does not include an adjustment for inflation. *See id.*

128 *See* Crauderueff, *supra* note 16, at 4. The primary reason for the added professional fees is that an architect or engineer must make numerous certifications as part of the permit application and, for roofs that are over 4 inches thick, must also submit various construction drawings. *See* N.Y.C. DEP'T OF BUILDINGS, NYC GREEN ROOF PROPERTY TAX ABATEMENT PROGRAM (2010).

129 *See* Conversation with Marne Majorelle, Founder, Alive Structures (July 19, 2017). Although beyond the scope of our tax discussion, we note that it would be beneficial to streamline the process to reduce the costs associated with the abatement application alongside reforms to the incentive structure.

130 S.W.I.M. estimated that, without taking steps to reduce the administrative costs, the incentive would need to be at least $14.56 per square foot for roofs of 10,000 square feet and $26.79 per square foot for roofs of 1,000 square feet to fully cover the application costs and 35 percent of the installation costs. *See* Crauderueff, *supra* note 16, at 5–6.

131 *See id.* at 9.

132 *See* N.Y.C. DEP'T OF FIN. OFFICE OF TAX POLICY, ANN. REP. ON TAX EXPENDITURES: FISCAL YEAR 2015 at 11, 44 (2015), *and* N.Y.C. DEP'T OF FIN.

took advantage of the Green Roof Abatement, for a total tax expenditure of less than $50,000.[133]

Not only have few total properties taken advantage of the abatement program, but the properties that have used the abatement have not all been in areas where green roofs are of high stormwater management value. As a glaring example of a roof that would seem to provide negligible environmental benefits, one of the green roofs that has been subsidized via this tax program sits on a single family home in suburban Riverdale, surrounded by an expansive grass lawn and trees. Riverdale is not among New York City's priority CSOs areas, and given the heavily vegetated surroundings, it is unclear that this roof system would provide significant additional biodiversity benefits.[134] Adding a green roof to this suburban home certainly does not advance environmental justice goals either.

The New York City Audubon's efforts to map green roofs in the City reveals the same problematic distribution of green roofs among owners who are building them without making use of the abatement; as noted above, approximately half of the green roofs identified in New York City are in Manhattan, despite the fact that there are no DEP CSO priority areas in the borough.[135] So, not only are there too few total roofs, but many of those that do exist are not located in particularly productive areas. The City's amended Green Infrastructure Grant Program—which now makes all property owners eligible for grants for green infrastructure, regardless of whether they are in priority areas or not[136]—will only exacerbate

OFFICE OF TAX POLICY, ANN. REP. ON TAX EXPENDITURES: FISCAL YEAR 2016 at 11, 46 (2016) [hereinafter 2016 TAX EXPENDITURE].

133 *See* N.Y.C. DEP'T OF FIN. OFF. OF TAX POL'Y, ANNUAL REPORT ON TAX EXPENDITURES: FISCAL YEAR 2017 at 11, 47 (2017) [hereinafter 2017 TAX EXPENDITURES].

134 According to Dustin Partridge, a PhD Candidate in Biology at Fordham University who is studying the importance of urban green roofs for bird populations, "suburban [green] roofs are overall less ecologically valuable than urban roofs." Email exchange with Dustin Partridge, PhD Candidate in Biology, Fordam Univ. (Nov. 21, 2017) (on file with authors). From a biodiversity perspective, the special value that urban green roofs provide is partially due to the fact that, "urban green space [including green roofs] is the only way to maintain biodiversity in the urban core." *Id. See also* Braaker et al., *supra* note 81 (demonstrating the value of green roofs as habitat connectors in urban areas).

135 *See supra* note 50 with accompanying text for a discussion of the City's priority areas.

136 All properties are eligible to apply; property owners only have to indicate if they are located in a combined sewer, separate sewer, or direct drainage area. *See* N.Y.C. DEP'T OF ENVTL. PROT., *Grant Program for Private Property Owners*

this distributional problem. If the primary goal of the green roof tax incentive is to encourage private property owners to install roofs for stormwater management benefits, it is not simply a matter of installing more roofs, but rather a matter of installing more roofs in areas that are vulnerable to CSOs.

III. PROPOSAL FOR REFORM: TOWARDS A LOCATION-SPECIFIC TAX INCENTIVE

To increase the impact of the limited funding that has been devoted to New York City's green roof incentive program, we propose that the City increase the size of the abatement offered to property owners in priority watersheds, while decreasing, or even eliminating, the size of the abatement offered to property owners located elsewhere.[137] This location-specific approach should address the current incentive program's chief shortcomings: it should increase the size of the abatement such that it is large enough to spur more property owners to take action and it should ensure that the incentivized roofs are in areas where they will deliver the greatest public value.

Which precise areas New York City, or any other jurisdiction, would choose to prioritize in this scheme would depend on the City's particular policy goals. For instance, New York City may eventually assign greater value to the promotion of urban biodiversity than it presently does, and, if so, it might want to offer the tax incentive in areas that would help create a contiguous habitat for migratory species.[138] To date, however, New York City's policymakers have valued green roofs primarily for their ability to advance the City's stormwater goals. As such, it would make sense to tailor the size of the incentive to the value that the roof could

(last visited Mar. 11, 2018), http://www.nyc.gov/html/dep/html/stormwater/nyc_green_infrastructure_grant _program.shtml.

