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Putting Green Infrastructure on Private Property in New York City

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By Justin Gundlach

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New York City, like other cities that built combined sewer systems in the early twentieth century, is embarking on the reconfiguration of its approach to stormwater management—one that shifts away from exclusive reliance on "grey infrastructure" (asphalt, pipes, tunnels, sea walls) to greater reliance on "green infrastructure" (green roofs, bioswales, rain gardens, permeable pavements, coastal wetlands). That reconfiguration will entail physical changes as well as changes to the regulation and financing of stormwater management. And, underlying these physical, regulatory, and financial changes is New Yorkers' role in managing and paying for stormwater runoff—that too must change to make stormwater management greener.

Why change from grey to green? The most immediate reason is that existing grey infrastructure is failing to manage stormwater in several important respects, chiefly in relation to maintenance of regional surface water quality, adaptation to a changing climate, and allocation of cost burdens pursuant to the "polluter pays" and "beneficiary pays" principles. There are other reasons as well. As has been noted by the U.S. Environmental Protection Agency (EPA), by New York State's Department of Environmental Conservation (DEC), by New York City's Department of Environmental Protection (DEP), and by a long list of commentators and authors, GI is the source of multiple benefits—both direct and ancillary.[1]

This paper proceeds in four sections. The first provides an overview of the problems confronting New York City as a result of existing stormwater management infrastructure and regulation, and also summarizes the City's current green infrastructure (GI) goals. The second section summarizes the benefits and costs that are expected to accompany GI in the New York City context. The third describes the City's goals for creating GI on public and private property, as well as the timeframes

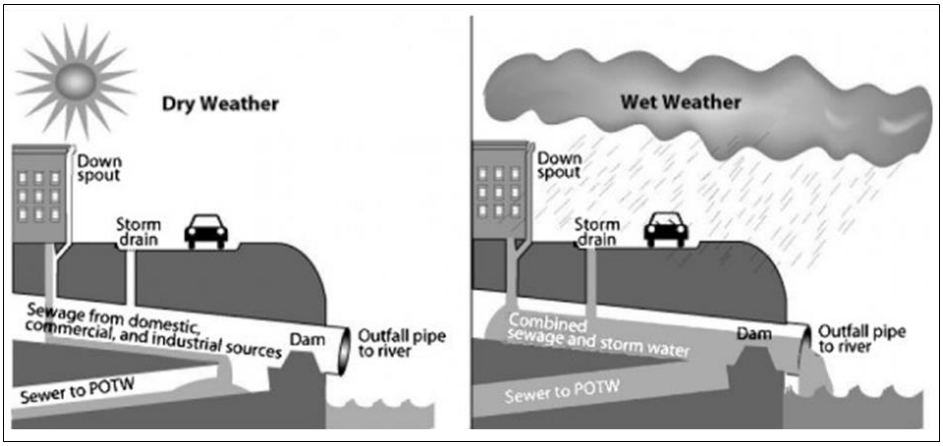
[1] EPA, Making the Case: the Benefits of Green Infrastructure (last updated Apr. 8, 2016), https://perma.cc/752L-4MBQ; City of New York, One New York The Plan for a Strong and Just City 204–05 (describing resiliency attributes of green infrastructure plans), https://perma.cc/BBP2-3V78; *see also* Mandy DeRoche, *A Stormwater Fee, with Strong and Equitable Credits for Green Infrastructure, Could Benefit New York City as a Whole and Environmental Justice Communities Such as the South Bronx*, 25 Envtl. L. in N.Y. 1, 5–6 (Jan. 2014)

currently envisioned for the task. It also notes the particular importance—and difficulty—of scaling up GI installations on private property. Finally, the fourth section examines the knotty administrative and legal issues involved in using public money to increase the volume of GI on private property.

1. STORMWATER MANAGEMENT PROBLEMS CONFRONTING NEW YORK CITY

As with other cities that designed and installed stormwater management and sewer systems circa 1900, New York is home to a combined sewer system. "Combined" refers to the fact that stormwater and wastewater flow through many of the same pipes before being treated and/or discharged into adjacent bodies of water. On sunny days, when stormwater is not running through the system, the city's 14 wastewater treatment plants (WWTPs) can capture and treat all of the city's wastewater. During precipitation events, however, the additional volume of water in the system overwhelms its capacity, and a portion of the storm- and wastewater goes untreated, flowing through at least some of the city's more than 420 combined sewer overflows. This happens regularly.[2] (See Figure 1.)

Figure 1. Combined Sewer Systems and Overflows.[3]



[2] Riverkeeper, Combined Sewage Overflows (CSOs), https://perma.cc/ZCW3-XPCH (accessed Apr. 11, 2017).

[3] EPA, CADDIS Volume 2: Sources, Stressors & Responses: What is a CSO?, https://perma.cc/WV9X-J6CB (last updated Feb. 22, 2016).

Recognizing the prohibitive scale of comprehensive system redesign in cities like New York, but also the crucial importance of managing urban runoff and wastewater management for water quality, EPA has done two things. First, it has tightened regulatory requirements for municipalities.[4] And second, it has increasingly emphasized the usefulness of green infrastructure (GI, sometimes also called low impact development or LID) to achieving compliance with those requirements.[5] Part 2 of this paper describes how GI serves this purpose.

Surface water quality in the New York City region has improved a great deal since the 1970s, but remains impaired.[6] Stormwater and wastewater are chief among the sources of pollution responsible for those impairments,[7] whose redress will be made harder by the rising sea levels and increases in intensity and frequency of regional precipitation resulting from climate change.[8]

DEC is the agency responsible for administering the federal and state laws that govern water quality in the state of New York, namely article 17 of the Environmental Conservation Law, N.Y. Envtl. Conserv. 17-0101 to 17-2105, and the federal Clean

[4] EPA, National Pollutant Discharge Elimination System Regulations for Revision of the Water Pollution Control Program Addressing Storm Water Discharges, 64 Fed. Reg. 68722 (Dec. 8, 1999).

[5] *See* EPA, Making the Case, *supra* note 1; EPA, Green Infrastructure, https://perma.cc/U7KF-HZTY (accessed Apr. 7, 2017); EPA, Reducing Stormwater Costs through Low Impact Development (LID) Strategies and Practices, EPA-841-F-07-006 (2007); Memorandum from Linda Bornazian, Director of Water Permits Division and Mark Pollins, Director of Water Enforcement Division to Water Division Directors, Regions 1-10, Regional Council/Enforcement Coordinators, Regions 1-10, and State NPDES Directors, re Use of Green Infrastructure in NPDES Permits and Enforcement (Aug. 16, 2007).

[6] NYC DEP, The State of the Harbor 2012, at 28–37 (2012), https://perma.cc/UUH3-GE5S.

[7] New York State Deparment of Environmental Conservation, *Urban Stormwater Runoff*, https://perma.cc/2YC6-4EEA (accessed Apr. 7, 2017); Charles R. O'Melia et al., National Academies of Sciences, Watershed Management for Potable Water Supply: Assessing the New York City Strategy 177–88 (2000).

[8] *See* Radley Horton et al., *Climate Observations and Projections*, *in* New York City Panel on Climate Change 2015 Report, 1336 Ann. N.Y. Acad. Sci. 18, 23–26 (Jan. 2015) (discussing temperature and precipitation); Radley Horton et al., *Sea Level Rise and Coastal Storms*, *in* New York City Panel on Climate Change 2015 Report, 1336 Ann. N.Y. Acad. Sci. 36, 42 (Jan. 2015).

Water Act, 33 U.S.C. §§ 1251–1376. Thus DEC has jurisdiction over pollution control throughout the state, including in relation to the storm- and wastewater generated by New York City. Within New York City's geography, DEC delegates front-line responsibility to DEP for managing compliance with permits issued pursuant to state and federal law. In those parts of the city where sewer and stormwater systems are separate, DEP's obligations are specified in a Municipal Separate Storm Sewer System (MS4) permit;[9] in the city's 10 CSS areas they are specified in long term control plans (LTCPs).[10] A Consent Order executed by DEC and DEP in 2005 codified particular obligations for DEP in the city's 10 CSS segments.[11] Those obligations include targets and deadlines for pollution reduction, spending, and—after a 2012 modification[12]—percentages of impervious surface to be covered with GI.

