Gray to Green:

Jumpstarting Private Investment in Green Stormwater Infrastructure

SARAH E. FRANCIS

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Green Economy Task Force
building a green economy for all philadelphians

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Executive Summary

Philadelphia, along with many other cities across the country, is facing a crisis in its aging infrastructure, increasing water pollution, and failures to comply with federal water quality standards. In response, the Philadelphia Water Department (PWD) developed Green City, Clean Waters. This plan will change the tone of the national infrastructure debate from focusing on expanding and replacing traditional gray systems, to implementing what is so far the most ambitious green stormwater infrastructure initiative in the country. By focusing on advancing green stormwater infrastructure, the plan intends to turn our declining infrastructure crisis into a successful framework to generate productive, sustainable and inclusive long-term growth. Over the course of 20 years, and an investment of $1.6 billion, PWD aims to convert one-third of the City's existing impervious cover, about 4,000 acres, to green stormwater infrastructure.

Over the course of 20 years and an investment of $1.6 billion, PWD aims to convert one-third of the City's existing impervious cover – about 4,000 acres – to green stormwater infrastructure.

1. Gray to Green

For the *Green City, Clean Waters* plan to succeed, the City will need a critical mass of installations – making private participation and investment imperative. As calculated by PWD, approximately 55% of the 4,000 acres they plan to convert are privately owned. New billing structures for stormwater management, targeted to nonresidential private landowners, will be implemented in 2010. It is in the best interest of the City to ease this transition and clearly communicate financing and best practices to companies considering new projects to reduce their impervious surface area.

This paper outlines several strategies that will help ensure that PWD meets its ambitious goals and that green stormwater infrastructure becomes a vital part of Philadelphia's future development and prosperity.

2. Lessons from Portland

To advance green stormwater infrastructure in Philadelphia, we can look to other cities such as Portland, whose success hinged upon making green stormwater infrastructure a core goal of city government. However, the City of Philadelphia cannot control every factor involved in successful implementation. Even though private sector participation represents a large component of the PWD plan, it faces significant barriers. By overcoming these barriers, Philadelphia would be able to realize the broad-based implementation of greening features at commercial, industrial, and educational facilities. The more features we have, the more resilient our communities will be in an uncertain future.

3. Philadelphia's Private Sector Challenge

The key barriers to private investment are:

Financing up-front costs – Limited financial products exist to meet the needs of potential green stormwater infrastructure customers in overcoming the hurdles of up-front costs.

Lack of information and "ethic" – While most Philadelphians support the idea of "greening", many still do not have a clear understanding of what green stormwater infrastructure is, how it works, and why it warrants their financial and philosophical investment.

Budget priorities – Limited financial resources can put stormwater management upgrades in competition with other priorities.

Small pool of local trained contractors and designers – Few vendors have the ability to implement green stormwater infrastructure measures, and even fewer are able to recognize the potential synergies that are created when these measures are integrated.

Ineffective marketing and lack of awareness on demand side – Even the best policies and incentives will fail if people are not aware of them and do not take advantage of them.

The recommendations outlined in this report provide workable solutions to addressing and overcoming these barriers, thus leveraging the PWD plan as a catalyst for smart, sustainable economic development.

4. Incentivize Private Sector Investment

PWD has changed the cost structure in which property owners pay for water services by introducing stormwater fees. For large properties these fees can be leveraged to incentivize the installation of green practices – much to the same effect as rising energy costs have prompted efficiency retrofits. Many of the financing structures incorporated by energy efficiency programs across the nation are applicable to stormwater management as well, depending on the details of the costs of installation projects versus the savings those projects offer over a period of time.

Establish green stormwater infrastructure service companies (GISCs) – Energy Service Companies facilitate the installation of comprehensive energy efficiency projects by offering financing, installation and maintenance services for equipment, and absorbing any financial risk. It is feasible to downscale this model to encompass green stormwater infrastructure projects.

Implement on-bill financing – On-bill financing programs for energy efficiency provide participants with energy audits and retrofits performed with the utility paying the upfront costs. Participants then pay the cost of the project over time as a line item on their utility bill.

Work with insurance companies to include discounts for green stormwater infrastructure in insurance packages – Given the amount of property damage in Philadelphia per year caused by flooding and sewer backups, insurance companies could provide additional incentives for green stormwater infrastructure investments by offering discounts to building owners who install green structures.

5. Promote Local Economies

Build the capacity of existing businesses related to green stormwater infrastructure services – Businesses must avoid the pitfall of transitioning to green services too quickly without the proper training in best practices. Minimum levels of expertise for green stormwater infrastructure design and implementation must be established to help potential clients be less apprehensive about including green structures in their projects.

Provide a networking framework, such as an Industry Partnership, to retrain existing businesses in green stormwater infrastructure techniques and pool their resources to arrange for insurance and quality assurance policies – An Industry Partnership for green stormwater infrastructure could bring together businesses in related fields to coalesce a common understanding of best practices, perform needs assessments, conduct gap analyses, build in-depth knowledge of the industry, and identify aggregate training and human capital needs.

PROMOTE LOCAL ECONOMIES (CONTINUED)

Remove the barriers for small, local businesses to apply for public and private contracts – Streamlining the process by which small businesses become certified to apply for public contracts would benefit the City as well as businesses. Certification lists could serve as a network whereby companies offering complementary services (e.g., designers, engineers, and contractors) can collaborate to better market themselves as multi-prime packages. Similarly, smaller companies with identical services could partner to expand their capacities for larger jobs, and divide burdens, like insurance requirements, between them.

Support new business development along the supply chain – In the economy for green stormwater infrastructure, there will be many points of access aside from design and contracting jobs – there is also the potential to invigorate sections of the manufacturing sector, as well as opportunities for building suppliers, urban agriculture, and plant nurseries.

6. Prepare Workforce Development & Education Institutions

More comprehensive engagement processes with relevant stakeholders, particularly with contractors and suppliers, will need to be developed in order to properly identify specific training needs and inform curriculum development.

By aligning these strategies to create cohesive worker pipelines, supply chains, and business networks, Philadelphia will be better poised to develop the nation's first green stormwater infrastructure industry.

GRAY INFRASTRUCTURE

Gray infrastructure refers to man-made, single purpose systems, such as highways or sewer and water treatment systems that are usually high-impact, costly, and displace natural systems. Green stormwater infrastructure, on the other hand, encompasses a wide range of water management practices that mimic natural systems, such as tree planting, installation of green roofs, infiltration basins, planter boxes, rain gardens, or the use of rain barrels. Non-structural practices include the conservation and linking of networks of ecologically significant lands such as wetlands, woodlands, and wildlife habitats that serve to protect the health of watersheds.

GREEN STORMWATER INFRASTRUCTURE

Green stormwater infrastructure is more cost-effective than gray infrastructure[1] and provides multiple benefits and uses, tends to appreciate over time, and forces built infrastructure planning to be done in concert with land use planning and conservation values. In addition, the development of a green stormwater infrastructure industry would spur small business development, create green collar jobs, and green Philadelphia's neighborhoods.

Green stormwater infrastructure can also be used as a framework for smart growth, or development that is "ecologically sound, environmentally friendly and supportive of community livability – growth that enhances our quality of life." Green stormwater infrastructure promotes the revitalization of urban cores by limiting sprawl and the use of impervious surfaces, while simultaneously protecting green spaces.

In this way, an effective green stormwater infrastructure policy has the potential to rejuvenate existing communities.

1 Reducing Stormwater Costs through Low Impact Development (LID) Strategies and Practices. Publication Number EPA 841-F-07-006, December 2007.

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Introduction

Philadelphia as Innovator: Placing a New Value on Water

While the connections between clean rivers, public health, and economic development might seem obvious, there is a long history in Philadelphia and elsewhere of failing to protect rivers to the extent required to ensure the prosperity of the city. Often, efforts to protect our rivers were misinformed, delayed because of the huge capital costs for infrastructure, or sidelined by other priorities such as trade and defense.[2]