137 As noted above, the City has never come anywhere close to reaching the program cap. *See infra* note 132 with accompanying text. Therefore, even if no additional funding were allocated to the program the City can increase the program's impact by encouraging more complete utilization of the funds already approved. Again, we believe more funds *should* be allocated to this important program but it is notable that the proposal outlined here could increase the program's impact irrespective as to whether the aggregate funding level is increased.

138 While green roofs alone can be valuable as oases, studies suggest that green roofs support more biodiversity when they are surrounded by other green spaces. *See, e.g.*, Parkins & Clark, *supra* note 79, at 354–55.

provide for stormwater reduction. DEP's existing priority CSO zones offer a good guide of where these high value areas may be located.[139]

Policymakers would also need to decide how intricate, or differentiated, the pricing regime should be. At one end of the spectrum, they could decide to craft a fairly blunt regime that would offer a uniform rate for all properties that are located within the City's CSO priority areas—perhaps something around $9 per square foot, which is what S.W.I.M. proposed as the minimum sum that would spur owners of properties one thousand square feet and larger into action[140]—and then make the incentive unavailable for properties located elsewhere. The great advantage of this approach is its simplicity: City officials promoting the program would be able to target a clearly circumscribed segment of the population, and property owners, as well as green roof developers, would be able to rely on a clear and consistent subsidy rate in their cost assessments. The downside to this approach is that it may not accurately reflect the disparate severity of stormwater impacts that exist among the City's priority CSO areas. It may also set the subsidy rate too low, or cover too broad a swath of buildings, to incentivize the concentration of green roof development in any one area that is needed to materially reduce runoff throughout the neighborhood.[141] As such, officials may want to consider differentiating the prices further. However, as noted above, adopting a highly differentiated pricing regime may introduce complexities that hinder the efficient administration of the program. While it is beyond the scope of this Article to recommend exactly how granular a pricing regime should be implemented, we acknowledge that policymakers would need to strike a balance between these competing considerations.

Importantly, there is precedent for integrating concerns about the geographic distribution of environmental amenities in both New York City and New York State environmental policy. At the municipal level, for example, the environmental justice movement has long bemoaned the relative dearth of environmental amenities,

139 *See supra* note 50 for a review of priority CSO areas.

140 *See supra* note 130 and accompanying text.

141 *See supra* note 45 and accompanying text (noting that 50 percent of the rooftops in a given area may need to be covered with green roofs to reduce stormwater runoff in the area by 10 percent). As discussed below in Part IV, the City may need to observe market responses, and adjust the amount of the abatement accordingly, before achieving the ideal rate of subsidy.

like parks, in low-income communities of color[142] and called on policymakers to facilitate a more even distribution of locally undesirable land uses, such as sewage treatment facilities.[143] In response, New York City's lawmakers have required that the City incorporate considerations of equity in deciding where to site facilities under its operation. And while the officials appear to have achieved only limited success in this pursuit, the procedural obligation to consider the distribution of environmental benefits and burdens in siting decisions is certainly long-standing.[144]

At the state level, regulators have recently taken some novel steps to incentivize a more desirable distribution of environmental amenities as well.[145] New York State's much-lauded efforts to change the way that distributed solar photovoltaic (PV) installations are compensated is a prime example of this trend. The State's efforts to reform the compensation of distributed PV deserves some elaboration because it effectively illustrates the pitfalls of failing to incorporate location-specific price signals into an incentive scheme

142 *See, e.g.*, Michel Gelobter, *The Meaning of Urban Environmental Justice*, 21 FORDHAM URB. L.J. 841, 853 (1994) (noting that, "[p]arks and open spaces in the city traditionally have been developed in white, well-to-do neighborhoods."). *See also* Jennifer R. Wolch et al., *Urban Green Space, Public Health and Environmental Justice: The Challenge of Making Cities 'Just Green Enough,'* 125 LANDSCAPE & URB. PLAN. 234, 235 (2014).

143 *See* Vicki Been, *What's Fairness Got to Do With It?*, 78 CORNELL L. REV. 1001, 1001–04 (1993). *See also* NRDC & NYU STERN, *supra* note 41, at 7 (calling for an equitable distribution of green infrastructure projects throughout New York City that incorporates environmental justice considerations).

144 *See* N.Y.C. COUNCIL, DOING OUR FAIR SHARE, GETTING OUR FAIR SHARE 3 (Feb. 2017), https://council.nyc.gov/news/2017/02/27/fairshare/ (noting, "[u]nfortunately, Fair Share has not worked as the Charter Commission intended. In many instances, the City's facilities and services are not more evenly distributed—in fact, their distribution has become less fair since 1989."). *See also* Joseph B. Rose, *A Critical Assessment of New York City's Fair Share Criteria*, 59 AM. PLAN. ASS'N J. 97 (1993).

145 Federal lawmakers have also taken steps to regulate the distribution of environmental attributes and harms. For instance, under the federal Clean Air Act, a state may be prohibited from siting a polluting facility in an area that exceeds ambient air quality standards, but is allowed to site it elsewhere. *See* 42 U.S.C. § 7502(5) and § 7503 (requiring permits for the siting of new major sources within a nonattainment area and setting restrictions on the issuances of such permits). Scholars have also called for regulating the geographic distribution of emissions permits that are sold within an emissions trading area to avoid the creation of "hot spots" where pollutants are concentrated and the damage caused is most severe. *See generally* Jonathan Nash & Richard Revesz, *Markets and Geography: Designing a Marketable Permit Scheme to Control Local Regional Pollutants*, 28 ECOLOGY L.Q. 569 (2001).

for environmental products.

