

The INSTITUTE for

Public Policy & Economic Development
at Wilkes University

A partnership among Keystone College, King's College, Lackawanna College, Luzerne County Community College, Marywood University, Misericordia University, Penn State Wilkes-Barre, The Commonwealth Medical College, University of Scranton & Wilkes University

GREEN BUILDING



5/12/2016

Planning, Land use, Transportation, and Infrastructure
Task Force

Green building is the practice of creating structures and using processes that are environmentally responsible and resource-efficient throughout a building's life-cycle from siting to design, construction, operation, maintenance, renovation, and deconstruction.¹

The Institute for Public Policy & Economic Development

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Study prepared by: The Institute for Public Policy & Economic Development

Executive Director – Teri Ooms

Research Analyst – Andrew Chew

Research Assistant – Nimita Patel

Student Interns – Mary Ayegbusi (University of Maryland)

The Institute’s Planning, Land Use, Transportation, and Infrastructure Task Force Task Force Members

- Dr. Marleen Troy, Professor, Wilkes University, Chair
- Tom Curra, President, WVIA Public Media
- Pam Fendrock
- Norman Gavlick, Executive Director, Luzerne County Transportation Authority
- Tom Lawson, Vice President, Borton Lawson
- Robert Luciani, Vice President, Prudential Retirement Services
- Lawrence Malski, Director, Pennsylvania Northeast Regional Railroad Authority
- Jill Murray, Ph.D., Executive Vice President/Chief Academic Officer, Lackawanna College
- Amanda Modrovsky, Director Sponsored Programs, Wilkes University
- Kevin O’Donnell, President, CAN DO
- Steve Pitoniak, Lackawanna County Planning Commission
- Lee Puskar, Interim Director, Luzerne County Planning Commission
- Nicholas Semon, Chief Sustainability Consultant, Semon Consulting, LLC
- Rick Williams, Luzerne County Council

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PLANNING, LAND USE, TRANSPORTATION, AND INFRASTRUCTURE TASK FORCE

INTRODUCTION

Green building is the practice of creating structures and using processes that are environmentally responsible and resource-efficient throughout a building's life cycle from siting to design, construction, operation, maintenance, renovation, and deconstruction.² This practice expands and complements the classical building design concerns of economy, utility, durability, and comfort. Green building is also known as a sustainable or higher performance building.

Green buildings are designed to reduce the overall impact of the built environment on human health and the natural environment by:

- Effectively using energy, water, and other resources
- Protecting occupant health and improving employee productivity
- Reducing waste, pollution and environmental degradation³

Improvements in these areas will increase sustainability in cities over time by saving on energy usage, and thus will promote greater economic longevity.

This report contains an introduction to the concept of green building as well as some commonly used green building tools. The strategies contained here represent a menu of green building solutions – some are costlier and have a big impact, others are less resource-intensive, but can still be a valuable way to enhance sustainability. Leadership in Energy & Environmental Design, or LEED, is one such program which seeks to provide builders with the resources necessary for the best building strategies and practices.⁴ In order for a building project to receive LEED certification, it must fulfill a number of prerequisites which can gain them a number of different certification levels, depending on the points accrued through those prerequisites. Additionally, building projects can obtain certification through other systems such as Green Globes. As an online certification tool, Green Globes can offer a more affordable way for building projects to gain certification through a questionnaire system.⁵ Green Globes then offers online modules for new things like construction projects and new renovation projects. As a result, it is clear that organizations can pursue selected green building initiatives without investing in full LEED certification if they desire not to – implementing green building is not an all or nothing proposition.

Some practices, such as using local and renewable materials or passive solar design, date back millennia – the Anasazi in the Southwest built entire villages so that all the homes received solar heat in the winter. The contemporary green building movement arose out of the need and desire for more energy efficient and environmentally friendly building practices. The oil price increases of the 1970s spurred significant research and activity to improve energy efficiency and find renewable energy sources. This, combined with the environmental movement of the 1960s and 1970s, led to the earliest experiments with contemporary green building.⁶

DID YOU KNOW?

In 2014, the areas with the greatest per capita investment in green buildings in the United States were:

- Washington, D.C.
- Illinois
- Colorado
- Maryland
- Virginia
- Massachusetts
- Hawaii
- California
- Georgia
- Minnesota
- Arizona
- New York

As of summer 2015, there were 182 Leadership in Energy & Environmental Design (LEED) Certified buildings in Pennsylvania and 586 more registered and moving toward certification. In 2000, the U.S. Green Building Council unveiled its LEED green building certification program that recognizes projects across the globe for commitment to environmental health and cost-efficient, energy-saving green buildings.⁷ There are four levels of certification, representing increasing use of green building techniques: LEED Certified, Silver, Gold, and Platinum. Several buildings in Northeastern Pennsylvania have achieved LEED certification. ENERGY STAR certification is also available for buildings on an annual basis. For certification in this program, products or projects need to be third-party certified through EPA testing, and so it is a separate form of certification altogether from other programs like LEED and Green Globes.

One such building is the Cohen Science Center at Wilkes University. The four story building was built to LEED silver standards, and includes lighting controlled by motion detectors, energy saving windows, and a partial green roof to reduce stormwater runoff. Students have the opportunity to monitor the building's energy and water use performance, which also makes it a teaching tool for sustainability and green building practices.