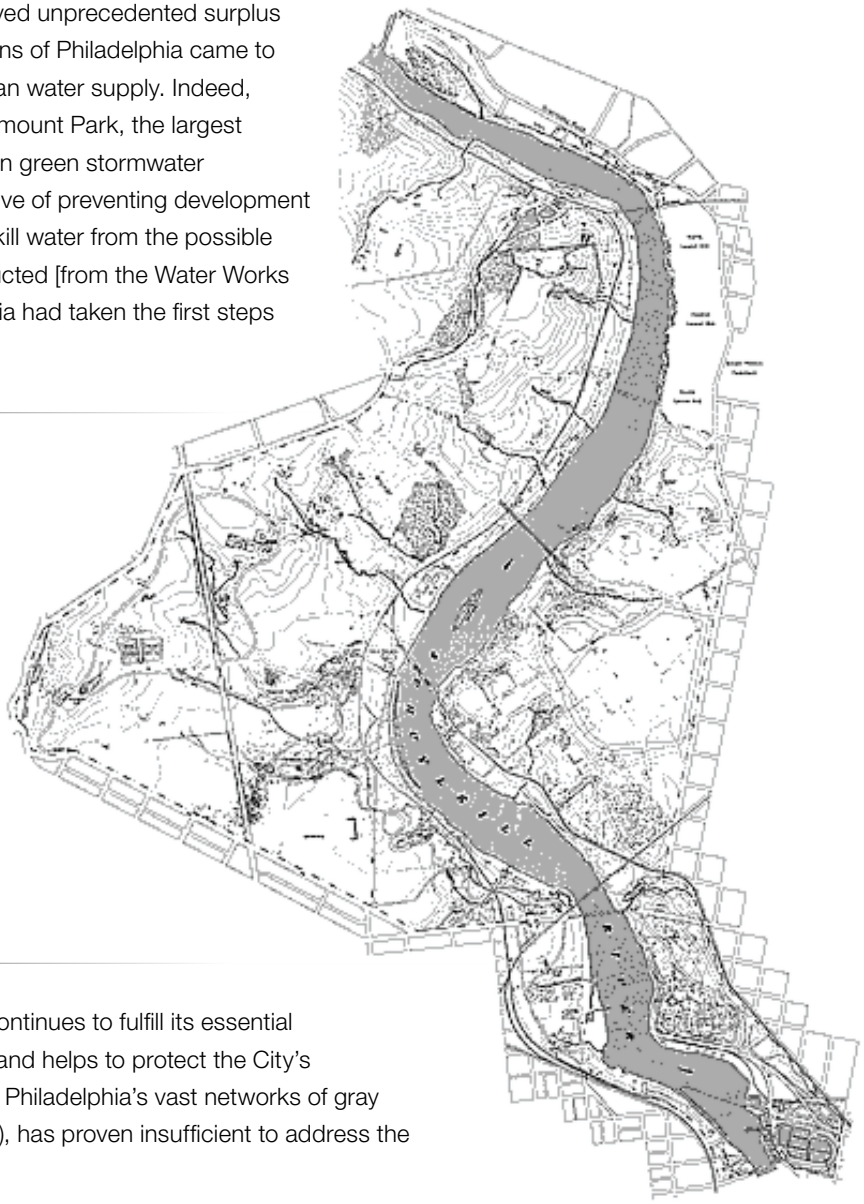
Yet, while Philadelphia has faced huge challenges in its struggle to effectively manage water resources and stave off devastating waterborne diseases over the past 200 years, it was able to cast itself as an innovator. Philadelphia was not only the first city in the nation to establish a public water utility, but it was also a pioneer of new technologies including: introducing the hydraulic turbine to the United States to power pumps; designing a centralized distribution system; and installing disinfection systems – all of which set the standard for water and sanitation for decades afterwards. [3]

European engineers, city planners, and even tourists would come to Philadelphia to tour the Water Works and marvel at its engineering ingenuity and cost-effectiveness.

2 United Nations Development Programme. Human Development Report 2006. New York, 2006.

3 Kramek, Niva and Lydia Loh. Philadelphia Global Water Initiative. "The History of Philadelphia's Water Supply and Sanitation System in Philadelphia" Global Water Initiative. June 2007. Available at: http://www.pgwi.org/Philalessonsinsustainability.pdf. Accessed September 15, 2009.

As typhoid cases declined, as the city treasury enjoyed unprecedented surplus revenues, and as industrial growth surged, the citizens of Philadelphia came to appreciate the far-reaching benefits of a reliable, clean water supply. Indeed, the purchasing of properties that now comprise Fairmount Park, the largest urban park in the country and arguably the first urban green stormwater infrastructure project, was done with the sole objective of preventing development along the river, thus preserving the "purity of Schuylkill water from the possible pollution which might result if buildings were constructed [from the Water Works up to the edge of city limits]."[4] In this way, Philadelphia had taken the first steps towards a system of integrated water management.



Topographical Map of Fairmount Park ~ 1870

(Reproduced in 1996 by the Historic American Buildings Survey) Fairmount Park Commission

Almost 170 years later, the Fairmount Park system continues to fulfill its essential function as a green buffer that filters polluted runoff and helps to protect the City's drinking water supply. But this system, in addition to Philadelphia's vast networks of gray infrastructure (including almost 3,000 miles of sewer), has proven insufficient to address the city's multiple water quality challenges.

The water infrastructure system that once inspired the world is now in decline. Misguided, stopgap measures need to be addressed and updated. Even with a system of interceptor sewers and treatment plants, Philadelphia's small streams are still being used as waste conduits. These streams dump sewage and polluted runoff into the Schuylkill and Delaware Rivers, the sources of Philadelphia's drinking water supply. These antiquated systems continue to threaten public health, property values, ecosystems, and Philadelphia's overall economic competitiveness on the world stage. [5]

4 Geffen, Elizabeth. "Industrial Development and Social Crisis: 1841-1854" in Philadelphia: A 300 year History. Russell Weigley, ed. W.W. Norton & Company, New York: 1982.

5 For example, recent economic studies point to trends in business attraction: a 2007 study by the Land Policy Institute found that companies are more interested in a trained work force, good schools and green infrastructure like parks when siting their operations, rather than traditional motives, such as tax abatements. http://www.landpolicy.msu.edu/modules.php?name=News&op=viewlive&sp_id=48; http://www.record-eagle.com/business/local_story_343094658.html

Re-linking Stormwater Management and Development

"DON'T WASTE A CRISIS." — M. F. WEINER, MD[6]

After 50 years of shrinking populations and a vicious cycle of lost revenues and disinvestment, Philadelphia is enjoying a sea change in the perception of cities as healthy, viable, and sustainable places to live.

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As of 2005, the majority of the world's population lives in cities, with this number expected to double by 2030. With the release of *Greenworks*, Philadelphia's framework for sustainable development, quickly followed by *Green City, Clean Waters*, the Philadelphia Water Department's (PWD) new combined sewer overflow (CSO) control plan, the city is repositioning itself to take advantage of these growth trends by striving to become "the greenest city in America."

Towards this end, PWD is planning to address challenges presented by aging infrastructure, water pollution, and Clean Water Act requirements[7] not by expanding and replacing its gray infrastructure networks, but by implementing a greener plan. Over the course of 20 years and an investment of $1.6 billion, PWD aims to convert one-third of the City's existing impervious cover – about 4,000 acres – to green stormwater infrastructure. The plan includes revising its billing structures and regulations, reimagining its relations with other governmental agencies, and promoting civic participation in order to implement the most ambitious green stormwater infrastructure initiatives in the country.

For their long-term CSO control plan to succeed, the City will need a critical mass of installations – making private participation and investment imperative. As calculated by PWD, approximately 55% of the 4,000 acres they are looking to convert are privately owned. These new billing structures will be implemented in 2010. It is in the best interest of the City to ease this transition and clearly communicate financing and best practices to companies considering new projects to reduce their impervious surface area. This paper outlines several strategies that will help ensure that PWD meets its ambitious goals and that green stormwater infrastructure becomes a vital part of Philadelphia's future development.

6 This expression has been traced back to 1976, to M. F. Weiner's article in the journal Medical Economics titled "Don't Waste a Crisis — Your Patient's or Your Own." Weiner meant by this that a medical crisis could be used to improve aspects of personality, mental health, or lifestyle.

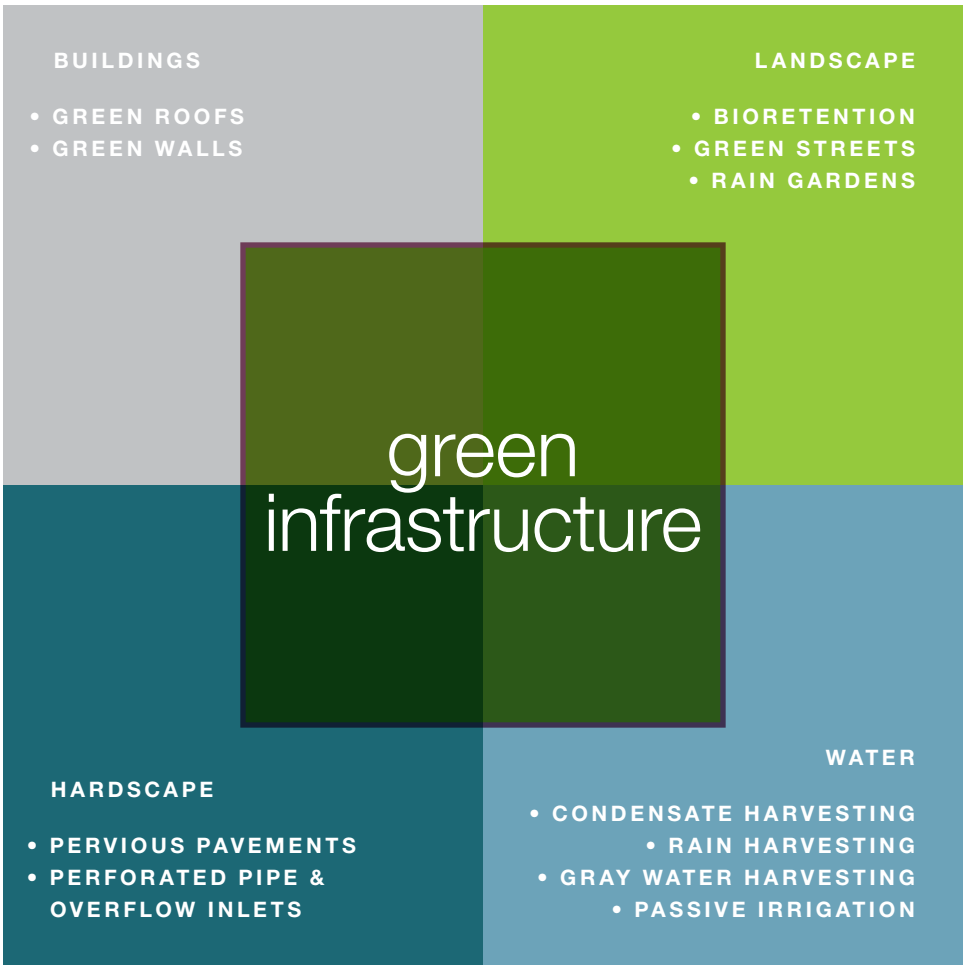
7 The Clean Water Act seeks to regulate polluted discharges into water bodies. For an overview of the regulations, visit http://www.epa.gov/lawsregs/laws/cwa.html.