Back in 1997, New York State adopted a system known as "net energy metering" to compensate the owners of distributed solar PV systems who sent energy to their utilities through the electric grid.[146] Under net energy metering, whenever owners of solar PV systems produced more energy than they used, they could export the excess to the grid and the utility would roll back their meter, providing a credit on the customer's utility bill equal to the amount of energy supplied.[147] One kilowatt hour sent to the grid was therefore effectively compensated at the same rate as a kilowatt hour purchased from the utility, and this rate was applied to all owners of solar PV systems, regardless of their location within New York.[148]

With time, New York's regulators came to realize that net energy metering failed, among other shortcomings, to capture the idiosyncratic value that distributed energy resources provide to different areas of the State.[149] New York's electric grid is far more congested around New York City than it is in the more sparsely populated upstate regions where most of the power is generated.[150]

146 *See* Associated Press, *Pataki Signs Bill Supporting Home Solar Power*, N.Y. TIMES (Aug. 20, 1997), https://www.nytimes.com/1997/08/20/nyregion/pataki-signs-bill-supporting-home-solar-power.html; *see also* New York State PSL § 66-j.

147 *See* New York State PSL § 66-j(4)(a).

148 *See id.* (failing to include locational criteria as a basis for determining the compensation rate).

149 *See* N.Y. PUB. SERV. COMM'N, ORDER ON NET ENERGY METERING TRANSITION, PHASE ONE OF VALUE OF DISTRIBUTED ENERGY RESOURCES, AND RELATED MATTERS, CASE 15-E-0751, at 3 (March 9, 2017) ("[S]uch business models and [net energy metering] in particular are inaccurate mechanisms of the past that operate as blunt instruments to obscure value and are incapable of taking into account locational, environmental, and temporal values of projects. By failing to accurately reflect the values provided by and the [distributed energy resource] they compensate, these mechanisms will neither encourage the high level of [distributed energy resource] development necessary for developing a clean, distributed grid nor incentivize the location, design, and operation of [distributed energy resources] in a way that maximizes overall value to all utility customers.") *see also id.* at 50. ("[A]t a minimum, accurate valuation and compensation requires the ability to recognize and account for the fact that the value of a kWh can vary greatly depending on where and when it is injected into or consumed from the grid.") For a comprehensive description of the deficiencies of net energy metering, *see* Richard Revesz & Burcin Unel, *Managing the Future of the Electricity Grid: Distributed Generation and Net Energy Metering*, 41 HARV. ENVTL. L. REV. 43 (2017).

150 *See* Emily S. Reub, *How New York City Gets Its Electricity*, N.Y. TIMES (Feb. 10, 2017), https://www.nytimes.com/interactive/2017/02/10/nyregion/how-new-york-city-gets-its-electricity-power-grid.html (stating that, "since most

During periods of peak demand, this congestion can cause gridlock and force the utility to turn on more expensive generators that are close to the source of demand.[151] Distributed generation, like rooftop solar PV systems, can help defer the need to turn on these expensive generators, and therefore help keep power costs down. As such, each additional kilowatt of distributed generation[152] installed in New York City may be more valuable than it is in other areas of the State. Yet, with its "one price fits all" approach, net energy metering offers no way to signal this enhanced value to the market, which was causing underinvestment in the area. To cure this defect, regulators have decided to transition towards a differentiated pricing scheme that assigns an idiosyncratic value to each kilowatt hour of energy produced based on, *inter alia*, where it is generated.[153] This, in essence, is what we are calling on the City to do with its green roof incentive: recognize that the value of green roofs varies by location and tailor the size of the incentive offered accordingly.

Washington, D.C. has already taken steps in this direction. Similar to New York City's current incentive program, when D.C. first launched its green roof incentive back in 2007 it offered a standardized $3 rebate for new green roof projects built anywhere in the district.[154] As in New York City, this initial incentive yielded lackluster results so the Department of Energy & Environment (DOEE) modestly increased the offering to $5 per square foot one

power is generated in less populated areas, certain lines that carry it downstate during times of peak demand can become gridlocked.").

151 *See* Emily S. Reub, *How New York City Gets Its Electricity*, N.Y. TIMES (Feb. 10, 2017), https://www.nytimes.com/interactive/2017/02/10/nyregion/how-new-york-city-gets-its-electricity-power-grid.html.

152 Distributed generation refers to small-scale power generation that is produced at, or near, the site of consumption. *See* U.S. DEP'T OF ENERGY, THE POTENTIAL BENEFITS OF DISTRIBUTED GENERATION AND RATE RELATED ISSUES THAT MAY IMPEDE THEIR EXPANSION i (Feb. 2007).

153 *See* Order on Net Metering Transition, *supra* note 149 at 50-51 (March 9, 2017).

