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The Green Edge: How Commercial Property Investment in Green Infrastructure Creates Value

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Buckman Heights Apartments, Portland, OR.

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Mixed-use development at Hill Center Green Hills, Nashville, Tennessee.

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Apartment complex at Headwaters at Tyron Creek, in Portland, Oregon.

The full report is available at www.nrdc.org/water/commercial-value-green-infrastructure.asp

Green infrastructure—water quality management techniques like green roofs, tree plantings, rain gardens, and permeable pavement—has been proven to help solve major urban stormwater problems and improve the health and livability of neighborhoods. Cities and others have promoted these practices to commercial property owners as a way to improve stormwater management and, in some communities, to reduce stormwater utility bills. But relatively little information has been publicized about the range of benefits that these practices, when used on private property, can provide to commercial property owners and their tenants—until now.

This issue brief explores how the multitude of green infrastructure practices can help advance the bottom line for the commercial real estate sector. It provides illustrative examples for specific building types, based on published research, as well as a summary of key findings from that research.

Commercial properties with well-designed green infrastructure can reap the rewards of higher rents and property values, increased retail sales, energy savings, local financial incentives (such as tax credits, rebates, and stormwater fee credits), reduced life-cycle and maintenance costs, reduced flood damage, reduced water bills, reduced crime, and improved health and job satisfaction for office employees. In fact, green infrastructure and other green building practices are increasingly becoming a quality benchmark for the private sector, because they illustrate a developer's commitment to healthier, sustainable communities and place-making, while creating measurable value added for property owners and tenants alike.

As illustrated below, the cumulative value of these benefits can total in the millions of dollars over a long-term (40-year) planning horizon—far exceeding the potential stormwater utility fee savings and dramatically accelerating the expected payback of green infrastructure investments on commercial properties.

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Commercial office building at 1050 K Street, Washington, D.C.

BUILDING EXAMPLES: OFFICE BUILDING, MULTI-FAMILY RESIDENTIAL, AND RETAIL CENTER

The following examples show the potential value of a set of hypothetical green infrastructure retrofits to owners (and tenants) of medium-sized office buildings, midrise apartment buildings and retail centers. In both the office building and apartment building examples, the total present value of benefits approaches $2 million; for the retail center, benefits exceed $24 million, including nearly $23 million of increased retail sales for tenants. These examples clearly illustrate that considering the full range of green infrastructure benefits is essential for making wise investment decisions.

Benefits of green infrastructure for private, commercial property owners

- Increased rents and property values
- Increased retail sales
- Energy savings
- Stormwater fee credits and other financial incentives
- Reduced infrastructure costs
- Reduced costs associated with flooding
- Reduced water bills
- Increased mental health and worker productivity for office employees
- Reduced crime

A note on methodology: The following examples are based on findings from published research and some basic assumptions. For building and property characteristics, we relied on data from the Department of Energy's commercial building benchmark specifications and other online data sources, or made reasonable assumptions. To estimate the potential benefits of green infrastructure for each building type, we applied findings from the literature and/or relied on existing models.

Where the value of a certain benefit is known to be contingent on factors that vary from one city to another—such as electricity rates or the value of local tax credits—we have used data from Philadelphia for illustrative purposes. However, the analysis is intended to be relatively generic in terms of location, such that the basic lessons to be drawn from these examples are broadly applicable nationwide. Further detail on sources and methods is set forth in our full report.

RETAIL CENTER

The figures below present the key assumptions, proposed green infrastructure property improvements, and the resulting benefits for a midsize retail center.

GREEN INFRASTRUCTURE IMPROVEMENTS

40,000-sq.-ft. **green roof**, installed at the end of the life of the existing conventional roof, with green covering 90 percent of surface, or 36,000 sq. ft.

50 strategically planted **medium-size trees**, 25 opposite west-facing walls and 25 opposite south-facing walls

Bioswales and **rain gardens** that manage 1 inch of runoff from 2,000 sq. ft. of adjacent impervious area

72,000-sq.-ft. **permeable-pavement** parking lot

Cisterns to capture runoff from 5,000 sq. ft. of roof area and use for irrigation

BUILDING ASSUMPTIONS
(BEFORE IMPROVEMENTS)

SIZE	40,000 sq. ft.
STORIES	1
ROOF SIZE	40,000 sq. ft.
LOT AREA	128,000 sq. ft.
PERMEABLE AREA (COVERED IN TURF)	4,000 sq. ft.
NUMBER OF STORES	15
ANNUAL RENT	$17 per sq. ft.
ANNUAL RETAIL SALES	$2,182,000 per store

POTENTIAL BENEFITS

Energy savings due to reduced demand for heating and cooling	**$3,560** Annually
Avoided costs for conventional roof replacement	**$607,750** net present value over 40-year analysis period
Tax credit	**$100,000** one-time credit in year of installation
Increased **retail sales**	**$1.2 MILLION** per year
Stormwater **fee reduction**	**$14,020** Annually (projected to increase 6% per year)
Total present value benefits (over 40-year analysis period)	**$24,202,000 +** (including $22,963,800 in increased retail sales, which accrue to the tenants)

NON-QUANTIFIED BENEFITS

Water **conservation**	+
Increased **property value**	++
Reduced infrastructure costs due to use of permeable pavement system	+/U
Reduced crime	+/U
Improved **health and employee satisfaction**	+ (for tenants and employees)
Reduced costs associated with flooding	U

\+ would likely increase net benefits;
\+ \+ would increase net benefits significantly;
U direction of net change is uncertain.

Present value benefits over 40-year period were estimated on the basis of a 6 percent discount rate, projected CPI, projected increase in electricity and natural gas prices in relation to CPI (based on historical relationship), and 6 percent annual increase in stormwater fees. Improvements assumed to be implemented in 2015. Avoided conventional roof replacement costs were added to net present value of other benefits. Tax credit and stormwater fee reductions are based on available credits and fee structure in Philadelphia; many other localities have similar incentives.

APARTMENT BUILDING

The figures below present the key multifamily building assumptions, the proposed green infrastructure property improvements, and the resulting benefits.

GREEN INFRASTRUCTURE IMPROVEMENTS

8,435 sq. ft. **green roof,** installed at the end of the life ofthe existing conventional roof, with green covering 90 percent of the surface, about 7,600 sq. ft.

12 strategically planted **large trees**, 6 opposite a west-facing wall and 6 opposite an east-facing wall

Bioswales and **rain gardens** that manage 1 inch of runoff from 2,635 sq. ft. of adjacent impervious area

POTENTIAL BENEFITS

Energy savings due to reduced demand for heating and cooling	**$1,780** Annually
Avoided costs for conventional roof replacement	**$128,160** present value over 40-year analysis period
Tax credit	**$52,720** one-time credit in year of installation
Increased **rental income**	**$77,720** Annually (assuming no vacancies)
Increased **property value**	**$37,500** one-time benefit to property owner at time of sale
Stormwater **fee reduction**	**$1,230** Annually (projected to increase 6% per year)
Total present value benefits (over 40-year analysis period)	**$1,740,000 +**

Present value benefits over 40-year period were estimated on the basis of a 6 percent discount rate, projected CPI, projected increase in electricity and natural gas prices in relation to CPI (based on historical relationship), and 6 percent annual increase in stormwater fees. Improvements assumed to be implemented in 2015. Avoided conventional roof replacement costs were added to net present value of other benefits.Tax credit and stormwater fee reductions are based on available credits and fee structure in Philadelphia; many other localities have similar incentives.

