



**DELAWARE VALLEY
GREEN BUILDING
COUNCIL**

Advancing green building:

**A policy framework
for Philadelphia's built
environment**



BUILDINGS PLAY A HUGE ROLE IN OUR LIVES.

We're born in them, we go to school in them, we work in them, and we go home to them every day. While we mostly take them for granted, the way we design, build, and operate buildings and their sites has a profound impact on environmental quality, on the local economy, and on public health.

Climate change is here. It has indisputably altered our region's weather in the past decade, and will continue to demand more of our built environment in the years ahead. The latest climate science for our region projects that extreme heat and heavier rains will increase significantly in the decades ahead, along with continued volatile weather patterns.

As a grassroots organization committed to advancing sustainability in the built environment at the regional scale, **DELAWARE VALLEY GREEN BUILDING COUNCIL (DVGBC)** feels a tremendous sense of opportunity toward reaching our mission, as the region is experiencing a significant construction boom and as green building practices and policies are becoming increasingly mainstream. But there is also a heightened sense of urgency, as the connection between buildings and our changing climate has come increasingly into focus.

To be sure, buildings are the primary driver of climate change in our region, and by far the best opportunity to mitigate and to adapt to future climate impacts. DVGBC proposes the following recommendations to dramatically reduce climate and environmental impacts from buildings and sites, while improving occupant health and comfort and lowering operating costs. When executed, these action steps will advance the City of Philadelphia toward the goal of a sustainable, healthy, and resilient built environment for all.

1

Improve building performance and educate consumers in order to reduce energy use and cut costs

Proposed action steps

- Incentivize energy modeling for new buildings at or above 50,000 square feet
- Include a resilience assessment as part of the permitting process for new buildings
- Require disclosure of residential energy use at the point of sale

2

Update and enforce building codes to create a safer and more efficient built environment

Proposed action steps

- Adopt a code standard in the City of Philadelphia that exceeds the Uniform Construction Code
- Adopt an update to Philadelphia's plumbing code
- Support rigorous code enforcement

3

Promote above-code building standards and practices, especially where it connects to affordability and improved health outcomes

Proposed action steps

- Grant a floor area ratio bonus for construction built to Passive House, Living Building Challenge, and WELL Building Standards
- Facilitate land bank transfers for high-performance buildings
- Create pathway for historic structures to undergo deep energy retrofits
- Encourage construction and demolition recycling

4

Advance green stormwater infrastructure to improve climate resilience

Proposed action steps

- Update credits to encourage green stormwater infrastructure where projects can demonstrate that performance exceeds design intent

01. IMPROVE BUILDING PERFORMANCE AND EDUCATE CONSUMERS IN ORDER TO REDUCE ENERGY USE AND CUT COSTS

In Philadelphia, more than 60 percent of the carbon emissions that cause climate change come from the building sector.¹ Emissions from the transportation and industry sectors are a distant second and third, respectively. In addition, the average commercial building wastes 30 percent of the energy it uses.²

The good news is that the tools and the expertise necessary to design, build, and operate buildings that will reduce energy use and our region's climate impact, save money, and withstand the demands a changing climate will place on our infrastructure already exist.

What are the proposed action steps?

PHILADELPHIA EXAMPLE

Benchmarking

Energy modeling and benchmarking are complementary tools to maximize the efficiency of a building. In particular, while energy modeling anticipates relative performance, building benchmarking tracks actual energy use over time. Currently, Philadelphia requires that all buildings in excess of 50,000 square feet track and publicly disclose their energy and water consumption using the U.S. Environmental Protection Agency's free ENERGY STAR Portfolio Manager (ESPM) tool. ESPM, the industry standard, helps building owners and managers track performance to make adjustments and improvements where design expectations are not being met through actual use. In addition, ESPM gives owners and managers the opportunity to compare a building's actual energy usages to its peer buildings nationally through its ENERGY STAR score rating.

INCENTIVIZE ENERGY MODELING FOR NEW BUILDINGS AT OR ABOVE 50,000 SQUARE FEET

In the life cycle of a building, the best time to make adjustments to ensure efficient energy usage and avoid unnecessary cost is in the pre-construction design phase. Like the testing done to determine a car's miles per gallon, energy modeling assesses for the consumer a building's expected relative energy use. This type of forecasting is a critical step to visualize different design options and their impact on energy performance to prioritize investment on design and construction strategies that have the highest energy savings and tenant comfort yield relative to the cost. For this reason, Philadelphia should incentivize projects that use energy modeling to assess and optimize their building's energy use pre-construction.