1. Gray to Green

What is green stormwater infrastructure?
What is it not?

In an urban setting, green stormwater infrastructure is a framework for development that can allow for the same level of ecosystem services as non-disturbed, native settings, thus mimicking the efficiencies of ecosystems. These ecosystem services, such as the reduction of air pollution, water filtration, nutrient cycling, and flood control, are essential life sustaining processes provided by ecosystems that we usually take for granted because they occur over time and out of sight. The process of calculating monetary values of ecosystem services is an important emerging field in economics that provides robust empirical evidence of just how critical functional ecosystems are to human development and welfare.

GREEN INFRASTRUCTURE MATRIX



Source: Green Infrastructure Digest: http://hpigreen.com/category/hawkins-partners/

"Gray" infrastructure refers to man-made, single purpose systems, such as highways, sewer, and water treatment systems that are usually high-impact, costly, and displace natural systems. Successful green practices involve restoring, or "working with", natural systems and/or engineering man-made structures that mimic natural processes. Green stormwater infrastructure, as referred to as best management practices (BMPs), has thus far been difficult to define because it has different meanings for different parties, depending on the context in which it is used. The term encompasses a wide range of water management practices on multiple scales:

Structural: On an individual/community scale, green stormwater infrastructure usually takes the form of engineered structures that mimic natural systems, such as the planting of trees in tree pits, installation of green roofs and infiltration basins, planter boxes, rain gardens, or the use of rain barrels;

Non-structural: On the largest, regional scale, it means the conservation and linking of networks of large ecologically significant lands such as wetlands, woodlands, and wildlife habitats that serve to protect and sustain the health of watersheds.[8]

Green stormwater infrastructure often incorporates the use of soil and vegetation to collect, filter, and transpire runoff. But other strategies, such as porous concrete and asphalt, are also included in the definition because they allow the infiltration of stormwater into groundwater reserves. Infiltration has the dual benefit of recharging groundwater while enhancing the effectiveness of gray infrastructure by diverting stormwater away from overburdened pipes.[9] Truly green practices, like natural and constructed wetlands, work to maintain or restore a site's natural hydrology and are totally disconnected from gray systems. Rather than "green" or "gray" these projects lie on a spectrum, with certain technologies, such as a plant medium that slows down and filters runoff yet is still hooked up to the sewer system, lying somewhere in the middle.

Green stormwater infrastructure differs from gray infrastructure in other important ways: it is more cost-effective, provides multiple benefits and uses[10], tends to appreciate in value, and forces planners and implementers to consider built infrastructure planning in concert with land use planning and conservation values.

8 For an excellent overview of stormwater best management practices, see StormwaterPA: http://www.stormwaterpa.org/overview-bmps.html

9 "Greening Water Infrastructure: Our Nation's Crumbling Water Infrastructure." American Rivers. http://www.americanrivers.org/our-work/global-warming-and-rivers/infrastructure/water-infrastructure-background.html. Accessed 10/30/09

10 In Chicago, for example, green roofs are more valued as a defense against heat waves than for their ability to manage stormwater. Hewes, Will, and Kristen Pitts. "Natural Security: How Sustainable Water Strategies are Preparing Communities for a Changing Climate." American Rivers. http://www.americanrivers.org/our-work/global-warming-and-rivers/infrastructure/natural-security.html. Accessed October 6, 2009.

Smart Growth: The Case for Green Stormwater Infrastructure

The integration of green stormwater infrastructure promotes the adoption of what Howard Neukrug, Director of the Office of Watersheds at PWD, calls "the urban form"[11]: denser urban cores that limit sprawl and the use of impervious surfaces, while simultaneously protecting green spaces. In this way, an effective green stormwater infrastructure policy has the potential to rejuvenate existing communities by enhancing:

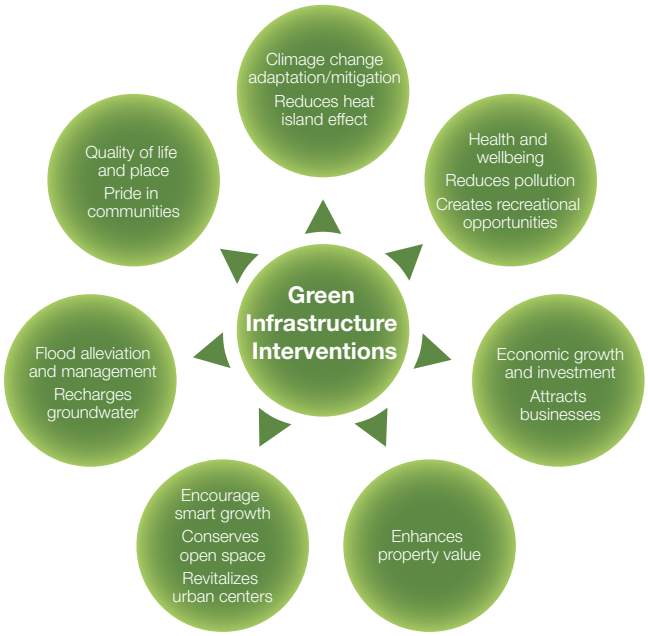
Quality of life – Beautification, crime reduction[12], combats heat island effect, promotes pedestrian use and safety by creating barriers between traffic and people, enhancing public health with clean water, air, and access to recreational opportunities and spaces, promotes mental health.[13]

Economic development – Creates quality jobs, raises property values, lowers maintenance costs, savings on heating/cooling bills, reduces property damage from flooding, reduces water treatment costs, stimulates manufacturing and construction sectors.

Ecological values – Restores groundwater reserves, reduces CSOs to rivers, protects wildlife habitats, and reduces water temperature.

Environmental justice and equity – Typically, lower-income neighborhoods in the city have the most impervious surface and vacant lots.[14] By converting these spaces using green stormwater infrastructure, these neighborhoods will be beautified, increase access to green space, and increase surrounding property values while building capacity and access to quality green collar jobs.

GREEN INFRASTRUCTURE BENEFITS: A RETURN ON INVESTMENT



11 Presentation by Howard Neukrug: "Green City, Clean Waters". Villanova Stormwater Management Partnership, Stormwater Symposium, Villanova University, October 15, 2009.

12 Numerous studies by the University of Illinois Landscape and Human Health Laboratory have shown that trees and other types of vegetation influences rates of crime and domestic violence: http://lhhl.illinois.edu/violence.htm. Accessed October 22, 2009.

13 Numerous studies by the University of Illinois Landscape and Human Health Laboratory have shown that trees and other types of vegetation positively impact well-being and mental health: http://lhhl.illinois.edu/all.scientific.articles.htm. Accessed October 22, 2009.