NON-QUANTIFIED BENEFITS

Reduced crime	+/U
Reduced costs associated with flooding	U

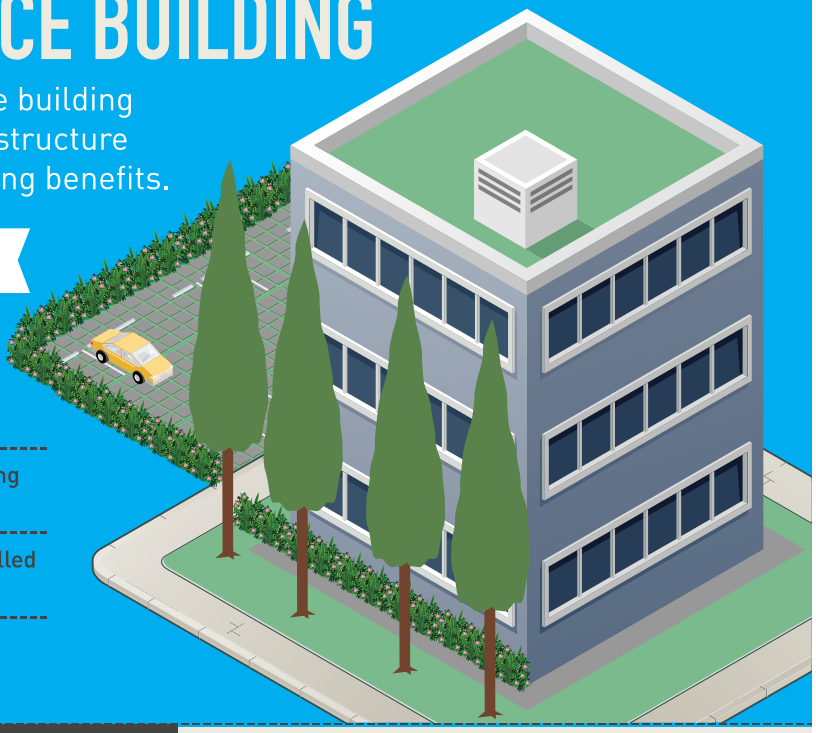
\+ would likely increase net benefits;
U direction of net change is uncertain.

BUILDING ASSUMPTIONS (BEFORE IMPROVEMENTS)

SIZE	33,740 sq. ft.
STORIES	4
ROOF SIZE	8,435 sq. ft.
LOT AREA	12,435 sq. ft.
PERMEABLE AREA (COVERED IN TURF)	1,000 sq. ft.
NUMBER OF UNITS	32
MONTHLY RENT	$1,265 per unit

MEDIUM-SIZE OFFICE BUILDING

The figures below present the key office building assumptions, the proposed green infrastructure property improvements, and the resulting benefits.



GREEN INFRASTRUCTURE IMPROVEMENTS

17,900-sq.-ft. **green roof**, installed at the end of life of the existing conventional roof, with green covering 80 percent of the surface, or 14,300 sq. ft. (Remainder of roof is impervious area.)

20 strategically **planted trees**,10 opposite a west-facing wall and 10 opposite an east-facing wall

10,000-sq.-ft. **permeable pavement** parking lot, installed at the end of life of the existing parking lot

Bioswales and **rain gardens** that manage 1 inch of runoff from 4,700 sq. ft. of adjacent impervious area

POTENTIAL BENEFITS

Energy savings due to reduced demand for heating and cooling	**$1,630** Annually
Avoided costs for conventional roof replacement	**$271,970** present value over 40-year analysis period
Tax credit	**$67,130** one-time credit in year of installation
Increased **rental income**	**$72,150** annually (assuming no vacancies)
Stormwater **fee reduction**	**$3,490** Annually (projected to increase 6% per year)
Total present value benefits (over 40-year analysis period)	**$1,863,000 +**

Present value benefits over 40-year period were estimated on the basis of a 6 percent discount rate, projected CPI, projected increase in electricity and natural gas prices in relation to CPI (based on historical relationship), and 6 percent annual increase in stormwater fees. Improvements assumed to be implemented in 2015. Avoided conventional roof replacement costs were added to net present value of other benefits.Tax credit and stormwater fee reductions are based on available credits and fee structure in Philadelphia; many other localities have similar incentives.

NON-QUANTIFIED BENEFITS

Increased **property values**	++
Reduced infrastructure costs due to use of permeable pavement system	+
Reduced crime	+/U
Improved **health and employee satisfaction**	+ (for tenants and employees)
Reduced costs associated with flooding	U

\+ would likely increase net benefits;
++ would increase net benefits significantly;
U direction of net change is uncertain.

BUILDING ASSUMPTIONS (BEFORE IMPROVEMENTS)

SIZE	53,600 sq. ft.
STORIES	3
ROOF SIZE	17,900 sq. ft.
LOT AREA	32,000 sq. ft.
PERMEABLE AREA (COVERED IN TURF)	1,000
ANNUAL RENT	$19.23 per sq. ft.

THE MANY BENEFITS OF GREEN INFRASTRUCTURE

The sections below describe the types—and the potential magnitude—of benefits that commercial property owners can reap from green infrastructure. This discussion is drawn from a wide range of published studies, which our full report documents in detail.