154 Notably, the district offered a larger incentive for small green roofs (defined as those less than 5000 square feet) because installation costs tend to be much higher on small roofs. *See* Conversation with Cecilia Lane, Watershed Protection Specialist, DOEE (Nov. 21, 2017); DEP'T OF ENERGY & ENV'T, *Green Roofs in the District of Columbia* (Mar. 11, 2018), https://doee.aqdev.dc.gov/node/9322 [hereinafter DOEE Green Roofs]. A green roof advocate and installer, DC Greenworks, pushed for the initial subsidy. *See* Nora Shepard, *Green Roof Incentives: A 2010 Resource Guide*, DC Greenworks 22 (Feb. 1, 2010), http://dcgreenworks.org/wp-content/uploads/2012/07/dc-greenworks-2010-survey-of-green-roof-incentive-policies.pdf.

year later.[155] Officials continued to be underwhelmed by the rate of green roof development following this price increase.[156] Around the same time, DOEE also found itself facing an increasingly urgent need to either increase green infrastructure in certain areas around the perimeter of the District or invest in even more costly gray infrastructure projects[157] in order to meet stormwater management obligations.[158] As a result of these pressures, DOEE decided to adopt a more aggressive and innovative approach to its rebate program: it offered basic funding of $10 per square foot for green roofs anywhere in the District,[159] and a special $15 per square foot for green roofs in targeted watersheds around the District's perimeter.[160]

DOEE is still analyzing the impact of its rebate program, which is difficult to isolate given that the District has various other programs in place to incentivize green infrastructure development

155 *See* DOEE Green Roofs, *supra* note 155.

156 *See* Telephone Interview with anonymous official at Dep't of Energy & Env't (Nov. 21, 2017).

157 *See* Telephone Interview with Michael Furbish, President & Founder, & John Parker, Director of Business Development, Furbish (Dec. 11, 2017) (on file with authors). In the central areas of the District, where CSOs are of greatest concern, the government has committed to build large underground tunnels to help convey excess stormwater, which reduces the need for additional green infrastructure projects there. *See id.*

158 The federal Clean Water Act requires permits for stormwater discharges from municipal separate sewer systems. *See* 33 U.S.C. § 1342(p)(3). For such a permit to be granted, the municipality must demonstrate that it has implemented "controls to reduce the discharge of pollutants to the maximum extent practicable, including. . . [*inter alia*] design and engineering methods." 33 U.S.C. § 1342(p)(3)(B)(iii). For a discussion of the stormwater management obligations that the federal Clean Water Act imposes on municipalities, see Caswell F. Holloway et al., *Solving the CSO Conundrum: Green Infrastructure and the Unfulfilled Promise of Federal-Municipal Cooperation*, 38 HARV. ENVTL. L. REV. 336, 354-59 (2014).

159 *See* DOEE Green Roofs, *supra* note 154. *See also* David Charron, *How Green Roofs Can Save You Lots of Green*, WASH. POST (Mar. 22, 2016), https://www.washingtonpost.com/news/where-we-live/wp/2016/03/22/how-green-roofs-can-save-you-lots-of-green/.

160 The targeted watersheds include Bloomingdale drainage areas, Dumbarton Run, Hickey Run, Nash Run, Texas Avenue Tributary, Pope Branch, Oxon Run, and Watts Branch. *See* DIST. DEP'T OF THE ENV'T, 2014 MS4 ANNUAL REPORT 19 (Jan. 22, 2015). For more information on the program, *see* DOEE Green Roofs, *supra* note 154; *RiverSmart Landscaping Program*, ALLIANCE FOR THE CHESAPEAKE BAY, https://www.allianceforthebay.org/our-work/key-program-focuses/reducing-stormwater-runoff/riversmart-homes/riversmart-landscaping-program/ (last visited May 24, 2018).

on private property.[161] Nonetheless, interviews with green roof developers indicate that the rebate is generous and should be an effective driver of change. As one local green roof developer noted, "the rebate makes the math really compelling."[162] To the extent that the rebate may have fallen short of expectations, the developers largely fault implementation challenges, including difficulties developing a robust educational campaign to notify property owners of their eligibility for the higher rebate rate and to explain the economics of green roofs.[163] They also note that many of the properties on the perimeter of the District, where the $15 rebate is available, are quite small, which can make installation substantially more expensive per square foot than in other areas.[164] New York City can draw upon D.C.'s experience when designing its own targeted incentive scheme. In particular, the City should be sure to develop adequate outreach programs to complement the revised incentive scheme and to tailor the size of the abatement to the cost of construction in the targeted areas.

Critically, targeting specific areas that offer the greatest policy benefits would not be a new approach to structuring tax abatements in New York City. To the contrary, several of the City's largest tax programs for housing already vary the available benefits based on

161 The rebate is part of a larger stormwater management program that encourages green infrastructure development including a stormwater management fee, which is assessed based on a property's impervious surface area, and a requirement that developers of new properties treat the first 1.2 inches of rainfall that hits their property onsite. *See* DEP'T OF ENERGY & ENV'T, 2013 STORMWATER MANAGEMENT RULE AND GUIDEBOOK; *District Establishes New Stormwater Fee Discount Program*, DEP'T OF ENERGY & ENV'T (Oct. 21, 2013), https://doee.dc.gov/release/district-establishes-new-stormwater-fee-discount-program. There is also a Stormwater Retention Credit Trading Program for properties that manage stormwater voluntarily or above the regulatory requirement, making them eligible to sell Stormwater Retention Credits in an open market. *See Stormwater Retention Credit Trading Program*, DEP'T OF ENERGY & ENV'T, https://doee.dc.gov/src (last visited May 24, 2018).

162 *See* Telephone Interview with Furbish & Parker, *supra* note 157 (green roof developers in the Washington, D.C. area).

