



Metro Washington, D.C., Greenprint Performance Report™

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**ULI Greenprint Center
for Building Performance**



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2012 Office Building Performance Report Metro Washington, D.C.



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[About the DowntownDC Business Improvement District](#)

The Downtown Business Improvement District (DowntownDC) is a private, nonprofit organization that provides capital improvements, resources, and research to help diversify the economy and enhance the Downtown experience for all. This special district, where property owners have agreed to tax themselves to fund services, encompasses a 138 block area of approximately 550 buildings from Massachusetts Avenue on the north to Constitution Avenue on the south, and from Louisiana Avenue on the east to 16th Street on the west. As a catalyst, facilitator and thought leader, DowntownDC promotes public/private partnerships to create a remarkable urban environment.

[About the DowntownDC ecoDistrict](#)

DowntownDC established the DowntownDC area as an ecoDistrict in 2011 to provide a framework in which to educate and promote sustainable practices such as the better management of energy, water and waste and multi-modal transportation investments. The DowntownDC ecoDistrict's goals include reducing peak and overall energy consumption, enhancing economic performance, and increasing market share of downtown buildings. The DowntownDC ecoDistrict supports developing and promoting DowntownDC as one of the most sustainable downtowns in the world

[About the Urban Land Institute](#)

The mission of the Urban Land Institute is to provide leadership in the responsible use of land and in creating and sustaining thriving communities worldwide. Established in 1936, the Institute today has more than 32,000 members worldwide representing the entire spectrum of the land use and development disciplines. ULI relies heavily on the experience of its members. It is through member involvement and information resources that ULI has been able to set standards of excellence in development practice. The Institute has long been recognized as one of the world's most respected and widely quoted sources of objective information on urban planning, growth, and development.

[About the ULI Greenprint Center](#)

The Urban Land Institute Greenprint Center (Greenprint) is a worldwide alliance of leading real estate owners, investors, and strategic partners committed to improving the environmental performance of the global real estate industry. Greenprint is a member-driven nonprofit organization that achieves its goals through measurement, action, and education. It strives to reduce greenhouse gas emissions by 50 percent by 2030, in line with the goals of the Intergovernmental Panel on Climate Change.

Greenprint provides an environmental management platform for members to measure and track energy, emissions, water, and waste performance for properties, funds, and portfolios. The platform supports comprehensive data management, analysis, and benchmarking that enables Greenprint members to take actions toward improving environmental performance.



INTRODUCTION

The ULI Greenprint Center and DowntownDC are pleased to present the inaugural *Metro Washington, D.C., Office Building Performance Report*. This report created by both organizations offers a glimpse of the analysis that is possible for the metro Washington, D.C., real estate market and is the starting point to examine trends and opportunities specific to properties in metro Washington. This report is one initiative within DowntownDC's ecoDistrict program of work.

The Greenprint metro Washington office portfolio includes 141 Class A office buildings, comprising 34.2 million square feet. This represents nearly 10 percent of the office properties in metro Washington. A growing membership and rising number of properties in Greenprint's office portfolio offer the opportunity for owners and landlords to create robust and transparent benchmarks for the metro Washington marketplace. The District Department of the Environment (DDOE) is also developing an energy benchmarking report using the data collected from the Clean and Affordable Energy Act of 2008. The *Greenprint Metro Washington, D.C.*, report differs from the DDOE report because it provides an opportunity for metro Washington office properties to be contextualized across various global markets. Furthermore, as a consortium of voluntary participants, the consortium can run different types of analytics and target metrics that can provide detailed insight into property performance.

Greenprint establishes a standard for measuring, benchmarking, and tracking energy consumption, water use, waste diversion and carbon emissions. This report presents an energy consumption benchmark as well as analyzes year-over-year environmental performance for a subset of properties. On a year-over-year basis between 2009 and 2012, the metro Washington Greenprint portfolio of 113 like-for-like buildings decreased energy consumption by 5.8 percent (124 million kBtu) and reduced carbon emissions by 5.2 percent (13.8 thousand metric tons CO₂e). The carbon reduction is equivalent to planting over 358,000 trees.

The improved efficiencies across metro Washington properties are even more impressive when considered alongside the rise in full-time equivalents (FTEs) throughout the same time period. From 2009 to 2012, the number of FTEs increased by nearly 50 percent from 53,877 to 79,592. Normalizing for FTE's and for other factors will provide further clarity into the performance of the metro Washington market.

In this first report, the analysis is focused on office properties. Future reports may include other property types such as multifamily, industrial, hospitality, and/or retail. The data examined in this report is displayed in aggregate and is reported anonymously. Over time, the goal is to drive the analysis towards more specific and targeted metrics that will provide a true assessment of environmental performance.



A GLOBAL PERSPECTIVE

The chart below presents the median energy use intensity for air-conditioned office properties in the Greenprint database across eight leading global markets. One of the goals of the partnership between DowntownDC and Greenprint is to develop a common approach to data management and analysis across global cities. This is intended to provide transparency in real estate energy use as well as facilitate best practices where specific markets seem to be outperforming.

With enough information, including weather, space use, and technology, performance data can be normalized and opportunities can be targeted, supporting broad sustainability initiatives.



<p>SAN FRANCISCO 60 properties</p> <p>55 annual kBtu/ft²</p>	<p>NEW YORK 44 properties</p> <p>82 annual kBtu/ft²</p>	<p>LONDON 167 properties</p> <p>128 annual kBtu/ft² *</p>	<p>TOKYO 17 properties</p> <p>44 annual kBtu/ft²</p>
<p>WASHINGTON, DC 141 properties</p> <p>64 annual kBtu/ft²</p>	<p>PARIS 17 properties</p> <p>58 annual kBtu/ft²</p>	<p>FRANKFURT 15 properties</p> <p>75 annual kBtu/ft²</p>	<p>SEOUL 4 properties</p> <p>87 annual kBtu/ft²</p>

* The median energy intensity of 57 naturally ventilated office buildings in London is 52 kBtu/ft², not represented above.