HIGHER RENTAL RATES, RETAIL SALES, AND PROPERTY VALUES

The landscaping that is a hallmark of green infrastructure can add tremendous value to a property, all while serving the purpose of keeping rainwater on site. Researchers have found that landscaping adds approximately 7 percent to the average rental rate for office buildings. Considering average rental rates in Philadelphia, a medium-sized office rental property could see an additional $72,150 in rental income each year.

Similarly, research on urban business districts and strip malls has found that consumers are willing to spend more on products, visit more frequently, or travel farther to shop in areas with attractive landscaping, good tree cover, or green streets. In areas with a mature tree canopy, customers indicate that they are willing to pay 8 to 12 percent more.

© City of Toronto

Toronto's City Council adopted construction standards in May 2009 that require all new buildings and retrofits with more than 2,000 square meters (approximately 21,528 square feet) of floor area to include a green roof; since the bylaw went into effect, approximately 1 million square feet of additional green roofs have entered the planning phase.

For a mid-size retail center, this could generate over $1 million of increased sales annually. Further, this increased revenue for retail tenants suggests that retail building owners should be able to earn rental premiums for providing green infrastructure amenities. These greening efforts can be especially effective when multiple landowners, as in a Business Improvement District, work together to improve a retail corridor.

A wide range of studies have found that landscaping and trees increase residential property values by 2 to 5 percent. In one study, green roofs have been found to add 16 percent to the average rental rate for multifamily units.

Green infrastructure can also help commercial buildings attain certification under LEED and similar eco-labeling programs. LEED certification has been shown to increase occupancy rates in office buildings and rental rates in residential buildings. A new eco-labeling progam focused on green infrastructure, the Sustainable Sites Initiative (SITES), is scheduled to come online in 2014.

LOWER ENERGY COSTS

Both green roofs and tree plantings can generate valuable savings on heating and cooling costs. Green roofs provide better insulation than conventional roofs, reduce the amount of solar radiation reaching the roof surface, reduce roof surface temperatures, and improve the operational efficiency of rooftop air conditioning units. Empirical research demonstrates energy savings across climates. The Chicago City Hall-County Building's 20,300-square-foot green roof yields $3,600 in annual energy savings. The Target Center Arena's green roof in Minneapolis decreased annual energy costs by $300,000. A recent NRDC study showed that during the summer in Southern California, a green roof can reduce daily energy demand for cooling in a one-story building by more than 75 percent. A Green Roof Energy Calculator developed by the Green Building Research Laboratory at Portland State University allows any building owner to estimate potential energy savings.

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Installation of porous pavers at the Energy Exchange in Milwaukee, WI (November 2009).

Extensive research by the U.S. Forest Service demonstrates that something as simple as trees can reduce building energy consumption for cooling in the summer and, depending on factors such as climatic region, size, tree type and the location of the tree, can also reduce heating costs in the winter. For example, based on Forest Service models for the Midwest region, a single large tree can generate nearly $45 in energy savings annually; multiplied by numerous tree plantings on a commercial property, annual savings can easily total hundreds of dollars per year.

CASH BACK: TAX CREDITS, STORMWATER FEE CREDITS, REBATES, AND DEVELOPMENT INCENTIVES

In many cities, a substantial portion green infrastructure costs can be recouped directly through tax credits, stormwater fee credits, rebates, and development incentives. For example, in New York City, recently-passed legislation renews and expands upon a property tax credit for green roofs, allowing property owners to earn a one-year credit up to $200,000 for the inclusion of a green roof on at least 50 percent of a structure. In Philadelphia, businesses are eligible for a credit of 25 percent (at a maximum of $100,000) of green roof installation costs. For example, a midrise apartment building in Philadelphia with an 8,400-square-foot green roof could receive a one-time tax credit of over $50,000. Philadelphia also provides up to an 80 percent reduction in stormwater utility fees for property owners who install green infrastructure. (Many other cities provide similar credits, in varying amounts.) A medium-sized office building in Philadelphia, with retrofits to manage an inch of runoff from the entire property, could save over $100,000 (present value) in stormwater fees over a 40-year timeframe.

Other municipalities offer rebates and cost-sharing programs for green infrastructure development. For example, Milwaukee's Regional Green Roof Initiative provides up to $10 per square-foot for green roof projects. King County, Washington pays builders for 50 percent of the costs of green infrastructure retrofits, up to $20,000. Portland, Oregon has a green roof bonus in its zoning code, which provides an additional three square-feet of floor area for every one square-foot of green roof installed, provided the green roof covers at least 60 percent of the roof area. Austin, Chicago, and Santa Monica provide discounts for builders who employ green infrastructure practices.