Though there is an upfront cost to energy modeling, the payback, per the U.S. Department of Energy, is "shockingly short." Global architecture and engineering firm HOK tracked the cost of modeling and predicted energy savings for their projects and found that the average payback for their clients is 1-2 months, as modeling helps lead to both operational savings and avoided costs such as an investment in an oversized HVAC system.³



INCLUDE A RESILIENCE ASSESSMENT AS PART OF THE PERMITTING PROCESS FOR NEW BUILDINGS

With climate projections for Philadelphia showing more extreme temperature and precipitation events, it is imperative that infrastructure investments take into account the potential for increased flooding, sea level rise, and storm surge to ensure that these assets are not at risk. Prior to the approval of major new construction projects, developers should demonstrate in the permit process that they have considered projected environmental stressors in their design, construction, and operations of their buildings.

PEER CITY EXAMPLE

City of Boston Resiliency Policy

The City of Boston implemented a Resiliency Policy in 2013 that requires that all projects “consider present and future climate conditions in assessing project environmental impacts, including building long-term integrity, passive survivability, and the safety of inhabitants and for describing actions to mitigate adverse impacts.”⁴ This is determined by a Resiliency Checklist⁵ that must be completed by all projects to ensure a project takes into account the city’s climate change vulnerabilities, including sea level rise, in its planning process.

PHILADELPHIA EXAMPLE

Growing Stronger and 80 x 50

For its part, the City of Philadelphia in partnership with ICF International published *Growing Stronger: Toward a Climate-Ready Philadelphia*.⁶ The report details climate projections for the region including key vulnerabilities and costs, and assesses risks and opportunities for the City of Philadelphia to prepare its municipal assets for the effects of climate change. In addition, Drexel University prepared on behalf of the City of Philadelphia a report, *Options for Achieving Deep Reductions in Carbon Emissions in Philadelphia by 2050*.⁷ Also known as ‘80 x 50’, the report outlines strategies for achieving an 80 percent reduction in greenhouse gas emissions in Philadelphia by the year 2050. Both publications are useful tools in considering aggregate and individual approaches to adapt to and to mitigate climate change.

REQUIRE DISCLOSURE OF RESIDENTIAL ENERGY USE AT THE POINT OF SALE

In its latest *Greenworks* report, the City of Philadelphia’s Office of Sustainability highlights the need to ensure that “all Philadelphians efficiently use clean energy that they can afford.”⁸ Energy is one of the largest monthly expenses incurred by homeowners. In particular, this is true of low-income homeowners, whose energy burden is up to three times more than higher-income household counterparts.⁹ Energy burden is the percentage of total annual gross household income spent on annual utility bills (electric, gas, and/or other heating fuel)¹⁰. Philadelphia is among the top ten U.S. cities where energy burdens were found to be the greatest for low-income households¹¹. To ensure that homeowners have access to affordable energy as part of the total cost of owning their home, energy use information ought to be part of a home’s sale package. Sellers should be required to rate their homes using the HERS Index Score to raise awareness about a home’s energy performance at the point of sale. To fully integrate this information into the sale package, the City of Philadelphia should work with the real estate community to add the HERS Index Score to the Multiple Listing Service (MLS) data alongside other basic property information.

RESNET’s Home Energy Rating System (HERS), the industry standard, is a nationally recognized rating system that allows homeowners to compare their home’s energy efficiency to their peers and provides recommendations for greater energy savings. Over 1.7 million homes have been rated by HERS nationally. A home’s HERS Index Score is determined by a certified RESNET HERS Rater who evaluates factors such as exterior walls and HVAC systems as part of an overall energy rating. That overall rating is evaluated against a ‘reference home’ of a similar size, shape, and type.¹² The lower a home’s HERS Index Score, the more efficient the home is relative to similar homes. The use of HERS will encourage energy efficiency improvements to increase a home’s marketability, reducing operating costs for potential buyers.

In addition, the HERS Index Score aligns with the International Energy Conservation Code (IECC) and is used in some jurisdictions as a way to demonstrate code compliance. For example, a home that was built under the 2004/2006 IECC standard has a HERS Index Score of 100; homes with a lower score are more energy efficient, homes with a higher score are less energy efficient.¹³

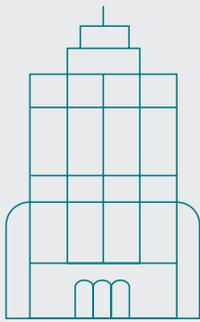


2030 DISTRICT

In addition to proposing policy changes, DVGBC is leading the formation of a private sector-led, district-scale initiative to reduce energy and water use and transportation emissions from the building sector by the year 2030. The Philadelphia 2030 District brings together property owners and managers with professional and community stakeholders and local governments to leverage financing and shared resources to reach voluntary aggregate reduction goals as prescribed by the 2030 Challenge for Planning Goals.

ACHIEVING DISTRICT-WIDE GOALS

2030 DISTRICTS COMMIT TO REDUCING:



Building Energy Use



Water Consumption



Transportation GHG Emissions

50% BY 2030

Owners and managers who commit their properties to the Philadelphia 2030 District's goals can realize cost savings while also lessening their environmental impact by assessing, tracking, and improving upon energy efficiency, water use, and transportation emissions. In addition, participating property owners and managers gain access to a network of peers to share strategies and best practices, and to tools and resources to improve upon the performance of and add value to their assets, including financing information, aggregate building performance data, and building operator trainings.

DVGBC is meeting with stakeholder groups with the goal of launching the Philadelphia 2030 District in 2017.



02. UPDATE AND ENFORCE BUILDING CODES TO CREATE A SAFER AND MORE EFFICIENT BUILT ENVIRONMENT

Building codes set a minimum construction standard to protect the health, safety, and welfare of those constructing, occupying, and using buildings and structures. Building codes ensure that construction standards are rigorous and keep pace with emerging technologies and market forces, including energy efficiency standards and practices.

Unfortunately, the Commonwealth of Pennsylvania is six years behind in its adoption of the latest International Code Council (ICC) Standard. Due to a combination of Pennsylvania's Uniform Construction Code (UCC) that requires that all municipalities are required to adopt the state's building codes and the cumbersome process by which the unelected Review and Advisory Committee (RAC) adopts new code standards, Philadelphia adheres to 2009 ICC codes.

The life cycle of a building is such that the code standard to which a building is constructed can be locked in place for many decades, which demonstrates the lasting harm of building to outdated code standards.

What are the proposed action steps?

ADOPT A CODE STANDARD IN THE CITY OF PHILADELPHIA THAT EXCEEDS THE UNIFORM CONSTRUCTION CODE

The sheer volume of new construction and major retrofits as well as the economic impact of development constitute an extraordinary situation in Philadelphia that warrants a separate and more rigorous code standard than the current uniform construction code standard in Pennsylvania. While it is preferable that action be taken to adopt updated code standards statewide, per the Uniform Construction Code, municipalities such as Philadelphia must consider the cost of inaction. Without swift action to change this reality, Philadelphia's construction market is falling behind due to outdated energy efficiency code standards, in particular, which precipitate unnecessarily high building energy use, resulting in higher costs and increased carbon emissions. Per the U.S. Department of Energy, overall energy savings under the 2015 International Energy Conservation Code (IECC) is up to 30 percent better than the 2009 IECC to which Philadelphia developers are held¹⁴.

PHILADELPHIA EXAMPLE

New construction and retrofit volume

Given the amount of new construction and major retrofits underway in the city as well as the long-term impact of the operation of those buildings, Philadelphia should be allowed to adopt the most up-to-date building codes. In the *2016 State of Center City* report, the Center City District and the Central Philadelphia Development Corporation note that 82 major developments totaling 27.8 million square feet in Center City were either completed in 2015 or are in the pipeline¹⁵. University City District also boasts impressive growth, with nearly 10 million square feet of new development either recently completed or under construction¹⁶. Considering these two examples alone, nearly 40 million square feet of new development is required to meet an outdated code standard that is significantly less energy efficient than the most recent code.



ADOPT AN UPDATE TO PHILADELPHIA'S PLUMBING CODE

In 2004, Philadelphia elected not to update its plumbing code alongside adoption of the statewide Uniform Construction Code.¹⁷ As a result, the city maintains an antiquated plumbing code that prohibits the use of cost-effective materials such as PVC pipe in all but small residential construction. What's more, increased cost to developers to build to current energy code standards can be offset by the decreased cost to substitute plumbing materials such as PVC pipe in place of cast iron, copper, or brass.

SUPPORT RIGOROUS CODE ENFORCEMENT

Even in municipalities that have up-to-date codes, proper enforcement is key to ensure that the benefits are realized. This is a significant concern in an environment where government departments charged with enforcement are underfunded. Philadelphia's Department of Licenses and Inspections must receive the resources necessary to ensure full energy code compliance to achieve energy savings, avoid cost, and cut carbon emissions.