163 *See id.*; Telephone Interview with William Cocke, Outfall Assessment & Outreach Manager, Anacostia Watershed Society (Dec. 11, 2017) (administers the RiverSmart Communities Green Roof Demonstration Program). DOEE appears aware of the importance of increasing education and outreach initiatives, and has made community engagement a priority area for development going forward. *See RiverSmart Communities*, DEP'T OF ENERGY & ENV'T, https://doee.dc.gov/service/riversmart-communities (last visited May 26, 2018).

164 *See* Telephone Interview with Furbish & Parker, *supra* note 158.

location.[165] One prominent example is New York City's 421-a program, which was designed in the 1970s amidst a housing shortage, to spur construction of new multi-family dwellings.[166] The program provides tax abatements to developers of new residential construction for a fixed number of years.[167] Initially, the program offered uniform tax benefits for qualifying projects, irrespective of where they were located. However, in the mid-1980s, officials became concerned that the tax breaks were being used to enrich the developers of luxury Manhattan condominiums, including Donald Trump's eponymous Fifth Avenue tower.[168] As a result, City officials worked with the State to amend the authorizing legislation such that developers of projects in Manhattan could only qualify for the exemption if they set aside a portion of their buildings for affordable housing units or helped support affordable housing development elsewhere in the City.[169] Though the precise restrictions have varied with time, the City has offered distinctive program benefits based on location ever since.[170]

165 Examples include the J-51 Program, Section 421-a Program, Commercial Revitalization Program, and Industrial and Commercial Abatement Program. *See* 2017 TAX EXPENDITURES, *supra* note 133, at 14, 16, 21, 41. The Commercial Revitalization Program is part of a revitalization strategy to increase the tenant occupancy of office and retail space and to encourage investment in older commercial spaces in lower Manhattan and other selected areas. This program has been incorporated as part of the Commercial Expansion Program. *See id*. at 21–22. The Industrial and Commercial Incentive Program, the predecessor to the Industrial and Commercial Abatement Program, provides benefits targeted to encourage commercial development in Manhattan above 96th Street, the Bronx, Brooklyn, Queens and Staten Island. *See id*. at 41.

166 *See* 2016 TAX EXPENDITURE, *supra* note 132, at 16.

167 *See, e.g., id.* (stating "[t]he program has been amended since its initial enactment in the early 1970's to expand benefits based on location and other qualifying conditions.").

168 *See* David Margolick, *Top State Court Rules Trump Entitled to Tax Break for Midtown Tower*, N.Y. TIMES (July 6, 1984), https://www.nytimes.com/1984/07/06/nyregion/top-state-court-rules-trump-is-entitled-to-tax-break-for-modtown-tower.html.

169 *See id.*; *The Latest Legislative Reform of the 421-a Tax Exemption: A Look at Possible Outcomes*, NYU FURMAN CENTER (NOV. 2015), http://furmancenter.org/files/NYUFurmanCenter_421aOutcomesReport_9Nov2015.pdf. *See also* Rosalyn Deutsche & Cara Gendel Ryan, *The Fine Art of Gentrification*, 31 MIT PRESS 91, 97 (1984) (noting that, in 1984, properties in Manhattan between 14th street and 96th street were ineligible for 421-a benefits).

170 *See* 2016 TAX EXPENDITURE, *supra* note 132, at 16 (noting that, prior to the passage of special legislation in 2013, properties that were built in certain areas of Manhattan were ineligible to receive 421-a benefits). *See also* Eric Stern & Mark Willis, *The Latest Reform Proposal for 421-A*, NYU FURMAN CENTER at 2 (Feb.

Another City housing program, popularly known as J-51,[171] also has a long history of tailoring tax benefits to target specific locations.[172] The J-51 program started in the 1950s to encourage the rehabilitation of multi-family housing and has offered tax exemptions and abatements[173] to select property owners who upgrade their buildings ever since.[174] However, as is the case with 421-a exemptions, J-51 benefits are not available everywhere in

2017) (noting that proposed reforms to the 421-a program set higher minimum wage requirements for the construction of buildings in Manhattan that are eligible for tax benefits than projects built in other areas of the City).

171 J-51 is an as-of-right tax exemption and abatement for residential rehabilitation or conversion to multi-family housing. The J-51 property tax exemption effectively freezes a building's assessed value for tax purposes, so the owner does not have to pay property tax on the increase in value resulting from the rehabilitation work. For example, in the case of a building worth $1 million before the work is done, and $2 million after the rehabilitation work, with a J-51 exemption the building owner pays taxes only on the initial $1 million assessed value, less any abatement. It is noteworthy, however, that J-51 abatements are much more common than exemptions, because in order for a building to receive an exemption, the rehabilitation work must have increased the assessed value of the property. Typically, only major upgrades will have an appreciable effect on property values. Thus, most rehabilitation work qualifies for J-51 abatements, but not exemptions. *See J-51 Property Tax Exemptions and Abatements* at 1, N.Y.C. INDEP. BUDGET OFF. (June 4, 2003), http://www.ibo.nyc.ny.us/iboreports/J51overview.pdf. The Department of Housing, Preservation and Development (HPD) administers the program and handles all applications for the program, while the Department of Finance applies the HPD approved benefits to real property assessed value and taxes.