Finally, direct funding may be given to property owners and/or community groups to implement a range of green infrastructure programs. New York City's Green Infrastructure Grant Program has committed more than $11 million to 29 green retrofit projects on private property since 2011. Onondaga County, New York provides grants to commercial properties that install green infrastructure retrofits in specific sewer districts and has distributed about $3.8 million. Philadelphia has awarded $7.9 million in competitive grants for green infrastructure retrofits on commercial properties.

REDUCED INFRASTRUCTURE COSTS

Green infrastructure can also reduce life-cycle costs associated with private property improvements. Green roofs do not need to be replaced as frequently as conventional roofs—they are typically considered to have a life expectancy of at least 40 years, as compared to 20 years for a conventional roof. For example, in a midsize retail building (with a 40,000-square-foot roof), a green roof could avoid a net present value of over $600,000 in roof-replacement costs over 40 years; a medium-size office building, with a roof half that size, could save over $270,000. In some instances, green roofs can also reduce air conditioning system capital costs by allowing for use of a smaller HVAC system.

Parking lots constructed with permeable pavement, though they carry higher initial capital costs, can have significantly lower maintenance costs compared with asphalt, resulting in lower overall life-cycle costs. For example, in designing a green street project, West Union, Iowa compared the life cycle costs of using a permeable paver system instead of traditional concrete pavement. Despite higher up-front costs, analysis showed that the city would begin to realize savings by year 15 of the project, with cumulative savings over the 57-year analysis period of close to $2.5 million.

Additionally, for development projects, integrating green infrastructure into the site design can result in net cost savings by decreasing the amount of required below-ground drainage infrastructure and other stormwater management-related facilities.

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A green roof on the offices of YouTube in San Bruno, California.

OTHER HARD-TO-QUANTIFY BENEFITS: REDUCED FLOOD DAMAGE, WATER BILLS, AND CRIME; IMPROVED HEALTH AND JOB SATISFACTION FOR OFFICE EMPLOYEES

Green infrastructure can also provide many other valuable benefits, which are difficult to quantify, in a generalized way, at the scale of individual properties. Nonetheless, these are important benefits for property owners to consider.

Reducing the volume of stormwater runoff can provide a cost-effective way to manage the frequency and severity of localized urban flooding. Large floods with catastrophic damage and costs are relatively infrequent, but small events (which can be mitigated by green infrastructure) are generally more frequent and widespread; though they cause less damage per event, their repetitive nature can create a greater overall economic burden. Mitigating flooding risks reduces these flood damage costs, and can increase property values (by 2 to 8 percent, according to some studies).

Green infrastructure practices that capture rainwater for reuse—like rain barrels and cisterns—can help save on water costs for landscape irrigation and other non-potable water uses. Opportunities to achieve these savings will vary widely depending upon such factors as the non-potable water needs of a given property, local water rates, and the number and intensity of storms throughout the year. For example, the EPA reports that one large building in Seattle and another in New York City use large-capacity cisterns to meet 60 percent and 50 percent of their toilet flushing needs, respectively.

Recent research indicates that green infrastructure even has the potential to reduce crime on private properties, especially in urban areas. Crime reduction is associated with specific types of vegetation, such as open space covered with grass and tall trees. Shrubs and bushes, if situated in places that provide places for criminals to hide, have been found to increase crime; however, they can be designed and arranged to minimize impacts on sight lines, providing pleasant places for people to gather and thus improving safety and security. Overall, numerous studies have found significantly lower rates of property crime, violent crime, graffiti, vandalism, and littering in urban areas with high levels of vegetation, when controlling for other factors. Deterring such crimes can result in significant avoided costs for commercial property owners.

Researchers have also found that office workers have a clear preference for nature near the workplace, leading to improved health and job satisfaction, and reduced levels of stress. Importantly, green space does not need to be extensive or pristine to provide these benefits; trees, landscaping, and other vegetation situated among buildings and parking lots have been found to be effective. These benefits accrue most directly to the companies that rent commercial space and their employees, rather than the property owner, although they may also be reflected in the increased rents tenants are willing to pay for offices and shops that have nice landscaping and shading.

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