In keeping with the Consent Order's instructions, DEP has spent about $285 million on GI, working with the Parks and Transportation departments and others to identify opportunities to install GI in public rights of way, in place of storm drains, and on or near publicly-owned buildings.[13] DEP also launched a GI grant program in 2011 to support private property owners' efforts to install green and blue roofs, rain gardens, and other stormwater-retaining features.[14] The most recent available estimate indicates that the city has installed 4,470 GI assets, which replace about 0.6 percent of

[9] New York State Department of Environmental Conservation, State Pollution Discharge Elimination System (SPDES) Discharge Permit (Aug. 1, 2015), https://perma.cc/6JP6-QG5M.

[10] A link to each LTCP is available at NYC DEP, Reducing Combined Sewer Overflows in NYC – DEP's Long Term Control Plan, https://perma.cc/99AJ-RQQ6 (accessed Apr. 7, 2017).

[11] Order on Consent, In the Matter of Violations of Art. 17 of the ECL and 6 NYRCC pt. 750 et seq, DEC Case No. CO2-20110512-25 (2005).

[12] Order on Consent (CSO Order Modification to CO2-20000107), In the Matter of Violations of Art. 17 of the ECL and 6 NYRCC pt. 750 et seq, DEC Case No. CO2-20110512-25 (Oct. 7, 2012) ['hereinafter "2012 Consent Order"].

[13] Letter from Heather E. Donnelly, Assistant Counsel, DEP, to Mary vonWergers, DEC, regarding Green Infrastructure Contingency Plan 1 (June 27, 2016), https://perma.cc/7FHH-YPQP (explaining that DEP has met the required expenditure of at least $187 million on GI by "encumbering" or allocating $259 million in capital funds and $26 million in expense funds).

[14] *See* NYC DEP, Grant Program for Private Property Owners, https://perma.cc/S29V-9GWG (accessed Apr. 7, 2017) (listing grantees from previous years, starting with 2011).

the impervious surfaces in those parts of NYC served by combined sewer outflows.[15] This amount falls short of the 1.5 percent goal for 2016, and means that the city must make up ground if it is going to achieve subsequent Consent Order targets: 4 percent by the end of 2020, 7 percent by the end of 2025, and 10 percent (or about 8,000 acres) by the end of 2030.[16]

2. BENEFITS AND COSTS OF GI

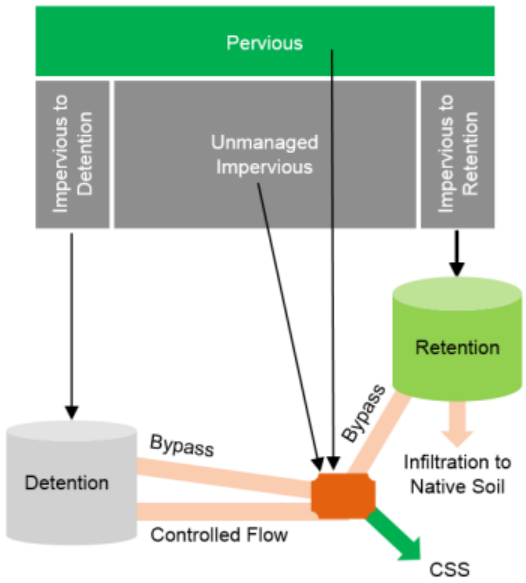
Historically, stormwater management has involved constructing artificial pathways—downspouts, channels, drains, tunnels, and outfalls—through which precipitation can escape from impervious surfaces to adjacent water bodies. Generally, these systems are simply a series of static conveyances, but some use pumps to displace water faster than is possible using a gravity-driven system.[17] Integrating GI into stormwater management systems reduces runoff and thereby reduces some of the need for artificial pathways. It does so by detaining stormwater, either for use as irrigation or graywater or to allow the water to naturally infiltrate back into the ground, or simply by allowing only for a slower incremental release into the storm/sewer system in the days following a storm.

[15] DEP, Green Infrastructure Contingency Plan 4 (June 27, 2016), https://perma.cc/7LY9-AVCA; Letter from Heather E. Donnelly, Assistant Counsel, DEP, to Mary vonWergers, DEC, regarding Green Infrastructure Contingency Plan 2 (June 27, 2016), https://perma.cc/QV3F-HMY9.

[16] 2012 Consent Order at 9–11.

[17] *See, e.g.*, Bruce J. Clark, *The Battle for Miami Beach*, Pub. Works Mag., Aug. 25, 2016, https://perma.cc/CZ8Z-RPYS (describing how modified system, which now includes motor-driven pumps, "isn't moving more water than the old system; it's designed to move the same amount of water more quickly").

Figure 2. Stormwater pathways.[18]



What is GI exactly? As described in the DEC-DEP 2012 Consent Order, it includes: extensive green roofs (shallow growth medium, lighter-weight plants), intensive green roofs (deeper medium, heavier plants and small trees), street trees and tree boxes, blue roofs (which capture and detain stormwater for use or slow subsequent release), permeable pavement, rain barrels and cisterns, rain gardens, pocket wetlands, infiltration planters, and bioswales.[19] In short, GI is any installation that detains or wholly retains stormwater where there would otherwise be impervious surface. Or, as Holloway et al. have put it: "a network of approaches and technologies that mimic, maintain, or restore natural hydrological features in the urban landscape."[20]

[18] NYC DEP, Green Infrastructure Performance Metrics Report 4-2 (June 2016) [hereinafter GI Performance Metrics], https://perma.cc/7N28-ZE3T. Previous versions of this report were titled "GI Annual Report".

[19] 2012 Consent Order at 3, para. 14.

[20] Caswell F. Holloway et al., *Solving the CSO Conundrum: Green Infrastructure and the Unfulfilled Promise of Federal-Municipal Cooperation*, 38 Harv. Envtl. L. Rev. 335, 360 (2014).

By preventing runoff from carrying sediment and various other pollutants from streets to water bodies, GI improves water quality.[21] As noted above, it also improves water quality by preventing precipitation from overwhelming wastewater management systems. In addition, plants that grow in cities—whether on rooftops, in parks, or in the "canyons" between rows of tall buildings—can improve some dimensions of air quality.[22] GI reduces urban temperatures through a combination of shading, increasing albedo, and evapotranspiration (though it is very difficult to say exactly how much cooling results from the presence of an additional unit of GI).[23] In temperate climates, green roofs and walls' insulating properties reduce demand for indoor cooling on cooling-degree days, and with it energy consumption and the emission of pollutants from local or proximate electricity generating units.[24] Those insulating properties also reduce energy demand on heating-degree days.[25] Vegetated

[21] *E.g.*, Catherine M. Barr et al., *Water Quality Impacts of Green Roofs Compared with Other Vegetated Sites*, J. Sustainable Water in the Built Env't 3(3) (2017), https://perma.cc/D2M8-VPRS; M.A. Benedict & E.T. McMahon, Green Infrastructure: Smart Conservation for the 21st Century (2001).

[22] The effects of GI on air quality vary widely depending on the type of GI. Whereas parks generally have salutary effects, individual green roofs or tree pits generally have little or no measurable effect. Furthermore, while some studies have identified reductions in airborne particulates in the presence of GI, it is unclear whether those reductions are temporary. In addition, GI's effects on other forms of air pollution are mixed—indeed, plants sometimes produce natural volatile organic compounds (VOCs) that are precursors of ozone. *See* Matthew J. Tallis et al., *The Impacts of Green Infrastructure on Air Quality and Temperature*, *in* Handbook on Green Infrastructure: Planning, Design and Implementation 32–38 (Danielle Sinnett et al., eds. 2015) (reviewing relevant literature and describing mechanisms and effects of GI on air quality); *see also* David J. Nowak & Gordon M. Heisler, Air Quality Effects of Urban Trees and Parks (Nat'l Recreation & Park Ass'n 2010).

[23] The mechanisms by which this occurs are not fully understood, which makes it difficult to model or estimate the relationship between GI and mitigation of the urban heat island effect. *See, e.g.*, L. Zhao et al., *Strong contributions of local background climate to urban heat islands*, 511 Nature 216 (2014) (finding, contrary to assumptions stated in earlier studies, that convection patterms rather than rates of evaoptranspiration better account for heat effects observed across different cities).