AREAS OF INTEREST

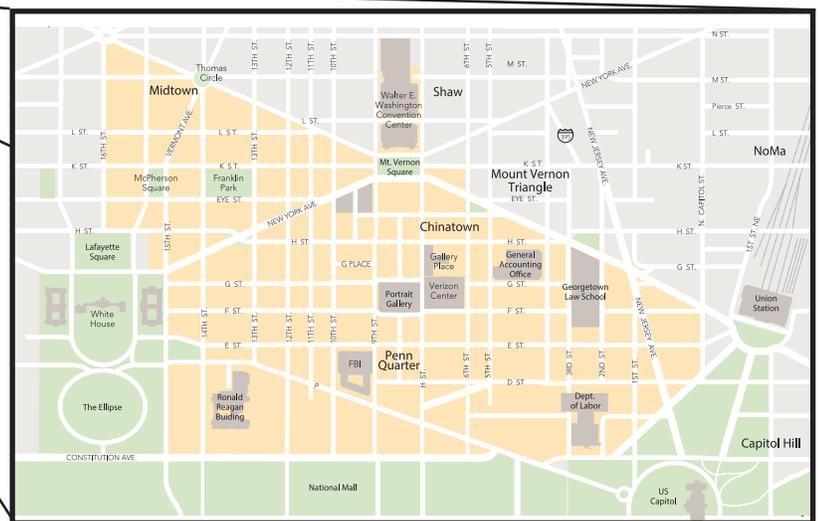
This report details the energy and environmental performance of properties within the Greenprint database that are located within the metro Washington area. The metro area consists of many different geographical boundary designations. For the purposes of this report, the information has been broken down in four categories: DC BID, Washington, D.C., (DC), Virginia and Maryland suburbs, and the entire metro Washington area.

The maps below depict the geographic boundaries of these designations. Map A illustrates the geographic boundaries of metro Washington. The DC BID includes properties that are located within the boundaries of the DowntownDC ecoDistrict, which is detailed in Map B.



Map A (left): A map of the metro Washington area depicting the three subcategories analyzed in this report: the DC BID, DC, and suburban Virginia and Maryland.

Map B (below): A map showing the DC BID area highlighted in yellow.





METRO WASHINGTON OFFICE PORTFOLIO

The portfolio of properties analyzed in this report consists of 141 Class A office buildings located throughout metro Washington. The participating properties have all been submitted on a voluntary basis by the asset owners. The initial participants include institutional investment companies, real estate investment trusts, and private real estate firms, which has led toward a strong representation of private sector properties in this analysis. Metro Washington includes a large number of federal buildings, a building category that will be better represented in future reports to make the portfolio more representative of the metro Washington market.

The table below provides an overview of the properties in the analysis. At a high level, the data seem to show large ranges in performance. However, as the information was analyzed, trends emerged, helping Greenprint and DowntownDC target the most relevant metrics.

141 Buildings	Range	Median
Size of Building (SF)	12,800 – 1,177,000	217,100
Year Built	1898 – 2012	1988
FTEs	35 – 4,036	520
2012 % Occupancy	43% – 100%	94%
Site Energy Intensity (kBtu/SF)	6 – 134	63
Energy Star Score	4 – 96	81



FACTORS THAT CONTRIBUTE TO ENERGY USE

Building environmental performance is affected by a variety of factors. This report specifically discusses space use, building age, building size, FTEs and occupancy. Subsequent reports will start to analyze the effects of other influencing factors and how they impact environmental performance.

A strong influencing factor in energy consumption is tenancy and space use. It is clear that data centers or tenants with cafeterias will have a higher energy use per square foot than do other office tenants. To further the space use analysis, the tenant mixes of the properties were compared. It was observed that certain locations attract specific types of tenants, affecting performance characteristics. For example, 28 percent of the buildings in the Virginia and Maryland suburbs have technology tenants, which tend to have a high density of energy-intensive electronic equipment. This could be one of the factors driving the 6 percent higher energy intensity of properties in these areas.

In order to benchmark comparable spaces, Greenprint is working to enhance its ability to benchmark specific space use inside buildings. Collecting more specific space data, including number of workers, types of use, and operating hours, will allow for a more comprehensive analysis of building use and associated energy consumption.

	METRO WASHINGTON	VIRGINIA AND MARYLAND	DC	DC BID
Number of Properties	141	63	78	37
Site Energy Intensity	65	68	64	63
Site Carbon Intensity (kg CO ₂ e/SF)	8.3	9.1	7.6	7.6
Total Floor Area (MSF)	34.1	14.8	19.3	9.90
Occupancy	90%	88%	92%	93%
Average Building Age	1987	1992	1982	1992
% Government	7%	39%	6%	6%
% General Business Services	58%	13%	59%	59%
% Financial Industry	6%	0%	6%	6%
% Health care	3%	0%	3%	3%
% Technology	3%	28%	2%	2%
% Retail	1%	0%	1%	1%
% Other*	22%	20%	22%	22%