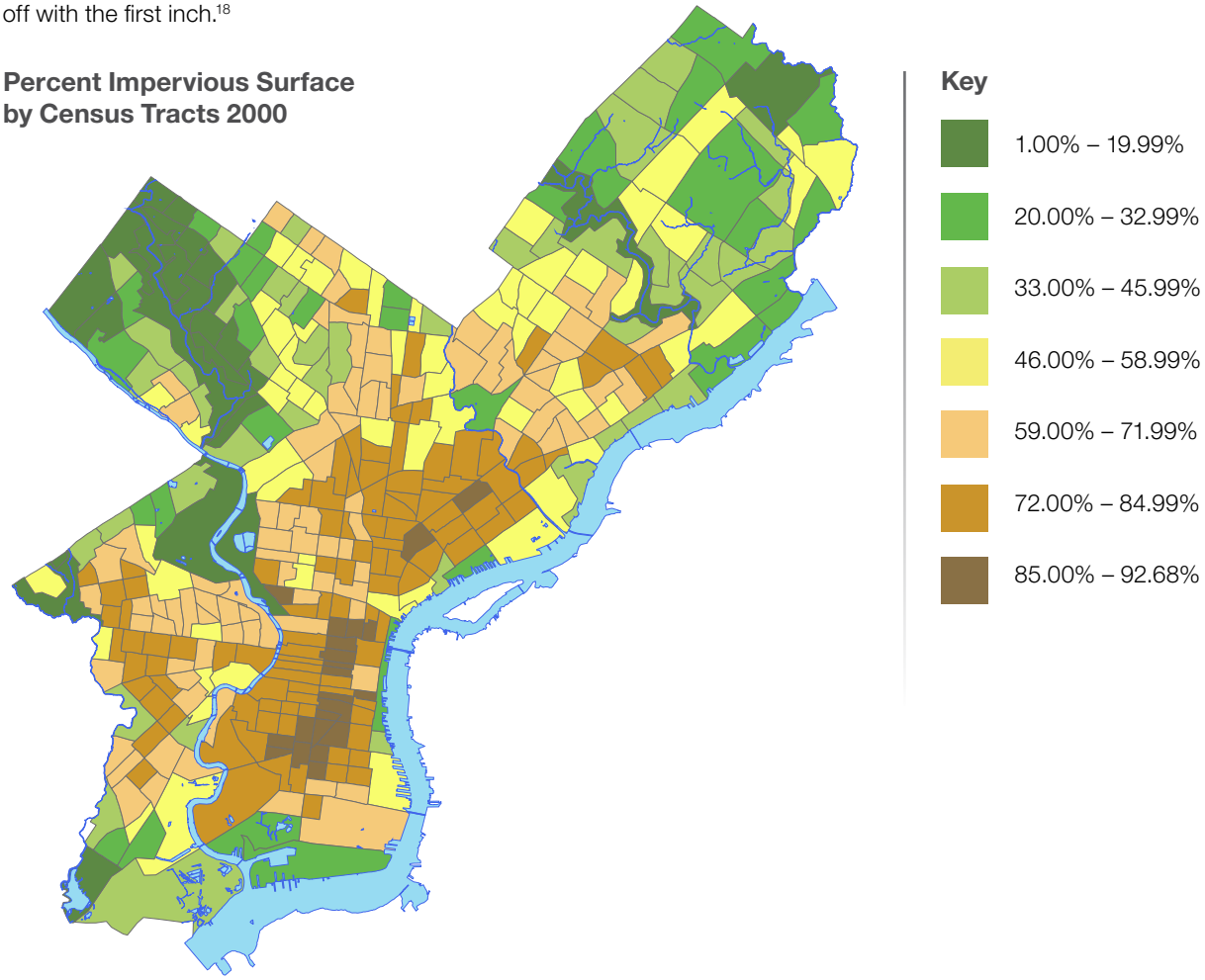
14 Presentation by Terry Gillen, Executive Director, Philadelphia Redevelopment Authority. Urban Sustainability Forum, "Re-imagining Vacant Land in Philadelphia", Academy of Natural Sciences, September 23, 2009.

Trends Influencing the Shift to Green Stormwater Infrastructure Investments

Trends over the past 10 years have contributed to the growing popularity and acceptance of green approaches to supplement existing traditional infrastructure:

Increased recognition and awareness of problems associated with urban sprawl and impervious surfaces. One inch of rainfall that falls on an acre of parking lot produces 27,000 gallons of stormwater.[15] As of now, 96% of this stormwater drains into Philadelphia's sewer system.[16] At these volumes, the sewer system can be overwhelmed in minutes, releasing sewage, pathogens, oils, trash, and heavy metals into our rivers by way of 164 combined sewer outflow points.[17] It is estimated that 80-90% of river pollution is caused by stormwater runoff, with the majority of the pollutants running off with the first inch.[18]

Percent Impervious Surface by Census Tracts 2000



Open Space Planning Group
Source: TreeVitalize

15 Elmendorf, Bill. "Managing Natural Resources: A Guide for Municipal Commissions." Pennsylvania State University's College of Agricultural Sciences, Agricultural Research and Cooperative Extension. 2008.

16 On average, 43 inches out of Philadelphia's annual 45 inches of rainfall becomes runoff, while 2 inches are evaporated. PA Stormwater Best Management Practices Manual, 2006.

17 City of Philadelphia. "The CSO Long Term Control Plan fact sheet: History and Background". Available at: http://www.phillyriverinfo.org/CSOLTCPU/CSOLTCP/pdf/LTCP%20Backgrounder%201105.pdf. Accessed December 8, 2009.

18 www.fairmountwaterworks.org. Accessed November 2, 2009.

TRENDS CONTINUED

Federal water quality mandates. Since 2007, the U.S. Environmental Protection Agency (EPA) has recognized green stormwater infrastructure as an important approach in meeting Clean Water Act goals and has called for leadership in its widespread implementation.[19]

Increase in marketability and sale value of homes and properties near green spaces. As green spaces are increasingly recognized as amenities to neighborhoods, there is a significant positive impact on proximate property values. The 2004 Wharton study by Susan Wachter on greening efforts in the neighborhood of New Kensington, Philadelphia demonstrated that planting a tree within 50 feet of a residence increased its value by 9% and that greening streetscapes raised the value of individual properties by 23%.[20]

A nationwide aging infrastructure system coupled with increased flooding events. In the past 10 years alone, floods have caused more property damage and deaths than any other type of natural disaster.[21] On an annual basis, floods cause over $1 billion worth of property damage in Pennsylvania. Over 94% of Pennsylvania's municipalities, including Philadelphia, have been designated as flood prone.[22]

In 2006 alone, one out of every three Philadelphia businesses and one out of five residents surveyed reported flood damage to their property.[23] This is particularly relevant for low-income communities, which seem to be more susceptible to such sewer backups and flooding events.[24]

Evidence for cost-effectiveness. PWD has calculated that every dollar spent on green stormwater infrastructure will reap an additional dollar in benefits to the city, as opposed to a negligible return on investment for gray infrastructure.[25] In this way, their long-term control plan represents a wise investment that also allows them spread out the impacts and benefits citywide. The decentralized nature of the plan's implementation gives PWD the ability to implement it in stages over time, and to scale up as needed. By integrating water infrastructure plans with other departmental maintenance schedules, the city will greatly reduce costs by merely replacing old streetscapes in need of repair with green stormwater infrastructure features, instead of installing them in an ad hoc fashion. In contrast, gray infrastructure systems, such as a deep tunnel project, require costly overhauls to expand their capacities. All told, some experts estimate that gray infrastructure, foot by foot, is 5-10 times more expensive to engineer, install and maintain than green stormwater infrastructure.[26]

19 US EPA. Green Infrastructure Initiative. Announced April 2007 in "Green Infrastructure Statement of Intent" Agreement between EPA, National Association of Clean Water Agencies, Natural Resources Defense Council, Low Impact Development Center and Association of State and Interstate Water Pollution Control Administrators. http://www.epa.gov/npdes/pubs/gi_intentstatement.pdf. Accessed October 21, 2009.

20 Wachter, Susan, "The Determinants of Neighborhood Transformations in Philadelphia – Identification and Analysis: The New Kensington Pilot Study." The Wharton School, University of Pennsylvania, 2004.

21 US Geological Survey, 2000. Significant Floods in the United States during the 20th Century: USGS Measures a Century of Floods: USGS Fact Sheet 024-00, Washington DC.

22 City of Philadelphia, Office of Emergency Management. "Overview of the Natural Hazards that May Affect Philadelphia." May 2009. Available at: http://oem.readyphiladelphia.org/Customized/uploads/OEM%20Documents/Hazards%20that%20May%20Affect%20Philadelphia.pdf. Accessed December 2, 2009.

23 Black, Karen. Next Great City Philadelphia. January 2007. Available at: http://www.nextgreatcity.com/actions/sewer. Accessed September 14, 2009.

24 The worst-hit neighborhoods – the Old Kensington section of North Philadelphia, Northern Liberties and Washington Square in the central part of the city, Pennsport and Girard Estates in South Philadelphia – correspond to the Delaware Valley Regional Planning Commission's "Degree of Disadvantage Map", created as part of their Title VI environmental justice mandate requirements: http://www.dvrpc.org/GetInvolved/TitleVI/maps/c9a.GIF. Accessed December 8, 2009. Also see Institute for Business & Home Safety, "The Importance of Reducing Disaster-Related Losses for Vulnerable Populations," March 2009. Available at: http://www.disastersafety.org/resource/resmgr/pdfs/vulnerable_populations.pdf Accessed December 10, 2009.

25 Presentation by Howard Neukrug: "Green City, Clean Waters". Villanova Stormwater Management Partnership, Stormwater Symposium, Villanova University, October 15, 2009.

26 Interview with Wes Horner, Brandywine Conservancy, October 5, 2009.

TRENDS CONTINUED

Evidence for job creation – At the same time, green stormwater infrastructure presents a large potential for job creation: a study by American Rivers and the Alliance for Water Efficiency, looking at the impacts of green roofs alone, found that an initiative of covering just 1% of America's "green-roof ready building area" would create over 190,000 jobs and provide billions in revenue for green-roof related suppliers and manufacturers.[27]

Increased awareness and research on problems associated with climate change – In addition to evaluating the role of cities in addressing global climate change, there has been a re-evaluation in how they think about water. With increasing variability in weather patterns, some cities are experiencing increased flooding events while others are continuously facing water shortages.[28] Due to these trends, municipalities have begun to view stormwater not as a liability to be moved through the sewers as quickly as possible, but rather as an asset that could be managed for additional benefit to the city.

In another example relevant to urban settings, green approaches, particularly green roofs, can directly mitigate global warming and lower greenhouse gas emissions by reducing energy use associated with heating and cooling buildings.[29]

Public relations value and increased marketability for businesses – Businesses have begun to make investments in greener facilities and operations, in part to capture the trend's marketing power. For example, PECO recently installed the largest green roof on an existing building in Philadelphia and made national news. Even with additional associated costs, there has been a nationwide increase in LEED®-certified office buildings and developments.[30] Whether or not a company's main impetus is to gain attention and tout its ethical investing, the public relations aspect of such eco-friendly projects certainly remain to be, and will continue to be, a valuable advantage.