[24] Benedetta Barozzi et al., *The Energy Impact in Buildings of Vegetative Solutions for Extensive Green Roofs in Temperate Climates*, 6 Buildings 33 (2016); Omidreza Saadatian et al., A review of energy aspects of green roofs, 23 Renewable & Sustainable Energy Revs. 155 (2013) (describing mechanisms through which green roofs reduce energy demand).

[25] Barozzi et al., *supra* note 24, at 49–50.

GI, of course, provides additional urban habitat. Finally, in addition to these concrete and quantifiable benefits, there are others whose precise causal mechanisms are not well understood; these include various measures of quality of life, including longer life spans, lower crime rates, and reduced stress levels.[26] Importantly, though GI can be said to yield these various benefits, some have proven difficult to characterize with precision.[27]

As for costs, the installation and upkeep of GI entails a combination of structural engineering, landscape design, and gardening—tasks and roles that depart from what city departments, property owners, and residents must do to maintain grey rather than green stormwater management system components. Consider, for instance that individuals can easily impair the function of a bioswale by trampling its plants, littering in it, or letting dogs urinate on the soil and thereby changing its acidity and nutrient composition. Similarly, if the city relies on some number of residents to maintain the plants and soil of their green roofs and rain gardens, both parties—the city and the residents—must agree about who is responsible for bearing the costs involved.

Even before deciding how to allocate these costs just characterizing them for accounting purposes presents a challenge for city governments, including that of New York: Is the installation of GI a capital cost? Is its maintenance a recurring expense? This paper will return to these questions below.

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[26] NYC DEP monitors these GI outcomes. GI Performance Metrics, *supra* note 18, at 6-1; *see also* Christopher Coutts & Micah Hahn, *Green Infrastructure, Ecosystem Services, and Human Health*, 12 Int'l J. Envtl. Resources & Pub. Health. 9768 (Aug. 2015); Yafei Wang et al., *Effect of ecosystem services provided by urban green infrastructure on indoor environment: A literature review*, 77 Building & Env't 88 (July 2014); *see also* L. Lottrup et al., *Workplace greenery and perceived level of stress: Benefits of access to a green outdoor environment at the workplace*, 110 Landscape & Urban Planning 5 (2013).

[27] Several constituent centers in Columbia University's Earth Institute, including the Urban Design Lab, have been conducting research into the functions performed by various forms of GI under different conditions. This research attends, among other things, to questions of which benefits can be demonstrated robustly and what factors inform GI delivering or failing to deliver those benefits. *See* Earth Institute: Urban Design Law, Developing High Performance Green Infrastructure Systems, https://perma.cc/8UDU-Z3KN (accessed Apr. 9, 2017).

3. DEP'S STORMWATER REDUCTION GOALS REQUIRE USE OF PRIVATE PROPERTY—A DIFFICULT AND COMPLEX ENDEAVOR

Installing GI solely on public property, including rights of way, parkland, or buildings and their grounds, cannot accomplish DEP's goals, even if those installations are widespread and substantial.[28] Reaching those goals will necessarily involve putting GI on large amounts of private property as well—DEP anticipates that private property will eventually underlie about one-half of the city's GI.[29] However, whereas installing GI for an indefinite duration on public property is simply a matter of changing policy and reallocating public funds, to do so on private property a city must undertake the more difficult tasks of aligning public and private objectives with respect to assets located on private property, and creating mechanism to redirect public money to private actors for the installation and maintenance of those assets.

This part explores what DEP must do to accomplish those tasks. But it first discusses past efforts to promote GI on private property in New York and elsewhere. Drawing from that discussion, it highlights key policy gaps that make New York City's task relatively more difficult than that of other cities. Having provided that backdrop, it then explores how DEP could navigate the gaps and obstacles that stand between the current state of affairs and one in which prolific GI covers a significant portion of private properties in the city.

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[28] The targets for each CSO area are as follows: Alley Creek and Little Neck Bay LTCP at ES-6 (Sept. 2014) (3% of impervious surfaces by 2030); Westchester Creek LTCP, at 5-10 (Sept. 2014) (3.5% of privately owned impervious surfaces by 2030); Hutchinson River LTCP, at 5-10 (Sept. 2014) (3.0% of privately owned impervious surfaces by 2030); Flushing Creek LTCP, at 5-10 (Dec. 2014) (8% of all impervious surfaces in Flushing Creek/Bay portion of Tallman Island CSO and 13% in Bower Bay WWTP CSS); Gowanus Canal LTCP, at 5-10 (June 2015) (12% of all impervious surfaces); Bronx River LTCP, at 5-10 (June 2015) (14% of all impervious surfaces); Flushing Bay LTCP (expected summer 2016).

[29] *See* NYC Green Infrastructure Plan: A Sustainable Strategy for Clean Waterways 139 (2010), https://perma.cc/FQ3G-84W2 (anticipating percentages of GI coverage on rights of way, and public and private "on-site" locations).

3.1 DEP policy efforts and outcomes to date

Like agencies in other cities, New York's DEP has tried several approaches to encourage the installation of GI on private property. In 2009, the city announced a tax abatement of $4.50 per square foot for the year after installation of a green roof and has since extended that abatement's availability to installations undertaken as late as 2018.[30] In 2011, the city also launched a parking lot pilot program and a grant program. As of June 2017, these programs have motivated relatively few private property owners to install GI.

DEP's GreenHub, a database that tracks GI assets in NYC, lists just 25 green roofs, 15 of which are private assets, and only 5 of which made use of the Green Roof Tax Abatement Program.[31]

The parking lot pilot program was based on the premise that the owners of parking lots, which generate a large amount of polluted stormwater runoff, ought to contribute to the costs of managing that runoff. Prior to the pilot, parking lot owners contributed nothing because stormwater system fees for private property owners are based on the rates charged for *consumption* of city-provided water. DEP's pilot program imposed a fee on parking lots above a threshold size and invited owners to avoid that fee by installing GI to control some or all of their runoff. Perhaps the fee was too low or the costs of GI installation were perceived to be too high. Whatever their reason, no lot owners have participated in the program by installing GI; instead, all have simply paid the fee.

The city's existing Green Infrastructure Grant program, which is aimed at private property owners more generally, has been only somewhat more successful. Between its launch in 2011 and the issuance of its Annual Report in 2016, the program

[30] 1 RCNY § 105-01; *see also* NYC Buildings, NYC Green Roof Property Tax Abatement Program (Jan. 2010), http://on.nyc.gov/2gvFQP7 (abatement is available for the first year of the green roof's existence and its value is capped at $100,000 per property).

[31] GI Performance Metrics, *supra* note 18, at 3-2.

had made grants to only 31 private property owners for 33 projects.[32] Furthermore, the majority of the approved projects are *blue* roofs and detention/retention cisterns, meaning that they capture stormwater through engineered means that yield only some—or none—of the co-benefits of GI described above. A further indication that the grant program has missed its mark is that private property owners in the city have indeed been installing GI, without participating or applying for any subsidy from the grant program.[33]

The upshot of these past programmatic efforts is simple: DEP cannot rely on them to accomplish its 2030 goal of 10% GI penetration.

3.2 Policies used elsewhere

New York City is not alone in needing to reconcile water quality goals with the impossibility of un-combining its combined sewer system. Philadelphia and Washington, DC, among others, face a similar task.[34] Still other cities in the U.S. and abroad, even where there is no need to resolve the water quantity and quality issues arising from combined sewers, have established GI-promoting policies in pursuit of GI's various benefits.[35] This section describes two categories of GI-promoting policies; its list is not exhaustive, but covers those of greatest interest for NYC policymakers.[36]

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[32] NYC GI Grant Program Annual Report 9–10 (2016), https://perma.cc/UMR7-GY8U; DEP, Request for Information (RFI): Management of a Green Infrastructure Incentive Program 2 (Sept. 19, 2016), https://perma.cc/GYU8-4SS4.

[33] *See* GI Performance Metrics, *supra* note 18, at 3-3 (reporting general awareness but no detailed census of "many additional GI assets that have been funded and constructed by various entities since 2010").

[34] *See* Caren Chesler, *How Philadelphia Will Solve the Sewage Nightmare Under Its Feet*, Popular Mechanics, Dec 3, 2015, https://perma.cc/C8CU-A7NY; Brian Clark Howard, *Inside D.C.'s Massive Tunnel Project*, National Geographic, July 5, 2014, https://perma.cc/P2RD-VUDU.