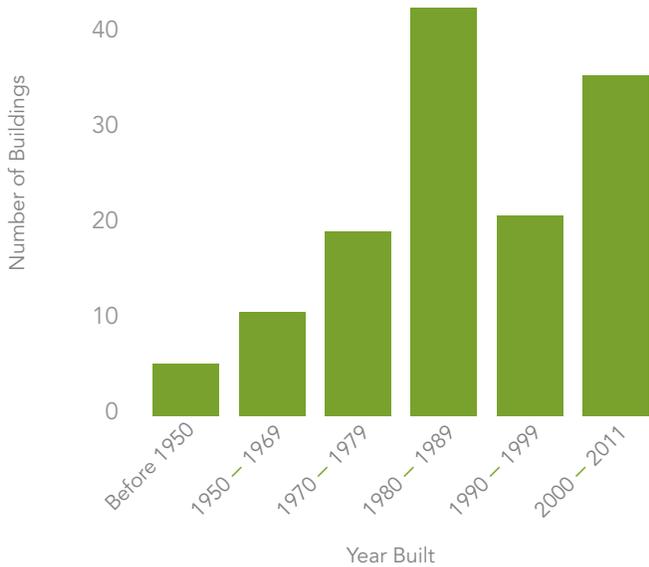
* These spaces include education, museum, storage, religious facilities, and smaller diverse nonstandard tenants within the mixed-use spaces of these buildings



PORTFOLIO BY BUILDING AGE

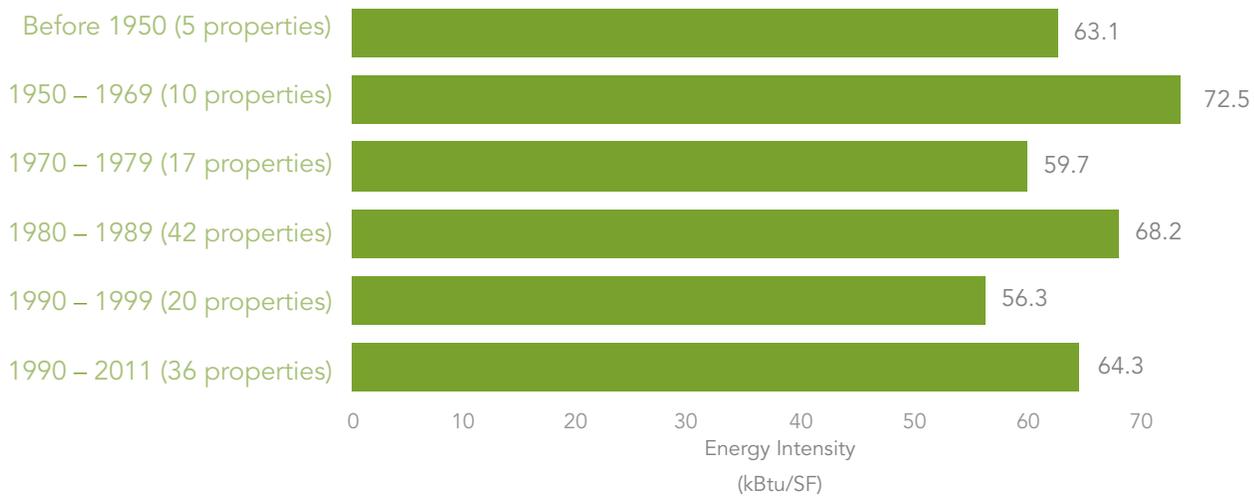
The year a building was built can affect energy consumption because of design strategies and engineering systems common during that era as well as the end-of-life renovation cycles.

130 Buildings



Compared with most U.S. cities, metro Washington has a newer building stock. More than 88 percent of the portfolio was built after 1970, and 43 percent was built after 1990.

MEDIAN ENERGY INTENSITY BY AGE

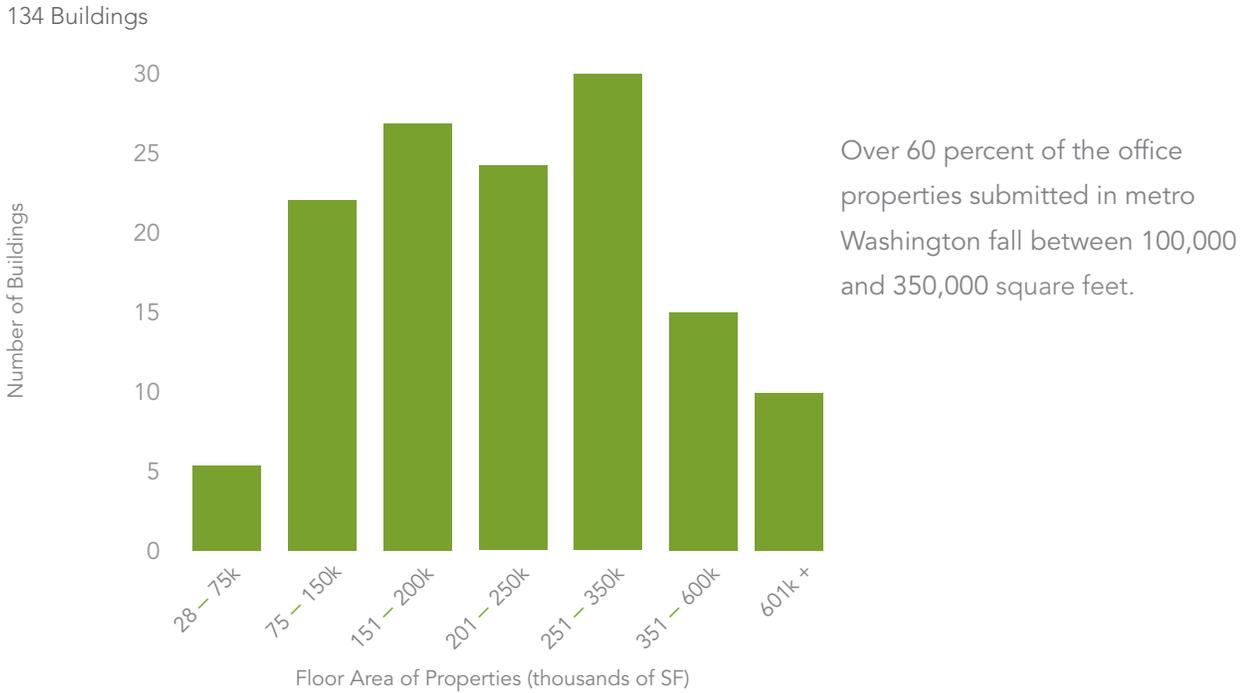


Buildings are retrofitted in 25 to 35 year cycles. The information presented in this report shows that properties built in the 1980s are currently some of the worst performers. This might be indicative of the fact that the equipment is nearing the end of its useful life.