172 *See* 2017 TAX EXPENDITURES, *supra* note 133, at 14. The legal basis for the program can be found in N.Y. Real Property Tax Law § 489 and the N.Y.C. Administrative Code § 11-243. Chapter 5 of Title 28 of the Rules of the City of New York also apply. When inconsistencies arise between the laws and rules, the laws govern. *See Tax Incentives: J-51*, N.Y.C. HOUSING PRESERVATION & DEV. (June 4, 2003), http://www1.nyc.gov/site/hpd/developers/tax-incentives-j51.page.

173 J-51 abatements are much more common than exemptions, because in order for a building to receive an exemption, the rehabilitation work must have increased the assessed value of the property. Typically, only major upgrades will have an appreciable effect on property values. Thus, most rehabilitation work qualifies for J-51 abatements, but not exemptions. *See supra* note 171.

174 The J-51 property tax exemption effectively freezes a building's assessed value for tax purposes, so the owner does not have to pay property tax on the increase in value resulting from the rehabilitation work. For example, in the case of a building worth $1 million before the work is done, and $2 million after the rehabilitation work, with a J-51 exemption the building owner pays taxes only on the initial $1 million assessed value, less any abatement. Notably, while property owners are enjoying the J-51 tax benefits, rental units are subject to rent regulation. *See Directory of New York City Affordable Housing Programs: J-15*, N.Y.U. FURMAN CTR., http://furmancenter.org/institute/directory/entry/j-51-tax-incentive (last visited May 24, 2018).

New York City. Instead, the program incorporates a "tax abatement exclusion zone," which covers most of Manhattan, where tax abatements are generally unavailable.[175] This exclusion zone has been in place since 1981.[176] Thus, for over three decades, both the 421-a and J-51 programs have varied their available tax incentives to target (or exclude) housing development in certain neighborhoods.

The City's extensive experience administering the 421-a and J-51 programs predicts a smooth transition towards a location-specific incentive in the green roof context as well. And yet, adopting a location-specific green roof tax incentive would require changing the law that authorized the program, which raises questions about the scope of New York City's taxation authority. In the Part below, we therefore review the scope of New York City's authority over its taxes and what would be required to enact a tax incentive for green roofs that targets specific locations.

IV. LEGAL PATHWAYS AND CONSTRAINTS

Like all local governments in New York State, New York City has very limited authority to make decisions about the size and shape of local taxes, including property taxes.[177] Under a doctrine known as "home rule," the New York State constitution authorizes local governments to initiate legislation on a range of matters of local concern.[178] The centerpiece of home rule is a grant to local

175 The benefits do not apply to properties within the exclusion zone except under very limited circumstances, such as projects carried out with substantial government assistance. *See* 28 RCNY 5-06. *See also* 5-19 STEINMAN'S BERGMAN & ROTH NEW YORK REAL PROPERTY FORMS ANNOTATED 631.3 (2017).

176 *See* Debra S. Vorsanger, *New York City's J-51 Program: Controversy and Revision*, 12 FORDHAM URB. L.J. 103, 115–16 (1983).

177 For caselaw demonstrating the narrow reading of local fiscal authority in New York, see, e.g., City of New York v. State of New York, 94 N.Y.2d 577, 591–92 (2000) (upholding a special law that repealed New York City's commuter tax); Albany Area Builders Ass'n v. Guilderland, 74 N.Y.2d 372, 378–79 (1989) (finding that the Transportation Impact Fee Law was preempted because the State laws already addressed both the amount of money a town could raise by taxation for highway purposes and the manner in which funds that are collected are to be expended); County Securities, Inc. v. Seacord, 278 N.Y. 34, 37 (1938) ("The power of taxation, being a State function, the delegation of any part of that power to a subdivision of the State must be made in express terms. It cannot be inferred.").

178 *See* Richard Briffault, *Local Government and the New York State Constitution*, 1 HOFSTRA L. & POL'Y SYMP. 79, 83 (1996).

governments to enact laws pertaining to their "property, affairs or government."[179] Each local government is also authorized to enact laws regarding certain enumerated subjects, such as the "use of its highways"[180] and "transaction of its business."[181] However, imposing taxes is not among the enumerated powers.[182] To the contrary, the State constitution makes it clear that the State can only delegate its taxation authority under a narrow set of circumstances[183] and the Court of Appeals has indicated that the constitution imposes similar restrictions on local governments' authority over tax expenditures.[184] Moreover, while the State has delegated some authority to local governments to adjust property taxes,[185] given that the State legislation authorizing the green roof tax abatement assigns a precise value for the abatement ($5.23 per square foot),[186] any City law assigning a different value would conflict with the relevant State law and would therefore be preempted.[187]

179 N.Y. CONST., art. IX, sec. 2(c). Notably, however, local legislation on these matters can still be preempted if it is "inconsistent with the State constitution or any general State law." *Id.*

180 N.Y. CONST., art. IX, sec. 2(c)(6). Local legislation on these enumerated subject matters is subject to the same restriction that it not be inconsistent with State law on the same subject.

181 N.Y. CONST., art. IX, sec. 2(c)(3).

182 *See* Briffault, *supra* note 178, at 83 (observing that issuing taxes is not among the home rule powers granted by the New York State Constitution). Note, however, that the Constitution does include, "[t]he *levy, collection and administration* of local taxes authorized by the legislature and of assessments for local improvements, consistent with laws enacted by the legislature" among the enumerated subjects about which local governments can legislate, but this authority is distinct from the power to adopt new taxes. N.Y. CONST., art. IX, sec. 2(c)(8) (emphasis added).

183 *See* N.Y. CONST., art. XVI, sec. 1. *See also* James D. Cole, *Constitutional Home Rule in New York*, 53 ST. JOHN'S L. REV. 713, 724 (1985).

184 *See* Baldwin Union Free Sch. Dist. v. County of Nassau, 22 N.Y.2d 606, 621–22 (2014).

185 *See* OFFICE OF REAL PROP. TAX SERVS., N.Y. STATE DEP'T OF TAXATION & FIN., HOW THE PROPERTY TAX WORKS (noting that a local property tax rate is calculated as follows: "First, the taxing jurisdiction (a school district, town, county, etc.) develops and adopts a budget. Revenue from all sources other than the property tax (state aid, sales tax revenue, user fees, etc.) is determined. These revenues are subtracted from the original budget and the remainder becomes the tax levy. It is the amount of the tax levy that is raised through the property tax.") Because local governments can control the size of their budget, they exert indirect control over the property tax rate.

186 *See supra* note 127.

187 Under the doctrine of "conflict preemption," New York Courts will strike down a local law where it creates a "head-on collision" with a relevant state law. *See, e.g.*, Matter of Lansdown Entertainment Corp. v. New York City Dept. of

A number of scholars have argued that the City should have greater control over its tax policy. The central charge these scholars make is that the ability to raise revenue is crucial to being able to pursue local policy objectives, which is the overarching purpose behind the concept of home rule.[188] For this reason, Clayton Gillette has bluntly remarked that, "the very notion of restricting revenue raising by home rule municipalities seems oxymoronic."[189] Moreover, the preference for state authority over fiscal matters appears to reflect historical concerns about municipal governments' financial misconduct that seem anachronistic today.[190]

Consumer Affairs, 74 N.Y.2d 764 (1989) (holding that a City law that required licensed cabarets to close between the hours of 4:00 am and 8:00 am created a "head-on collision" with a State law which allowed patrons to remain on the premises of such businesses until 4:30 am and was therefore preempted.).

188 *See, e.g.*, Clayton P. Gillette, *Fiscal Home Rule*, 86 DENV. U.L. REV. 1241. Gillette's arguments in favor of expanded fiscal autonomy build off Charles Tiebout's theory on market residence. Essentially, Tiebout's theory is that people and firms move to areas that reflect their bundle of preferences, which includes the combination of provided goods and services at a certain tax rate. *See id.* In theory, cities should be able to tailor taxes and spending to meet the unique values and preferences of their residents in a way that states, which contain numerous communities with a range of preferences, cannot. *Id.* at 1242–43. But, in practice, they can only do so if they can raise adequate funds to supply the desired goods and services, and can choose how to allocate the necessary tax burden consistent with local preferences. For this reason, the idea of home rule is illusory without a measure of fiscal autonomy. For an example of other theorists advocating for expanded fiscal autonomy, see also Erin Adele Scharff, *Taxes as Regulatory Tools: An Argument for Expanding New York City's Taxing Authority*, 86 N.Y.U L. REV. 1556, 1556 (2011) (arguing that curtailing cities' authority over taxes can force local governments to pursue their policy objectives through inefficient means) and GERALD E FRUG & DAVID J. BARRON, CITY BOUND 4 (2008) (arguing that, "[t]he rules that limit local fiscal authority [. . .] influence, or even distort, city land use planning" because the city is forced to match the type of economic development initiatives it pursues to the type of revenue stream the state has permitted it to tap).

189 Gillette, *supra* note 188, at 1242.

190 Concerns about municipal corruption rose to a fore in New York towards the end of the nineteenth century when the City's Tammany Hall was run by the infamous William Tweed and financial malfeasance was rampant. *See, e.g.*, Briffault, *supra* note 178, 91–92 (noting that, in an attempt to constrain the rampant corruption and fiscal instability that plagued New York City during that time period, in 1874, the State legislature amended the constitution to restrict cities' ability to raise taxes and take on new debts.). Today, however, it is far from obvious that fiscal misconduct is any more prevalent at the local than state level in New York. *See, e.g.*, Jesse McKinley, *More Corruption Trials? Possible Reprise Makes Albany Groan*, N.Y. TIMES (Oct. 4, 2017), https://www.nytimes.com/2017/10/04/nyregion/corruption-trials-albany-silver-skelos.html.
Yet, the principle enshrined in the constitution in the late nineteenth century—that the State must exercise control over local fiscal affairs—remains intact. *See*

Irrespective of the merits of these criticisms, it is clear that under the existing legal framework New York City could not legally implement a differentiated tax abatement scheme for green roofs on its own.[191] Instead, the City would need to convince lawmakers in the State capital to amend the existing legislation to this effect.[192] It would not be unprecedented for the City to request the required flexibility. Indeed, the City sought similar authority to make the J-51 and 421-a programs more granular and, in both instances, the State responded by granting a City agency the authority to define key program terms as they saw fit.[193] The City should request similar authority when seeking an updated green roof tax abatement, with legislation granting either the Mayor's Office of Sustainability or the NYC DEP the authority to define priority areas and set rates. This flexibility will be particularly important as the City may need to adjust the value of the abatement, as well as the size of the targeted area, as it observes the market response to the increased rate. Thus, the first iteration of the reformed program could be viewed as a pilot study, allowing the City to gather information about the level of incentive required to spur a significant number of

Briffault, *supra* note 178, at 92–93 (1996). Moreover, New York State is far from alone in restraining local governments' fiscal autonomy. In fact, a comprehensive study of home rule in 50 states concluded that only 12 states give their local governments fiscal home rule. *See* DALE KRANE ET AL., HOME RULE IN AMERICA: A FIFTY-STATE HANDBOOK 476, tbl. A1 (2001).