[35] *See, e.g.*, Thomas Brudermanna & Tachaya Sangkakool, *Green roofs in temperate climate cities in Europe – An analysis of key decision factors*, 21 Urban Forestry & Urban Greening 224 (Jan. 2017); Hesham Choudhery et al., Greening Washington D.C through Green Roofs: Recommended Policies & Incentives for DDOE (2015), https://perma.cc/3TCR-B5SV (summarizing policies used in 8 U.S. cities); Chi-Feng Chen, *Performance evaluation and development strategies for green roofs in Taiwan: A review*, 52 Ecol. Eng. 51, 53 (2013).

[36] It excludes, for instance, the sort of mandates adopted in Tokyo in 2001 and in Copenhagen and Toronto in 2010. *See* Toronto Mun. Code ch. 392, https://perma.cc/L8GZ-VCR4; Green

One is direct and indirect financial supports, which include grant funding, tax abatements, expedited permitting, and exceptions to height and density limits for buildings that install GI. The other is performance standards, which can encourage GI installation as a means of meeting requirements for stormwater management, energy use, and surface albedo (reflectiveness). Though the following descriptions list policy elements individually, it is important to recognize that successful programmatic efforts generally apply combinations of multiple policies. Another important point to keep in mind is that policy outcomes are a function not only of policy design but also of how well those policies were implemented.

3.2.1 Direct and indirect financial support

The policies summarized below use positive incentives or inducements to align public and private interests in GI.[37] In addition to describing how each policy is meant to work, these summaries also note their weaknesses.

Tax abatements. Cities use tax abatements to encourage a host of investments and behavior changes—developing additional affordable housing units, generating electricity using rooftop solar, and new commercial construction to name a few.[38] As mentioned above, NYC offers a partial, one-year tax abatement for the installation of a green roof. Tax abatements do not provide *additional* money to an entity considering GI, but invites developers and building owners to direct some of their taxes towards

Roofs Copenhagen (2010), https://perma.cc/L9CP-382K; Takehiko Mikami, *Tokyo: Cooling Rooftop Gardens*, *in* Green Roofs: Ecological Design and Construction 113, 114 (Earth Pledge ed., 2005). For a more comprehensive description of policies used to promote GI, see Kathleen O'Brien et al., *Legal Hurdles Faced by Deep Green Buildings: Case Studies and Recommendations*, 3 Wash. J. Envtl. L. & Pol'y 125 (Nov. 2013), and Catherine Malina, *Up on the Roof: Implementing Local Government Policies to Promote and Achieve the Environmental, Social, and Economic Benefits of Green Roof Technology*, 23 Geo. Int'l Envtl. L. Rev. 437 (2010-2011).

[37] For a longer list of funding sources and financing options, see Seth Brown et al., Funding Sources, Financing Options and Program Frameworks that Facilitate Implementation of Green Stormwater Infrastructure, The Green Infrastructure Leadership Exchange (Jan. 2017), https://perma.cc/2QQG-JYZ7.

[38] *See* NYC Dep't of Finance, Property Related Benefits, http://on.nyc.gov/2nd8fbG (accessed Mar. 28, 2017).

green roof installation on their own building. Notably, the one-year limit on NYC's tax abatement means that it provides no support for maintenance costs.

Grant funding. By requiring private actors to seek funding via public grants, to which conditions attach, a city can ensure that grant recipients adhere to the city's goals for the funding. However, as DEP's experience shows, simply making grants available is not enough. Grant programs work far better when they impose low search costs (e.g., by providing a list of approved contractors), low transaction costs (e.g., by facilitating any sort of changes to the property's deed), align tasks with the least cost avoider (e.g., by dividing grant application and reporting components between a contractor familiar with the process and a building or home owner who will only experience it once), and provide enough money to garner substantial participation.

Stormwater fees. Nearly 1,600 U.S. localities require residents and businesses to pay a fee based on an approximate measure of the stormwater they generate. Such fees support the capital spending and maintenance required for upkeep of the stormwater management system.[39] They are generally calculated to be roughly proportionate to the impervious surface area on a given property. In many jurisdictions, property owners can avoid paying some or all of the local stormwater fee by reducing the impervious surface area on their property[40]—for instance, by installing a green roof or rain garden. When they are calculated and applied well, stormwater fees embody the principle that polluters should pay in proportion to the costs they impose on the system devised to deal with their pollution. Because stormwater fees generate a revenue stream, they are also a potential source of funding for GI, whether installed on public property or on private property with public sponsorship. Two additional points to note about stormwater fees are legal in nature.

[39] C. Warren Campbell et al., Western Kentucky University Stormwater Utility Survey 2016 (June 2016), https://perma.cc/3R23-5RCN.

[40] Minneapolis allows property owners to reduce their fee to zero if they eliminate the impervious surfaces on their property; other cities limit the potential reduction to 30 or 50% of standard fee calculation. *See* Choudhery et al., *supra* note 35, at 1 ("financial incentives . . . are the driving force in spurring green roof development").

First, their opponents often seek to characterize them as a tax that applies generally instead of a fee, charged only to users who receive a service. And second, the next most common stumbling block for localities seeking to impose a stormwater fee is a lack of authority to do so—whether because the locality has not been granted adequate authority under state law or because existing local laws do not empower an agency to impose a fee specifically on stormwater. (Of course, ultimately, such a lack of authority owes to a lack of political will or popular support.)

"Off-site" projects and tradable credits. Washington, DC and a small number of other cities have established schemes that facilitate investment in GI by a property owner not only on its own property, but on other private properties as well.[41] Such schemes credit property owners for compliance with stormwater retention or detention performance standards (described below) when they invest in increased stormwater management capacity on other properties—that is, "off-site." Linking properties in this way expands the pool of liquidity available for GI installation by causing building owners to contribute to city-wide improvements after exhausting all the cost-effective improvements to their own facilities. These schemes tend to make use of tradable credits to mediate the exchanges among property owners; such credits also make it relatively easy for regulators to track compliance with program requirements.[42]

3.2.2 Direct and indirect regulatory requirements

Zoning and permitting exceptions. Chicago and Portland, Oregon have adopted land use regulations that distinguish between buildings with and without GI installations. In Portland, buildings can be granted variances from restrictions that

[41] *See, e.g.*, D.C. Code § 6-1451.01–.11 (codifying Green Building Act of 2006); https://perma.cc/ZSV9-4PZR; D.C. Department of Energy & Environment, RiverSmart Homes - Overview, https://perma.cc/WU5Z-E445 (accessed May 30, 2017).

[42] *See* Krishna P. Dhakal & Lizette R. Chevalier, *Urban Stormwater Governance: The Need for a Paradigm Shift*, 57 Envtl. Mgmt. 1112 (2016) (comparing different cities' policies, including use of tradable credits).

would otherwise impose limits on height or occupancy.[43] In Chicago, those seeking permits for a building that includes GI in its design (most often a green roof) can have those permits expedited.[44] These incentives, though potentially significant for developers, are unlikely to spur GI investments unless coupled with additional, complementary measures.

Performance standards. Parameters for the operation or performance of new, modified, or existing buildings are the vector through which a variety of policy priorities are communicated to developers and property owners. They are generally—but not exclusively[45]—embodied in building codes. Because GI can help manage stormwater, insulate buildings, and improve the albedo of built surfaces, it can be designated as a means of complying with several different types of performance standard.[46] Because the cost of new construction that embodies specific or novel design features is generally far lower than the cost of retrofitting, most localities impose performance standards on new or significantly modified structures and not on existing ones. In NYC, new medium or large structures in CSO areas must limit their release of stormwater runoff into the sewer/stormwater system.[47] In Washington D.C., in addition to the stormwater capture requirements for newly developed or modified structures, building owners can also achieve compliance by purchasing stormwater retention credits from the owners of sites that capture more stormwater than the law requires.[48]

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[43] Portland, Or., Zoning Code, tit. 33, ch. 510 § 210 (2010).

[44] City of Chicago, Overview of the Green Permit Program, https://perma.cc/H9PT-D24L (accessed Mar. 28, 2017).

[45] *See, e.g.*, Toronto Mun. Code ch. 492 (2016), https://perma.cc/7LWN-VRPS.

[46] *See, e.g.*, NYC Department of Design & Construction, Cool and Green Roofing Manual 2.7–2.8 (June 2007), https://perma.cc/QX9Q-ZWEL.

[47] 15 RNYC § 31-03(a)(1) ("The Stormwater Release Rate must be no more than the greater of 0.25 cfs or 10% of the Allowable Flow or, if the Allowable Flow is less than 0.25 cfs, no more than the Allowable Flow"), https://perma.cc/6M5M-W4KH.

[48] *See* note 41, above.

Design standards. Specifying parameters for the design of GI installation can reduce costs to participants in the GI marketplace by creating certainty for property owners, contractors, and regulators about whether particular designs will actually serve the public purposes of water quality and quantity management—and be recognized as serving those purposes.[49]

4. CONSTRAINTS ARISING FROM NEW YORK CITY'S POLITICAL, LEGAL, AND ADMINISTRATIVE CONTEXT

The policies described above, and others as well, have all been adopted in cities aiming to increase the amount of GI on private property in their jurisdictions. However, because all of those policies have potentially significant cost implications for private property owners and/or municipal budgets, none of them would be simple, in political terms, anywhere—and especially not for the NYC City Council and Mayor, who are already engaged in a battle with the real estate community over whether and how to address NYC's ever-rising rents and cost of living.[50] For that reason, this paper leaves discussion of potentially helpful legislative measures to the end and first considers policy options that could be implemented pursuant to legislative authority already granted to DEP or another agency. The rest of this section discusses the interwoven legal, fiscal, administrative, and practical constraints that limit what GI-promoting programs might be established and how they might be funded. More specifically, it examines constraints on NYC efforts to achieve the following two goals: 1) to give public money to private actors for improvements to their property, and 2) to secure assurances from them that they will maintain those improvements so that the improvements perform a public function. The subsequent section discusses possible pathways through those constraints.

[49] *See, e.g.*, City of Toronto, Low Impact Development Stormwater Management Planning and Design Guide, (2010), https://perma.cc/KP85-FDM3.

[50] *See* NYC Housing, Problem: Our current affordable housing crisis, https://perma.cc/Q7RR-Y5MG (accessed Mar. 28, 2017).

4.1 Program costs

Private property owners seem responsive to financial support and incentives for GI,[51] but converting a traditional "grey" stormwater management system to a "green" one is expensive. In NYC, where property values are especially high, it is extremely expensive. Thus, the most basic constraint on DEP's goal of large-scale GI installation on private property are the irreducible costs involved. The other constraints discussed in this section all build on this one.

4.2 Fiscal prudence requires certainty *for* NYC *from* property owners

Paying for GI installations on private land is DEP's first goal, but it is inseparable from a corollary goal of securing assurances about the performance of that GI. Consider this issue from NYC's perspective. NYC currently manages stormwater by spending water-ratepayers' money on grey and green infrastructure on public land. These assets on average have a multi-decadal year useful life; NYC owns that infrastructure and DEP can access it easily for maintenance or replacement. Substituting GI for these long-lived, time-tested solutions means spending substantial sums on plants and growth medium—assets with a different and in some respects more intensive maintenance profile. This substitution also means taking on new risks that the stormwater management system will not perform as designed—sudden changes in weather, for instance, can kill plants, reducing water uptake and leaving growth medium unsecured and less useful for stormwater detention or infiltration. If the GI is on private land, it also means having less ability to control that risk because system performance would hinge in part on the operation of assets the city does not own and the actions of people it does not employ—if a property owner lets a GI asset degrade to the point of failure, DEP must deal with the resulting additional runoff

[51] Choudhery et al., *supra* note 35, at 1; *see also* Alisa Valderrama et al., Creating Clean Water Cash Flows Developing Private Markets for Green Stormwater Infrastructure in Philadelphia 13–17 (Jan. 2013), https://perma.cc/W2ZE-XGWE (estimating subsidy tipping points at which property owners in Philadelphia will install various forms of GI).

while also working to restore the asset, with or without the cooperation of the property owner.

These factors pushed NYC to impose significant commitments on participants in its existing GI grant program. Whatever means NYC might adopt to accomplish its objective of encouraging more GI on private property, these factors will push the city to ensure that has a material degree of control over several aspects of the GI installations it pays for. That control would necessarily entail:

- Specifying design and performance parameters for GI installations;
- Having permission to access GI installations for the purposes of inspections, possibly also maintenance, and, if necessary, engaging in remedial upkeep (see part 5.d below);
- Having recourse to an efficient means of remedying noncompliance that compromises design or performance parameters;
- Establishing a process that provides NYC with solid assurances that it could recover non-amortized value of a GI installation decommissioned before the scheduled end of its useful life, should the property owner decide to exit the GI program.

4.3 Transaction costs for private property owners

In addition to legal and administrative considerations, an unavoidable practical consideration is what it will cost property owners in time, money, resources, and hassle to participate in any government-funded, GI-promoting initiative.

Rather than imaging an abstract array of potential requirements and costs to private property owners who participate in a city-funded program, consider those of NYC's existing GI grant program, which offers recipients funding if, *prior to receiving any funds*, they do the following (among other things):

- Seek DEP approval for proposed GI designs, which must be prepared or certified by a New York State-licensed engineer, architect or landscape architect;
- Submit to DEP a Site Safety Plan prepared by a Certified Safety; Professional (CSP) or a Certified Industrial Hygienist (CIH);
- Obtain all necessary permits, e.g., for construction;
- Submit to DEP a Maintenance Plan that will govern maintenance for the 20+ year life of the installation;
- Record a Declaration of Restrictive Covenant with the deed to the property and submit evidence of that recording to DEP;

- Obtain insurance coverage for all aspects of the project's construction.[52]

In addition to these requirements of grant program *applicants*,[53] grant *recipients* must also, pursuant to the terms of a mandatory restrictive covenant, do the following (again, among other things):

- Provide DEP officials with access to inspect the GI installation "[a]t any time and from time to time during the [20-year] Performance Term upon reasonable prior notice";
- Grant the city intellectual property rights over material developed from study or imaging of GI installations;
- Stipulate that the city holds, on the portion of the property used for GI, a lien secondary only to the first mortgage on the property;
- Restore the installation in the event of damage or destruction regardless of the foreseeability of the cause or the coverage of the event by an insurer;
- Stipulate that money damages would not make the city whole for breach of the covenant by the property owner, such that the city can seek an injunction from a court that compels specific actions on the part of the property owner.[54]

Listing these requirements illustrates what cities—and NYC in particular—want from GI program participants. It also highlights that the resulting burdens can be substantial,[55] and suggests a possible reason for why, along with the requirement that all proposed installations cost at least $35,000 (related to the program's reliance on NYC's capital budget for funding, discussed in part 4.e below), DEP's GI grant program has had few participants.

[52] New York City Green Infrastructure Grant Program 2015 Funding Agreement, https://perma.cc/7JZ4-AKRH.

[53] Tiffany M. Lowe, Green Infrastructure Grant Program: Grant Workshop presentation 20, https://perma.cc/GX9A-Q78K (accessed Apr. 5, 2017).

[54] Declaration of Restrictive Covenant ¶ 7, https://perma.cc/MG9V-8M3J (accessed Apr. 5, 2017).

[55] Notably, different private actors are likely to find one or another of the requirements listed to be relatively more burdensome—for instance, the grant of intellectual property rights can be expected to preclude participation by universities.

4.4 Property owners' federal tax liability would drain program spending

If DEP's first goal is to give private actors money to build GI on private land, and the existing grant program has proved to be a cumbersome source of transaction costs, why not just give such actors money with less bureaucratic fuss (i.e., without tethering it to a restrictive covenant and assorted other conditions of performance) by providing rebates for the cost of GI installation? The first of two salient answers to this question (the second is discussed in the next subsection) is that unconditional rebates would *create* rather than stem a sizeable drain on the stream of money directed toward GI installations. That drain would take the form of federal income tax liability for property owners on money they receive to install and maintain GI. Tax rates vary, but treating program spending as taxable income could mean reducing it by a sizeable percentage.