At the University of Scranton, The Loyola Science Center opened in September 2012, providing 200,000 square feet of formal and informal learning spaces designed to promote discussion and debate for the five academic departments housed there. The Center features wood that has been certified by the forest council as harvested from sustainable sources, and an HVAC system that re-circulates already heated or cooled air to save energy.

Geisinger Health Systems strongly promotes LEED certification in its new facilities as a way to be energy efficient and cost effective. Geisinger has 15 buildings throughout Northeast PA that are part of the LEED certification program. Geisinger Wyoming Valley Campus in Wilkes-Barre Township is home to its Critical Care Building which was completed in March 2009, and the Frank M. and Dorothea Henry Cancer was completed in December 2008 – both of these buildings are USGBC certified. The five-story Critical Care Building houses supportive services, emergency department, operating rooms, ICU and intermediate care beds in 175,000 square feet. The Henry Cancer Center provides outpatient clinical care in 75,000 square feet over three floors. The buildings were designed to recycle construction waste, use recycled building materials and reduce water and energy consumption.

Marywood University's new Center for Architectural Studies also demonstrates green building. The building is an adaptation of the former gymnasium, and is LEED Gold Certified. It includes a green roof, rainwater capture system to supply toilets, radiant cooling system with "chilled beam" technology, recycled construction materials, and preserved floor from the old gymnasium.

Lackawanna College's newly-opened Environmental Institute in Covington Township is LEED Gold Certified, and includes a wind turbine, geothermal HVAC, and software that provides live analysis of water and

Green Building

energy usage of the building. The Nesbitt Academic Commons building at Penn State Wilkes-Barre is also LEED Certified.

King's College's recent renovation of the former Ramada Hotel into the King's on the Square facility has a solar roof to support the building's energy needs and returns excess energy to the power grid. This commercial application will significantly reduce the college's carbon footprint.

Pittston's BENCO Dental building gained Silver LEED certification in 2011. Some features of their building include 20 to 30 percent higher water efficiency, the use of green power, and reused furnishings and recycled content building-wide.

These are just a few of the many great examples of green building projects within Lackawanna and Luzerne Counties. As sustainability becomes a growing priority for governments, businesses, and institutions, it is important that local leaders keep up with this important trend.

GREEN BUILDING STRATEGIES

Alternative Energy

Examples of green energy generation are solar panels and wind turbines. The use of these technologies by homeowners and businesses to meet their own energy needs has increased in recent years as they have become more widely available and affordable. Property owners that generate an excess of energy on their property are even entitled to "sell back" surplus electricity back onto the power grid.⁸

Geothermal Systems

These highly efficient systems reduce or eliminate the amount of electricity, oil, or natural gas needed to heat and cool a building. These highly efficient systems reduce or eliminate the amount of electricity, oil, or natural gas needed to heat and cool a building.

Green Roofs

A green roof is a vegetative layer grown on a rooftop of a building. Also known as roof gardens, these green roofs serve as a large contributor to energy efficiency of buildings. Green roofs reduce the temperature of the building and the surrounding air in multiple ways by shading (they provide shade to the top of a building) and evapotranspiration, wherein the plants in a green roof absorb water through their roots, and then use surrounding heat from the air to evaporate the water. Green roofs can provide cost savings by reducing the amount of energy required to heat and cool the building. Green roofs can also provide an aesthetic benefit by creating a comfortable and usable green space on what would otherwise be a simple rooftop, and finally, green roofs can be beneficial resources for stormwater mitigation, as there will be less runoff due to rain. This can minimize cleaning of urban areas and water sources.⁹

Cool Roofs

Cool roofs heat absorption by reflecting the sun's heat and then emitting its radiation back into the atmosphere. While many roofs are dark and absorb heat, cool roofs are made with lighter, heat-reflective materials. Cool roofs can be coated roofs, which have a light colored paint-like coat to reflect heat, foam roofs, which utilize a foam-like material for insulation, or built-up roofs, which are roofs covered in various layered reflective materials to keep heat out of a building. Essentially, cool roofs allow for a more comfortable and controlled indoor environment. This again results in cost savings by reducing the amount of energy needed for air conditioning.

INDUSTRY SECTORS WITH MOST GREEN BUILDING

1. Education
2. Health Care
3. Commercial/Office

Energy- Efficient Windows

Newer types of windows minimize the need for heating, cooling, and artificial lighting by using some combination of window lazes, multiple panes, tightly- sealed edges, insulated frames, and gas fills.

Other Green Construction Materials

In addition to energy-efficient windows, alternatives to other common building materials such as siding, flooring, paints, roofing materials, and drywall can be made from recycled materials or other more environmentally-friendly products. These types of materials often have relatively low levels of volatile organic compounds (VOCs), which means that use of these green construction products is conducive to better indoor air quality.

Permeable Pavement

Permeable pavement (also known as pervious or porous concrete) is a specific type of pavement with a high porosity that allows rainwater to pass through it into the ground below. Permeable pavement can significantly mitigate stormwater issues for parking lots and other large paved areas.

Stormwater Planters, Rain Barrels, and Rain Gardens

Stormwater planters are contained vegetated areas that collect stormwater runoff. Using bio-retention practices, these planters collect and filter water through various layers of vegetation and soils.

A rain barrel is a water tank used to collect and store rainwater. It maintains harvested rain – rainwater that gets reused before reaching the aquifer. Such tanks can be used in any area and are commonly used to collect water from rooftops or rain gutters. The water can be used later for tasks such as watering plants. