



Green Infrastructure & Economic Development

Strategies to Foster Opportunity for Marginalized Communities

FINAL REPORT

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Executive Summary

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This report articulates local economic development opportunities associated with Green Infrastructure (GI) investments. GI entails reintegrating natural plantings, soils, and hydrologic regimes into urban spaces; cities and other actors are increasingly turning to GI as a stormwater management technique. This report is intended for economic development organizations (EDOs) and stormwater management agencies. It suggests how practitioners within these organizations can support economic opportunity for local and/or historically disadvantaged communities. Such opportunities include greater representation amongst the GI labor force and contracting firms' ownership, as well as by improving prospects for career advancement and job quality.

To identify economic development strategies that may be associated with GI investments, this report reviews practices in two cities leading in GI planning and implementation: New York, and Portland, Oregon. It also conducts a more cursory review of GI investments in Philadelphia.

The report provides an estimate of the number of gross job-years of employment associated with GI investments in these three cities. We estimate that New York's average GI investment levels per year will be associated with between 262 and 608 job-years of entry-level construction employment; between 67 and 160 entry-level construction job-years in Portland; and 147 to 368 in Philadelphia.

The New York and Portland cases reveal a number of lessons pertinent to economic development efforts relating to GI investments. First, the involvement of city and regional scale economic development organizations (EDOs) in GI planning and implementation has been minimal to date; likewise, cities have not clearly articulated economic development goals

and strategies as part of their GI planning. Nevertheless, this report suggests that city and regional EDOs can take a more active role during GI planning, helping to articulate economic development goals and convene the stormwater agencies, GI contractors, workforce development organizations, and community-scale EDOs to develop strategies to realize positive economic development outcomes in the GI sector.

The New York and Portland cases suggest that broad targeted procurement policies favoring local, small, minority, and/or women-owned businesses can help enable these communities to serve this space. They also suggest that successful efforts to target procurement to contractors from disadvantaged communities should be complemented by efforts to develop small businesses' ability to serve city contracts, and other forms of business development and technical assistance. Likewise, enabling procurement policies that allow city project managers to reward enterprises that deliver positive economic development outcomes for their employees, such as training and career planning, can improve the economic development impacts of GI investments. Additionally, community workforce agreements specifying target percentages of employees from disadvantaged communities can ensure fair access to employment opportunities for these communities.

The cases further suggest the importance of community-based organizations to facilitating positive economic development outcomes in the GI sector. These groups can recruit disadvantaged people into the GI workforce and provide training and work experience that can facilitate advancement in the landscaping industry. Community scale organizations in New York and Portland have successfully developed GI training programs and social enter-

prises; these programs provide basic construction and landscaping skills to participants, and assist them in building a career in GI and related fields. This model may be replicated by community scale EDOs in other cities.

Lastly, EDOs can encourage the implementation of GI, as part of neighborhood beautification efforts, and as requisite standards for real estate projects funded by EDOs. Organizations such as Business Improve-

ment Districts, Community Development Financial Institutions, and other community organizations are positioned to make GI a part of their activities.

By seeking to maximize the economic development impacts of GI investments, cities, EDOs, stormwater management agencies, and others can maximize the triple bottom line outcomes of environmental sustainability, social justice, and environmental opportunity.

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I. The Growing Use of Green Infrastructure

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Cities and other public and private actors are increasingly turning to “green infrastructure” (GI) to manage stormwater, restore ecologies, beautify urban spaces, and provide a range of other ecosystem services. This report articulates local economic development opportunities associated with these investments. It is intended primarily for two audiences:

- Economic development organizations (EDOs), including government agencies, and non-profit organizations such as neighborhood organizations, community development financial institutions, business networks, and workforce development organizations, which seek to foster economic opportunity in their jurisdictions.
- Stormwater management agencies with responsibility for GI investments.

This report focuses on how these organizations can work to realize economic benefits for local and/or disadvantaged communities. By “disadvantaged communities”, we mean communities with high rates of unemployment and under-employment; lower levels of income and wealth attainment; barriers to employment, such as a lack of work history, lower educational attainment, history of incarceration, etc.; and/or a history of marginalization and subsequent exclusion from economic opportunity, as has faced minorities, women, and other communities. This report aims to improve understanding and foster conversation of how stormwater management agencies and EDOs can improve job opportunities, wealth creation, and career outcomes for members of these communities.

This report includes cases of cities on the forefront of GI planning, identifying promising economic development models others may emulate. It also qualifies and quantifies the economic development opportunities created by GI investments. We provide rough estimates of the number of jobs GI investments will stimulate in the case cities, and a qualitative picture of the employment tenure, compensation, and career trajectories for entry-level workers in the GI sector. Economic developers and stormwater agencies can realize improved economic and environmental outcomes by better understanding and capitalizing on these opportunities.

A. What is Green Infrastructure?

“Green Infrastructure” (GI) is a broad term, referring to plants, soils, and built structures purposefully integrated into urban and other built environments. GI “naturalizes” hydrological regimes in built environments by infiltrating rainwater into soils or otherwise storing water. GI is thus an important stormwater management practice to reduce the volume of rainwater entering stormwater conveyance systems and the associated pollutants carried into rivers, lakes and bays.^{*} Additionally, GI investments may restore natural habitat, counteract the urban heat island effect, and provide a variety of other ecosystem services. GI installations can also help manage traffic, and serve other transportation management purposes when integrated into the streetscape. Finally, GI can beautify neighbor-

^{*} This is especially true when storms deliver large amounts of water that overwhelm the capacity of treatment plants.

hoods, and realize associated community benefits. Thus, governments and private organizations may invest in GI for reasons beyond stormwater management.* This paper focuses primarily on the economic development potential of GI investments intended to manage stormwater; however, it documents other investment drivers and recognizes the economic opportunities they may engender.

GI differs from traditional, “gray” stormwater infrastructure in several important ways:

- **GI mimics natural hydrologic processes.** The entire landscape is a potential sink for stormwater. In contrast, traditional gray infrastructure channels all runoff to treatment plants and designated outfalls.
- **GI processes stormwater through infiltration, detention, and evaporation.** Rather than covering urban areas with hardscape, GI solutions increase plantings, wetlands and rainwater storage capacity in the urban landscape. This results in dramatically less runoff water entering the sewer system and less “intense” peak flows during precipitation events, more closely mirroring natural hydrology.
- **GI improves water quality at the source.** Many forms of GI filter stormwater naturally through plant material and soil or rock layers. Additionally, solutions that slow down stormwater may enhance the quality of runoff by promoting the settling of pollutants.
- **GI is decentralized and involves a network of installations across a built environment.** While planning for GI must be coordinated at a watershed or storm sewer system level, individual projects manage small areas and installation can occur over time. These incremental GI investments immediately begin to reduce the volume of stormwater entering the stormwater conveyance system, and the volume of contaminants released during stormwater overflows. By contrast,

* Indeed, many city agencies explicitly recognize the need to invest in GI to meet a wide range of environmental and social priorities.

gray infrastructure are connected to more centralized treatment and outflows. Thus, gray infrastructure investments tend to be less incremental, and require larger, “lumpier” investments, which do not realize improved environmental performance until their construction is complete.

Green Infrastructure Best Management Practices (BMPs)

In the stormwater management lexicon, Best Management Practices (BMPs) refers to a range of physical infrastructure that reduces stormwater flow volumes entering sewer systems. GI BMPs are both vegetated and structural. Vegetated strategies provide the dual benefit of infiltration and evapotranspiration. Most non-vegetated strategies detain or re-use stormwater. When used together throughout a stormwater management system, vegetated and non-vegetated strategies can handle larger stormwater volumes.

Types of BMPs

VEGETATED:

- **Green Roof -** Rooftops with vegetated installations. “Extensive” green roofs are comprised of more shallow soil depths and hardy plants requiring less maintenance. “Intensive” green roofs include deeper soil depths and a variety of plants; they are typically more expensive to install but provide greater public benefits and amenities to roof users. Green roofs can reduce building heating and cooling costs, particularly for buildings with high roof area to volume ratios, such as one-storey warehouses.
- **Rain Garden -** A planted depression that holds and filters stormwater and absorbs or releases it slowly into the ground.
- **Bioswale -** A vegetated swale designed to infiltrate, filter and slow down stormwater runoff.

- **Tree Trench** - A series of street trees connected to a stormwater catchment area that holds water, allows absorption by trees, enables infiltration, and slowly releases water during a storm event.
- **Stream Buffer Restoration** - reconstruction of stream banks' native habitat to reduce damage from peak stormwater flows and reduce water flow speeds.

NON-VEGETATED:

- **Cistern or Rain Barrel** - A tank to store stormwater for future uses (irrigation, toilet flushing, cooling towers, and other non-potable uses).
- **Blue Roof** - Rooftops designed to delay the release of roof runoff.
- **Porous Paving** - A hard surface designed to infiltrate water into the ground through gaps in units (pavers or grids), or through permeable materials (concrete, asphalt, etc.)

B. Drivers of GI Investment

Increasingly, cities, other government agencies (e.g. water/sewer utility districts, highway departments, conservation districts, parks departments, and others), businesses, and non-governmental organizations, invest in GI to address stormwater and environmental challenges.

Drivers of investment in GI include:

Preventing Combined Sewer Overflows (CSOs)

The federal Clean Water Act compels many cities in the U.S. to reduce CSOs. According to the EPA, roughly 40 million people live in the 772 communities served by combined sewers, located mainly in the Northeast, Midwest, and Pacific Northwest. CSOs

occur during storm events when existing systems are not large enough to handle runoff and, as a result, raw sewage is discharged into waterways. Historically, gray infrastructure improvements were the standard approach for many cities to reduce CSOs, with little attention paid to reducing stormwater runoff. However, GI approaches to reduce runoff volumes can be more cost effective than gray infrastructure improvements in many instances. In one CSO control project in Portland, Oregon, traditional gray infrastructure solutions would have cost \$144 million (2009 dollars). Instead, the city incorporated a mix of green and gray solutions that cost a total of \$81 million, and saved taxpayer \$63 million^{*}. In recent years, the EPA has encouraged cities to consider GI approaches to manage stormwater. State environmental protection agencies have accepted city plans relying substantially on GI to meet CSO reduction targets. Compliance with CSO regulations is anticipated to drive a substantial amount of investment in GI.

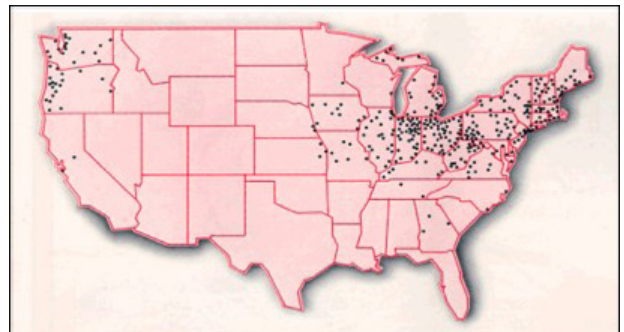


Figure 1. CSO areas in the USA

Source: EPA. http://cfpub.epa.gov/npdes/cso/demo.cfm?program_id=5

Complying with Other Watershed Regulations

Other regulations also may impact the level of stormwater agencies' investment in GI. The Federal Clean Water Act and other Federal and State legislation

^{*} "Forging the Link: Linking the Economic Benefits of Low Impact Development and Community Decisions." UNH Stormwater Center, Virginia Commonwealth University, and Antioch University New England, (p. 3-22). Accessed at http://www.unh.edu/unhsc/sites/unh.edu.unhsc/files/docs/FTL_Chapter3%20LR.pdf

creates a complex web of regulations with which stormwater management agencies must comply. For example, these agencies may have to comply with total maximum allowable pollutant loadings for different water bodies. Some GI work addresses habitat degradation, and GI principles are sometimes used in conjunction with Endangered Species Act Compliance. GI can be used to restore Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA or “Superfund”) sites. And state, regional and local building standards and watershed health goals can further drive demand for GI.

The complexity of watershed protection in many regions supports GI projects that simultaneously solve several issues. The following chart shows the complex web of regulation in Portland, Oregon.

Integrating into other Public Urban Infrastructure

GI can be integrated into a range of urban infrastructure. For instance, GI may be implemented as part of the re-design of streets and parks. Thus public investments in streets and parks may contribute to the total demand for GI.

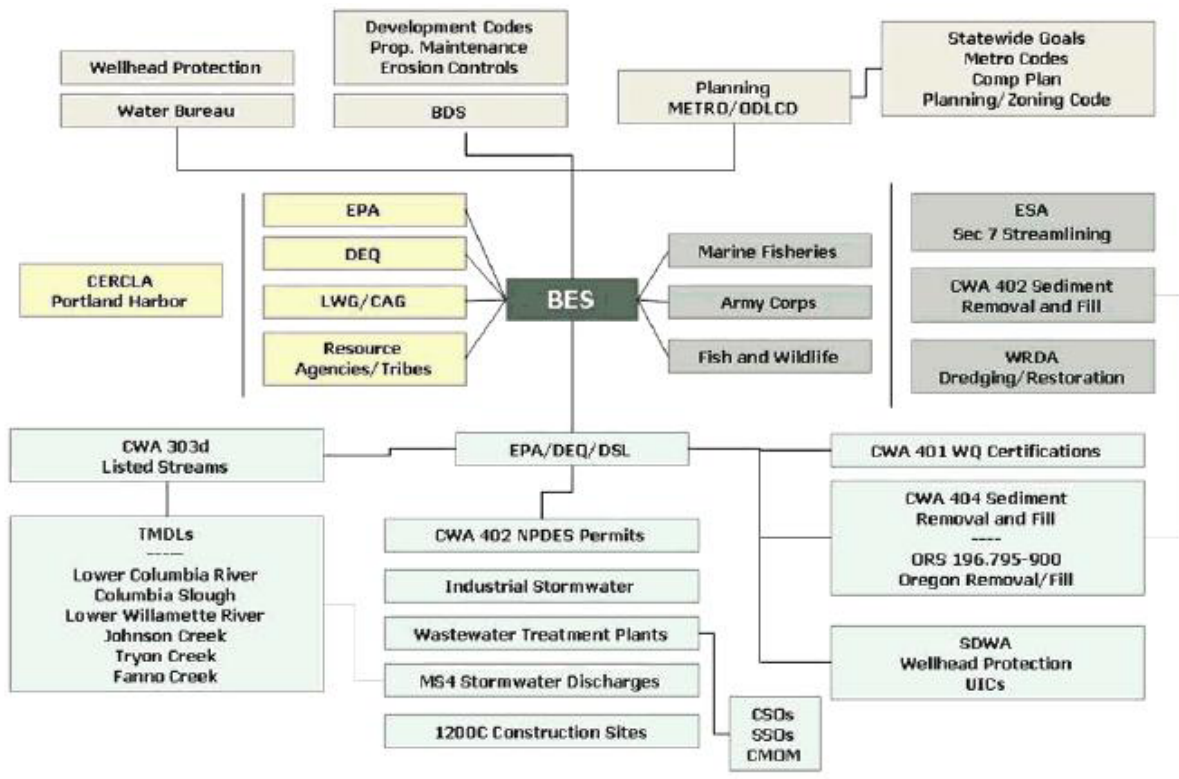


Figure 2. The complexity of regulations for watershed protection in Portland, Oregon. Source: Dan Vizzini. “Restoring Watershed Health”.

Incorporating into Green Building Projects

On-site stormwater management is increasingly being recognized as good design and engineering practice by private design, development and construction firms. In many applications, GI can reduce development costs, compared to traditional gray infrastructure^{*}. The rise of the green building movement and the Leadership in Energy and Environmental Design program (LEED) drives investment in GI. LEED certification includes several incentives for building owners to implement better stormwater management techniques and vegetated open space.

Marketing a Positive Image

The sustainability movement also drives investment in GI. Organizations and cities that implement GI projects send a positive message to constituents about their commitment to sustainability and doing their fair share to lessen environmental impact. The rise of corporate social responsibility corresponds with efforts to implement GI as well.

Advocacy

Many community and environmental organizations have been vocal advocates for GI investments. These efforts have driven cities to adopt GI, and will likely serve as an important driver of investment in the future.

C. GI & Economic Development

Cities are recognizing that green, decentralized stormwater management, combined with cost-effective traditional gray infrastructure upgrades, provides superior value and community benefits than traditional gray infrastructure alone. As a result, the

^{*} US EPA. December 2007. Reducing Stormwater Costs through Low Impact Development (LID) Strategies and Practices. http://water.epa.gov/polwaste/green/costs07_index.cfm

GI industry is on the rise nationally.

While GI continues to expand in scope, economic development practitioners need to better understand the economic development potential of this industry. This understanding can help economic developers accelerate use of GI as good economic and environmental practice while working to nurture their local GI firms, prepare a labor force with the necessary skills, and advocate for improving career opportunities and job quality within the GI industry. This report summarizes the economic development potential of GI based on existing research and case studies; however, more research is needed to fully understand the job impacts from growing GI investment as well as the workforce composition and required skills. We identify several benefits that may occur from nurturing the GI industry:

- **Supporting local and small businesses:** GI represents a growing set of services within existing sectors such as landscape design, contracting, maintenance, and horticulture and roofing. Investments in GI can occur in a more incremental, piecemeal manner than large gray infrastructure projects. Thus, with procurement policy oriented to providing opportunities for such firms, there is likely greater opportunity for small, local businesses (including firms owned by members of disadvantaged communities) to serve this sector.
- **Increasing labor demand and job creation:** The relative amount and quality of employment associated with GI versus gray infrastructure was not investigated as part of this report, but warrants further study. GI may be more job intensive than more capital-intensive gray infrastructure. However, GI may also be lower paid, given the given that much of the employment associated with GI is landscaping and lesser-skilled construction labor, occupations which are typically lower wage than “hard” construction.
- **Addressing equity in the industry:** GI investment can address social equity considerations. Many of the jobs created by GI investments can be filled by entry-level, historically disadvantage populations.

Additionally, good practices in the GI sector have the potential to influence the broader landscape services sector, which features substantial inequities. The landscaping sector employs over 1.2 million people, 43.7% of which are Hispanic.* However, Hispanic employees only represent 19.1% of first line supervisors.† Opportunities exist to purposefully improve the career development prospects for minorities in the landscaping profession, which may be catalysed by workforce development efforts related to GI investments.

■ **Greening practices across the sector:**

GI stimulates greener practices across the infrastructure, building construction and landscape industries. As these industries gain experience with greener practices, such as low impact development design or native plantings, they can transfer this knowledge to other landscape, building and infrastructure projects. Such experience and training may increase environmental consciousness and could lead to institutionalized best practices.

- **Fostering liveable communities:** Greener stormwater installations improve the beauty and quality of the built environment. They foster civic pride in the natural attributes of communities and attract residents who increasingly value a higher quality environment. For instance, in a study of a Seattle retrofit “green streets” program, land values for adjacent properties increased six percent.‡ GI’s potential to make neighborhoods more beautiful and healthy constitutes an important environmental justice opportunity; many inner-city neighborhoods lack adequate access to greenspace, and also feature older stormwater management and conveyance infrastructure that must be upgraded. GI

represents an opportunity to address both problems.

It is important that economic development practitioners move beyond a narrow focus on job creation and business development, to embrace a richer conception of economic development that includes greater social equity, community livability, and environmental quality. This report explores the extent of new job and business development opportunities created by GI, but also suggests that economic development practitioners should support the GI sector for the other benefits it can realize in local regions.

D. Methods and Purpose of this Report

This report draws upon case studies of the GI sector in New York City and Portland, two leaders in green infrastructure investments. It also includes a more limited review of Philadelphia, a city that has recently committed to making substantial investments in GI. The report is further informed by interviews with subject matter experts, academics, government officials, and trade association personnel involved in GI sectors. Additionally, to help identify business and workforce development issues and assess GI jobs impacts, an online survey of GI designers and contractors was conducted along with several detailed surveys that indicate the extent of employment, pay, and tenure of the GI workforce. This survey work had small sample sizes and only provides indicative results; further research on workforce and business operations within the GI sector is necessary to provide a more complete picture of these issues. The main goals for this report are to:

- Document existing initiatives and best practices connecting economic development with GI in New York City and Portland, Oregon.
- Articulate economic development and workforce development opportunities associated with GI, especially as a source of jobs for low income and less skilled workers.
- Identify ways in which EDOs and stormwater agencies can advance and foster economic opportunity in the GI sector.

* Labor Force Statistics, 2011. Bureau of Labor Statistics. <http://www.bls.gov/cps/cpsaat18.htm>

† Labor Force Characteristics by Race and Ethnicity, 2011. <http://www.bls.gov/cps/cpsrace2011.pdf>

‡ “Low Impact Development: An Economic Fact Sheet.” NC Cooperative Extension http://www.ces.ncsu.edu/depts/agecon/WECO/nemo/documents/WECO_LID_econ_factsheet.pdf

II. Green Infrastructure in Practice

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New York City, Portland, Oregon, and Philadelphia are national leaders in GI planning and investment. Each of these cities has been compelled to invest substantially in GI due to water quality regulations, notably to limit CSO volumes to comply with the federal Clean Water Act. In each of these cities, government and nonprofits have sought to create opportunity for local businesses and workers, and to realize improved economic development outcomes associated with GI investments. These actors' strategies are profiled in the cases below.

A. New York City

New York City has prioritized improved stormwater infrastructure and watershed health as part of the city's commitment to environmental sustainability as well as to meet the regulatory obligations set forth in the Amended Consent Order to reduce combined sewer overflows (CSOs) with the New York State Department of Environmental Conservation (NYSDEC). The Consent Order requires that the City reduce CSOs by 8.4 billion gallons per year below projected 2045 levels in order to comply with federal Clean Water Act standards, and the City faces steep fines for non-compliance.^{*} With a tightly constrained budget, the City sought the most cost-effective ways to reduce CSOs while maximizing combined benefits that address other sustainability goals. In 2007, PlaNYC, the City's long-term planning framework, called for increased investment in GI to complement gray stormwater infrastructure investments. PlaNYC established goals for improved water quality, reduced CSOs, and greater climate, recreational and neighborhood livability benefits associated with green infrastructure. The Plan tasked New York's Department of Environmental Protection, responsible

for managing New York's stormwater systems, with achieving these targets in partnership with other city departments.

New York City further developed its stormwater management approach in its 2008 Sustainable Stormwater Management Plan (SSMP). The SSMP assessed the costs of various GI techniques and the opportunities for integrating these strategies into the urban fabric of various watersheds. It then compared the cost of achieving CSO reduction targets using traditional gray infrastructure with a combined gray-green approach, finding that in many cases water quality improvements were more cost effective with GI strategies.[†] The SSMP launched 30 pilot projects to test GI techniques, their feasibility, costs, and benefits.

These initiatives laid the groundwork for New York's 2010 Green Infrastructure Plan (GI Plan). The GI Plan substitutes many of the gray infrastructure improvements dictated in prior state consent orders with more cost-effective green solutions, while also combining with other programs to achieve maximum benefits. Adopting many of the strategies and guidelines laid out in the SSMP, the GI Plan will reduce CSO volumes by an additional 1.9 billion gallons per year (gpy) beyond what the comparable gray infrastructure improvements would accomplish. The GI Plan consists of cost-effective gray investments, strategies to optimize the existing stormwater conveyance system, and green infrastructure installations. For each combined sewer watershed, the GI Plan identifies GI strategies appropriate for different land uses and identifies technologies and city policies appropriate to realize GI investment in these areas (see Table 1). This analysis suggests that forty-eight percent of the total

^{*} City of New York, "PlaNYC: A Greener, Greater New York."

[†] City of New York, "Sustainable SWM Plan."

GI stormwater capture potential needs to occur on existing private property, twenty-seven percent can be met via strategies in street right-of-ways, eleven percent in parks, and the rest in various public buildings and new developments. This breakdown affects polices and procurement models for GI installation, and the extent to which the City can influence GI investment.

The NYSDEC’s Consent Order and the GI Plan enshrine an adaptive management approach to GI planning, allowing for experimentation and monitoring of GI projects to guide future investment. Notably, the GI Plan establishes an inter-agency Green Infrastructure Task Force, whose membership includes the DEP, the Department of Parks and

Recreation (DPR), and the Department of Transportation (DOT), among several others. It also establishes a Green Infrastructure Citizen’s Group to facilitate public feedback and discussion about the GI Program and to help support the implementation of the goals in the GI Plan.*

CIVIL SOCIETY ADVOCACY

A number of civil society organizations and professionals are working to deepen New York City’s GI investment and to realize environmental and economic development outcomes above those necessary to meet regulatory mandates. Storm Water Infrastructure Matters (SWIM) is a coalition of about 70 organizations including community advocates, green infrastructure designers, educational organizations and others that advocates for increased GI investment and supporting policy. SWIM provides a convening platform for participants in the GI sector to interact and articulate shared interests, serving as a de facto industry association. Likewise, two community watershed organizations, the Bronx River Alliance and Newtown Creek Alliance, have identified and engaged in watershed restoration projects, and advocate for greater resources for GI installations.

GI Investment and Policies

The GI Plan committed \$192 million in capital dollars to a DEP-administered GI Fund between FY2012 and FY2015, which is invested through various city departments and agencies, and a grant program for private property owners.† In the Consent Order with the NYSDEC the city committed to spending \$1.5 billion on green infrastructure, and to leverage an estimated additional \$0.9 billion in private spending, by 2030, to meet its Consent Order CSO reduction targets and other water quality objectives.‡

Table 1. Projected volume of stormwater managed by GI by landuse type. NY GI PLAN 2010.

New Development and Redevelopment	5.00%
Streets and Sidewalks	26.60%
Multi-Family	26.60%
Parking Lots	0.50%
Parks	11.60%
Schools	1.90%
Vacant Lots	1.90%
Other Public Properties	1.10%
Other Existing Development	48.00%

* New York City Department of Environmental Protection, "NYC GI Plan."

† New York City Department of Environmental Protection, "NYC GI Plan."

‡ New York State Department of Environmental Conservation. March 2012. NYS-DEC & NYCDEP Announce Groundbreaking Agreement to Reduce Combined Sewer Overflows Using Green Infrastructure in New York City. <http://www.dec.ny.gov/press/80919.html>

DEP established the Office of Green Infrastructure (OGI), which implements the GI Program including projects such as:

- Right of Way Bioswales and Stormwater Greenstreets.
- Retrofits to publicly owned properties such as public schools, playgrounds, and New York City Housing Authority (NYCHA) housing.
- Neighborhood Demonstration Areas, consisting of multiple GI installations within individual neighborhoods, monitored for performance.
- Rain Barrel Giveaway Programs.
- A Green Infrastructure Grant Program that provides grants on an annual basis to private property owners, businesses, and non-profits implementing GI projects. During its first year, the program awarded \$3.8 million in grants to ten projects.

INTER-DEPARTMENTAL COLLABORATION

The DEP process involves substantial cross-departmental collaboration and coordinated procurement. For example, DEP's engagement with NYCHA involved both parties entering into a memorandum of understanding. NYCHA screens housing located in DEP targeted combined sewer sheds, identifying buildings that may already be upgrading roofing or landscaping and provide opportunities for GI. DEP proposes GI designs, which are approved by NYCHA's in-house landscape architects and engineers. The DEP manages construction administration of projects. The DEP has committed funds for maintaining GI installations on NYCHA property for the first 5 years; NYCHA manages and procures its own maintenance.

Likewise, the DEP, DPR and DOT have collaborated on the right-of-way bioswale standard design. The Bioswales project developed out of an existing Green Streets program between the DOT and DPR dedicated to increasing plantings in the streetscape. Dedicated DPR based maintenance crews will maintain the bioswales and other ROW green infrastructure.

FOSTERING INVESTMENT ON PRIVATE PROPERTY

The GI Plan recognizes that a significant amount of private land must be retrofitted or developed with GI features in order to reach stormwater management targets.^{*} To that end, in July 2012, following substantial engagement with industry and other departments, NYC established new on-site stormwater management requirements for new development projects and major renovations.

The City also established a one-year property tax abatement of \$4.50/square foot for owners who install a green roof. However, this abatement has not been widely used and several green roof designers and installers report that this incentive is too small to cover the incremental costs of a green roof installation.[†] In light of these concerns, the City recently extended the abatement period.

Lastly, the GI Grant Program has led non-profit housing organizations, businesses and educational institutions to implement GI projects.[‡]

Economic Development Strategies

A variety of procurement and workforce development efforts are positioned to realize equitable economic development outcomes associated with New York's GI investments.

TARGETED PROCUREMENT

The City's Local Law 129 (LL129) of 2005 created a Minority and Women-owned Business Enterprises (MWBE) program. LL129 specifies aspiration target percentages of procurement spending towards MWBEs on projects under certain size thresholds. The New York City Department of Small Business Services (SBS) certifies MWBEs and local business enterprises. SBS' Business Solutions Center recently launched the "Compete to Win" initiative, which is open to all MWBE contractors including those serving the GI space. This initiative includes

^{*} New York City Department of Environmental Protection, "NYC GI Plan."

[†] This comment was made a by multiple green roof designers.

[‡] New York City City Department of Environmental Protection, "GI Grant Press Release."

a variety of services to support MWBE businesses, including:

- Workshops and assistance to understand city procurement. The DEP has both participated in SBS workshops on MWEB and procurement policy, and held their own workshops.
- Providing solicitations to appropriate MWBE firms to bid on city projects.
- NYC Teaming, providing matching services to pair MWEB firms with others so they may compete on larger contracts.
- An Upfront Capital Loan program, which can fund contractors' labor, insurance and equipment requirements.
- A Bond Readiness service, providing advice and assistance in attaining surety bonds.
- A Corporate Alliance Program, which helps connect MWEB contractors to private sector institutions.
- Strategic Steps for Growth, a nine month executive education program for MWBEs.
- An NYC Construction Mentorship service. The service provides technical assistance and on the job training for MWEBs.*

In addition to building the capacity of MWBE contractors, some procurement tools enable DEP project managers to target MWBE firms. For instance, the DEP issued a Request for Qualifications for GI installations specifying that they would only accept responses from MWEB firms, or firms in a joint venture or subcontracting greater than 50 percent of the awarded work to a MWBE firm.†

COMMUNITY WORKFORCE PROVISIONS IN PROJECT

* City of New York Mayors Office of Contract Services and Department of Small Business Services. Minority and Women-Owned Business Enterprise (M/WBE) Program: Annual Report for Fiscal Year 2012.

† NYC DEP. General Contractor Request for Qualifications for Green Infrastructure Improvements at Edenwald Houses. http://www.nyc.gov/html/sbs/nycbiz/downloads/pdf/summary/selling/DEP_Prequalification_Application.pdf

LABOR AGREEMENTS

In 2009, the City agreed to a series of Project Labor Agreements (PLAs) with the New York City Building and Construction Trades Council (BCTC). In addition to providing standard agreed upon terms of employment and dispute resolution tactics on city projects, the PLAs specified targets for equitable economic development. Notably, the City and BCTC agreed that 45 percent of new apprenticeship positions be filled by New York City residents. Of these apprenticeships, the agreement specifies that 10 percent be graduates of New York public high schools referred by the Construction Skills pre-apprenticeship program; 10 percent veterans, referred by the Helmets to Hardhats program; 10 percent women; 10 percent NYCHA or Section 8 housing residents; and 5 percent employees of MWEB employers or other employers not signatory to the PLA.‡

The applicability of these PLA agreements to GI projects appears limited, however. The PLAs note that they do not apply to contracts for work on streets and bridges, nor to any specify construction in Parks; thus, they do not seem to apply to the majority of the current city contracting on GI projects. Some GI installations on city buildings, such as green roof installations or onsite BMPs, may be covered by these PLAs, however. Nonetheless, these community workforce provisions provide a good model for how greater economic development outcomes could be achieved via city contracting.

WORKFORCE DEVELOPMENT

Several training programs and workforce diversity initiatives support the GI industry in New York City. The Bronx Environmental Stewardship Training program (BEST), run by Sustainable South Bronx (SSBX), has operated since 2003. Two training programs are offered: BEST Ecology relates to green infrastructure and BEST 4 Building to energy improvements. BEST Ecology provides construction, horticultural, and employment readiness skills for low-income, unemployed Bronx residents and seeks to place them with firms active in green infra-

‡ Maria Figueroa, Jeff Grabelsky & Ryan Lamare. October 2011. Community Workforce Provisions in Project Labor Agreements: A Tool for Building Middle-Class Careers. Cornell University ILR School.

structure.^{*} An impact statement from 2011 indicates that 300 trainees graduated from BEST's programs, and that 82 percent of these graduates had retained their jobs after three years.[†] SSBX works to place graduates, liaising with industry and workforce development organizations that can facilitate job search and placement. The SSBX has made connections with the Bronx River Alliance and other green infrastructure advocates, to have BEST graduates engage on their GI projects.

The New York City Horticultural Society (the "Hort") runs a similar training program providing a Green Infrastructure Technician credential, (developed by some of the same staff who developed BEST). The Hort recruits via a network of community economic development partners and the GreenHouse, a training center that the Hort established on Rikers Island in 1996 to provide inmates with horticultural and vocational skills following their release. The Green Infrastructure Technician program involves 200 hours of training in stormwater management systems and best practice designs, construction safety, horticulture, and other skills. The program launched in January 2012. As of August 2012, it had served three cohorts of about 15 participants each, with around a 50% retention rate. Program graduates receive a range of certifications, including:

- OSHA Construction Safety and Harness Safety.
- Pervious Concrete Contractor Certification Program – National Ready Mix Concrete Association.
- Citizen Pruner Tree Care Designation - Trees of New York.
- Live Roof Installation Technician – Training for a proprietary extensive green roof system that is available nationally.
- Trainings offered by the New York City DPR.

^{*} Annette Williams, Sustainable South Bronx, "Interview with Annette Williams."

[†] GuideStar. 2011. Sustainable South Bronx – Quick View. <http://www.guidestar.org/organizations/02-0535999/sustainable-south-bronx.aspx>. These values are for both BEST Ecology and BEST 4 Building; the number of BEST Ecology graduates is likely smaller. Queries to SSBX on total current graduates were not returned by the time of publication of this report.

The Hort's Program manager regularly evaluates and integrates other trainings into the program as costs allow. The Green Infrastructure Technician curriculum continues to evolve, based on the Hort's interaction with industry and as new credentials become available.

The Hort works closely with community organizations, including the South Bronx Economic Development Corporation and the Rutgers University Heldrich Center for Workforce Development. These organizations provide case management for the Hort's graduates, assist with outreach to industry, and facilitate placement of graduates. Hort staff note that relationships with organizations providing trainee case management and placement is critical to graduates' success, and allows the Hort to focus their resources program development and liaising with industry. They further note that community EDOs often need guidance on understanding the green infrastructure service area and the types of firms serving this area. Once they receive this guidance from the Hort, they are able to manage ongoing placement and job prospecting.

The Hort also operates a fee-for-service design-build landscaping firm, the Green Team. Many Green Infrastructure Technician and GreenHouse graduates work with the Green Team until they are placed with other firms.

Graduates of the SSBX BEST and the Hort's programs have gone on to work for various smaller landscaping companies, green roofing firms, solar installations firms, and others. The Hort notes placing trainees in major landscape contracting firms has proven difficult.

BUSINESS IMPROVEMENT DISTRICT ACTIVITY

New York's Business Improvement Districts (BIDs) are established and overseen by the SBS. The purchasing power of BIDs is substantial; in the past twenty years, New York BIDs provided nearly a billion dollars worth services, infrastructure, and neighborhood improvements.

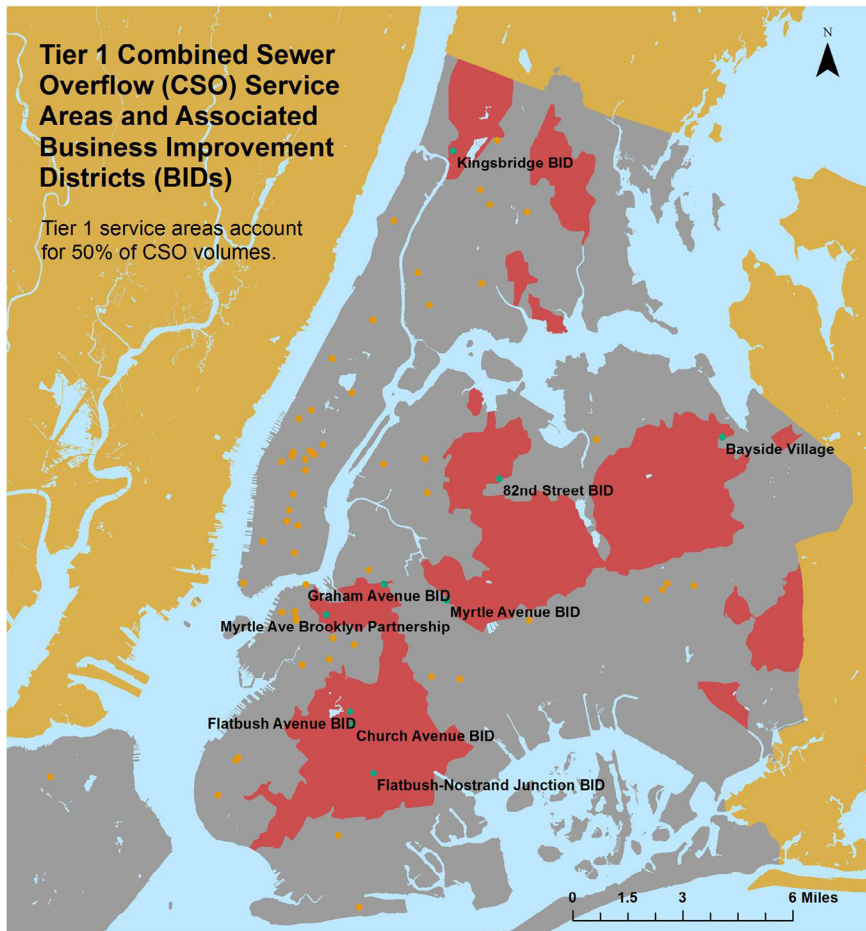
A few BIDs have engaged in Green Infrastructure projects to enhance communities' environmental attributes and beautify the neighborhood. The

Hudson Square BID is installing tree pits, permeable pavement, planted rainwater containers and green fences, as part of a neighborhood improvement project estimated at \$27 million. They intend to apply for the next round of DEP grants and are using their property assessments on district properties to repay funds borrowed from a bank and the City to complete this project. The BID does note that it is prepared to manage certain GI features, such as bioswales and tree trenches, while the City will maintain pipes connected to the stormwater system. Likewise, the Columbia Avenue BID has installed GI as part of its neighborhood improvement projects.

Moreover, BIDs have capacities that may be valuable in expanding private sector adoption of GI

practices and effectively maintaining GI infrastructure. Many larger BIDs are responsible for designing and maintaining the streetscape, including street trees and plantings. This maintenance experience may be an efficient and effective way to expand GI maintenance capacity. Since BIDs are funded by property assessments, they often work closely with private property owners; these relationships could be useful in educating developers and property owners about the city's new stormwater management regulations, green roof tax abatement and GI grant programs, as well as promoting use of BM by private property owners. As Figure 3 shows, there are BIDS throughout New York City, including many within DEP's three priority CSO areas in the Bronx, Brooklyn and Queens. The DEP has anticipated these oppor-

Figure 3.



BID locations from NYC OpenData, 2013; CSO Service Areas from NYC Green Infrastructure Plan, 2010. Detailed Boundary File and Water File from ESRI Data and Maps, 2000;

tunities, and intends to explore opportunities to coordinate their GI installation efforts with BIDs.

B. Portland, Oregon

Portland has long been a leader in GI approaches to stormwater management and ecological restoration, having experimented with these strategies since the 1980s. It was one of the first cities to propose GI deployment in response to CSO abatement requirements under the CWA. The City views GI as a response to multiple local, regional, state, and national goals and regulations relating to stormwater quality, environmental restoration, and public health.

Portland's 2005 Watershed Management Plan formally established a "watershed approach" to stormwater management and ecological restoration. The city analyzes multiple scenarios to determine what combination of green and gray infrastructure best meets regulatory requirements and other city goals. The city's Bureau of Environmental Services (BES), which manages its stormwater systems and watersheds, has developed detailed hydrological models of these systems. Using these models, the BES analyzes which city blocks are responsible for CSOs and other stormwater pollution, and the amount of stormwater detention required to mitigate these problems. The BES plans for GI installations on private and public property, and for gray system upgrades, as needed.

GI Investment and Policy

The BES invests in a diversity of projects involving GI, gray infrastructure, and other improvements; due to a mix of infrastructure involved in these projects, city staff is unable to estimate the total amount of BES spending on GI alone. However, notable recent GI expenditures include:

- The **Tabor to River** program, which will spend \$81 million over five years on gray and green infrastructure.
- The 2008-2012 **Grey to Green (G2G)** initiative, which entails \$48 million for a

range of GI projects, including ecoroofs, green street bioswale implementation, re-vegetation of native plants, invasive removal, culvert replacements, as well as land acquisition for stormwater management and naturalization purposes

- The 2010-2013 **Green Streets Program** funds, which include \$20 million in capital funding for infrastructure serving both stormwater management and bicycle path purposes.*

Additionally, the Bureau of Transportation, Bureau of Parks, and other regional public agencies invest in GI stormwater management. Notably, the City's "1% for Green Fund" charges one percent of the budgeted costs of non-SWM road projects, and supplies grants to organizations wishing to build SWM projects in the right of ways in their community.†

Throughout Oregon there is increased investment in ecological restoration of stream banks, logging roads, highway infrastructure, previously developed lands, and other areas. This restoration work responds to various environmental regulations, such as requirements for habitat protection under the Endangered Species Act, as well as voluntary objectives. The Freshwater Trust is a non-profit that builds and brokers restoration projects; one staff person estimated that there is \$50 to \$60 million in annual spending on ecological restoration projects in the state of Oregon. Much of this work involves similar design and landscape contracting procurement to GI, as well as involving greater work for hydrological engineers, horticulturalists, ecologists, and restoration specialists. The extent to which this work is available to contractors and labor markets in metro Portland is unclear, though much is performed by rural firms and workforce.

BES PROGRAMS AND INCENTIVES

The BES has established a range of programs to implement GI in private and public lands, funded with sources noted above as well as private investment. These programs include:

* NRDC. 2011. *Rooftops to Rivers*.

† Portland Bureau of Environmental Services, "1% for Green."

- The **Downspout Disconnection Program**, in operation since 1993, involves funding and project management for private property owners. The program targets both residences and larger commercial and industrial properties. The BES conducts outreach to households and businesses in targeted areas, promoting installations of green roofs, rain gardens, or other GI. The BES designs and manages installations, using contractors on retainer. The BES also provides incentives directly to property owners to undertake this work, though the large majority of property owners opt to have the BES manage these projects.
- The **Treebate Program**, which provides up to 50% of the cost for trees that are installed on private property or street boulevards.* The BES provides contractors to install trees, and provides area residents installation training. Under this program, using G2G funds, the City estimates 33,000 new trees will be planted on private lands and a further 50,000 trees will be planted on city properties and streets.
- The **Green Streets Program** installs GI in the street right-of-way. The BES is experimenting with training residents in maintaining these installations. It is also monitoring performance, and contracting with landscapers to provide maintenance services as needed. G2G and other green street funding will provide 920 stormwater curb extensions, bioswales and tree planters on city streets.
- **Revegetation** and invasive species removal efforts, for which G2G projects are expected to remediate 350 acres of public natural area in the city.
- **GI grants** that fund various GI installations on private and public property.

The BES typically analyzes the avoided cost of gray infrastructure realized by GI investments. The BES is willing to spend up to this avoided cost on

* Portland Bureau of Environmental Services, "Plant a Tree for Clean Rivers and Get a Rebate."

GI, on a dollar per volume of water detained. The BES stages its engagement using different types of infrastructure and programs. Once it has identified stormwater system catchments where reduced runoff is required, the BES first focuses for two years on the upgrades achievable on private property; next employs GI upgrades on public lands including street right-of-way and park retrofits; and finally uses gray infrastructure to realize any remaining required stormwater detention capacity requirements.

The programs on private property noted above use a range of incentive mechanisms to encourage GI installations. Notably, the BES offers:

- An **Ecoroof Incentive**, which provides rebates of \$5 per square foot of green roof space. Contractors and industry analysts note that this can help cover substantial portions of the incremental costs of a new or retrofit modular extensive green roof. More intensive and specially designed green roof systems typically result in significantly higher costs, and the Ecoroof incentive does not cover a large percentage of those projects. While offering the same dollar value as New York's tax rebate, the grant program involves less soft costs in applications and applying the rebate.
- The **Clean River Rewards Program** credits property owners on their stormwater bill for stormwater retrofits such as downspout disconnections and rain garden installations.† Property owners must agree to properly maintain GI to receive this reduced stormwater bill.

Economic Development Strategies

In its Portland Plan, the cities' long term community development plan, the city recognizes the GI industry as an important "urban innovation" cluster, and that the region possesses exportable GI design services and a GI systems manufacturing base. The Portland Plan further suggests that the economic development outcomes associated with GI can be improved by targeting jobs and contracts to local and

† Portland Bureau of Environmental Services, "Stormwater Discount Program."

historically disadvantaged communities via community workforce agreements and collaboration with nonprofits.* The sections below reviews the city's targeted procurement policies, how the non-profit Verde has developed a GI workforce from disadvantaged communities, and how the demand for GI in the region has led to the development of design and manufacturing firms serving export markets.

TARGETED PROCUREMENT

The city has taken progressive efforts to increase its procurement of services from minority-owned, women-owned and emerging small businesses (MWESBs).† These efforts expanded following a 2009 Disparity Study suggesting that minority owned-businesses comprise 0.6 percent of city procurement spending, and women owned businesses 1.9 percent. Subsequently, the Procurement Services Division (PSD) in the city's Bureau of Internal Business Services accelerated efforts to increase equity in the ownership and workforce of the city's procurement, particular in the construction sector. In the summer of 2012, the city Council adopted two key policies furthering these goals: A Social Equity Contracting Strategy, expanding the PSD's MWESB procurement efforts, and a Model Community Benefits Agreement policy, applicable to large city construction projects over \$15 million.

SOCIAL EQUITY CONTRACTING STRATEGY

The PSD's Social Equity Contracting Strategies and resources for MWESB contractors include:

- **Tracking and regular reporting** of MWESB hiring rates in various departments.
 - **Fair Contracting Forum:** Since 2009, the city has convened contractor trade associations and workforce development organizations to identify means to allow contractors to access city projects and ensure that city procurement policies are fair and transparent. This organization addresses the timely payment of contractors and required contractor insurance
- **Capacity building** for MWESB contractors – The PSD offers MWESB contractors a Prime Contractor Development Program, providing training, mentoring, and business planning assistance. They also convene outreach events, provide information about city procurement, and build relationships with city project managers through a Regional Mentor-Protégé program.
 - **A Workforce Training and Hiring Program:** For contracts above \$200,000, and sub-contracts above \$100,000, the PSD requires that 20 percent of labor hours in apprentice-able trades be performed by registered apprentices. Additionally, it establishes targets of at least 18 percent minority and 9 percent female labor hours worked by apprentices and journey-people level workers.
 - **Good Faith Hiring** efforts: To support its aspirational labor targets, the PSD introduced a Good Faith Efforts protocol. Contractors must document hiring processes, including a written record of requests to union hiring halls, apprenticeship programs, and Oregon workforce development programs.
 - **Minority Evaluator Forum:** Since 2009, the city requires a representative of the Alliance of Minority Chambers, an association of ethnic organizations and minority businesses, to sit on city contract selection panels.
 - **A Sheltered Markets Program (SMP) and related procurement evaluation policies,** which favor MWESB and firms providing other economic development benefits on smaller city contracts. The SMP founded in 1997, has gone through different iterations. The procurement policies which enable BES project managers to engage in contracts which facilitate MWESB involvement and similar economic development outcomes include:
 - For some contracts below a minimum threshold (recently \$50,000), only MWESB

* City of Portland, "Portland Plan."

† The Business Oregon agency Office of Minority, Women and Emerging Small Business certifies MWESB firms.

firms may be eligible, providing the city receives a sufficient number of bids.

- For some “on-call” contracts below a minimum threshold (recently \$50,000), project managers can specify in their bid evaluation criteria that contractors will be rewarded for providing workforce development and training, hiring diverse employees, and other factors. These factors comprise up to 15 percent of the total points awarded to firms as part of bid evaluations. On-call contracts can be renewed for multiple years without reevaluation.
- For low-bid RFPs (recently contracts above \$50,000), the city enacted minimum equitable hiring requirements for contractors, including the Good Faith Hiring policies noted above and other criteria that the PSD and project managers agree upon.

BES project managers and the non-profit social enterprise Verde (see below) note that these procurement policies have helped create greater opportunities for landscaping contractors to provide better quality jobs and workforce development opportunities. Indeed, the Ecoroof Incentive program, downspout disconnection projects, street tree programs and others have purposefully contracted with Verde because of their quality jobs standards and focus on career development for disadvantaged minority and women employees.*†

COMMUNITY BENEFITS AGREEMENT POLICY

While the city’s procurement policies have increased contracts with MWESB firms, including GI contracts, Portland’s total percentage of procurement from MWESB firms remains low. The vast majority of large construction projects do not utilize MWESB firms. To achieve greater equity in total contracting and employment, the city has actively engaged with the Metropolitan Alliance for Workforce Equity (MAWE), an alliance of community-based organizations,

contractor associations, unions, and pre-apprenticeship programs dedicated to increasing workforce diversity and opportunity for disadvantaged communities in the construction trades. MAWE members negotiated the Model Community Benefits Agreement for city construction projects over \$15 million, which was adopted as city policy in September 2012.

The Model Agreement solidifies union labor as an important part of city procurement, increases diversity in union membership and apprenticeship programs, ensures greater local employment, and provides for quality jobs. The agreement stipulates that:

- Contractors must hire from union hiring halls, though state-certified disadvantaged businesses can retain their existing crews, provided their pay and benefits are equivalent to union wages.
- Contractors make a good faith effort to hire minimum proportions of minorities (18 percent) and women (9 percent), and that these ratios be achieved for both journeypeople and apprentices.
- Apprentices conduct a minimum percentage of work (20 percent for contracts greater than \$200,000).
- 20 percent of construction costs go to MWESB or disadvantaged businesses, which also receive a five percent bonus in bid evaluations.
- 30 percent of the workforce are residents of U.S. Small Business Administration “historically underutilized business zones”.
- 1.5 percent of construction costs will go towards monitoring and enforcement of the Model Agreement, towards workforce development and training via Worksystems Inc, a non-profit coordinating the city’s workforce investment, and for capacity building of MWESB firms.

The Community Benefits Model Agreement promises to generate greater local economic development benefits and more equitable outcomes in contracting

* Portland Bureau of Environmental Services, “Ecoroof Incentive.”

† Alan Hipólito, Verde, “Interview with Alan Hipólito.”

and employment for minority, women and economically disadvantaged communities. The \$15 million threshold will not include many GI investments, but it may facilitate these outcomes on GI investments within larger projects. It provides a policy approach that other cities can replicate to promote more equitable and shared benefits from large public sector or publically funded projects.

VERDE – THE ROLE OF SOCIAL ENTERPRISE AND COMMUNITY ENGAGEMENT

Established in 2005, Verde is a social enterprise based out of Portland's Cully neighborhood, a lower income neighborhood with a substantial Latino immigrant population. Verde began as a spinoff venture from Hacienda Community Development Corporation, which serves the Northeast Portland area. Verde undertakes environmental improvements in low-income neighborhoods while providing well-paying jobs for community members. Verde manages a number of social enterprise units, including a home energy upgrade enterprise (Verde Energy), a landscape contracting firm specializing in GI (Verde Landscape), and a nursery (Verde Nursery). The ventures are often capitalized with grant funds. Hacienda provided early demand as well as office space and other resources for Verde. Verde's energy and landscaping ventures are currently self-sustaining businesses.

Verde Landscape anticipated revenues of \$750,000 in 2012, mainly from green streets maintenance and street tree planting contracts with the City of Portland. Verde has successfully carried out numerous public GI contracts. Verde also worked with BES project managers to incorporate employment and economic development criteria in city procurement documents.

Verde realizes substantial economic development benefits in its work. Verde hires predominantly lesser skilled Latino immigrants. The organization provides its landscaping employees wages and benefits that exceed those of most contractors in the region.* In 2012, they employed 17 workers total in the peak

* Verde's Executive Director, Alan Hipólito, states that the organization's wage grid of \$12 - \$15/hour plus benefits often amounts to nearly double the labor cost of many competitors. Source: Personal Interview, 2012.

season, and eight year round.

Verde works to advance upward mobility among its employees, but faces the challenge that many employees do not want to give up the quality employment that Verde offers. To address this challenge, Verde has begun engaging employees in substantial career development planning. In summer 2012, Verde hired a Training Liaison to update employee individual career development plans every six months, and Verde regularly evaluates career progress of employees. Employees are encouraged to develop within various employment tracks, which include advancement within Verde, placement with another contractor or for-profit landscaper, or starting their own business.

Verde invests heavily in employee development and training, with the typical employee receiving 80 hours of paid training per year. Verde has developed its own basic training program, which includes job safety, job readiness, personal finance, and training modules focusing on landscaping and GI principles. Much of this learning is completed on the job. Verde provides employees with relevant certifications where possible, such as the Oregon Department of Agriculture's Commercial Pesticide Applicator certification. However, Verde notes that many skills pertinent to their work are not recognized with discrete credentials; moreover, much of their crew (like the broader national landscaping profession) is not fluent in English, but many landscaping related certifications are not offered in Spanish.

Verde is successful in organizing GI projects in Northeast Portland, in large part because community members like the idea of supporting high quality jobs for a local workforce. Verde facilitates community organizations obtaining GI grants from the BES, as well as serving as an information conduit to alert community members to city programs and incentives. In this way, Verde facilitates neighborhood greening and revitalization in a historically disadvantaged community, while expanding markets for Portland's GI programs.

INCLUDING GI AS PART OF BUSINESS TECHNICAL ASSISTANCE AND PROMOTIONS

The City of Portland's Bureau of Planning and

Sustainability's Sustainability at Work program matches businesses with a Sustainability Advisor free of cost. The Advisor provides businesses with advice on a wide range of greening services available to them at low to no cost, including the City of Portland's various stormwater management programs.

SUPPORTING LOCAL EXPORTABLE CLUSTERS

Portland's emphasis on GI, and its push towards green building and sustainable city development more broadly, support a growing cluster of GI designers and manufacturers. For example, Columbia Green, a modular green roofing system manufacturer, founded in Portland, serves regional markets, and has since expanded into national markets. Filterra, a modular stormwater detention system producer, uses local manufacturing facilities. The emergence of these firms suggest that strong stormwater policies foster local expertise and businesses that serve export markets, contributing to an expanded and more competitive regional economy, with the support of state and local EDOs.

More broadly, local businesses, the City of Portland, the regional economic development corporation, Greater Portland Inc., and Business Oregon all recognize and promote the region's expertise in green development. These organizations' collective We Build Green Cities regional marketing campaign promotes green infrastructure design, development and manufacturing firms. The Portland Metro Greenprint engaged the green building design and development industry, which includes stormwater management and green infrastructure experts, to identify strategies to grow their business. The Greenprint has subsequently informed Greater Portland Inc.'s Comprehensive Economic Development Strategy, which prioritizes regional marketing; support for new green ventures; and alignment

between higher education, the workforce development system, and economic development initiatives.

C. Philadelphia

The City of Philadelphia is emerging as a national leader in stormwater management. This case does not aim for a comprehensive review of the city's GI activities nor their efforts to realize economic development outcomes associated with GI – a much more thorough case of these efforts is provide by other authors.* This case is provided for comparative purposes with New York and Portland.

Like many cities in the U.S., Philadelphia must reduce CSO volumes to comply with consent orders for CSO overflows under the Clean Water Act. The city has worked with the State and the Environmental Protection Agency to develop its Green City Clean Waters (GCCW) initiative, predicated on meeting their CSO targets largely using GI. Philadelphia intends to begin targeting public areas for GI, which cover a total of 45% of impervious land area in its CSO. It anticipates ramping up programs on larger properties, followed by residences, as appropriate. GCCW is specifically targeted at watersheds that contain combined sewer systems, which covers 48 percent of the City. Additionally, the Philadelphia Water Department (PWD) leads integrated watershed management plans, which are multi-stakeholder, cross-municipality efforts to achieve specified water quality, environmental preservation and recreation goals for individual watersheds. These efforts coordinate several cities' stormwater management and ecological restoration, and establish watershed-based goals for reducing stormwater flows, pollution,

* Living Cities. Publication forthcoming.

Table 2. Percentage of impervious cover in Philadelphia CSO sheds. Source: PWD GCCW Program Summary, 2011.

STREETS	ALLEYS, DRIVEWAYS, WALKWAYS	SCHOOLS	PUBLIC FACILITIES	PARKING	PUBLIC OPEN SPACE	COMMERCIAL & INDUSTRIES	RESIDENTIAL
38%	6%	2%	3%	5%	10%	16%	20%

and enhanced amenities.

GI Investment and Policy

The GCCW plan has a 25-year implementation period. Over that time, PWD projects:

- A \$1.2 billion net present value (NPV) investment in stormwater management, focused predominantly on GI.^{*}
- Approximately \$480 million in stormwater-related plan review, stream restoration and public outreach spending.[†]
- Private sector investment of over \$300 million NPV.

In addition to specific GI techniques, the City has implemented several policies designed to increase on-site SWM:

- The City charges a stormwater fee, based on the percentage of impervious surface on their property. Property owners can reduce their fee payments by implementing on-site stormwater management measures.
- A tax credit is available for businesses that install green roofs.[‡]
- In the case of new development projects, the City has mandated that the first inch of stormwater be managed on-site, and has published a manual of different on-site management techniques.[§]

^{*} Includes construction and maintenance spending.

[†] Philadelphia Water Department, "Green City, Clean Waters Program Summary."

[‡] Philadelphia Department of Revenue, "Business Privilege Tax - Green Roof Tax Credit."

[§] Philadelphia Water Department, "City of Philadelphia Stormwater Management Guidance Manual."

D. Conclusions

Given their extensive investment in GI, New York, Portland, and Philadelphia's experiences suggest lessons and opportunities for other cities to realize economic development opportunities in this emerging sector. Below, we summarize important themes from the New York and Portland cases, including: parallels in cities' governance of GI investments; the general lack of participation by city and regional scale EDOs in GI planning to date; the importance of targeted procurement policies to realize economic development in disadvantaged communities; city policies to increase demand in GI; and the importance of community scale organizations in providing access to disadvantaged communities to GI jobs, business, and installations.

GI GOVERNANCE

The reviewed cities all engage in planning to estimate the amount of GI that will be required to meet city goals and regulatory requirements. They use detailed watershed, stormwater, and sanitary sewer hydrological modeling to estimate the amount of investment required in different regions; the granularity of these models differs between cities. These models allow the cities to estimate what neighborhoods require what volume of stormwater diversion. From these efforts, they can extrapolate the extent to which GI will have to be implemented in public parks, street rights of way, and/or private property. Likewise, cities and other agencies project the levels of investment in GI required to meet other goals, such as habitat restoration.

Such modeling efforts allow cities to make rough estimates of the costs of GI implementation. These cities have engaged in detailed benefit/cost analyses to determine the costs of GI strategies compared to more traditional gray strategies, including a wide array of environmental, social and economic parameters, along with the amount of spending estimated to be associated with GI and gray infrastructure.

However, GI retrofit markets and programs are still in their infancy, and it is unclear what the ultimate costs of GI program delivery will be. Ultimately, GI programs and installations will be driven by the price

of different interventions, as well as their demand by private and community organizations. Thus, the mix of GI BMPs that each city will ultimately implement will change over time, as will the associated investments, contracts, and job impacts.

To manage this uncertainty, and direct resources to the most beneficial infrastructure strategies as they emerge, these cities have adopted an explicit strategy of adaptive management. To meet CSO consent order requirements and other regulatory commitments, cities commit to varying levels of spending on stormwater management deemed to meet these requirements. However, the programs to which they deploy this spending will evolve.

LIMITED PARTICIPATION BY CITY AND REGIONAL SCALE EDOS, NOR ARTICULATION OF GI'S ECONOMIC DEVELOPMENT POTENTIAL

Involvement by City scale economic development agencies in GI planning and implementation processes has been limited to this point. New York's economic development agencies (including the New York Department of Small Business Services, Center for Economic Opportunity, and Economic Development Corporation) have not been significantly involved in GI planning; likewise, though Portland's EDOs have promoted green building broadly, they have not been involved the GI planning efforts.

Furthermore, strategies to realize greater local economic development benefit from GI investments have not been clearly articulated by New York and Portland. Our interviews from these cases, and survey of the broader industry, suggest that some stormwater management authority staff people recognize that targeting jobs and contracts to disadvantaged communities is an important economic development priority; others prioritize targeted

contracting to a lesser degree, or perceive budget constraints as hindering these opportunities. Despite the recognition by some stormwater agencies that GI investments can realize economic opportunity, they have not clearly articulated the economic development potential associated with these investments.

PROCUREMENT POLICIES TO TARGET DISADVANTAGED COMMUNITIES FOR ECONOMIC BENEFITS

Despite limited consideration of strategies to achieve economic development impacts as part of GI investments, broader policies targeting city procurement to certain communities are poised to support positive economic development outcomes in the GI sector in both New York and Portland. Both cities have procurement policies supporting MWESB firms. In Portland, the City's targeted procurement policies allowed BES project managers to reward contracts to enterprises that realized economic development benefits – these policies include targets and preferential procurement procedures for firms owned by people of historically disadvantaged communities; for firms employing workers from disadvantaged or local communities; and business development resources. Similarly, New York's DEP has specified that submissions of qualifications for some projects may only be submitted by teams including MWEB firms. Both cities provide a range of technical assistance and capacity building for MWESB firms, at varying stages of programmatic development.

Additionally, the Portland case illustrates how the BES's liaison with Verde allowed for positive workforce development outcomes and GI investments in underserved communities.

DEMAND FOR GI DRIVEN BY PUBLIC AND PRIVATE SECTOR INVESTMENT AND POLICIES

Table 3. Procurment Strategies in New York and Portland

PROCUREMENT STRATEGIES	NEW YORK	PORTLAND
Preferential procurement for local/MWESB contractors	✓	✓
Community workforce agreements	✓	✓
Business development for MWESB firms.	✓	✓
Stormwater authority coordination with non-profit for workforce development & community benefit		✓

Cities' stormwater management planning is a major source of investment in GI. Additionally, cities' stormwater management policies drive private sector investment. Such policies include stormwater management development standards; incentives for GI installations, including cash sources such as grants or direct rebates, as well as tax rebates; stormwater fees that account for the volume of runoff produced by sites, with reduced fees allowed when property owners document GI installations; and the introduction of financing tools to facilitate retrofits of GI strategies into properties. The following table summarizes City policies.

The cases in this report suggest the importance of community-based organizations to facilitating positive development outcomes in the GI sector. SWIM, SSBX and the Hort in New York, as well as Verde and watershed advocacy groups in Portland, illustrate the important functions of community scale organizations. These groups recruit disadvantaged people into the GI workforce and provide training and work experience that can facilitate advancement in the landscaping industry. Verde and the Hort operate social enterprises, providing sources of relatively well paying work for their trainees, and assistance with career planning. Verde has served as a broker and advocate for projects that retrofit GI into lower income neighborhoods, providing increased neighborhood amenities for disadvantaged communities.

COMMUNITY SCALE ORGANIZATIONS IMPORT TO ECONOMIC DEVELOPMENT IN TARGET COMMUNITIES

Table 4. Policies to Stimulate Demand for GI in the Private Sector

POLICIES	NEW YORK	PORTLAND	PHILADELPHIA
Standards for new development	✓	✓	✓
Financial incentives for GI installation	✓	✓	✓
Tax rebate for GI installation	✓		
Stormwater user fees scaled to runoff volume proxies		✓	✓
Considering financing tools for GI retrofits	✓	✓	✓

III. The Economic Development Potential of GI Investment

The cases of New York and Portland in the previous chapter suggest that community-based organizations and city-wide targeted procurement policies have been the main driver of economic development in the GI sector. City or regional scale EDOs have not focused on this emerging sector and cities, philanthropic and civic groups have not created comprehensive strategies to link GI investment to economic and community development goals. To help EDOs recognize the opportunities associated with the GI sector and to inform more strategic and comprehensive initiatives, this chapter focuses on the potential economic development outcomes in the GI sector, and suggests priorities for realizing these outcomes. It begins by describing the major components of GI investment activity, and the type and number of jobs that GI investments may create. It then notes considerations for workforce development, business development, and engaging community organizations that are vital to address in creating a GI economic development strategy.

A. Major Components of Investment Activity

GI investment is diverse and decentralized. On the demand side, different government agencies and private sector actors are involved in procuring GI. Likewise, on the supply side, firms from multiple industries are involved in the design and delivery of GI projects. The following sub-sections summarize

the different forms and sources of demand for GI installations and the various sectors involved in GI supply chain. This characterization of the GI sectors draws on our cases, and interviews with a range of GI industry participants.

Demand of GI

At the city scale, stormwater management agencies are responsible for a large portion of spending on GI projects. Their procurement is typically broken into a range of different programs, utilizing different GI techniques. Additionally, City stormwater management agencies, such as New York's DEP, fund GI installations by other departments; these other departments may likewise fund some GI installations from their own budgets, and be involved in the management of projects to varying extents. State and federal transportation, environment protection, and natural resource agencies are also involved in procuring GI for stormwater management.

Private property owners are also increasingly expected to invest in GI for stormwater management, driven by public grants, incentives, stormwater system charge structures, regulations and design standards for new developments, and growing ecological awareness. The extent of private investment is evolving and its scale remains unclear, but it will be influenced by future government policy, social values and professional practices. Cities typically assume that government spending will exceed private sector spending.

Private sector spending may be mediated through government project management to varying degrees. For example, most GI installations on private property that are delivered through Portland's BES programs are directly managed by BES staff. However, some cities have structured their programs differently, pre-certifying contractors and having them contract directly with property owners. These differences in organizing demand for GI will influence the appropriate strategies to engage the demand side to advance economic development goals. When city agencies are selecting contractors, city procurement policies are an effective way to affect outcomes. However, when multiple property owners ultimately serve as the customers and contract managers, different strategies are required to link contracting with strong economic development outcomes.

Ecological restoration by public and private actors is another significant source of GI demand. All three city environmental departments profiled in this report are investing in ecological restoration. In some regions, the spending on ecological restoration by industry and state government is substantial – for example, the estimated \$50-60 million spent on GI for habitat restoration purposes in Oregon exceeds annual spending on the BES's G2G initiative. However, the geography of this restoration work needs to be understood to determine if it is feasible to integrate into a city or metropolitan GI economic development initiative. When restoration investment are primarily rural, they may be inaccessible to urban labor markets and need to be addressed in rural economic and workforce development plans.

Supply of GI

The delivery of GI is spread across different sectors. The extent to which these different sectors are involved depends on the type GI installed, and the extent to which a GI installation is standardized or "commodified" to reduce the need for design professionals.

DESIGN

Landscape designers, landscape architects, architects, civil engineers, and environmental engineers all are involved in the design of individual GI applications, as well as in product design of modular GI stormwater management systems. Many riparian ecological restoration projects involve hydrologists, horticulturalists, ecologists, and restoration specialists. In New York and other cities, a number of entrepreneurs with an architecture or construction background have established design-build green roof firms, integrating design and construction capacity in one enterprise.

CONSTRUCTION CONTRACTING

A range of contractor services may be involved in building or installing GI installations, including:

- General construction contractors.
- Landscape contractors.
- Roofing contractors.
- Heavy construction and other specialty services, including excavation, grading, concrete breaking, pipe laying, concrete laying, and tree planting.

The extent of unionization in these contracting sectors, and thus the wage levels, training and hiring processes, varies by the construction trade and by geography. Landscaping contracting, which comprises a large portion of total contracting for GI projects, has especially low union density nationally. However, in the case cities noted, government projects typically pay prevailing wages, which are close to union wages.

MANUFACTURING AND DISTRIBUTION

The different types of firms involved in producing materials and inputs for GI projects include:

- Nurseries.
- Construction materials suppliers – materials required include soil, concrete, aggregate, etc.
- Manufacturers of modular GI systems, including green roof, rainwater capture infrastructure, and individual components (e.g., rain barrels).

The size and importance of the GI market for these manufacturers varies considerably. While GI projects may be a large share of the market for green roof systems, it will likely represent a small share of demand for nurseries or concrete suppliers.

MAINTENANCE

Many GI installations require careful maintenance to ensure that they maintain their effectiveness: drains must be cleared, plantings tended, invasive species removed, soils uncompacted, etc. In the cases reviewed, maintenance was variously provided by:

- Landscaping firms who installed the GI
- Specialized landscape maintenance firms
- Horticulturalists
- Volunteer community partners
- Public agencies

The extent of maintenance work that stormwater management agencies will undertake and secure by contract is still uncertain. Stormwater agencies are under fiscal pressure to minimize maintenance spending, though they recognize that an amount of funded maintenance is necessary to keep systems operating properly. Cities are experimenting with a variety of techniques to reduce maintenance costs. In Portland, the BES is training community members to maintain GI on their property and in local streets, as well as working to integrate GI into their capital asset management and monitoring systems to increase the efficacy of maintenance efforts. It is unclear, at this point, what the extent of cities' spending on GI maintenance will be in the future.

MONITORING

Hydrologic flow and other monitoring equipment is increasingly associated with GI installations. Firms servicing these monitoring devices may be involved in monitoring.

Implications for Economic Development Efforts

The diversity of GI customers and suppliers, presents challenges to economic development efforts in this

sector but also provide an opportunity to broaden impacts. Initiatives to stimulate demand and provide for “high road” procurement standards must navigate a range of government agencies, as well as diverse private property owners. Workforce development efforts must anticipate a range of career trajectories for new entrants to the industry. Likewise, business development and workforce placement efforts must be prepared to serve a variety of different sectors. Consequently, an important component of GI economic development work will include identifying, articulating and organizing these diverse stakeholders and firms into a “sectoral” or “cluster” based network to promote and help implement GI economic development initiatives. How these implications of the GI sector inform effective GI economic development strategies is detailed in the final section of this report.

B. Business Development Needs

Firms engaging in the green infrastructure sector who responded to our survey* indicated several business development needs. Responses were received from 15 states, with a majority of responses from the New York City region. Additionally, interviewees for the Business United for Conservation Industry Partnership in Philadelphia study†, also identified gaps and opportunities for economic development practitioners to address. These include:

- **Navigating Codes and Regulations:** Respondents to our survey cite barriers to GI implementation in overcomplicated codes and regulations. The permitting process in many cities is not streamlined for GI and unnecessarily piecemeal. Others cited permit expenses as a challenge. Opportunities exist to help businesses understand the required permits and certifications necessary for GI installations as well as helping navigate the often complicated paperwork required.

* See Appendix 1.

† Business United for Conservation Industry Partnership, “Capturing the Storm: Profits, Jobs, and Training in Philadelphia’s Stormwater Industry” (2010).

- **Marketing Assistance:** Both our survey and the Philadelphia study highlight the importance of marketing assistance in the GI industry. Forty-six percent of our survey respondents said that they had to make some adjustments to their business in order to target new customers. * Practitioners can assist businesses in both consumer education and marketing to potential clients.
- **Industry Convening:** The Philadelphia study stresses the importance of communication across the industry as well as to contractors and financiers. According to their report, only 14% of respondents listed installers and financial backers as favoring green infrastructure solutions. † They also found that firms worked primarily independently and were unaware of their peers. Addressing these challenges requires broader education and support.
- **Technical Assistance:** Respondents to both surveys cite the importance of technical assistance to their success. Fifty-two percent of respondents in our survey stated that they had to make some adjustments to their business to provide GI by gaining new technical expertise. The Philadelphia study emphasized the importance of financial knowledge to obtain low interest loans and navigate various local and state incentives. Programs to assist businesses with these tasks will help locally owned and small firms benefit from investment in GI .
- **Training Programs:** The Philadelphia Study highlights workforce training programs to better address demand in the GI industry. Curriculum development, certification standards, and degree programs need to be created since many employees must be “hybrids of traditional occupations.” Economic development practitioners can assist in this process.
- **Procurement:** Respondents to our survey cite procurement as another challenge. Forty-six

* See Appendix 1.

† “Capturing the Storm,” 7.

percent of respondents said that they had to make some adjustments to their business by sourcing new materials or finding new suppliers. GI may use non-traditional materials, such as native plants, modular green roof systems and new construction materials. Businesses need access to updated supplier information and knowledge of the latest technologies.

C. Job Creation Potential

As economic development practitioners engage in the GI sector, it is important to understand the number and type of jobs that will be associated with GI in their region. ‡ These practitioners particularly need to understand the amount of entry-level jobs that will be created and potential for skill and career advancement, to inform the extent to which they can engage in workforce development programs and broader efforts to support the industry and influence employment outcomes. In particular, the number of entry-level positions will affect the scale of workforce development programs needed to serve the sector and its potential to provide jobs and improved earning to low-income residents.

The table below provides rough estimates of the gross amount of GI construction labor jobs, and entry level construction labor jobs, associated with the planned or current GI investment in the different cities studied. It is an order of magnitude approximation, intended to inform these cities’ economic development efforts and provide a comparative value

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‡ It is important to note that proper analysis of the benefits and costs of public infrastructure projects should only consider the net jobs created in projects. This section projects estimates of gross jobs. While jobs are involved in the implementation of public sector works, these jobs are ultimately paid via taxes and other payments to government by the private sector. Thus, the jobs that might have been created in the private sector are lost (However, during economic downturns, public spending stimulates economic activity that would not otherwise have occurred, resulting in net job creation). Thus, this analysis is not intended as a supporting greater GI investment due to job creation; rather, it is intended to assist economic development practitioners in understanding the number of jobs that GI investments may entail, to inform business and workforce development activities. Comparisons between GI and gray infrastructure are not attempted in this analysis.

for other cities. *

The values noted in the table are comparable to the estimates of entry-level construction work in Philadelphia's Long Term Control Plan Update. The Plan estimates that the City's GI investment will create about 10,000 job years worth of employment for lower skilled workers over the 40 year planning horizon, equivalent to an average of 250 entry level jobs per year.

There are a few important points to make about this analysis that are pertinent to economic development efforts associated with GI. First, entry-level jobs will also be stimulated in other sectors, such as GI maintenance, nurseries, and materials, and perhaps manufacturing and distribution. Thus, the job impacts of GI investment should be greater than noted above. Moreover, economic and workforce development related to the GI sector may also be aligned with business and job growth that is not GI related per se, but draws on comparable workforce skills and business networks. Indeed, Verde and the Hort's workforce development efforts place individuals in a range of positions, some not related to GI .

Additionally, the total extent of GI work that is created is dependent on the extent of demand accessible to the labor force in the region. The estimates above include City stormwater spending on GI, and private sector investment for stormwater management purposes. The private sector may invest in GI for other reasons. Likewise, ecological restoration may stimulate significant increased demand. This analysis did not attempt to account for the extent of GI spending from these sources, which could be substantial.

Improving Job Impact Estimation and Tracking

Understanding the labor density and quality of jobs associated with different types of GI installations can

5 See Appendix 2 for calculation methodology.

allow for better economic development planning. Moreover, it could facilitate prioritization between a GI-centered strategy and gray infrastructure; for example, cities may be more interested in pursuing GI strategies that offer more jobs, provide entry level employment opportunities, or jobs located throughout the city.

Ultimately, better estimates of number and quality of jobs associated with GI will have to depend on collecting better data. Economic development efforts would ideally be informed by data on the number and type of jobs associated with city's GI contracts; their pay and benefits; labor tenure, including whether work is subcontracted or part of the contractor's regular crew, unionized, etc.; the residency of employees, and their age, race and gender. Most of this information can be garnered using a certified payroll system and/or other reporting under public GI contractors.