The Internal Revenue Service (IRS) has made clear that rebates—"water conservation subsidies"—would, in contrast to subsidies for energy conservation measures, which Congress has exempted from income taxation[56]—be treated as part of gross income.[57] This treatment is not sensitive to characterization of the rebate (or similar means of transferring money) as a mere reduction in the purchase price of GI, nor to the argument that the money would be given to improve the performance of the stormwater management system rather than to confer a benefit on the property owner.[58]

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[56] 26 U.S.C. § 136 (2016).

[57] Letter from members of western Congressional delegations to John Koskinen, IRS Commissioner, Dec. 11, 2015, https://perma.cc/XP99-8L4K ("When water conservation and green infrastructure rebate payments are taxable to the property owners who receive them, it significantly deters participation in these programs."); Letter from John Koskinen to Rep. Jared Huffman, Jan. 5, 2016, https://perma.cc/9QHE-M282 ("section 136 excludes from gross income subsidies from electric and natural gas public utilities for energy conservation measures. However, expansion of section 136 to water conservation subsidies provided by water utilities would require a legislative change.").

[58] Letter to Koskinen, *supra* note 57, at 2 ("The rebates should be nontaxable because they are fundamentally a reduction of the purchase price of the water conservation or [GI] installation. * * * Additionally, the rebates should be nontaxable because the benefit of the water conservation

Notably, this problem would not arise if instead of *giving* money to property owners, DEP alleviated a regulatory obligation—such as a stormwater utility fee—in return for property owners installing GI and thereby reducing their property's impervious surface area. (More on this below.) Of course, because that fee would have to be remarkably high to cover the cost of GI installation, it would likely not provide a complete solution. However, in the absence of a stormwater utility fee, however high or low, private property owners' tax liability for direct transfers or rebates puts the cost-effectiveness of any GI program at legal/financial risk, should it simply provide direct payments to the owners of private property.

4.5 Administrative costs and authority

Whatever programmatic structure is adopted, increasing the volume of GI on private property to the extent contemplated by the 2012 Consent Order will require substantially increasing the staff currently assigned to manage DEP's existing grant program. DEP could either expand its own staff for this purpose or contract with a third party administrator that would handle program development, implementation, and management.[59] Though other factors would also be important to consider, the most salient administrative cost differences between the in-house and outsourced approaches would be the speed and flexibility of hiring, the relative costs of staff employed directly or indirectly by the city, and, once staff is hired, the flexibility available from direct employment versus the limits on how a third party administrator could be steered and compensated.

Another type of constraint, in addition to the costs of administering a program capable of putting GI on a substantial fraction of NYC's private property, arises from rules restricting how NYC agencies like DEP may purchase goods and services.

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or [GI] installation goes to the water utility . . . . [R]ebate programs are not intended to confer a net benefit on the property owner . . . .").

[59] For a discussion of what might be involved in making use of a third-party program administrator, see Valderrama et al., *supra* note 51, at 18–19.

Among those procurement restrictions, which are diverse and complex, two in particular are salient here.

The first is NYC agencies' lack of what is called "design-build authority." A government agency that has such authority may contract with a single entity to both design a particular structure or facility and then build what it designed.[60] New York State law withholds this authority from several NYC agencies, including DEP, which means that DEP must contract separately for the design and construction of, among other things, GI installations. What implications does this have for GI installed on private property with public money? It makes it highly likely that GI installations will be more expensive if paid for by DEP, for various reasons and most obviously because they will involve two procurement processes instead of one.[61] (Legislative efforts to amend New York State's prohibition on design-build contracting for city agencies like DEP are ongoing.[62]) In addition, this restriction makes it harder for any given installation to be both cost-effective *and* customized to the circumstances of the property.

The second procurement restriction relates to the designation of an expenditure as either the acquisition of a capital asset or an operating expense. This distinction is important chiefly because operating expenses may not be debt-financed—they must be paid for by program-specific fees or out of NYC's annual Expense Budget.[63] Thus, to pay for an expanded GI program, DEP must either assess a new fee (a politically and administratively difficult task), secure funding from NYC's annual Expense Budget for a new and untested GI program (a politically difficult task), or it must find

[60] *See generally* Design-Build Institute of America, *What is Design-Build?*, https://perma.cc/PR6T-QRM5 (accessed Apr. 5, 2017).

[61] NYU Rudin Center for Transportation Policy and Management, Maximizing the Value of New York's Investment in Public Construction: The Role of Design-Build Procurement (June 2015), https://perma.cc/3N6X-ZZAN.

[62] Winnie Hu, *New York Slow to Embrace Approach That Streamlines Building Projects*, N.Y. Times, Dec. 25, 2016, https://perma.cc/4L6Z-GTJ2.

[63] NYC Independent Budget Office, Understanding New York City's Budget: A Guide (June 2013), https://perma.cc/YMY8-WES6.

a way for the program's outlays to qualify as spending on capital assets so that they can be financed through the issuance of municipal bonds. New York law uses four criteria to distinguish capital assets from other goods.[64] Of those, the two that are especially relevant here require that the asset must 1) have an expected useful life of at least five years, and 2) cost at least $35,000. Though the first of these criteria presents no difficulty for a given GI installation, the second could because many small or mid-sized GI installations cost less than $35,000.[65]

4.6 Land use and environmental review: ULURP, SEQRA, and CEQR

Projects in NYC that require certain kinds of discretionary land use approvals, such as rezonings or use variances, must go through Uniform Land Use Review Procedure (ULURP).[66] Projects that need discretionary governmental approvals are also subject to the State Environmental Quality Review Act (SEQRA) and its New York City implementing program, City Environmental Quality Review (CEQR), and if they are deemed to have the potential for significant environmental impact will require the preparation of an environmental impact statement (EIS). GI projects rarely require the sorts of approvals that invoke ULURP. In the unusual case where a GI project requires a discretionary approval within the ambit of SEQRA/CEQR, its lack of negative environmental impacts would generally make it eligible for a negative

[64] New York City, N.Y., Code § 5-101; NYC Comptroller Directive 10-Charges to the Capital Projects Fund (May 2011); NYC Comptroller Directive 30-Capital Assets (May 2011).

[65] One potential solution would be to treat multiple GI installations as part of a system or network of capital assets whose function is to control stormwater. NYC Admin. Code §§ 5-101(1)(a) and New York City Comptroller Directive 30-Capital Assets incorporates by reference the definition of a "capital asset" contained in "generally accepted accounting principles for municipalities," which are codified in Statement No. 34 of the Governmental Accounting Standards Board (GASB). GASB's definition of a "network of assets" and/or its definition of a "subsystem of a network" both seem to encompass GI installations. *See* GASB, Statement No. 34 of the Governmental Accounting Standards Board Basic Financial Statements— and Management's Discussion and Analysis—for State and Local Governments (June 1999), https://perma.cc/JF99-KFNF.

[66] *See* NYC Charter § 197-c.

declaration, meaning that no EIS would be required.[67] If the GI project is performed in conjunction with a project that otherwise must undergo SEQRA/CEQR review, it may even make a negative declaration more likely because it may serve to mitigate the negative impacts of projects to which they are attached.[68]

5. PATHWAYS THROUGH THE CONSTRAINTS

No single policy intervention will carpet NYC's private property holdings with GI to the extent called for by the 2012 Consent Order. To achieve that result, the city must adopt a suite of interventions that reinforce one another's affects and give rise to a thriving marketplace for GI installation and maintenance. In addition to being compatible, those interventions must also skirt the constraints noted above. This part, which presents a menu of interventions, notes how each could avoid or respond to the constraints discussed above. In addition to relating those interventions to the constraints discussed above, this part also points out key considerations for the implementation of particular interventions.