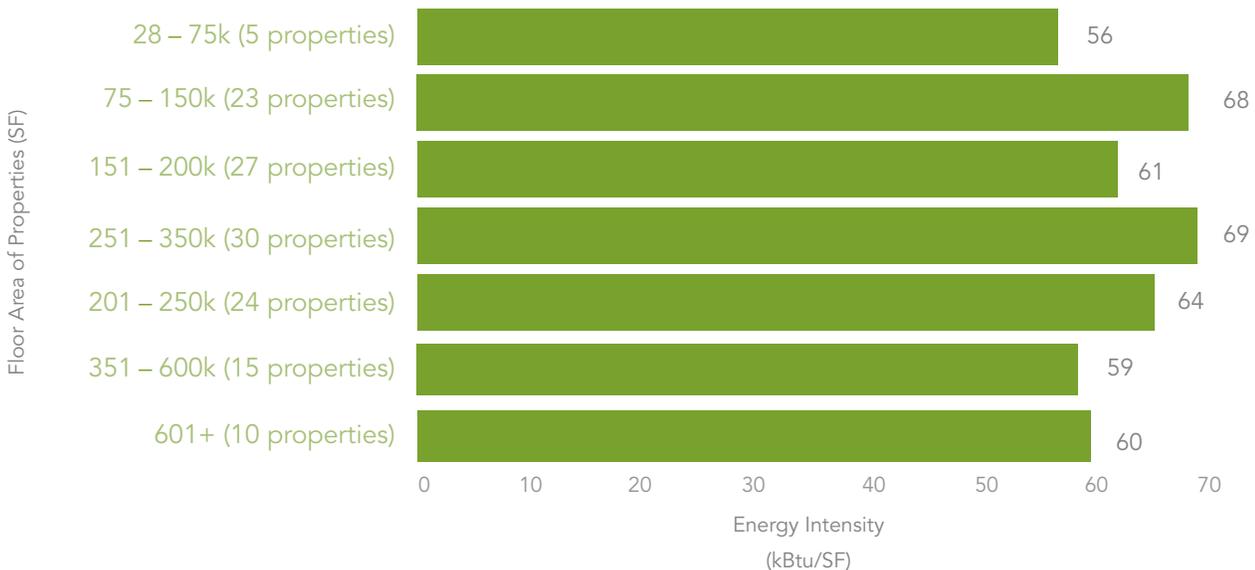
PORTFOLIO BY BUILDING SIZE

The size of a building affects energy use. Generally, increasing the heights of buildings correlates with higher energy intensities, and increasing the area of a building correlates with lower energy intensities.



MEDIAN ENERGY INTENSITY BY BUILDING SIZE

In the metro Washington market, due to the height caps, energy intensity tracks more closely to building size where the largest properties are the most efficient and smaller properties are the least efficient. This generally holds true, except for the smallest properties in the analysis.





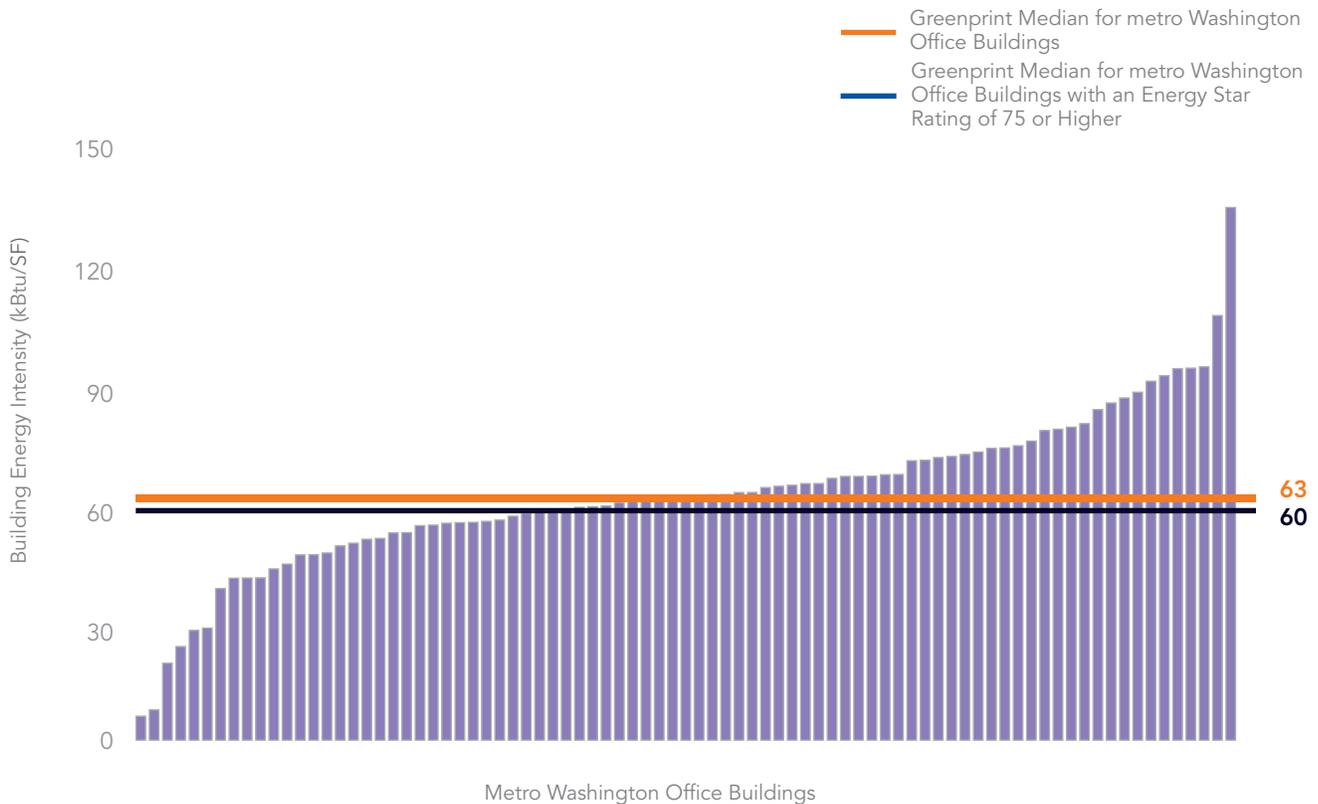
METRO WASHINGTON, D.C., OFFICE BENCHMARKING

The energy intensity of the metro Washington office portfolio is depicted below. Each vertical line on the chart represents a building. The Greenprint metro Washington office benchmark, based on the median energy intensity of office buildings in the metro Washington area, is 63 kBtu/SF. There are 73 buildings with an Energy Star score of 75 or higher in the Greenprint benchmark for metro Washington.

The Greenprint benchmark for this report is based on performance data for the full-year of 2012. Energy Star uses the Commercial Building Energy Consumption Survey (CBECS) as the basis for benchmarking. The property owners and managers, as well as, the building design, operations, occupancy, and space use, are factors that may help explain the performance of Greenprint office buildings relative to alternative market benchmarks.

GREENPRINT METRO WASHINGTON OFFICE PORTFOLIO BENCHMARKING

101 Buildings

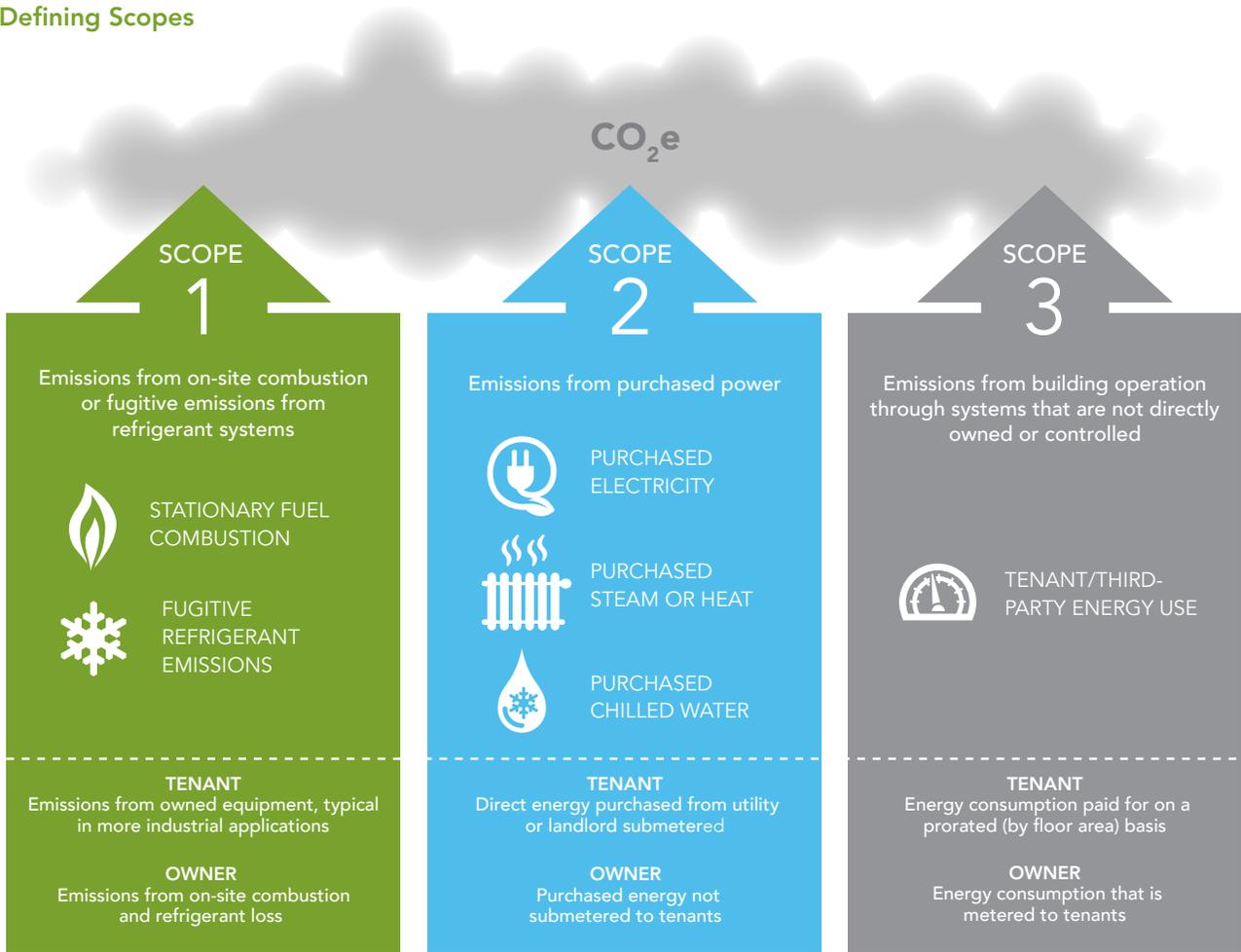




EMISSIONS SCOPES EXPLAINED

Standard greenhouse gas (GHG) accounting separates GHG emissions into three categories: Scopes 1, 2, and 3. Greenprint’s calculation methodologies align with the World Resources Institute/World Business Council for Sustainable Development’s Greenhouse Gas Protocol. Categorizing emissions by scope enables separate accounting of GHG sources by related entities, such as landlords and tenants, and increases transparency.

Defining Scopes



Scopes 1+2+3 = Total Building Emissions

Calculating Greenhouse Gas Emissions

$$\text{Energy [kWh]} \times \text{Emissions Factor [kg CO}_2\text{e/kWh]} = \text{Greenhouse Gas Emissions [kg CO}_2\text{e]}$$

Emissions factors are used to calculate the total carbon dioxide equivalent (CO₂e) generated. Developing and applying accurate emissions factors are critical to reliable GHG emissions reporting. Emissions factors are updated over time as updated data and methodologies are released.



METRO WASHINGTON OFFICE PORTFOLIO TRENDS

The like-for-like portfolio is composed of 113 office properties with consistent data from 2009 to 2012. Like-for-like performance excludes the effects of acquisitions and dispositions across the portfolio. Details for each region of this analysis are provided in the tables on the next page.

ENERGY

For metro Washington, energy intensity decreased 5.8 percent from 2009 to 2012 while properties in the DC BID reduced energy use by 4.8 percent. The average Energy Star score increased by 11 percent during this period, from 73 to 81. DC and Virginia/Maryland properties saw decreases in energy consumption of 5.4 percent and 6.4 percent respectively. This is impressive considering that FTEs across all 113 like-for-like properties increased by 48 percent from 53,877 to 79,592 FTEs.

The 4.8 percent reduction in energy use experienced by DC BID properties supports the ecoDistrict's commitment to the Better Buildings Challenge of achieving a 20 percent reduction in energy consumption by 2020.

The cost of energy was reduced by around 6 percent from 2009 to 2012, saving approximately \$3.3 million in annual operating expenses.¹

EMISSIONS

Carbon emissions decreased 5.2 percent from 2009 to 2012. Emissions have decreased through a combination of energy-efficient technologies and operational best practices at the properties, and the implementation of less carbon intense energy generation (i.e. natural gas or renewable energy sources replacing coal) throughout the local grid.

Emissions are decreasing at a faster rate in DC than in Virginia and Maryland. This could be due to fuel switching at properties or across the region's electricity grid.

Greenprint's Metro Washington Office Portfolio reduced emissions equivalent from 2009 to 2012



Planting 358,974 trees



Taking 2,947 cars off the road



LIKE-FOR-LIKE PERFORMANCE

Below are tables detailing the like-for-like performance of the metro Washington properties broken into four segments: Metro Washington, Virginia and Maryland suburbs, DC, and the DC BID.

	Metro Washington: 113 Properties			Virginia/Maryland suburbs: 52 Properties		
	2009	2012	% Change	2009	2012	% Change
Energy (million kBtu)	2,121	1,997	-5.8%	924	865	-6.4%
Gross Floor Area (MSF)	29.9	29.9	—	12.4	12.4	—
FTEs (thousands)	53.9	79.6	48%	25.7	38.9	51%
Site Energy Intensity (kBtu/SF)	71.0	66.9	-5.8%	74.8	70.0	-6.4%
Emissions (thousand metric tons)	269.2	255.4	-5.2%	125.6	119.7	-4.7%
Site Emissions Intensity (kg/SF)	9.0	8.6	-5.2%	10.2	9.7	-4.7%

	DC: 61 Properties			DC BID: 31 Properties		
	2009	2012	% Change	2009	2012	% Change
Energy (million kBtu)	1,198	1,132	-5.4%	637	607	-4.8%
Gross Floor Area (MSF)	17.5	17.5	—	9.2	9.2	—
FTEs (thousands)	28.2	40.7	44%	15.3	21.2	39%
Site Energy Intensity (kBtu/SF)	68.4	64.7	-5.4%	69.0	65.7	-4.8%
Emissions (thousand metric tons)	143.7	135.7	-5.6%	76.2	72.7	-4.2%
Site Emissions Intensity (kg/SF)	8.2	7.8	-5.6%	8.3	7.9	-4.2%



WEATHER NORMALIZATION

The energy used in properties is dependent on a variety of factors, including occupancy rates, building space use, climate, and many others. Each of these factors will contribute to the regular variations in energy use. Often, weather is noted as a major contributor to annual changes in performance. Weather normalization is one strategy to enable annual performance comparisons.

The charts below depict weather normalization for properties in the metro Washington market. Chart B tracks heating degree days (HDD) and cooling degree days (CDD) against their 30-year averages. HDD and CDD averages provide proxies to determine how much heating or cooling is typically needed for a particular period. For example, in Chart B, the 2012 HDD are below the 30-year average, indicating that winter temperatures in 2012 were mild.

Chart A depicts the weather-normalized energy intensity of metro Washington properties. This chart shows that performance is improving over time on both the normalized and unnormalized basis.

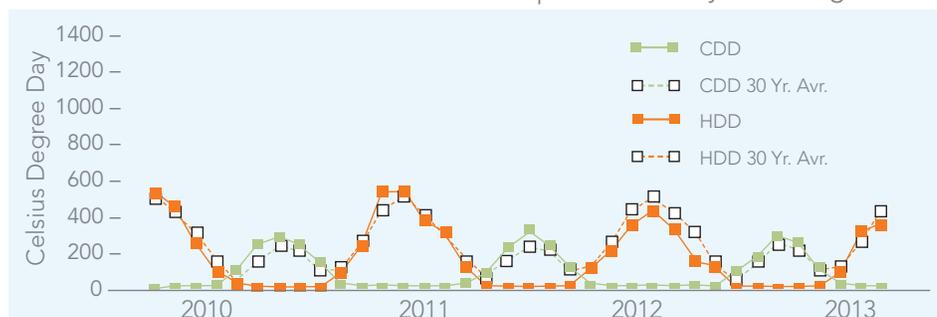
WEATHER NORMALIZATION METRO WASHINGTON OFFICES

54 Buildings

Chart A: Normalized energy use intensity



Chart B: 2012 CDD and HDD data compared with 30-year averages



Greenprint partners with New York University’s Center for Urban Science and Progress (CUSP) to develop its normalization algorithms. For the next report, Greenprint intends to work with CUSP to analyze the metro Washington data and target the metrics that most significantly affect energy performance.