…a study by American Rivers and the Alliance for Water Efficiency, looking at the impacts of green roofs alone, found that an initiative of covering just 1% of America's "green-roof ready building area" would create over 190,000 jobs and provide billions in revenue for green-roof related suppliers and manufacturers.

27 Hewes, Will. "Creating Jobs and Stimulating the Economy through Investment in Green Water Infrastructure." American Rivers and Alliance for Water Efficiency. 2008.

28 Hewes, Will, and Kristen Pitts. "Natural Security: How Sustainable Water Strategies are Preparing Communities for a Changing Climate." American Rivers. http://www.americanrivers.org/our-work/global-warming-and-rivers/infrastructure/natural-security.html. Accessed October 6, 2009.

29 In summer, green roofs can be as much as 90 degrees cooler than conventional roofs. Hewes, Will. "Creating Jobs and Stimulating the Economy through Investment in Green Water Infrastructure." American Rivers and Alliance for Water Efficiency. 2008.

30 The overall green building market (both non-residential and residential) is likely to more than double from today's $36-49 billion to $96-140 billion by 2013. McGraw Hill Construction. "Green Outlook 2009: Trends Driving Change". 2009.

2. Lessons from Portland

Integrative Planning and Water Resource Management

When Mr. Neukrug insists that "we need a sustainable city if we are to have a sustainable utility"[31], he is saying that it would be impossible for PWD alone to implement plans such as *Green City, Clean Waters*. Meaningful sustainable development will require a restructuring of narrowly defined, traditional municipal planning and operational procedures to allow collaborative efforts towards a common goal. The city of Portland, Oregon, has achieved success in its Green Street pilots by placing such emphasis on process and planning.

One Portland Green Street pilot, the downspout disconnection program, diverts 1.2 billion gallons of water a year from sewers – one-tenth of all stormwater in the city. By investing $8 million in the program, the city provided $250 million in savings that would have otherwise been required for infrastructure repairs and pipe construction costs.[32] This figure doesn't include savings from stormwater facility fees associated with treating the water before returning it to the watershed.

Natural System Benefits

Provide habitat
Slowly release storm flow
Filter pollutants
Recharge groundwater
Reduce erosion

Approximate Cost

$17,000 for two stormwater curb extensions and
$3,000 for the ancillary sidewalk/curb work.

Portland Green Street Pilot Tour Map

http://www.portlandonline.com/shared/cfm/image.cfm?id=96962

31 Presentation by Howard Neukrug: "Green City, Clean Waters". Villanova Stormwater Management Partnership, Stormwater Symposium, Villanova University, October 15, 2009.

32 Dunn, Alexandra Dapolito and Nancy Stoner, "Green Light for Green Infrastructure" Environmental Law Institute, Environmental Forum. May/June 2007.

Key Takeaway:

When comprehensive, multi-objective planning is done, the costs of implementation are greatly reduced.

Portland's Key to Success:

The city developed policy to establish Green Street as a citywide priority requiring cross-departmental coordination and communication.

- Plans were integrated into the city's comprehensive plan and transportation system plan.
- Office of Management and Finance created a task force to identify funding sources.
- Created requirement to incorporate green stormwater infrastructure into all publicly-funded development/ enhancement projects or else pay 1% for construction costs into a "1% For Green" street fund.
- Developed clear short-term, mid-term and long-term approaches with clear departmental responsibilities.
- Established monitoring as a priority.
- Created a framework to calculate capital and long-term maintenance costs of individual practices.
- Recognized the cumulative impacts of small efforts, such as the downspout disconnection program.

Challenges in Applying Model to Philadelphia:

Different municipal governance structure – While Portland city government has a history of integrated planning and cross-departmental communication, Philadelphia city departments have narrowly defined purviews and responsibilities.

History of effective marketing and neighborhood engagement – Portland city government places such a high value on community engagement that they have created an Office of Neighborhood Involvement (ONI) to coordinate educational efforts and actively create citizen advocates for issues such as stormwater management.

Scale – Philadelphia's plan is simply larger than Portland's model. PWD's model neighborhood initiative, a pilot of what is proposed in the CSO control plan, encompasses 14 neighborhoods. This initiative alone already outpaces the seven pilot street projects that comprise Portland's Green Street program.

Focus beyond publicly owned land – Aside from their downspout disconnection program, in which the city worked with individual homeowners, the city of Portland's plan mostly involved government property. This allowed them to take on the majority of responsibility for the planning, implementation, and maintenance of structures. Philadelphia, whose plans include a diversity of landowners, will require assistance and buy-in from myriad other partners, such as community groups, non-profits, residents, and developers.

Why it Should be Applied in Philadelphia:

What is truly interesting about sustainability planning is how it forces planners to embrace a systems-based approach– thus realizing the synergies and long-range consequences of their plans. By leveraging the current state of urgency around addressing sewer back ups and CSOs, and establishing the development of green stormwater infrastructure as a citywide priority, Philadelphia would have a mandate to put its resources into creating a more robust, effective government by opening up lines of cross-departmental communication and collaboration around a common goal. Such restructuring would boost the City's problem-solving capacity as a whole.

FOR MORE INFORMATION ON PORTLAND GREEN STREET PROGRAM, VISIT: HTTP://WWW.PORTLANDONLINE.COM/BES/INDEX.CFM?C=44407

3. Philadelphia's Private Sector Challenge

While there has been an overwhelmingly positive response to the idea of community greening and green stormwater infrastructure by those who have participated in PWD's outreach programs, there are significant barriers to its widespread implementation. While private sector participation and investment is critical to the success of the PWD plan, there currently are no supportive mechanisms to ease this transition from a focus on gray to green infrastructure.[33] The key barriers to private investment are:

Financing up-front costs – Limited financial products and business models exist to meet the needs of potential green stormwater infrastructure customers in overcoming the hurdles of up-front costs with limited internal funds.

Lack of information and "ethic" – While the vast majority of Philadelphians support the idea of "greening"[34], most still do not have a clear understanding of what green stormwater infrastructure is, how it works, and why it warrants their financial and philosophical investment. As an emerging industry, Philadelphia businesses and institutions might be hesitant to invest in approaches that are so new to them. Beyond early adopters, those who have already taken concrete action to implement green stormwater infrastructure features in the private sector are few.

Budget priorities – Both commercial and personal budgeting can put stormwater management upgrades in competition with other priorities. With the rising costs of healthcare, energy, and education, a solid case, with short-term benefits, has to be made for green stormwater infrastructure investments.

Small pool of local trained contractors and designers – Few vendors have the ability to identify and implement green stormwater infrastructure measures, and even fewer are able to recognize the potential synergies that are created when these measures are integrated.

Ineffective marketing and lack of awareness on demand side – Many promising programs and tax incentives are not taken advantage of because of ineffective marketing – that is, potential customers simply aren't aware of them. This barrier acts as a mortar that binds the other barriers together.

By overcoming these key barriers, Philadelphia would be able to realize the broad-based implementation of green stormwater infrastructure features at commercial, industrial, and educational facilities. The more green stormwater installations we have, the more resilient our communities and our rivers will be in an uncertain future.

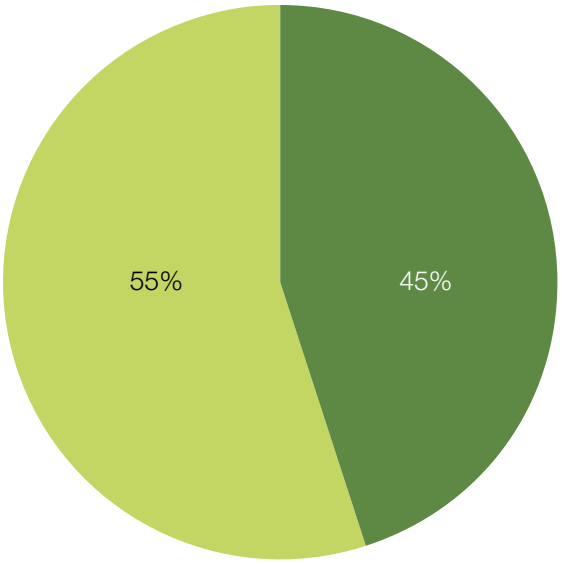
33 For more information on policy and innovative funding recommendations targeted to the public sector, see the Pennsylvania Environmental Council's paper "Implementing Green Infrastructure: Developing a Winning Strategy to Fund Philadelphia's Ambitious Visions." Available at: http://www.pecpa.org/files/downloads/Implementing_Green_Infrastructure.pdf.

34 Philadelphia Water Department, Office of Watersheds. "Green City, Clean Waters Summary report" pg. 42. Available at: www.phillywatersheds.org/ltcpu. Accessed September 12, 2009.

4. Incentivize Private Sector Investment

While PWD is working to engage public interest, allocate funds, and prioritize the conversion of public lands to green stormwater infrastructure, many questions as to how this plan will affect the private sector remain. As stated previously, for their long-term CSO control plan to succeed, the City will need a critical mass of installations – making private participation and investment imperative.