5.1 A stormwater fee

NYC property owners currently pay a fee to DEP based on how much they draw on city-provided potable water and wastewater management services. DEP's revenues for the stormwater management system come from those fees, meaning that system users responsible for little or no impervious exterior surface pay "too much" for

[67] CEQR Technical Manual § 121.3 (2014), https://perma.cc/GBL7-3NL4 (describing GI as a stormwater "best management practice (BMP)");

[68] *See e.g.*, Admirals Row Plaza Final Environmental Impact Statement, CEQR No. 11DME001K, at 8-1 (Oct. 2011), https://perma.cc/4ZNK-32RE, ("The amount of impervious surface on the 6.08-acre site would increase . . . . [B]est management practices (BMPs) would be designed and implemented in coordination with the New York City Department of Environmental Protection (DEP), including the incorporation of a green roof and both planted areas and permeable pavement within the proposed parking lot. These measures . . . would reduce the overall stormwater runoff generation, overall volume of stormwater runoff, and peak runoff rates into the combined sewer system. Accordingly, the proposed project would not be expected to result in any significant adverse impacts on the water supply, wastewater or stormwater conveyance and treatment infrastructure.").

stormwater-related services, while owners of impervious acres with few or no potable or wastewater connections pay far "too little."[69] A stormwater fee would give life to the "polluter pays" and "beneficiary pays" principles in this context, and better align private and systemic costs with respect to stormwater management—notably, it would do so as a changing climate causes precipitation on NYC to increase in frequency and intensity—driving growing volumes of polluted runoff and straining the combined sewer system more and more. Consistent with that alignment, DEP could also credit property owners who reduce their impervious surface area by installing (and maintaining) GI.[70] Ideally, the fee would precisely offset the costs to property owners of maintaining GI, and thereby align private and public operating and maintenance costs and benefits of stormwater management.

So why not adopt a stormwater fee post haste? There are at least three likely responses to this question, but none of them warrants significant delay in stormwater fee adoption in NYC.

First, reconfiguring water-related fees and outlays would require administrative changes, which in turn would require investments of political capital and bureaucratic effort. These investments would not be enormous and almost certainly cost-beneficial, but the reason to undertake them, while highly rational, is not politically advantageous or directly cost-saving for DEP to an extent that the Mayor or a member of the City Council would list "Established Stormwater Fee" on a mailer during election season.

[69] Joseph DiStefano, *UPenn Wins, Philly Airport Loses in Stormwater Fee Shift*, Philadelphia Inquirer, Oct. 25, 2010, https://perma.cc/5U9F-99Q9 (contrasting impact of stormwater fee on airports and big box stores, which have expansive impervious coverage and use little water, with universities and hospitals, which have compact coverage and use a lot of water).

[70] Many jurisdictions that impose stormwater fees invite this means of reducing or avoiding them. *See* EPA, Getting to Green: Paying for Green Infrastructure 7–14 (Dec. 2014), https://perma.cc/4TQ5-RTAN.

Second, though the majority of property owners would barely notice the change, some—those who currently pay "too little"—could feel it quite acutely.[71] The danger of a sudden jump in stormwater utility charges is that businesses subject to them resist instead of adjusting.[72] Philadelphia dealt with this problem by phasing in a commercial stormwater fee over several years.[73] Notably, this does not argue *against* adopting a stormwater fee, only doing so over a timeframe that provides those most affected with a chance to adjust, ideally by installing GI.

Third, a ratepayer made to pay more under a new stormwater regime could sue NYC to challenge it. Arguments made in opposition to new stormwater fees in other jurisdictions have included:

- The fee is not specific to stormwater management and is actually a general tax, which an agency like DEP does not have the authority to impose;
- The jurisdiction seeking to establish the fee lacks the legal authority to do so because its state government has not delegate such powers to it, or the agency lacks authority to do so because the legislative authority governing its administration of stormwater management provides limited or no basis for such a fee;
- arguments about the fairness of the process through which a fee is adopted or the soundness of the method used to calculate its amount.[74]

Again, none of these arguments should prevent DEP from adopting a stormwater fee: the fee's purpose could be clearly and narrowly tailored to stormwater management;[75] New York State is not poised to preempt the city's

[71] Distefano, *supra* note 69 (noting that UPenn's water fees would fall by $11,000 a month while Philadelphia International Airport's fees would jump $126,000 a month).

[72] According to a 2016 survey conducted by Black & Veatch, businesses were plaintiffs in 95% of the legal challenges to the adoption of stormwater fees. Black & Veatch, 2016 Stormwater Utility Survey 26 (2016), https://perma.cc/AX3R-694F.

[73] *See* Valderrama et al., *supra* note 51, at 17 (tabulating planned phases of transition from meter-based to fee-based rates for stormwater management services).

[74] National Association of Clean Water Agencies, Legal Considerations for Enacting, Implementing, & Funding Stormwater Programs 7 (2016), https://perma.cc/U8GV-822Q (citing Black & Veatch, *supra* note 72).

[75] For examples of cases disputing whether a fee was in fact a tax in disguise, see *id.* at 11–27.

adoption of such a fee by regulating the field of stormwater management at the state level;[76] and DEP is well aware of how to conduct the technical, administrative, and legal processes involved in a fee's adoption.

5.2 Streamlining the ministerial features of direct money transfers

If DEP means to spend public money efficiently on GI installations on private property, then it must strike a balance between securing its investment (see part 4.b) and not dissuading private property owners from accepting both the money and responsibility involved in hosting a GI installation (see part 4.c). For reasons discussed above, some transaction costs are unavoidable when giving public money to private property owners for GI installations that are to be maintained and effective for decades. Thus, a program that must impose those costs should minimize their impact in two ways: it should make them transparent, and seek to allocate them to parties relatively better able to shoulder the cost burden.

Making the fact and nature of ministerial tasks and transaction costs transparent means, at least: providing a thorough and legible description of the installation process; identifying the timing of key decisions, outlays, and reimbursements; and highlighting steps that are contingent on completion of a prior step. Written materials are a necessary part of this, but cannot substitute fully for access to someone capable of answering questions about how to navigate procedural steps in a particular case.[77]

Allocating transaction cost burdens efficiently might mean hiring program staff to shepherd program participants through the process of identifying contractors, gathering permits, securing certified designs and site plans, and so on. Or—as Philadelphia's Greened Acre Retrofit Program has done—it might mean designing the program to interface only with design and construction professionals who, acting as

[76] *Cf.* Code of City of Ithaca, New York, Ch. 283: Stormwater Utility, https://perma.cc/D6A6-SWL7.

[77] DEP supplements its written materials with quarterly workshops on grant program participation. Lowe, *supra* note 53.

intermediaries between the city and property owners, would have both incentives and means to deal efficiently with the ministerial tasks involved in meeting program funding requirements.[78] In any case, it means seeking to keep as much of the ministerial burden as possible off of small private property owners, such as members of a condo or co-op board, for whom construction permitting and interpreting legal documents about property management are likely novel and unfamiliar tasks.

5.3 Program management: metrics and administrators

Less important than who administers the program is that DEP seek to compensate those who install and maintain GI based on the volume of stormwater runoff that GI helps avert. Paying by volume of averted stormwater would best align public and private interests in pollution control, stormwater management, and GI upkeep because it would cause the city to pay most directly for efforts toward its basic objective, as defined by the 2012 Consent Order, namely improved water quality through better management of stormwater quantities. This in turn would cause private property owners to invest in and manage GI installations with an eye to achieving that objective.

Practically speaking, this means paying for each of two phases of very dissimilar efforts: installation first, then maintenance. These dissimilar efforts have dissimilar cost profiles: whereas paying for installation entails a lump sum, paying for maintenance entails a small but steady flow of funding. Thus compensating private property owners on an ongoing basis at a given rate for the (approximate) volume of stormwater they avert could cleanly offset maintenance costs, but would not provide an optimal means of offsetting installation costs. For initial installation, lump-sum compensation per square foot of GI installed would be more appropriate.

[78] The Philadelphia Water Department's Greened Acre Retrofit Program (GARP) employs the logical extreme of this approach by offering funding *only* to companies or "project aggregators," and not to individual residents or owners of small buildings. Thus the only entities eligible for GARP funding navigate the regulatory and ministerial aspects of the GI installation *and* funding processes routinely.

Who should administer the program—DEP staff or a third-party program manager that contracts with DEP?[79] This paper takes the view that the primary administrative concern is that the metric employed to compensate private property owners should align their objectives for the GI on their property with DEP's objectives. If DEP is better able to implement that approach by hiring staff and managing a GI promoting-program directly, it should seek to do so. If DEP is better able to implement that approach but establishing a large in-house GI-promoting program is difficult for DEP, then DEP should work to overcome whatever presents a difficulty.

5.4 Accessing and maintaining GI: easements

For reasons noted in part 4.b above, ensuring performance by private property owners means that the installation GI on private property with public money must change the legal status of the property's ownership. Property law is rife with exceptions to the basic premise that a property owner can exclude visitors and can make use of their property however they like. In dense cities like NYC, where most people live and work in units stacked on top of each other in buildings that share walls and that rely on common linkages to utilities, the exceptions are legion. Thus it is no great departure from conventional uses of urban private property to designate the GI-covered portion of it as legally distinct. Specifically, that portion of the property might be made accessible to a third-party, who would be responsible to DEP rather than the property owner, for the purposes of inspections and maintenance. Further, and more fundamentally, the deed to that property might be amended to define the GI-covered portion as subject to a negative easement whose provisions place it in service to the public purpose of capturing and detaining stormwater by supporting GI.[80]

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[79] *See* DEP, Request for Information (RFI): Management of a Green Infrastructure Incentive Program (Sept. 19, 2016) (seeking solicitations from would-be third-party program managers).

[80] *See* N.Y. Real Prop. Law §§ 290-336 (defining "easement"); 5-40 Warren's Weed New York Real Property § 40.03[3] (describing negative easements).

Designations like these would not convert private property to public property, but they would alleviate political and legal concerns about spending public money—whether directly or indirectly—to install valuable assets on private property.[81] A closely analogous designation is a utility easement, which is granted to a regulated utility for the purpose of placing, maintaining, and replacing pipes, cables, or other capillary elements of network infrastructure on or within a privately owned parcel or structure for the benefit of that structure's occupants pursuant to their contract with the utility. Formally, a GI easement would be an express negative easement, established by the property owner's signing of a restrictive covenant and made appurtenant (i.e., applicable to the property and not just to the property's present owner) by the recording of that covenant with the property's deed.[82]

5.5 GI decommissioning and program exit for the property owner

DEP should provide participating private property owners with a clear and predictable protocol for ceasing participation in whatever GI program DEP adopts. This recommendation would be no different in a city where GI is a standard feature of the urban landscape and property owners could study the outcome of adding GI to situations comparable to their own. In NYC, it takes on more importance because, here, GI on private property is sparse, seldom installed specifically for the purpose of stormwater management, and its implications for property values are still unclear.

How then to engineer an approach to decommissioning that is predictable and clear, but not desirable? Two features must inhere in it: the property owner must be able to wipe the property's deed clean of any encumbrance, and DEP must be able to recover the remaining value of its investment (i.e., value not yet amortized). The first of these is straightforward, and simply involves the time and effort involved in

[81] *See* In re City of New York, 41 N.Y.S.2d 859, 861 (N.Y. App. Div. 1943) ("A public easement is one that runs in favor of the public generally. The easement of the utility, although devoted to a public use, is essentially private property."); *see also* Lopez v. Adams, 69 A.D.3d 1162 (App. Div. 3d Dep't 2010) (the right of an easement holder to lawfully use the property in question is limited by the activities necessary to carry out the purpose of the easement).

[82] *Cf.* Declaration of Restrictive Covenant, *supra* note 54.

amending (once again) the deed to the property. The second, however, requires DEP to develop a basis for determining the value that would (1) be viewed as reasonable by property owners considering program participation; (2) make DEP whole; and (3) withstand whatever legal challenge might arise out of a dispute over an instance of GI decommissioning. Notably, such a determination becomes simpler if DEP implements a stormwater fee. With a stormwater fee in place the only calculation required to recover DEP's costs from the property owner is the remaining useful life of the GI installation; no estimate of the installation's value for stormwater management purposes is necessary because that value is captured in the fee that the owner will begin paying in full once the GI on their property is decommissioned. In the absence of a stormwater fee, however, valuing GI requires two calculations: its remaining value as an amortizing asset *and* its value over the remainder of its useful life as a means of reducing the burden on the stormwater management system.

5.6 Winning hearts and minds

The commitment involved in putting GI on private property has several facets. One is legal: to make a commitment to long-term maintenance of a part of the city's stormwater infrastructure credible, those involved must employ instruments (contracts, recorded modifications to a deed) that demonstrate that credibility by accepting the consequences of nonfeasance. Another is economic: installing GI means spending money, adding a significant line item to one or more insurance contracts, and altering an asset in a way that future potential buyers and the city's real estate market more generally will interpret as affecting that asset's value. A third facet, which is less concrete but no less significant, is aesthetic and conceptual: GI on private property is a practical and voluntarily assumed burden for the owner, and one that means reducing the degree to which the practical concerns and responsibilities involved in stormwater management are delegated to city agencies.

Why would anyone commit themselves in all these ways?

While a significant part of the answer must be that private property owners can expect to benefit directly in one or more ways from a GI installation, at least some part of the answer relies on public education, over time, causing them to take on an enlarged understanding of the role they *inevitably* play—whether they install GI or not—in generating and managing urban stormwater. Eventually, assuming more and more private property owners reduce their contribution to the city's impervious surface by installing GI, one might expect to see a flip in the common understanding of what installing GI means: whereas today those who do so might appear altruistic, "green" for the sake of appearances, or otherwise outside the norm, eventually those who fail to do so might appear to be seen not as reasonably careless about stormwater but as shirkers of an unremarkable civic duty. Arriving at—or even beginning to approach—that transition will require concerted efforts on multiple fronts to inform stakeholders about the value available from GI and about their options for adding or just helping to maintain GI in their corner of the city. A stormwater utility fee, or even plans to adopt one in the foreseeable future,

6. HELPFUL LEGISLATION

This paper assumes that no new state or local legislation will be adopted to support GI installation and maintenance in NYC. Nonetheless, this part identifies legislation that would be especially helpful for the purpose of scaling up urban GI on private property.

6.1 State-level

Confirm the legality of stormwater utility fees. No one has challenged the stormwater fee adopted by the City of Ithaca as being somehow beyond that city's authority under New York State law. Nonetheless, given that DEP's adoption of a stormwater fee would be more likely to engender legal challenge from someone made to pay more as a result, clarification from the state legislature that such fees are available to cities and to NYC in particular would be helpful.

Grant NYC agencies design-build authority. That DEP lacks the authority to contract with a single entity to design and building GI installations is not the foremost impediment to such installations proliferating on public or private property. Nonetheless, DEP's lack of such authority is yet another small impediment to possible efforts to support GI's proliferation.

6.2 City-level

Expand the number of buildings subject to stormwater detention requirements. NYC's building code currently imposes a stormwater detention performance standard on new developments on medium and large lots.[83] Reducing that threshold would cause a larger number of buildings' designers to integrate GI of some sort into buildings and their surroundings. Adjusting the existing requirements to also encourage GI instead of blue roofs would be even better.

Impose a stormwater fee, allowing discounts for GI installation and maintenance. The merits of such a measure for the city as a whole have been discussed at length above. Additional merits of taking this step through legislation are that doing so would remove political and administrative barriers, as well as legal risks, that currently impede DEP from taking such a step based on its existing authority to manage stormwater.

Recognize GI as a form of infrastructure. Legislation could prescribe to the City Comptroller the accounting treatment of qualifying GI (i.e., GI that stems the flow of stormwater) in two respects. First, such GI is to be considered a form of infrastructure and thus eligible for spending from the city's Capital Budget so long as it meets the $35,000 cost threshold. Second, multiple GI installations in different locations should be aggregated for accounting purposes, so long as they are paid for by the city and installed in the same timeframe. This pair of clarifications would recognize that GI installations, even though they are scattered across the city, serve as unified a purpose

[83] The City Record CXXXVIV No. 2, at 15 (Jan 4, 2012), https://perma.cc/Z2NV-4AM3; *see also* 15 RNYC § 31-03 (specifying permissible flow rates).

as grey infrastructure and so should be treated as components of a city-wide system of capital assets. In addition to being conceptually appropriate, these clarifications would help ensure that DEP can rely on funding for GI on private property from outside the city's Expense Budget.

7. CONCLUSION

Taking the goals for GI installation set for NYC by the 2012 Consent Order as its starting point, this paper considers key challenges that stand in the way of DEP's efforts to provide financial support to private property owners to install GI on their property. After examining those challenges, this paper describes several potential means of addressing them. Importantly, it does not envision or seek to prescribe a particular path forward for NYC and DEP—to the contrary, it envisions that progress toward the city's GI installation goals will follow from the adoption and implementation of a variety of measures. Consistent with the idea that several measures in combination will be necessary to achieve the city's goals, this paper also notes briefly a supportive legislative agenda.