ENERGY, FULL-TIME EQUIVALENTS, AND OCCUPANCY

The metro Washington energy use decreased 5.8 percent from 2009 to 2012 while full-time equivalents (FTEs) increased by 48 percent from 53,877 to 79,592 FTEs. This points to the increase in office space densification and has significant implications for the real estate industry, only one of which is energy consumption. Even with the large increase in FTEs, energy use intensity per FTE decreased 10 percent from 2009 to 2012, showing that the properties in metro Washington have been focused on improving performance while the building's infrastructure is taxed through more occupants.

This analysis also highlights the distinction between occupancy rates and FTEs. From 2009 to 2012, occupancy showed a slight decrease across participating properties. However, over the same time, the FTEs reported increased by approximately 48 percent.

ENERGY, FTEs, AND OCCUPANCY

113 Buildings





WATER USE IN METRO WASHINGTON OFFICES

Out of the portfolio of 141 buildings in the metro Washington market, 74 properties provided consistent, like-for-like water data from 2010 through 2012.

	Metro Washington: 74 Properties			Virginia/Maryland suburbs: 38 Properties		
	2010	2012	% Change	2010	2012	% Change
Water (million gallons)	411.2	518.4	26.1%	53.1	49.5	-6.9%
Gross Floor Area (MSF)	22.7	22.7		10.2	10.2	
Site Water Intensity (gallons/SF)	18.1	22.9	26.1%	5.2	4.9	-6.9%

	DC: 36 Properties			DC BID: 21 Properties		
	2010	2012	% Change	2010	2012	% Change
Water (million gallons)	358.1	468.9	30.9%	246.3	359.7	46.1%
Gross Floor Area (MSF)	12.5	12.5		7.2	7.2	
Site Water Intensity (gallons/SF)	28.7	37.5	30.9%	34.3	50.1	46.1%

WATER

Water use intensity increased 26 percent from 2010 to 2012. DC properties saw a large increase of over 30 percent in water consumption while Virginia/Maryland properties experienced a decrease in consumption of 6.9 percent.

Water use strongly correlates with physical occupancy. The increase in water consumption experienced across DC properties in the like-for-like comparison aligns with the increase in reported FTEs, which increased from 42,092 to 56,124 or 33 percent from 2010 to 2012.

WATER COSTS

Water cost data was provided for 56 properties from 2010 to 2012. The average cost per gallon of water has increased by 19 percent from about \$5 to \$6 per 1,000 gallons. These cost increases are in line with what property owners across the country have experienced.

In many global markets, water costs are one of the fastest-growing operating expenses.



WATER USE IN METRO WASHINGTON OFFICES

In metro Washington buildings, water use intensity by floor area increased by 26 percent from 2010 to 2012. During the same time, FTEs increased 33 percent from 42,092 to 56,124, leading to a 20 percent decrease in water use intensity per FTE. While water use per floor area increased, water use per FTEs showed a significant decrease, demonstrating signs of more efficient water use. This trend is illustrated in Chart B, below.

Chart A depicts the average water use by system in a typical office building in the United States. Half of the water consumption is directly correlated to variations in FTEs: Domestic and Restroom, and Kitchen and Other uses. Even Heating and Cooling water usage is impacted by FTEs.

CHART A: WATER IN OFFICES BY TYPE AND PERCENTAGE²

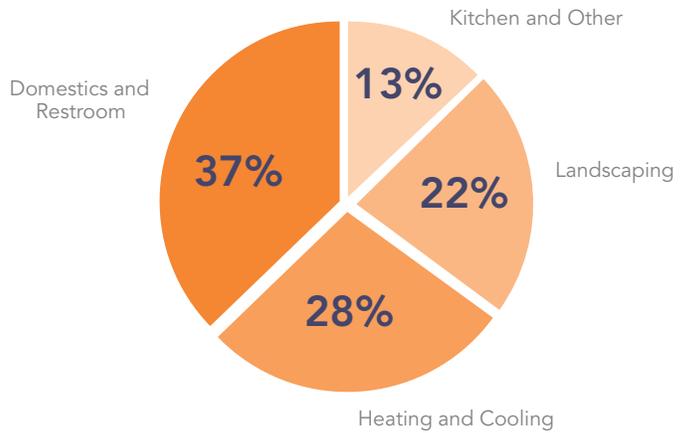
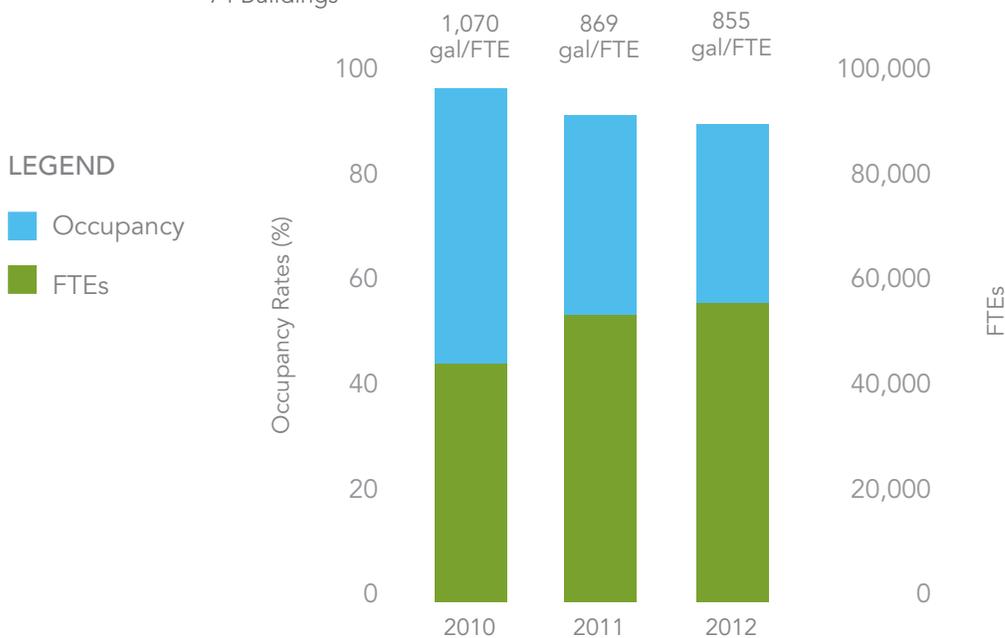