PWD calculates that only about 45% of the 4,000 acres they plan to convert are publicly owned.



45%

Publicly-Owned Lands

Streets
Public schools
Public open spaces
Public facilities

55%

Privately-Owned Lands

Industry, business, commerce, institutions
Homes
Parking lots
Alleys, driveways, walkways

In addition, the city has realized the potential of converting some of Philadelphia's 40,000 vacant lots to "greened acres" – yet over 70% of vacant lots are privately owned.[35] Moreover, the City must codify extra measures for enforcement to ensure that landowners who claim to be installing stormwater management features are actually doing so, and to the required efficiencies. Without increased consideration for inspection, enforcement and maintenance, it is unlikely that the City will fulfill its federal clean water requirements.

35 Presentation by Terry Gillen, Executive Director, Philadelphia Redevelopment Authority. Urban Sustainability Forum, "Re-imagining Vacant Land in Philadelphia", Academy of Natural Sciences, September 23, 2009.

As of the writing of this paper, PWD is still working out the details of several programs, including:

1. Stormwater management regulations require development projects disturbing over 15,000 square feet of earth to manage the first inch of rainfall over all impervious area that is directly connected to the sewer system, and require practices that allow for infiltration where possible. PWD is currently considering lowering the threshold to 5,000 square feet, dramatically improving the environmental impact, but affecting many more property owners.[36]

2. Stormwater management service (SWMS) charges based on amounts of impervious cover. The PWD is planning to implement this new fee among its large-meter non-residential customer base. However, the City recognized that it would be too administratively complex to calculate charges for each of the city's 450,000 residential properties. Instead, they chose to combine all residential properties, to be treated as a single land parcel with the SWMS charge divided equally among them. Early calculations indicate that most residential customers will see a minor impact, if any, on their water bills. Thus, all of the recommendations in this section are directed toward owners of commercial properties.

3. SWMS credits for managing stormwater on-site, and,

4. Devising additional incentives, such as expedited permitting, for using green techniques for managing stormwater. As of now, it would be permissible to use gray structures, like underground holding tanks, which only allow for slow release of stormwater into the sewer system, in order to qualify for the SWMS credit.

While this new billing structure does the City service by more accurately capturing the burden that stormwater places on our water system, as well as creating incentives for individuals to take responsibility for stormwater on their site, it also has the potential to hurt key non-residential landowners. These groups, which include commercial, industrial landowners, as well as schools and hospitals, represent a significant portion of PWD's plan's goals. For some private landowners, this new billing system could inflate their water bill exponentially. While a conceptual buy-in and support of "greening" is a necessary first step, it is not sufficient to ensure widespread retrofits and green-focused development.

In light of this, the range of incentives that will properly drive private investment must be supportive as well as firm. Regulations alone have the potential to drive off development. Well-intentioned policies that aim to force such investment, such as manipulated building requirements, can sometimes have the opposite effect of delaying retrofit and development projects by imposing additional costs without also providing supportive measures. Additional financing structures, akin to what is being used in the energy efficiency industry, will be required to incentivize the conversion to green stormwater infrastructure by negating the upfront capital costs these conversions will place on landowners.

36 See http://www.phila.gov/water/pdfs/pwd_regulations6.pdf.

Establish Green Stormwater Infrastructure Service Companies (GISCs)

The energy efficiency industry is well established, with many success stories for savvy financing mechanisms. By introducing SWMS charges, PWD has created a cost structure similar to energy efficiency projects. These charges essentially incentivize landowners to install green stormwater infrastructure projects – much to the same effect as rising energy costs have prompted efficiency retrofits.

TARGET MARKET:

Large properties such as schools, industrial, and commercial properties.

How it works:

Energy Service Companies, or ESCOs, facilitate the installation of performance-based, comprehensive energy efficiency projects by offering financing, installation and maintenance services for equipment, and absorbing any financial risk. All of the costs associated with the project are folded into the company's compensation contract that is repaid over time by the customer with the savings generated by the project. i.e. the difference between the pre-installation energy costs and the post-installation costs.

In addition to the environmental and cost savings produced by these projects, ESCOs have become a source of job creation for employees at every skill level – from contractors, to energy auditors, to financial managers. It is estimated that out of the $20 billion of energy efficiency projects installed to date, $7 billion is represented by labor costs.[37]

If this model were applied to the green stormwater infrastructure industry, it could reduce barriers of scale and capital for developers and retrofitters. Green Stormwater Infrastructure Service Companies (GISCs) would conduct an "audit" by evaluating each property and identifying which strategies are the most appropriate and represent the most cost savings.[38] Using a list of preferred contractors, they would oversee installations. Calculating the long-term costs and payback periods, they would devise a financing structure that, on a monthly basis, would be equal to or less than the stormwater fee that the customer would otherwise have to pay to the utility. By the end of the contract period, the customer will be released of obligations to pay the utility or the GISC, and would only incur the maintenance costs, which could be sub-contracted or performed by the customer.

All of the costs associated with the project are folded into the company's compensation contract that is repaid over time by the customer with the savings generated by the project.

Challenges:

Typically, the establishment of ESCOs requires a substantial initial capital investment to pay for these projects, while maintaining a buffer over payback periods that can be as long as 20 years. As a result, in combination with high transaction costs, these companies have tended to focus on large projects, of $5 million or more.

37 National Association of Energy Service Companies. www.naesco.org/resources/esco.htm. Accessed October 5, 2009.

38 Some strategies, such as green roofs smaller than 5,000 ft, aren't always cost-effective.

Why it could work for green stormwater infrastructure:

It is feasible to downscale this model to encompass a larger range of clients and projects. On average, green stormwater infrastructure retrofits would be:

- Less expensive, thus shorter payback periods, and less risk,[39]
- Avoid many of the pitfalls of energy efficiency retrofits, such as "split incentives," where the renters in a building pay the energy bills, thus removing the incentives for the owner to invest in the implementation of energy efficient measures. As water bills are nearly always paid by landlords in Philadelphia, and not passed on to tenants, it preserves the integrity of the incentive.
- Easier to administer, since stormwater charges represent a fixed monthly cost offset, as opposed to unpredictable, fluctuating energy cost offsets.

Funding:

As stated, the main impediment to establishing GISCs would be initial capital setup costs, such as salaries, travel, research, temporary metering, and in some cases initial "audits." Over time, the company will run off of recovered contract payments, some of which will revolve back into the company's working capital. A possible funding source could be one of the city's Community Development Financing Institutions (CDFIs). These institutions are funded by the US Department of the Treasury with the mission of providing financial services and technical assistance to underserved communities. Properly structured, GISCs could fulfill this capacity in numerous ways: by carefully selecting the contractors that will be on the list of approved companies, by ensuring that a diverse pool of financing institutions are included in such projects, and providing extra incentives for projects in low-income areas.

39 Large-scale energy retrofits, including auditing, equipment, and installation, run, on average, in the millions of dollars. In comparison, the largest and most expensive green roof in Philadelphia, at the PECO headquarters, cost about $800,000 ($19/square foot). Some green roof companies, such as BioNeighbors, have been able to bring down the cost of green roofs to about $3.50/square foot, depending on the conditions. Large-scale rain gardens and swale cost in the range in the tens of thousands.

Implement On-Bill Financing

Many of the financing structures incorporated by energy efficiency programs across the nation are applicable to stormwater management as well, depending on the details of the costs of installation projects versus the savings those projects offer over a period of time. On-bill financing is highlighted in this report merely because it is one of the most prevalent and successful schemes profiled in a report of comprehensive case studies conducted by the green collar job advocate, Green For All.[40] Variations on the programs, such as attaching the costs of retrofits to the equity of the property and adapting existing loan products to cover green stormwater infrastructure, should also be considered.

TARGET MARKETS:

Many comparable on-bill financing programs are targeted to small residential properties. However, residential properties will not experience a cost increase in their water bills – thus residents won't have enough financial incentive to participate. A key market for these programs will instead include schools, commercial, and industrial landowners.

How it works:

In the energy efficiency industry, participants in on-bill financing programs have energy audits and retrofits performed on their properties by a pre-approved contractor, with the utility paying the upfront costs. Participants then pay the cost of the project over time as a line item on their utility bill. Because energy savings are instantaneous, these bills are equal to or below expected energy costs, sometimes resulting in positive cash flow to the participants. These agreements are assigned to the property's energy meter, so that they remain with the property if it is sold to another owner.

On-bill financing programs have proven successful for business and residential customers in New England, New York, California, and some Midwestern markets with an average default rate of 0.5% or less.[41] Interest rates range from 0 to 9.75% with terms of up to 20 years.

40 Green For All. "Communities of Practice: Retrofitting America's Cities." Resource binder from the Green Jobs Community of Practice Meeting, March 23-24, 2009, Oakland, CA.

41 Hinkle, Bob, and Steve Schiller. "New Business Models for Energy Efficiency" California Clean Energy Fund Innovations White Paper, March 2009. Available at: http://www.calcef.org/innovations/activities/nbm-eir.htm. Accessed October 2, 2009.

Challenges:

In most states, legislation is required to enable the utility and/or the city to bill for energy efficiency improvements. This could entail a lengthy lobbying process. Moreover, it would place additional administrative and service delivery burdens on an already-overwhelmed municipal system. Most importantly, however, is the fact that utilities are not in the business of loaning money to their customers, and see a risk in doing so with their own capital or ratepayer funds. As a result, in order to limit their risk, these programs usually target small projects with short repayment periods of less than five years.

Why it could work for green stormwater infrastructure:

This initiative would be best focused toward specific project areas, such as parking lot retrofits, with relatively short payback periods, but have a huge impact for stormwater management. A well-structured on-bill financing scheme for green stormwater infrastructure, coupled with an expanded outreach/education program, could provide the much-needed push for thousands of non-residential landowners to tap into other existing resources, such as tax credits and rebates, and do their part in managing their own stormwater.

Funding:

Most often, on-bill financing programs have been funded through a combination of sources including utility general revenue funds, the issuance of bonds, state-funded programs, private capital, and administrative fees.[42] For the purposes of on-bill financing for green stormwater infrastructure projects in the Philadelphia region, more innovative approaches would be called for, such as a public/private partnership with a bank or community development financing institution. Entities that are actually in the business of making and managing loans can manage the underwriting and lending processes for the utility. The utility then is in charge of arranging the marketing, contracting, project evaluation, and collection mechanism.[43]

42 Ibid.

43 Ibid.

CASE STUDY: ON-BILL FINANCING

Power Smart Residential Loan, Manitoba Hydro, Canada

– Since 2001, the program has disbursed 41,000 loans, one of the highest annual loan volumes of any energy retrofit program.

– In 2007, it disbursed 8,100 loans with an average value of $4,800, with a participation rate of 2% of their customer base, one of the highest participation rates in North America.

Keys to success:

- Loan agreement coupled with generous rebates.
- Web-based network of approved 1,300 contractors and retailers.
- Same day loan approvals for clients. The utility uses bill payment history to assess credit worthiness. 94% approval rate.
- Below market interest rates of 6.5% for up to 5 years.
- Fast and efficient payment system: Utility pays the contractor within 20 business days, a fast and efficient payment system.
- Overdue payments subject to an interest charge of 1.25% per month. After 90 days, client is subject to a disconnection of services. As a result, they have a default rate of less than 0.2%.

Challenges with applying model to Philadelphia:

Scale – Green stormwater infrastructure retrofits for some properties may not be as cost effective as energy retrofits, depending upon the cost savings that these projects produce.

Capital – Program funds come from utility's general revenue funds. PWD will already be billing clients what was assessed to be their upper limits of affordability. Additional fee increases would thus be detrimental by charging clients what they cannot afford.

Marketing – Existing rebates, such as green roof tax credits, are not often taken advantage of in Philadelphia because they are poorly marketed, or potential customers perceive the transaction costs to outweigh the benefits.

Work with Insurance Companies to Include Discounts for Green Stormwater Infrastructure in Insurance Packages

The $16 trillion insurance industry has begun offering lower rates on automobile, homeowner and property insurance to policyholders who drive fewer miles, own hybrid cars or build energy efficient houses. In March of 2009, insurance regulators adopted rules that require insurance companies with annual premiums of $500 million or more to report risks they might face from climate change. The same month Ceres, a coalition of investors, environmental groups and other organizations, released a report showing a 50 percent increase in climate-related activity (i.e. anything from mile-based car insurance to discounts for lowering emissions) by insurers from 2007 to 2008.[44]

The insurance industry can promote efforts to adapt to the impacts of weather hazards through the promotion of three measures:

- Disseminating information about reducing the vulnerability of properties;
- Providing financial incentives to invest in mitigating the impacts of extreme weather, Including both flooding and heat waves; and
- Establishing partnerships with policy makers to establish maximum thresholds of acceptable risk.

Given the amount of property damage in Philadelphia per year caused by flooding and sewer backups, insurance companies could provide additional incentives for green stormwater infrastructure investments by offering discounts to building owners who install green structures.

For the insurers, the motivation is obvious: The potential for insured losses is enormous as climate change brings on stronger storms, longer droughts and more intense heat waves.

For the insurers, the motivation is obvious: the potential for insured losses is enormous as climate change brings on stronger storms, longer droughts and more intense heat waves.

44 Mincer, Jilian and Shelly Banjo. “Insurers offer Rewards for Going Green.”The Wall Street Journal. April 22, 2009. Page D5

5. Promote Local Economies

Once the market for the design, installation, and maintenance for green stormwater infrastructure is firmly established, it will be pivotal to ensure that regional businesses are prepared to fulfill these contracts.

Form Industry Partnership

- Build the capacity of existing businesses related to green stormwater infrastructure services, and
- Provide a networking framework to retrain existing businesses in green stormwater infrastructure techniques and pool their resources to arrange for insurance and quality assurance policies, such as an Industry Partnership.

Businesses that provide gray infrastructure services must avoid transitioning to green services too quickly without the proper training in best practices. First generation demonstration projects specific to Pennsylvania, like the installations on the Villanova University campus by the Villanova Urban Stormwater Partnership, are still being monitored for effectiveness. As an emerging specialization, there are still no nationally recognized standards for certifications, degrees, or apprenticeships that pertain to green stormwater infrastructure practices and thus directly denote specialized knowledge and experience to potential clients. There is a need to establish a minimum level of expertise for green stormwater infrastructure design and implementation. Once standards and codes are established, potential clients will be less apprehensive about including green stormwater installations in their projects. A respected, independent certification for green stormwater infrastructure practices could accomplish for the field what LEED® has done to boost and transform for the green building industry. Philadelphia is ideally positioned to become of the first areas where such standards are developed.

The establishment of an Industry Partnership around green stormwater infrastructure would bring together otherwise disparate businesses in design, engineering, construction, and maintenance to coalesce a common understanding of best practices, market gaps, and training and human capital needs. Many Industry Partnerships also take on the role of advocate to influence legislation and regulations pertaining to the industry. Most importantly, such a partnership would have the capacity to brand the industry, fulfill marketing needs, and disseminate relevant information throughout the market.

PENNSYLVANIA INDUSTRY PARTNERSHIPS PROJECT

"Each Industry Partnership is a multi-employer management and labor collaboration to improve the competitiveness of a cluster of companies or organizations that produce similar products or services and that share similar supply chains, critical human resource needs, infrastructure requirements, business services, or retention/recruitment challenges. By bringing together employers and their workers, the Pennsylvania Industry Partnerships Project expects to learn significantly more about the opportunities and challenges facing a set of similar companies."[45]

45 National Fund for Workforce Solutions: Pennsylvania Industry Parternships Project. http://www.nfwsolutions.org/collaboratives_detail.html?id=13. Accessed December 26, 2009.

CASE STUDY: INDUSTRY PARTNERSHIP

Smart Energy Initiative of Southeastern Pennsylvania

One of the premier examples of an Industry Partnership is Smart Energy Initiative, a regional, public-private energy industry partnership sponsored by the Chester County Economic Development Council. Key collaborators include: Energy industry representatives, PennFuture, regional Workforce Investment Boards, Ben Franklin Technologies, the Delaware Valley Industrial Resource Center, and area colleges/universities/technical schools. In addition to promoting growth for the clean energy industry as a whole, they also provide benefits/services to partners, including:

- Financial assistance for training current employees.
- Development of a stable industry workforce that provides good job opportunities to residents in the region.
- Establishment of an array of educational programs and seminars to supply a pipeline of qualified, entry-level workers.
- Immediate access to an interconnected “web” of business resources.
- Single point of contact for access to grant/loan programs (workforce development, facilities, new construction, etc.).
- Access to industry leaders for high-quality technical expertise.
- Business support, consulting, and mentoring.

FOR MORE INFORMATION ON SEI,
VISIT: HTTP://WWW.SMARTENERGYPA.ORG/

Remove Barriers to Participate in Contracts

Streamlining the process in which small businesses become certified to apply for public contracts would benefit the City as well as businesses.

So far, many businesses have reported that being certified has benefited them by raising their profile, thus giving them a competitive edge.[46] But the process is lengthy, usually taking between 90 and 120 days, involving gratuitous paperwork, and sometimes-stringent requirements – most notably, the requirement to possess a bonding insurance policy that covers a minimum of $1 million.

In addition, certification lists could also be treated as a network whereby companies offering complementary services (e.g., designers, engineers, and contractors) can collaborate to better market themselves as multi-prime packages. Similarly, smaller companies with identical services could partner to expand their capacities for larger jobs, and divide burdens, like insurance requirements, between them.

Certainly, achieving this level of coordination between city agencies and regional businesses involves overcoming a series of hurdles, but the economic benefit of such strategies could far outweigh the frustration. Working towards such information and resource sharing networks should be easier than going about building the capacity of individual businesses on a case-by-case basis.

By streamlining the certification process, offering targeted workshops, networking opportunities, and programs, the City could cut down its administrative costs while stimulating the local economy through its nurturing and promotion of local businesses for local contracts.

46 Interviews with Mae Kate Dooley, Dooley's Landscaping & Tree Care Services, LLC, November 10, 2009; and Nella Goodwin, Risk Management Services Manager, Department of Finance, November 2, 2009.

Support New Business Development

In the economy for green stormwater infrastructure, there will be many points of access aside from design and contracting jobs – there is also the potential to invigorate sections of the manufacturing sector, as well as opportunities for building suppliers, urban agriculture, and plant nurseries. In the case of many building supply and landscaping product manufacturers, existing products, such as various waterproofing material and an array of aggregates, could be tweaked to become specialty items for green roofs that, as of now, are only manufactured in Europe.[47] In order to reach an economy of scale for green installations such as green roofs, more specialized equipment and materials must be made available locally. In this way, the cost of green roofs could potentially be cut from the current cost of $10-20 per square foot to $2-4 per square foot, which is what occurred in the green roof industry in Germany.[48]

PRODUCTION – INCLUDING MANUFACTURING, URBAN AGRICULTURE AND NURSERIES:

Plant media – This range of aggregates for engineered soil is possibly the most critical element of green roof structures. The plant media provides the storage of rainwater, giving the plants ample time to absorb and transpirate moisture. The most effective plant media mix is made to match the conditions of each specific site. Different weights, pore sizes, pH, and ratio of mineral to organic material are all considerations when choosing a medium.

Waterproof membranes/root barrier – To protect the roof and prevent leakages, a waterproof material is laid on top of the roof structure.

Post-production drainage mats (made of recycled materials such as sneakers, tires) – A lightweight layer that promotes drainage and aeration of the plant medium. Efficient mats incorporate depressions that can intercept and store additional quantities of rainwater.

Geotextiles – Engineered filter fabrics confines the plant media by preventing particles from reaching the drainage layer of the system.

"Clean" stone – Uniformly graded, crushed, washed stone meeting the size requirements of any given project. Used on a large scale for infiltration basins, tree pits, and pervious pavement applications.

Porous concrete and asphalt media – These materials, with limited fine aggregates, have larger and more numerous pores through which water can percolate.

Rainwater harvesting systems – Like those designed and manufactured by Shift Space Design, LLC (see case study on page 36).

Construction equipment for green roof installation – Modified cranes, pumping trucks, and conveyors.

47 Interview with Melissa Muroff and Charlie Miller, Roofscapes, Inc. November 18, 2009.

48 Ibid.

PRODUCTION CONTINUED

Local urban farms – Businesses such as GreensGrow have proven to be successful models that not only turn a profit, but also offer educational programs to students, create jobs, and retrofit vacant lots into productive systems for local food and stormwater management.

Vegetated mats and plugs – Used for extensive (sedum) green roofs.

Plant species development – Plant deemed appropriate for use in stormwater planters, rain gardens, and intensive green roofs – usually self-sustaining, drought and flood tolerant.

CASE STUDY: LOCAL SUPPLY CHAIN

Shift Space Design, LLC

As city residents continue to struggle with flooded basements and become more aware of the benefits of greening strategies, this Philadelphia-based workshop and studio recognized a relatively unexploited niche market in rainwater harvesting systems specifically designed for urban dwellings. Collaborating with a local manufacturer, Tung, Shift Space Design produces a line of products and install-yourself kits that are more durable, more efficient, require less maintenance, and are more attractive than plastic rain barrels. Working with Southern Liberties, LLC on the Montrose Green project, Shift Space Design installed a customized system in a renovated 100-year old row home that is able to divert 100% of downspout flow from the sewer system. The system proved effective even for the August 2, 2009 storm, when the city received its monthly average rainfall over the course of just one hour.

Although the stainless steel tanks are pricey compared to their plastic counterparts ($600-$750, depending on capacity), Shift Space Design is currently developing a line of smaller, less expensive tanks that still incorporate durable, recyclable materials (above left). In addition, by partnering with the local green product distributor, Greenable, they expect to sell enough systems to reach an economy of scale, thus reducing their costs and making their products more affordable.

FOR MORE INFORMATION ON SHIFT SPACE DESIGN:
HTTP://SHIFTSPACEDESIGN.COM

THE INSTALLATIONS AT MONTROSE GREEN:
HTTP://MONTROSEGREEN.BLOGSPOT.COM/

6. Prepare Workforce Development & Education Institutions

Workforce and Business Development around Green Infrastructure

The emerging industry of green stormwater infrastructure and stormwater management has enormous potential for the creation of "green collar jobs" i.e. well-paying, long-term jobs in an environmentally-conscious field. Skills and levels of technical expertise for green stormwater infrastructure positions vary widely, and include, but are not limited to: critical, specialized knowledge of pervious concrete technology; basics in hydrology and hydraulics; water quality treatment; workplace safety and OSHA certification for construction; fundamentals of landscape architecture and planting for water capture; soil and water sampling, testing and interpretation; construction management, administration and budgeting; project management; project blueprint reading and interpretation; project software; applied math and measurement skills; data management and reporting; communication skills for the workplace; customer service and community relations.[49] Many of the positions are mid-skilled to lower-skilled occupations with possibilities for advancement and median hourly earnings of $10/hour to $26/hour.[50]

Product development - Engineers, Designers, Landscape architects	Advanced degree
Manufacturing/distribution - Landscape media companies - Construction equipment - Building suppliers - Nurseries, horticulturists - Marketing/sales	Management MBA – Administrative high school
Site design - Landscape architects, architects, city planners, civil engineers, hydrologists - Permitting and administrative services - Soil scientists	Advanced degrees High school/trade school
Construction - General, concrete, paving, roofing contractors - Landscapers - Site management and evaluation	High school – Technical trade school/apprenticeship
Monitoring/maintenance - Service technicians - Landscapers	Technical trade school High school

49 United Way of Southeastern Pennsylvania, American Recover and Reinvestment Act (ARRA) application, 2009.

50 Ibid.

However, more comprehensive engagement processes with relevant stakeholders, particularly with contractors and suppliers, will need to be developed in order to properly identify specific training needs and inform curriculum development. Current curriculum in construction management and landscaping could be easily adapted and customized, but would also have to include support services such as work readiness and soft skills, including time management and interviewing skills. Because of the important role of unions in the Philadelphia region, any strategy must include coordination with apprenticeship programs and with relevant unions for job placement and retention services.

An Industry Partnership, working alongside the *Collegiate Consortium for Workforce & Economic Development* – a partnership between Drexel University and the five community colleges in the Delaware Valley – is primed to lead the implementation of new training programs, curriculum and career ladders by adapting already established degree and certification programs in the related fields of Waste Water Treatment, Construction Technology, Applied Engineering Technology, Green Technology, and LEED® and Green Advantage® certification.[51] Ultimately, such programs, geared separately towards existing business owners as continuing education, and members of underserved communities as workforce development, could be replicated across the nation, especially in communities with aging infrastructure and increasingly stringent stormwater management regulations.

By aligning these strategies to create cohesive worker pipelines, supply chains, and business networks, Philadelphia will be better poised to develop the nation's first green stormwater infrastructure industry.

51 Ibid.

CASE STUDY: HIGHLIGHTED BUSINESS MODEL

Philadelphia Setting the Standard for Quality Green Roofs – Roofscapes, Inc.

Roofscapes, Inc. is a green roof design/build company that is also one of the most highly regarded green roof knowledge bases in the country. They provide integrated services, long-term warranties, and their own certification of quality assurance (Roofmeadow®) by way of their understanding of roofing, engineering, horticultural, hydrologic and thermodynamic issues that contribute to the long-term viability and success of their installations. In the absence of American green roof standards, Charlie Miller, President and Founder of Roofscapes, was recruited to become the primary author for four out of the five standards recently published by the American Standards Testing Methods (ASTM) and its Green Roof Task Force.

In this nascent field of green roof design and construction, companies from all different sectors of the building industry, from roofing suppliers to landscape contractors, are rushing into the fray. Philadelphia will be best served by more companies that provide integrated services by bringing different fields of expertise under one umbrella to assure product quality. The company presently offers different assemblies to best match your project profile, technical expertise, design consulting, supervision of roof installation, leak detection systems, comprehensive warranty protection, and a preferred network of contractors from across the country.

FOR MORE INFORMATION: HTTP://WWW.ROOFMEADOW.COM

LIST OF ROOFSCAPE NETWORK MEMBERS: HTTP://WWW.ROOFMEADOW.COM/CONTACT/NETWORK.PHP

Conclusion

For the most part, infrastructure debates still revolve around the amount of upfront costs, rather than its quality and impact. The PWD plan presents the City with a huge opportunity to spur top-level economic development. If fully implemented, the plan will turn our declining infrastructure crisis into a successful framework to generate productive, sustainable and inclusive long-term growth.

City leaders have repeatedly stated that Philadelphia is an incubator for many initiatives, but we can also learn from other cities that have positioned themselves as "green laboratories", such as Portland, whose pilot's success depended upon establishing the development of green stormwater infrastructure as a core goal of city government.

However, every factor involved in successful implementation will not and cannot fall on PWD's shoulders alone. While well-structured tax policies and regulations are an important and integral ingredient in the mix, other systems that spur and attract private investment, such as innovative financing mechanisms, business networking, and workforce development programs, are needed.[52] Only with such a systems-based approach can Philadelphia reinvent itself as the greenest city in America.

52 In addition, The American Cities Foundation has taken a forward-thinking approach to the growing importance of stormwater management by developing a curriculum on stormwater management for public schools: Hill, Marc Lamont, and Joy Barnes. "Learning Stormwater: Curriculum and Activity Guide for Urban Schools." American Cities Foundation, 2008.