Alternately, the number of jobs can be estimated from construction budget estimates, using quoted labor and average regional pay or prevailing wage for the relevant construction occupations to determine the number of jobs. Such values could also be estimated after the fact by contractors. As part of this study, MIT GEDI developed a detailed spreadsheet questionnaire for contractors regarding the time, pay, and tenure for specific projects (see Appendix 3). Ultimately, with a rich enough dataset, the labor density and quality of jobs associated with different types of GI installations could be estimated, using such project by project data. However, GEDI was only able to obtain this data from a few contractors during our fall 2012 study period. There is potential to integrate such reporting into city reporting, as well as databases of individual GI installations performance like the EPA's *BMP Database*.

D. Conclusion

Economic development practitioners have an opportunity to support the GI sector. The total job creation associated with anticipated GI investments for stormwater management is modest, but by no means inconsequential, comprising a few hundred person years of entry-level employment in the cities reviewed. Economic development practitioners can

Table 5. Gross Jobs Associated with GI Investments

CITY	NPV GI CONSTRUCTION SPENDING	TOTAL YEARS	AVG. ANNUAL SALARY POTENTIAL RANGE FOR LANDSCAPE CONSTRUCTION CONTRACTS		EST. TOTAL		EST. ENTRY LEVEL	
			Low	High	Low	High	Low	High
			New York	\$2,400,000,000	20	\$33,040	\$63,960	436
Portland	\$25,000,000	1	\$26,680	\$50,660	112	200	67	160
Philadelphia	\$1,500,000,000	25	\$29,390	\$52,830	245	460	147	368

Assumptions

	LOW ESTIMATE	HIGH ESTIMATE
Percent budget on GI contracts	60	90
Percent spending on labor	20	45
Percent construction jobs entry level	60	80

work to improve access to these jobs for disadvantaged segments of the labor force, as well as improve the quality of work these investments entail.

Economic development practitioners should also recognize the value GI offers to communities, over and above jobs and wealth generation opportunities. GI can enhance and beautify communities, contribute to an improved quality of life, and more vibrant communities. Green roofs, rain gardens and bioswales are often designed as high quality public spaces for people to enjoy. Many are designed with educational or amenity features, such as outdoor furniture. GI infrastructure not only captures stormwater, but also supports ecological restoration, habitat creation, climate change mitigation and urban heat island effect alleviation. Indeed, supporting GI can contribute to a “triple bottom line” conception of economic development that values a better environmental, improved quality of life, and broadly shared wealth, along with expanded economic activity.

For these reasons, economic development practitioners have reason to be involved in the planning and implementation of GI initiatives. The next chapter outlines the different means of supporting development in this sector.

IV. Advancing Economic Development in the Emerging GI Sector

This chapter makes recommendations for how to pursue economic development priorities in the GI sector. It first outlines strategies to grow demand for GI that EDOs can influence. It then reviews how city procurement policies that prioritize local and disadvantaged communities can enable stormwater management agencies to pursue positive economic development outcomes. It outlines strategies to structure workforce development programs focused on the GI sector. Next, it suggests business development strategies to support small and emerging firms serving the GI sector.

Finally, this chapter notes the roles that different types of EDOs can play in GI planning and implementation. It first suggests important roles for city and regional scale EDOs. It then notes how community scale EDOs and other community organizations can be engaged in GI implementation efforts.

Throughout this chapter, recommendations for both stormwater agencies and different types of EDOs are offered. The types of EDOs noted include:

- State, regional and city-scale economic development agencies.
- Neighborhood and community scale EDOs, who support local business and workforce development.
- Neighborhood scale organizations that seek to revitalize commercial and residential areas, such as Business Improvement Districts.
- Workforce development organizations, including Workforce Investment Boards, community colleges, non-profit training organizations, and others.

- Business networks, such as chambers of commerce, sustainable business alliances and relevant industry associations.
- Community development financial institutions, which provide financing for a business, homeowners, and real estate development.

A. Growing Demand for GI

Stormwater and conservation agencies have the greatest influence on the total demand for GI. These organizations directly procure GI installations and influence private procurement via standards, incentives, performance-based fees and other policies. However, EDOs also have an important role in generating demand for GI via their relationships with firms and property owners. EDOs can educate firms and developers on the benefits of on-site stormwater management and encourage these groups to install GI, and to procure GI installation and maintenance services from contractors that provide good wages and working conditions. Different ways in which EDOs can increase demand for GI are noted below.

Facilitating GI Planning and Design at a Neighborhood Scale

Business Improvement Districts (BIDs) and other neighborhood development organizations often serve to convene local businesses and residents to create plans and projects to improve the public realm. Notably, BIDs are often responsible for coordinating the installation and maintenance of neighborhood

commercial district public space and greenery. These design projects provide an opportunity to integrate GI into public and private spaces. For example, New York's Hudson Square BID engaged local businesses in their Streetscape Plan, leading to the integration of GI into the street right-of-way. These efforts also can draw private investment in GI, via BID funds and bonding.

Organizations like BIDs, community development corporations (CDCs), and neighborhood associations often are networked by one central agency, such as the Department of Small Business Services in New York and citywide associations of CDCs and neighborhood civic organizations, who provide assistance establishing new organizations, links to funding opportunities, training and technical assistance. Such groups can encourage their membership to install GI as part of their neighborhood planning; provide technical assistance, such as standardized contracting and maintenance provisions with sewer agencies; and serve as an intermediary between regional GI agencies and local BIDs and community organizations. Additionally, many EDOs have long-standing relationships with community groups and other smaller scale civil society organizations. EDOs can connect these groups with grants and other resources to implement GI projects.

Incorporating GI Practice into Financed Projects

EDOs frequently provide below-market financing, grants and other gap financing to business, non-profit organizations, and real estate projects. In appropriate applications, such as real estate projects, EDOs can require and/or provide financing tools or incentives to increase the use of GI installations. Indeed, many CDFI's are beginning to specify green design standards as requisite for their investment, including onsite GI. Craft3, a CDFI in the Pacific Northwest has used restoration and preservation of riparian zones as criteria for lending to projects and created loan products to upgrade septic systems, as a means to improve water quality.

B. Procurement Policies to Promote Diversity and Quality Jobs

EDOs can play a leading role to shape cities' procurement policies so that they foster local contracting, high quality jobs, and a diverse workforce—all of which expand local economic development outcomes from city procurement.

New York and Portland experiences suggest that providing job quality standards and targeted contracting in GI procurement is predicated on broader enabling procurement policies. Public agencies make the greatest share of GI investments, and GI project managers are often constrained by low-bid procurement policies. For these reasons, progressive procurement policies are a key enabler of greater economic development outcomes from the GI space, and cities' broader procurement.

A variety of procurement policies promote quality jobs and/or diversity, including:

- **Prevailing wage policies.** Many states have prevailing wage policies that apply on public contracts. These typically ensure that public contracts pay union-level wages. When prevailing wage policies apply, they will ensure better paying jobs for GI workers.
- **Targeted contractor procurement policies.** Direct contracts towards firms owned by racial minorities, women, and/or other disadvantaged groups (MWESB) as well as firms located in the city or targeted neighborhoods. Targeted contracting policies facilitate greater equity in ownership as well as employment, as MWESB firms have been shown to hire a greater proportion of employees from their own communities than other firms. An important component of targeted contracting is breaking down contract sizes into amounts that are feasible for smaller contractors to perform.

■ **Community workforce agreements.**

Such policies specify that contractors hire a minimum percentage of their workers from disadvantaged communities, local communities, and/or union members and apprentices. Often, these hiring policies are subject to “good faith effort” clauses for contractors; such clauses will ideally contain specific job posting and candidate search criteria contractors must undertake, and their process for documenting these efforts. To be most effective, these policies need to be accompanied by workforce programs that identify and train a “pipeline” of targeted employees qualified to fill these jobs. EDOs can be bridging organizations to help link procurement policies with workforce programs.

Establishing Targeted Procurement Policies

Procurement policies targeting historically disadvantaged owners typically begin with assessments documenting biases in historic procurement. The 1989 US Supreme Court case *City of Richmond v. J.A. Croson Co.* specified that such programs must be “narrowly tailored” to address documented inequities between groups in government procurement; thus most state and local government affirmative action programs are justified on the basis of statistically and qualitatively supported “disparity studies”.^{*†} Thus, cities and other agencies must define the range of owning communities they wish to evaluate, and commission studies to determine whether there is truly disparity in the ownership of firms from which they procure. Likewise, community workforce agreements specifying targets for under-represented communities in the workforce and apprenticeship programs may be preceded by evaluations of disparity in the workforce. Once cities have established cause to target procurement to certain communities, they may develop procurement policies that provide opportunities for MWESB firms.

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^{*} Enchautegui, Maria, Michael Fix, Pamela Loprest, Sarah von der Lippe & Douglas. Wissoker. 1997. Do Minority-Owned Businesses Get a Fair Share of Government Contracts? The Urban Institute.

[†] Office of the City Auditor. January 2010. Sheltered Market Program: Need for clearer focus and stronger management. City of Portland.

The Impact of Program Design on Efforts to Target Economic Development Impacts

For GI installed in public space, such as parks and street right-of-ways, stormwater agencies or other public agencies will typically procure these works. City procurement policies will therefore apply, along with any tools to foster greater access to contracts and more equitable contracting outcomes.

However, cities often also need to invest in GI on private property. In such cases cities may procure contractors, or they may facilitate private property owners’ contracting. In the case of Portland’s programs for private property, the BES contracts directly with firms on retainer. The BES then markets stormwater programs to residents and businesses in stormwater system-sheds that require investments. In this model, the city’s procurement policies apply.

However, cities’ incentive programs are more removed from the contracting process. For example, some programs may pre-approve contractors, then allow them to market directly to private property owners. These programs will provide incentives or grants to property owners to install GI. Under this model, more equitable outcomes can be achieved by structuring pre-approval criteria for contractors to realize economic development outcomes. However, enforcing these criteria may require greater resources, as City’s will have to work with a broader array of contractors.

The Need to Integrate Procurement Policies with Workforce and Business Development

Policies that target procurement to workers and owners from disadvantaged communities are often not sufficient to realize economic development for these communities on their own. Instead, economic development practitioners must simultaneously build contractors’ and workforce capacity to deliver high quality services at a reasonable price. Workforce and business development strategies are explored below.

C. Workforce development

A significant proportion of GI work requires little prior experience or training; these positions include construction labor, maintenance, as well as entry-level work in nurseries, construction materials and other components of the GI supply chain. Moreover, training and experience in GI skills, such as basic plant care and construction skills, provides occupational competency that can translate to a range of job opportunities. Thus, well-structured GI training programs, with strong connections to employers in the GI and related industries, can enable lower-skilled workers to build careers in a range of sectors. In this way, GI workforce development efforts realize greater economic opportunity for disadvantaged peoples, leveraging an important policy goal from the several hundred annual gross jobs expected from cities' GI investments.

Finally, GI work provides opportunities for people residing in neighborhoods with environmental justice challenges to improve their own community. Neighborhood residents can participate in greening and beautifying their communities.

Unfortunately, it is challenging to link entry-level positions in the GI industry to viable, long-term career pathways. Management and ownership positions are sparse in the industry, and private firms seek to keep labor costs low to put forth competitive contract bids.* Workforce development efforts will ideally be responsive to these challenges, providing participants resources to build longer-term careers.

Workforce development organizations and other EDOs frequently have well-established workforce development infrastructure, into which GI programs can be integrated. As part of GI planning and implementation, city stormwater management agencies and EDOs should invite appropriate workforce development organizations into their planning processes. The following sections present important considerations for workforce development programs.

* Alan Hipólito, Verde, "Interview with Alan Hipólito."

Choosing the Right Workforce Development Tools

Economic development practitioners should consider the type of workforce development tools that can best realize opportunities for the greatest number of the target entry-level workforce. The programs reviewed in this paper largely focused on providing training and credentialing for participants - The Hort and SSBX's BEST program are grounded by extensive, multi-week training programs; likewise, Verde provides 80 hours of training per employee.

Providing such credentialing likely leads to greater workplace safety, and provides trainees important skills to advance their careers. However, the contractors and designers in New York and Portland interviewed for this study rarely cited credentials that they considered valuable for entry-level employees. Instead, they emphasized on-the-job training and learning, and how skills required in GI construction and maintenance, as well as broader landscape contracting work, are acquired quickly through experience.

Thus, other workforce development tools that facilitate the hiring, retention and career advancement of employees may be equally or more important to include in GI employment strategies. Many workforce development agencies and work with community groups to recruit employees and address job readiness skills while also providing wage support and other on-the-job training resources, structured to incentivize retention of employees by contractors.

Training Program Components

Notwithstanding the potential for other models, The Hort, SSBX, and Verde have proved the concept of for GI workforce training programs. These programs share some key characteristics:

- Job readiness and life-skills – The programs link participants with basic job-readiness trainings, providing job search assistance, résumé development, interview skills, instructions in professional conduct, anger management, and other capacities. Likewise, they link workers to financial management

resources, basic education and GED, childcare, health assistance and other resources, often mediated by a “case management” organization.

- Construction safety – Including basic construction safety, first aid, and harness use. OSHA credentials were typically conferred.
- GI principles – The programs provide participants with a solid grounding in GI techniques and their functions in stormwater systems. City project managers note that such understanding is critical to ensure that GI laborers and maintenance workers do not compromise GI performance, for example by compacting soils or blocking drainage systems.
- A range of short modular trainings in job skills provided by third party organizations, typically associated with certificates. These included horticulture; construction equipment use; pesticide applications; concrete workmanship; and other credentials.

Developing Culturally Sensitive Credential Modules

Thirty-five percent of the national landscaping workforce is Latino,^{*} many with limited English skills. Verde notes the lack of training in Spanish as a barrier for employees to receive certain horticultural and construction related credentials. EDOs might engage industry and training organizations to identify valuable trainings not offered in English, and provide resources to translate these modules.

Vigorous Industry Liaison and Ongoing Support

The GI sector is quite fragmented; moreover, people who have training and experience in GI installations or maintenance can be prepared for a wide array of subsequent work. Thus, it is important that GI workforce development programs have a strong industry liaison network, to facilitate participants’ job search

^{*} Inter-University Program for Latino Research. 2011. The Economic Impact of Landscape and Lawn Care Services Industry on U.S. Latinos.

and placement. Additionally, GI workers may need ongoing “case management”, ensuring they have the encouragement and assistance accessing employment resources such as childcare, and education or training options to continue an upward career trajectory.

Many EDOs, or their workforce development partners, have developed human resources and institutional infrastructure to conduct this work. Notably, the Hort partners with the South Bronx Economic Development Corporation and Rutgers University Heldrich Center for Workforce Development to deliver these services. Likewise, Verde has invested substantially in employee career planning and ongoing support, and knows the industry well to facilitate outside placements. These EDOs may need coaching themselves in what GI is, and what sorts of sectors those with experience in GI are capable of providing.

Much GI landscaping and maintenance work is seasonal. Thus extra resources for ongoing case management and re-placement are likely necessary to help workers stay employed year round.

Have a Farm Team – A Social Enterprise Employing Disadvantaged People

Both the Hort, SSBX BEST, and Verde directly engage in landscaping contracts themselves. This provides short-term employment for trainees, while they look for other work and engage in career planning. The Hort’s Green Team and SSBX typically employ graduates for a few months following their training. Verde has longer employee cycles, but still focuses on career development and placement of most workers outside their organization. Besides providing stop-gap employment, these ventures also serve as a revenue generator.

City stormwater agencies and EDOs can encourage the formation of such social enterprises, to complement training programs. They can procure from these organizations. Likewise, they can use their influence with business and other public sector actors to encourage civic-minded organizations to support such social enterprises.