CHART B: WATER, FTEs, AND OCCUPANCY

74 Buildings





CONCLUSION

Greenprint and DowntownDC are pleased to present the results of the inaugural *Metro Washington, D.C., Office Building Performance Report*. The overall trends uncovered throughout the participating properties depict metro Washington as a high-performing market that has shown consistent improvements in performance over the reporting period, from 2009 through 2012. During this time, the like-for-like metro Washington portfolio in Greenprint decreased energy consumption by 5.8 percent (124 million kBtu), reduced carbon emissions by 5.2 percent (13.8 thousand metric tons CO₂e). Improved performance was achieved even though there was an increase in the number of FTEs by 48 percent.

The analysis also enabled Greenprint and DowntownDC to consider how to evolve the information captured and analyzed for future reports. With over 4,000 properties globally in the Greenprint platform, Greenprint has come to the conclusion that localized benchmarking and space type comparisons can help provide deeper insight into property and market environmental performance. This is due to the unique particulars of each market — in metro Washington's case, this would include the specific tenant mix and distinctions in construction, such as the height cap. Future reports will attempt to capture more properties, including federal buildings, and start to clarify the metrics that truly matter in the metro Washington market.

The hope is that Greenprint and DowntownDC can support real estate owners and investors by providing them with metrics that examine and explain environmental performance overtime. This will likely involve multivariable analyses that take into account the metrics that most directly affect variations in performance. In the end, the goal is to inform how real estate owners make decisions about investing capital into projects that improve both financial and environmental performance.



Glossary

Carbon dioxide equivalent (CO₂e)—the metric used to compare emissions from various greenhouse gases based on their global warming potential; it includes carbon dioxide, methane, and nitrogen dioxide.

CO₂e averted as on-site renewable electricity—the amount of GHGs averted from the use of on-site renewable energy, e.g., wind, hydroelectric, solar, and geothermal energy.

CO₂e averted as certified renewable—the amount of GHGs averted through the purchase of certified renewable electricity from power supply companies.

CO₂e emitted from on-site thermal energies—the GHGs emitted from the on-site generation of thermal heating and/or cooling.

CO₂e emitted running on-site CHP—the GHGs emitted from the operation of an on-site combined heat and power (CHP) plant producing thermal energy and electricity (for consumption both on site and exported).

CO₂e emitted from all imported fossil fuels—the GHGs emitted from the consumption of fossil fuels purchased by the landlord or tenant(s) from power supply companies.

CO₂e emitted from noncertified grid electricity—GHGs emitted from the consumption of standard grid electricity purchased by the landlord or tenant(s).

CO₂e emitted from fugitive emissions—the GHGs emitted through intentional or unintentional refrigerant leaks and other industrial processes.

Energy use intensity (EUI)—the annual energy consumption divided by floor area.

Full-time equivalent (FTE)—the number of employees working an eight-hour interval, e.g., one employee working eight hours equals one FTE, and two employees working four hours also equals one FTE. This does not include visitors such as clients or customers, but does include subcontractors and volunteers.

ISO 14064—a globally recognized standard for quantification, monitoring, and reporting of sources of greenhouse gas emissions, as well as the validation of emissions data and assertions.

Like for like—a specific year-over-year analysis of the current year's properties that also have data from the previous year.

Median—the value lying at the midpoint of a distribution of observed values.

Normalized—a reference to adjusting values on a different scale to a common scale, such as energy intensity that is independent of the size of the building by dividing energy use by corresponding floor area.

Occupancy—the percentage of rentable floor area that is leased.

End Notes

1 - Energy cost savings are calculated by using the median the cost per kBtu across the portfolio and applying that to the annual savings across the like-for-like properties. Across the portfolio, the median cost per kBtu is \$0.027 (~\$0.091/kWh). The savings are 124 million kBtu * \$0.027 = \$3.3 million.

Market	Energy Savings (MM kBtu)	Cost/kBtu (\$)	Annual Savings (\$MM)
Metro Washington	124	0.027	3.3
Virginia/Maryland	59	0.021	1.2
DC	65	0.029	1.9
DC BID	30	0.032	1.0

2 - United States Environmental Protection Agency. <http://www.epa.gov/watersense/commercial/types.html>

Disclaimer

All calculations presented in this report are based on data submitted to the ULI Greenprint Center. While every effort has been made to ensure the accuracy of the data, the possibility of errors exists. This report is not intended to be a flawless accounting of carbon emissions by Greenprint's membership. Greenprint does not accept responsibility for the completeness or accuracy of this report, and it shall not be held liable for any damage or loss that may result, either directly or indirectly, as a result of its use.

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