191 Notably, the State could have chosen to design the green roof abatement in a manner that would have enabled the City to make adjustments without State authorization. For instance, the State has authorized NYC to alter property tax rates without seeking State approval. *See* Scharff, *supra* note 188, at 1575. Unfortunately, however, the legislation establishing the green roof abatement does not include this type of flexibility.

192 The City could issue a formal "home rule message" to request that the State make implement this change. *See* RICHARD BRIFFAULT & LAURIE REYNOLDS, STATE AND LOCAL GOVERNMENT LAW 410–14 (2016) (describing special legislation and home rule messages). However, because home rule does not apply to local finances, the City, or other interested parties, could also lobby the State to take action without submitting a formal home rule message.

193 *See* NY CLS RPTL § 489 (The New York City Department of Housing Preservation and Development is authorized to "exempt from taxation for local purposes" class A multiple dwellings undergoing "moderate rehabilitation" as defined by "local law or rules and regulation" in the J-51 program); NY CLS RPTL § 421-a ("Except as otherwise specified in this section, a city to which this section is applicable may enact a local law to restrict, limit or condition the eligibility, scope or amount of the benefits under this section in any manner provided that such local law may not grant benefits beyond those provided in this section and provided further that in the city of New York such local law shall not take effect sooner than one year after it is enacted.").

property owners to install green roofs; the more concentrated the priority areas selected, the higher the incentive price can be without exceeding the total funds allocated to the program. Under our proposed approach to the legislation, the City would be able to continue to fine-tune the incentive to maximize its utilization.

The State, unfortunately, has not always looked favorably upon New York City's requests to adjust tax revenues. For instance, the State famously rejected Mayor Bloomberg's efforts to establish a congestion pricing scheme and thwarted Mayor de Blasio's attempts to reform City income tax levels.[194] Yet, both of these proposals would have authorized the City to raise substantial new revenue.[195] By contrast, our proposal to move towards a differentiated green roof abatement concerns an almost trivial percentage of the City's annual tax expenditures.[196] It may therefore prove relatively uncontroversial. This would be particularly so if the City does not simultaneously request an increase in the total amount of money allocated to the program; so long as the total funding allocated to the program remains unchanged, such that there is no additional concern about fiscal irresponsibility, why should the State care how the funds are distributed?

Of course, to achieve transformational change the City will ultimately need to secure additional funding for the program so that it can incentivize a larger number of property owners to install green roofs. However, in light of the State's prior resistance to allocating

194 *See* Erin Adele Scharff, *Powerful Cities?: Limits on Municipal Taxing Authority and What to do About Them*, 91 N.Y.U. L. REV. 292, at 297 (2016).

195 Under the congestion pricing plan, drivers would have been charged eight dollars to enter selected areas of Manhattan during peak hours. The plan would have raised 500 million dollars towards mass transit improvements and allowed the City to qualify for an addition 354 million dollars in federal grants for mass transit aid. *See* Nicholas Confessore, *Congestion Pricing Plan Dies in Albany*, N.Y. TIMES (Apr. 7, 2008) https://cityroom.blogs.nytimes.com/2008/04/07/congestion-pricing-plan-is-dead-assembly-speaker-says/. Mayor Bill de Blasio's plan to income the top income tax rate to 4.41 percent for five years would have raised 530 million dollars per year. Joseph Bishop-Henchman, *New York City Mayor Unveils Proposed Increase in Top Income Tax Rate*, TAX FOUND. (Feb. 19, 2014), https://taxfoundation.org/new-york-city-mayor-unveils-proposed-increase-top-income-tax-rate/.

196 In fiscal year 2017, the City spent $6 billion in property tax expenditures to advance a range of public policy goals ranging from rent relief for senior citizens to the promotion of renewable energy to urban redevelopment. *See* 2017 TAX EXPENDITURES, *supra* note 133, at i. The $1 million currently devoted to the green roof tax abatement therefore represents less than 0.02 percent of total annual tax expenditures and is of little consequence.

significant funding to this program, it may be prudent to focus first on securing State support for a differentiated incentive scheme that encourages full utilization of the funds available, and then move to increase the spending cap later.

CONCLUSION

Although New York City's green roof tax abatement has been on the books for nearly a decade, fewer than ten property owners have taken advantage of it. Sadly, policymakers do not seem to be paying attention to this failure. Some environmental advocates have begun to focus on how to reform the green infrastructure grant program,[197] but few have expressed an interest in fixing the beleaguered tax incentive. This is a significant oversight. While the grant program is important, it is an expensive way for the City to finance development and seems to appeal primarily to non-profit property owners. Thus, to effectively leverage private capital and engage diverse constituencies in developing green roofs both the grant program *and* the abatement will need to be improved.

As the City contemplates how to improve the abatement program, it should seriously consider transitioning towards a location-specific incentive scheme. The City and State have long recognized that certain goods—from new housing to distributed solar energy—provide different values in different locations, and have varied the size of the tax incentives offered accordingly. It is time to apply this same wisdom to the promotion of green roofs.

197 *See, e.g.*, NRDC & NYU STERN, *supra* note 41.