Serve as a Launch Pad for Union Apprenticeship

A conscientious focus on integrating with union apprentice pipelines may be warranted for some programs, especially those in cities with strong unionized construction trades, to help workers who gain experience in GI construction build a broader array of construction proficiencies and access to better quality jobs. Union apprenticeship and membership provide ongoing education and higher pay and benefits, and qualified construction trades will be in demand in the future in many regions. Support for GI workforce development programs can comprise part of larger efforts to integrate lower income, historically disadvantaged peoples into the unionized construction industry.*

D. Business Development

Integrated business and workforce strategy

EDOs should seek to coordinate their business development and workforce development efforts. Such coordination can allow for more accurate estimation of the skills and type of support workforce development programs should provide, as well as the number of employees in demand. Community organizations and small business alliances are well positioned to facilitate this work.

Addressing Barriers to City Procurement

The firms and project managers interviewed as part of this analysis suggested a range of barriers that can hinder their accessing city contracts:

- Large bonding requirements for smaller contracts.

* A strong model for unionized construction jobs to advance the green economy is provided in: Daniel Villao, Uyen Le, Hugo Sarmiento, and Stefanie Ritoper. 2012. Beyond Green Jobs: Building Lasting Opportunities in Energy Efficiency. UCLA Labor Center.

- Delayed payment and granting. Smaller firms are susceptible to cash flow difficulties when payments are delayed.
- Large contract sizes, providing too great a scope of work for smaller firms or social enterprises to bid on projects. Breaking large projects into smaller increments could ameliorate this issue .

Additionally, some of the smaller contractors interviewed noted that they did not possess sufficient capital to acquire new tools to serve a diverse range of client needs.

Business Development Services

Many regional and community scale EDOs have programs and financing resources that can assist small and emerging GI contractors and other businesses. Emerging contractors can benefit from resources and mentoring in business administration processes, such as business planning, managing payroll, and marketing. Firms may require working capital, and access to insurance and bonding to be able to meet government procurement contracts. Additionally, opportunities in GI services can be improved when EDOs convene businesses active in this sector. Such convening facilitates businesses articulation of collective needs to government procurers, the workforce development system, and other actors. Notably, Philadelphia's Sustainable Business Network's has convened the Businesses United for Conservation, allowing them to suggest procurement policy changes to allow for greater contracting of small businesses and to project workforce needs.

E. Roles for City and Regional EDOs

To date, city and regional EDOs have been minimally involved in GI planning activities. The limited scale and disaggregated nature of GI investments probably means that such EDOs will not expend large amounts of resources in facilitating economic development in this sector. However, greater involvement

is warranted early in GI planning processes, as these EDOs can help define the economic development priorities for the sector.

Participate in GI Planning

Citywide and regional EDOs can help align city GI plans with economic development policies. To facilitate this alignment, EDOs should involve themselves early in the planning of stormwater management, habitat restoration, and other GI initiatives. Roles for EDO organizations and practitioners include:

- Advocating for the suite of GI investments and practices that make the best use of public spending, while realizing the greatest local economic development impacts.
- Industry analysis. EDOs can analyze construction markets, and inform other local agencies about what the job and local contracting implications of investing in GI. This can include identifying opportunities to expand local supply chains, identifying any barriers that local firms may face in responding to contracting opportunities and specialized workforce needs.
- Engaging industry and creating a GI industry network. EDOs frequently have experience engaging the multiple stakeholders that comprise an industry. They can serve to convene the nascent GI industry, to help them inform GI planning efforts and the design of effective policies, economic development efforts and workforce programs to support GI business development.

Stormwater agencies and other implementing agencies undertake some of these functions but can benefit from collaborating with EDOs and capitalizing on their experience with industry engagement, and funding and a mandate to undertake this work.

Convene and provide resources to GI initiatives

EDOs often possess resources and relationships to seed and support GI business development,

workforce development, and demand generation initiatives. The following subsections discuss the roles that EDOs are suited to fill in leveraging greater economic development benefits from GI investments. City and regional scale EDOs can provide the leadership to build these institutional roles to help realize greater economic development potential in the GI sector. They can work to establish and bolster organizations filling these roles, and encourage stormwater agencies to connect with these organizations. Larger EDOs can also provide resources to establish these efforts through grants, “soft” financing products, and coaching to business organizations and community groups.

Building GI Agencies' Capacity

EDOs can work with stormwater agencies, and other GI project managers, to prioritize economic development outcomes as important parts of the GI investments. Larger EDOs especially have a role to play influencing cities' procurement policy, which can enable GI agencies to better support economic development outcomes as part of their contracting; procurement policies, which will have positive impacts beyond the GI sector.

F. Engaging Community Scale Organizations

The modest scale, job creation and dispersed nature of GI investment means that a well functioning community organization can make a significant impact on the sector. Roles for community scale organizations include:

Increasing implementation of GI

The organizations noted above have organized neighborhoods to implement GI projects. This can expand demand for GI industries and target GI installations to disadvantaged neighborhoods where their social and economic benefits may be greatest. SWIM in New York and Portland's various water-

shed organizations advocated for GI investment, and help to put expanded levels of GI investment on stormwater agencies' policy agenda. EDOs and stormwater agencies can work with and support these organizations, as they are critical partners in establishing momentum GI programs. Additionally, they can be critical brokers with neighborhood residents, to facilitate the installation and maintenance of GI.

Workforce and business development

SSBX, the Hort, Verde, and their partners provide training and job placement services to connect lower skilled and low-income residents to employment in the GI industry. As community-based organizations they are well positioned to recruit unemployed or disadvantaged community member and including referrals from other community organizations. It also allows them employ their trainees in projects organized by community organizations, such as the Bronx River Alliance.

Stronger relationships with stormwater management agencies and their contractors can help these community-based program expand employment opportunities and potentially career advancement for their trainees.

G. Conclusion

A variety of options are open to stormwater management agencies and different types of EDOs to promote economic development. These options are summarized in the table below. Two checks indicate an especially strong case for an organization to involve themselves in this role to advance economic development in the GI sector. A single check represents our opinion that there may be a role for some organizations.

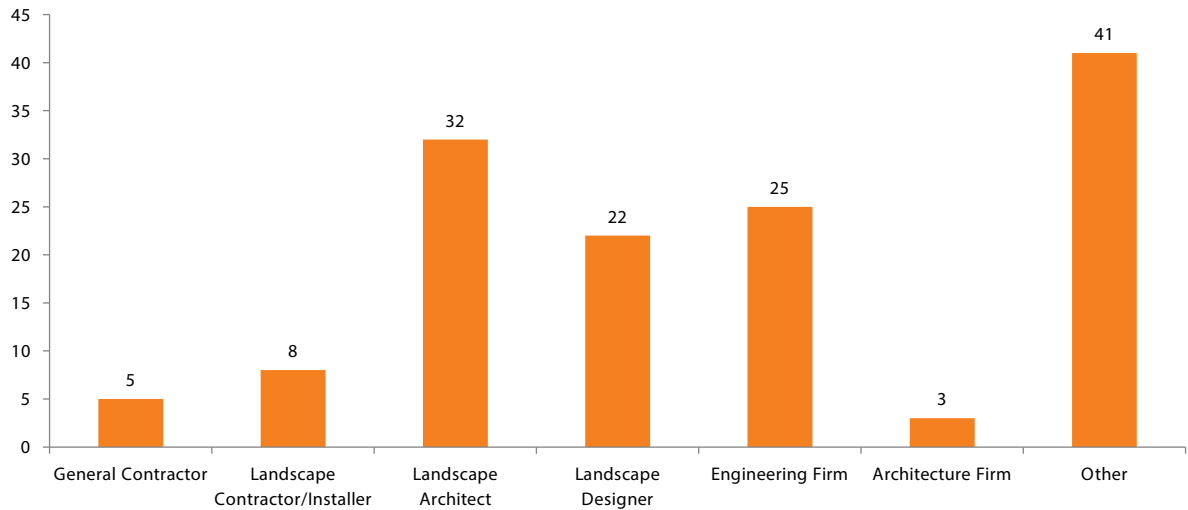
Table 7. Stakeholder Organizations by Role

		ORGANIZATION TYPE											
		STORMWATER MANAGEMENT AUTHORITY	STATE, REGIONAL AND/ OR CITY EDO	COMMUNITY/ NEIGHBORHOOD-SCALE EDO	BUSINESS IMPROVEMENT DISTRICT	WORKFORCE DEVELOPMENT ORGANIZATIONS	COMMUNITY DEVELOPMENT FINANCIAL INSTITUTION	BUSINESS NETWORKS					
GROWING DEMAND & PROCUREMENT	Influence GI regulation	✓	✓	✓	✓								
	Technical assistance for businesses & households	✓	✓	✓	✓	✓	✓					✓	✓
	Advocating for targeted procurement policies for disadvantaged communities	✓	✓	✓	✓	✓	✓	✓	✓			✓	✓
WORKFORCE DEVELOPMENT	Identify optimal workforce support programs by consulting industry, and implement		✓	✓	✓								✓
	Develop and implement training programs	✓	✓	✓	✓								✓
	Conduct industry liaison to place workers in the GI industry		✓	✓	✓								
	Incubate social enterprises staffed by workforce from disadvantaged communities		✓	✓	✓	✓	✓					✓	✓
BUSINESS DEVELOPMENT	Integrate business development and workforce development strategy	✓	✓	✓	✓	✓							✓
	Address barriers to city procurement	✓	✓	✓	✓								✓
	Provide business development and technical assistance resources to GI contractors	✓	✓	✓	✓								✓
	Convener	✓	✓	✓	✓								✓

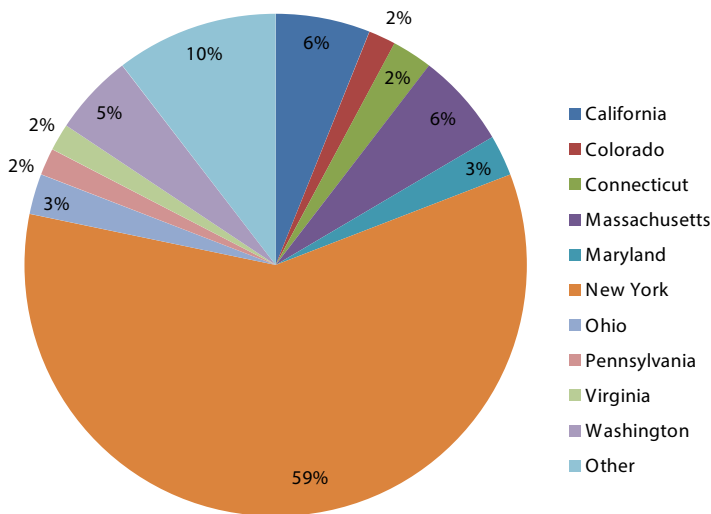
Appendix 1

The following charts summarize data from a survey of green infrastructure designers and contractors conducted by MIT GEDI in Fall 2012. GEDI disseminated the survey to firms and agencies engaged in stormwater management. The survey was also disseminated by various agencies and professional organizations, including the New York City Soil and Water Conservation District and the American Society of Civil Engineers.

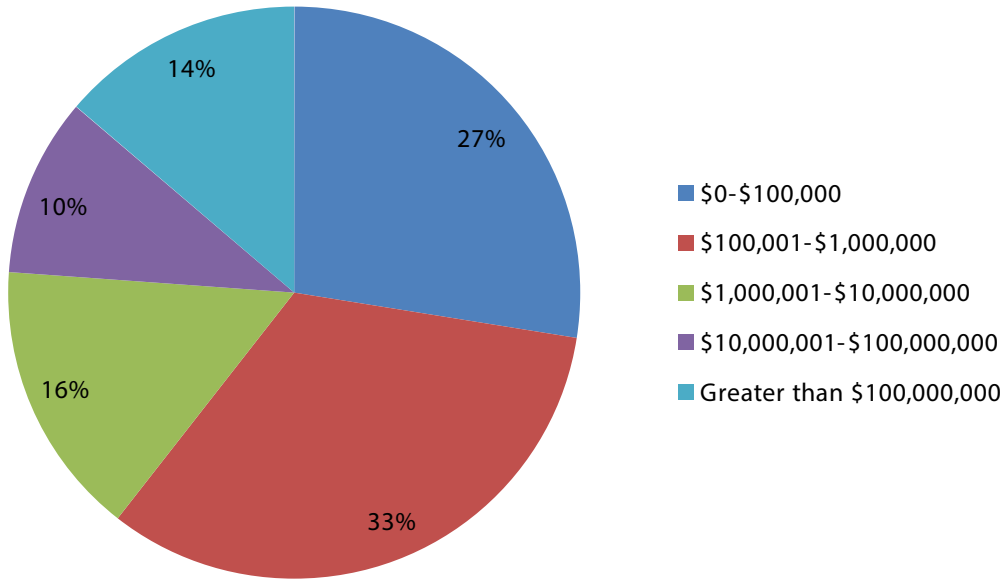
WHAT FIRM TYPE(S) BEST DESCRIBES YOUR COMPANY?



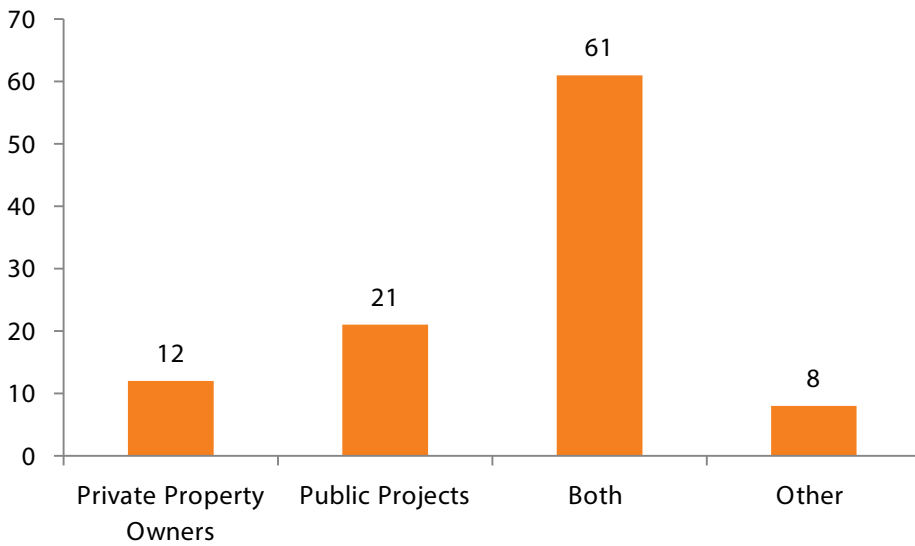
IN WHAT STATE IS YOUR FIRM LOCATED?



WHAT IS YOUR FIRM'S APPROXIMATE YEARLY REVENUE?

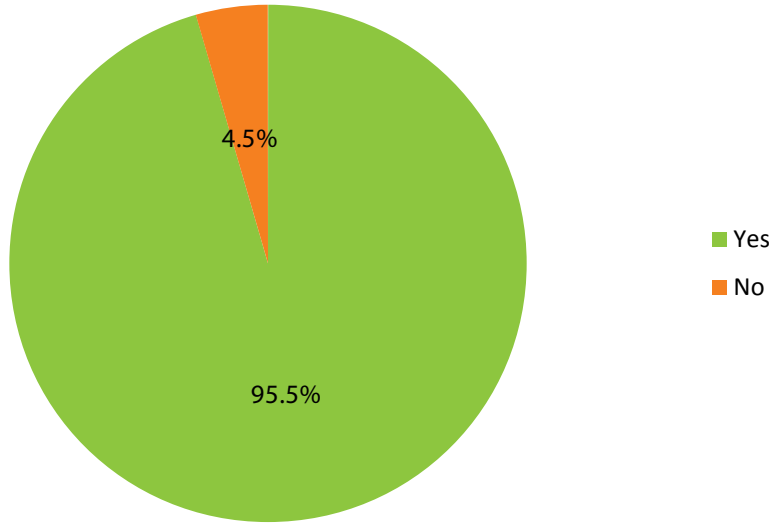


DOES YOUR FIRM PROVIDE SERVICES FOR ON-SITE STORMWATER RETENTION/MANAGEMENT FOR PRIVATE PROPERTY OWNERS OR PUBLIC STORMWATER INFRASTRUCTURE?