The Pennsylvania Energy Code Collaboration, of which DVGBC is a part, calculated an estimate of avoided costs by meeting current energy code requirements. Assuming Pennsylvania's current compliance rate aligns with the national average rate of 70 percent, \$82 million dollars in energy costs could be avoided by 2040 under a full compliance scenario.¹⁸



03. PROMOTE ABOVE-CODE BUILDING STANDARDS AND PRACTICES, ESPECIALLY WHERE IT CONNECTS TO AFFORDABILITY AND IMPROVED HEALTH OUTCOMES

Per the U.S. Environmental Protection Agency, people spend as much as 90 percent of their time indoors.¹⁹ For this reason, we ought to ensure that our indoor spaces are of the highest caliber with respect to indoor air quality, material reuse, energy use, and aesthetic value. Fortunately, many vetted above-code green building standards and practices exist that can help guide new construction and major retrofits. Promoting voluntary above-code standards is especially critical in Pennsylvania, where the entire commonwealth is six years behind the latest 2015 ICC Code.

ABOVE CODE BUILDING STANDARDS AND CERTIFICATIONS

Leadership in Energy & Environmental Design (LEED)

Developed by the U.S. Green Building Council (USGBC), LEED provides building owners and operators the tools they need to implement green practices and positively impact a building's performance, bottom line, and indoor environmental health.

Building projects earn points for satisfying green building criteria. Within each of the environmental LEED credit categories, projects must satisfy prerequisites before attempting to earn additional points. The number of points the project earns determines the level of LEED certification the project receives.

LEED encourages strategies that minimize the impact on ecosystems and water resources, including reduced potable water consumption, improved building energy performance and indoor air quality, as well as using sustainable building materials and reducing waste.

Passive House

Passive House was developed in the early 1990s in Germany by Professors Wolfgang Feist and Bo Adamson who were interested in making building design more sustainable and more energy efficient. Passive building techniques can be applied to all building types, including residential, multifamily, commercial, industrial, and is customizable to local climate conditions.

The design principles behind Passive House seek to minimize air leakage and employ super-insulation and high-performance windows, significantly reducing energy use that contributes to climate change. Passive principles can reduce energy use for heating and cooling by about 90 percent as compared to the average existing building and by about 75 percent when compared to the average new build²⁰. Passive House features also promote comfortable indoor temperatures year-round and improved indoor air quality.

Living Building Challenge

The Living Building Challenge (LBC) is a building certification program that was launched publicly in 2006 by Jason McLennan, CEO of the International Living Future Institute and Cascadia Green Building Council, turning concepts gathered from an advanced sustainable design project in Montana into a comprehensive standard.

LBC is comprised of seven performance standards called petals—Place, Water, Energy, Health & Happiness, Materials, Equity, and Beauty—each of which is subdivided into twenty total imperatives. All imperatives are mandatory to achieve the certification and are evaluated based on actual performance as opposed to design intent.

Living Buildings are designed holistically with the goals of aligning humans with the built environment and making significant progress toward reversing the built environment's impact on climate change and unsustainable water use by improving the ecosystems in which they are located.

WELL Building Standard

The WELL Building Standard is the outcome of seven years of research performed by physicians, scientists, and industry professionals to transform the interaction of the built environment and its occupants. WELL is certified by Green Business Certification Inc. (GBCI), the same third-party reviewer that administers LEED certification and credentials.

WELL seeks to improve health and well-being through the building environment. With a focus on seven different concepts—air, water, nourishment, light, fitness, comfort and mind—WELL measures building attributes that impact the health of occupants.

Currently, this standard can be applied to commercial and institutional office buildings but there are pilots underway to explore the use of the standard on retail, multifamily residential, education, restaurant, and commercial kitchen projects.



What are the proposed action steps?

GRANT A FLOOR AREA RATIO BONUS FOR CONSTRUCTION BUILT TO PASSIVE HOUSE, LIVING BUILDING CHALLENGE, AND WELL BUILDING STANDARDS

To further encourage the design and construction of new buildings and major retrofits to above-code standards, the City of Philadelphia should add Passive House, Living Building Challenge, and WELL Building Standard to the menu of options that qualify a project for a floor area bonus. With the amount of commercial and multifamily construction underway, any extra incentive to build to above-code standards can help scale its usage dramatically, while saving money on energy usage for the property owner and improving indoor air quality and comfort for its users. In addition, the bonus should be scaled according to project impact, granting greater bonuses to projects that pursue more rigorous standards.

FACILITATE LAND BANK TRANSFERS FOR HIGH-PERFORMANCE BUILDINGS

For residential construction projects that are committed to high energy efficiency standards, there ought to be a discounted land bank transfer. Incentives for rigorous voluntary standards such as Passive House and LEED Platinum can help encourage market adoption for these standards.

CREATE PATHWAY FOR HISTORIC STRUCTURES TO UNDERGO DEEP ENERGY RETROFITS

The residential sector presents unique challenges with respect to scaled energy efficiency programs due to a host of funding, financing, and sheer complexity challenges. For this reason, DVGBC supports a reasonable path for approval of historic renovation projects where building owners have the capability and expertise to pursue voluntary deep energy retrofits. The Philadelphia Historical Commission and its partners in government ought to establish reasonable standards that allow for ambitious, modern design standards that promote energy efficiency while maintaining the historic character of the structures in question.

ENCOURAGE CONSTRUCTION AND DEMOLITION RECYCLING

According to the PA Department of Environmental Protection, construction and demolition (C&D) waste constitutes approximately 17.5 percent of Pennsylvania's municipal waste stream²¹. In 2009, nearly 100,000 tons of C&D waste originated in Philadelphia²². Due to both volume and the high potential to recycle or reuse, the city should adopt an ordinance that requires a minimum diversion percentage of the weight of C&D debris generated by construction and demolition projects both private and public to reduce waste. C&D recycling and reuse mandates keeps materials out of landfills, reducing the amount of climate change-causing methane emissions generated by the breakdown of waste, and reduces the need to extract and create new construction materials, which requires processes that also contribute to greenhouse gas emissions.



04. ADVANCE GREEN STORMWATER INFRASTRUCTURE TO IMPROVE CLIMATE RESILIENCE

Green stormwater infrastructure (GSI) seeks to manage rainfall in place, using soils, plants, and engineered design features to allow for infiltration of water as opposed to running into a sewer or water body. While stormwater has traditionally been managed by gray infrastructure - think pipes, tanks, pumps, treatment plants - designers, engineers, and regulators are increasingly turning to managing stormwater runoff through green infrastructure solutions.

In particular, this region features built-out urban and suburban environments that are covered in impervious surfaces that do not absorb rainfall. Under these conditions, stormwater runoff generated from rainfall events picks up chemicals, nutrients, and sediments as it travels to our region's sewers and waterways. This causes flooding, increased water treatment costs, and pollutes our water bodies. Managing stormwater in place through vegetated practices helps to reduce both flooding and pollution.

In addition, GSI is a proven technique to manage the more frequent and more extreme weather events that are predicted in climate change projections for our region. GSI also increases green acreage in urban areas, reducing heat island effect that is exacerbated by climate change.

Lastly, in addition to its functionality, green infrastructure provides numerous ancillary benefits to communities including positive impacts on health, property values, and other quality of life indicators.

What are the proposed action steps?

PHILADELPHIA EXAMPLE

Exceeding Intent

DVGBC and the Sustainable Business Network's Green Stormwater Infrastructure (GSI) Partners released *Exceeding Intent: A precedent library of exemplary green stormwater infrastructure projects* in December 2016. The report highlights GSI designs, systems, and approaches that can be used as a tool to help inform the approval of additional vegetated and innovative stormwater management projects in Philadelphia, and as a resource for industry professionals and other stakeholders to help increase the collective understanding of the dynamic capacity of GSI.

UPDATE CREDITS TO ENCOURAGE GREEN STORMWATER INFRASTRUCTURE WHERE PROJECTS CAN DEMONSTRATE THAT PERFORMANCE EXCEEDS DESIGN INTENT

Through a combination of monitoring data, academic studies, and anecdotal evidence, there is ample evidence that installed green stormwater infrastructure is outperforming its design in many circumstances. To reflect better the actual performance of green stormwater infrastructure projects, Philadelphia Water Department ought to update its calculation methodology for GSI projects to give additional credit to projects that are outperforming design expectations. Giving additional credit where it is due will incentivize further innovation and better monitoring on new and existing sites with the goal of reducing stormwater fees and saving money. This update to the calculation methodology will help to scale green infrastructure acreage and its benefits including flood mitigation and reducing pollutants from running into our waterways.

Per Exceeding Intent, "Philadelphia Water has projected that it will invest anywhere from \$1.2 to 2.4 billion in stormwater infrastructure projects over the life of [Green City, Clean Waters], and is inducing additional private GSI projects through regulation and incentives. Conservatively, these investments will produce a \$3.1 billion impact in the Philadelphia economy, supporting about 1,000 jobs per year and generating \$2 million per year in local tax revenues for the entire 25-year period."²³



ENDNOTES

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