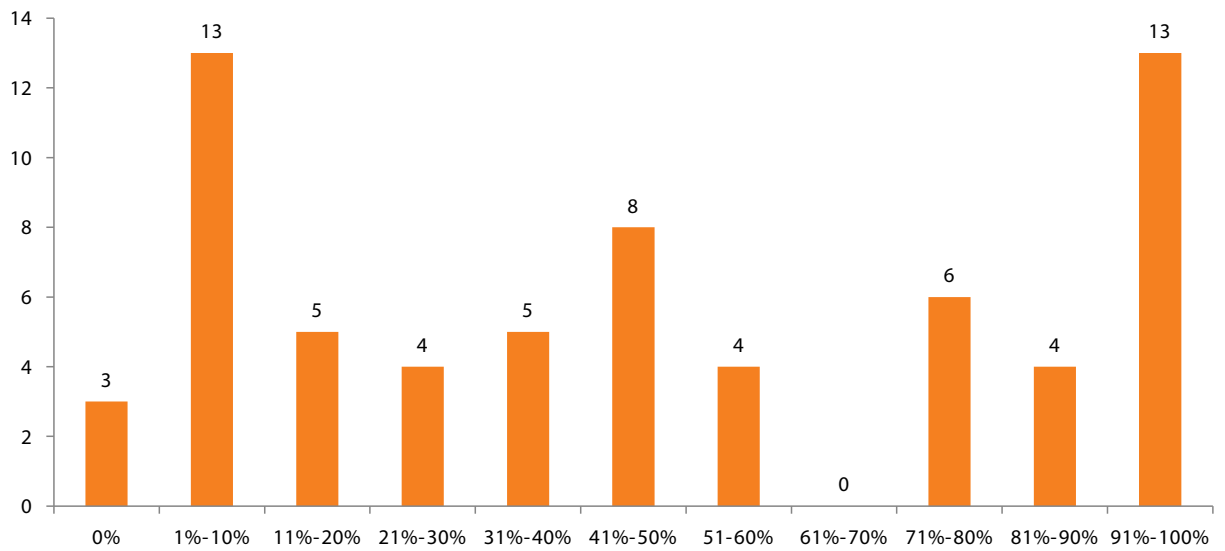


DOES YOUR FIRM HAVE EXPERIENCE WORKING ON GREEN INFRASTRUCTURE PROJECTS?

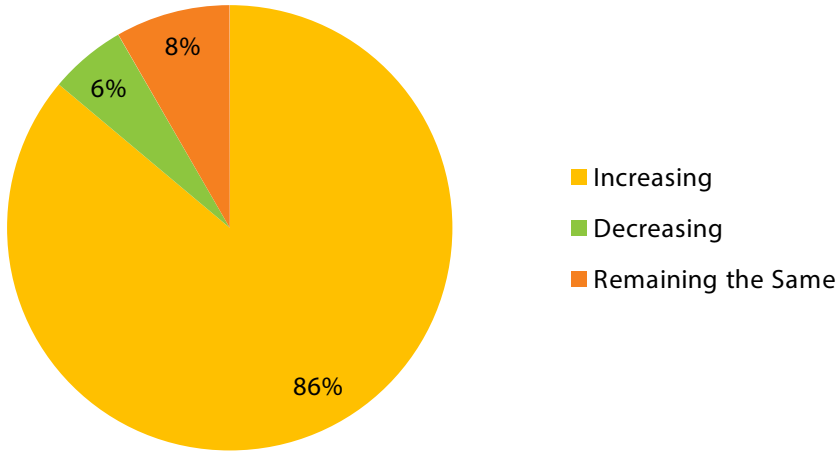
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OF YOUR TOTAL REVENUE FROM STORMWATER PROJECTS, APPROXIMATELY WHAT PERCENTAGE COMES FROM GREEN INFRASTRUCTURE PROJECTS?



OVER THE NEXT FIVE YEARS, HOW DO YOU SEE YOUR FIRM'S SHARE OF REVENUE FROM GREEN INFRASTRUCTURE PROJECTS CHANGING?

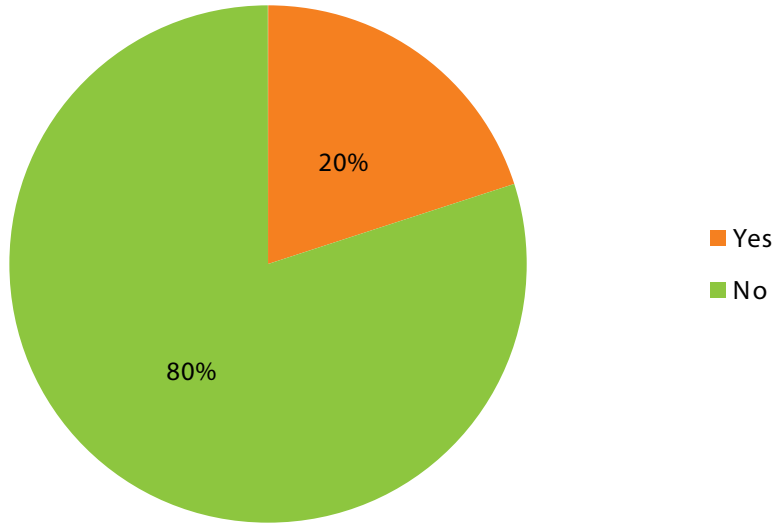


WHAT CHANGES HAS YOUR BUSINESS HAD TO MAKE TO PROVIDE SERVICES FOR GREEN INFRASTRUCTURE?

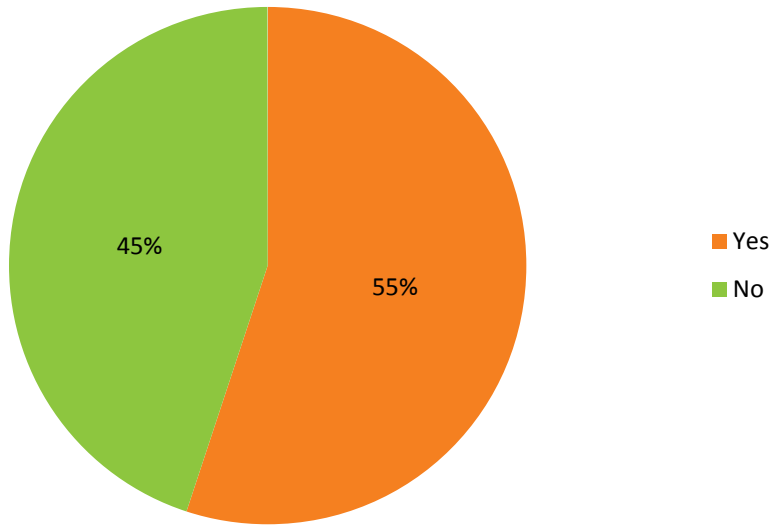
	EXTENSIVE ADJUSTMENT	SOME ADJUSTMENT	MINIMAL ADJUSTMENT	NO ADJUSTMENT	TOTAL	TOTAL RESPONDERS
Hiring or retaining workers to gain skills related to green infrastructure	7 9.9%	28 39.4%	17 23.9%	19 26.8%	71 100%	71 100%
Gaining technical knowledge about green infrastructure services and how to provide them	14 20.0%	34 48.6%	16 22.9%	6 8.6%	70 100%	70 100%
Purchasing or leasing new equipment	1 1.4%	11 15.7%	24 34.3%	34 48.6%	70 100%	70 100%
Sourcing new materials or finding new suppliers	8 11.4%	28 40.0%	21 30.0%	13 18.6%	70 100%	70 100%
Targeting new customers	11 15.7%	30 42.9%	12 17.1%	17 24.3%	70 100%	70 100%

IF YOUR FIRM HAS HAD TO HIRE NEW WORKERS FOR GREEN INFRASTRUCTURE PROJECTS, HAVE YOU HAD DIFFICULTY IN FINDING WORKERS WITH THE REQUIRED SKILLS OR EXPERIENCE?

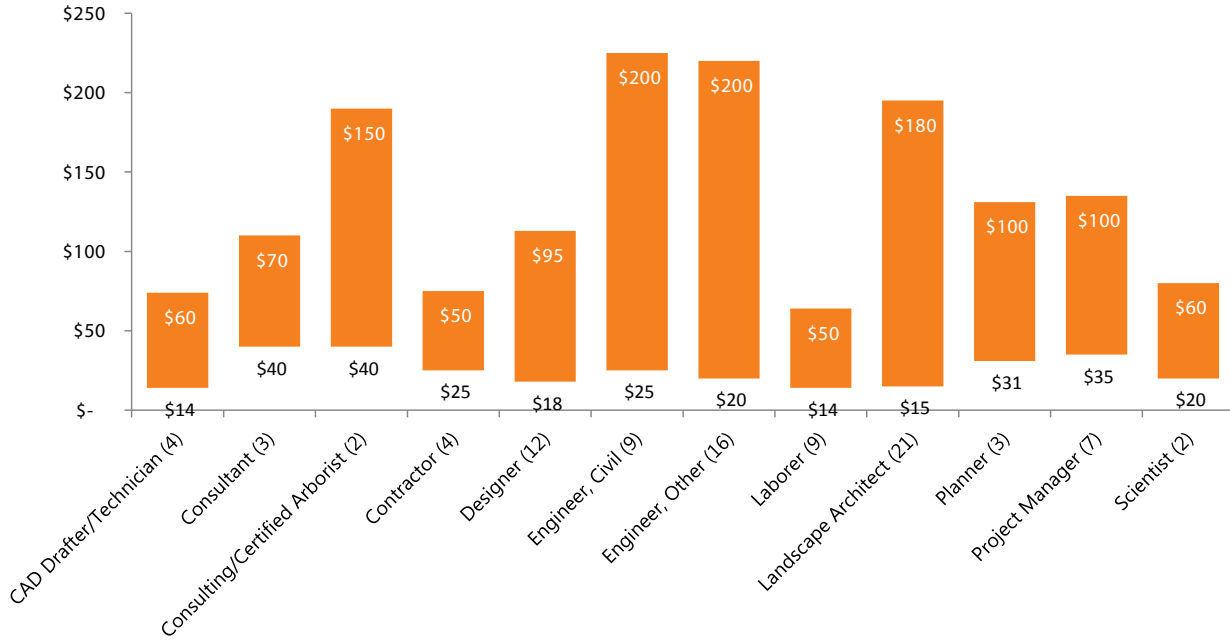
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HAS YOUR FIRM FACED ANY BARRIERS OR CHALLENGES IN GAINING THE CAPACITY TO PROVIDE GREEN INFRASTRUCTURE SERVICES OR BUILDING GREEN INFRASTRUCTURE PROJECTS?



FOR YOUR FIRM'S GREEN INFRASTRUCTURE SERVICES OR CONSTRUCTION PROJECTS, WHAT TYPES OF POSITIONS/OCCUPATIONS ARE EMPLOYED? FOR EACH OF THESE POSITIONS, WHAT ARE THE TYPICAL PAY RANGES?



Appendix 2

The estimate of job-years associated with cities' GI investments are based on the following calculation:

- The total net present values public and private GI investments projected in New York's Green Infrastructure Plan and Philadelphia's Long Term Control Plan Update are divided by the number of years over which these analyses are pertinent, to arrive at an annual average investment. For Portland, the annual investment for one year is estimated; this value reflects Portland's current yearly average spending on the Grey to Green Initiative and related projects, with an additional speculative 25 percent spending from the private sector added.
- The resultant values are then multiplied by a range reflecting possible percentages of this total GI budget that will be spent on landscape contracting – based on conversations with program managers, we assume a range of 60-90 percent.
- These values are then multiplied by the percentage of landscape construction contracts for GI that goes towards labor. We estimate a range of 20-45 percent. The actual mix of labor as a part of costs will depend on the type of GI that is installed in cities, as different GI practices have different labor density, and the construction practices that evolve in the industry. Our range is derived from engineering cost analyses for a bioswale and an underground retention tank from New York's Green Infrastructure Plan, which indicate labor cost percentages of 20 and 40 percent, respectively. Our survey of GI practitioners indicated an average labor cost of 45 percent, so we included 45 percent labor as an upper bound.
- The resultant value is divided by the annual

average salary that might pertain in landscape construction work in each region, to arrive at the total number of landscape construction jobs associated with this GI construction. We use a range from the Bureau of Labor Statistics' (BLS) metro-area Occupational Employment Wage statistics is provided for each city. Landscape construction does not have its own Occupation Code within the BLS' Standard Occupational Class system. Instead, we take the occupational wage for grounds maintenance workers and construction workers as the high and low wage, respectively; landscape construction is typically lower paid than construction, but higher than landscape maintenance work. Thus, we anticipate this range provides a reasonable range of the potential average salary for landscape construction.

- Finally, this value of the total jobs is multiplied by the percentage of jobs estimated to be accessible to entry-level workers, to arrive at the total number of entry level jobs each year associated with GI investments. We estimate 70 percent of jobs to be entry level, derived from BLS data on the employment by industry for Landscape Services, with labor and grounds maintenance jobs considered entry level; similarly, Philadelphia's Long Term Control Plan estimates that 70 percent of construction work is entry level. These calculations provide a rough order of magnitude estimate of person-years of entry level employment associated with green infrastructure spending, reflecting estimated future levels of public and private investment.

Appendix 3

The following tables are suggested fields for databases of jobs and wages associated with GI stormwater management projects. GEDI attempted to have firms supply such data for past GI projects, but received too few submissions. Such data could be a valuable addition to databases of GI projects, such as those kept by stormwater management agencies or the EPA's BMP Database, to suggest the economic development impacts associated with GI projects.

General Project Labor Database Fields - Option 1

PROJECT NAME	BMPTYPE	DESIGN COSTS (\$)		CONSTRUCTION COSTS			
		LABOR	OTHER OVERHEAD	LABOR	MATERIAL (CAN INCLUDE MARKUP)	EQUIPMENT	OTHER / OVERHEAD

General Project Labor Database Fields - Option 2

PROJECT NAME	BMPTYPE	LABOR BY DISCIPLINE									
		DESIGN/ ENGINEERS		LEADCONTRACTOR / PROJECT MANAGEMENT		EXPERIENCEDLABOR (PRIOR EXPERIENCE)		LESS EXPERIENCE LABOR/ENTRYLEVEL		OTHER: _____	
		NUMBER OF HOURS WORKED (APPRX)	HOURLY PAY RANGE	NUMBER OF HOURS WORKED (APPRX)	HOURLY PAY RANGE	NUMBER OF HOURS WORKED (APPRX)	HOURLY PAY RANGE	NUMBER OF HOURS WORKED (APPRX)	HOURLY PAY RANGE	NUMBER OF HOURS WORKED (APPRX)	HOURLY PAY RANGE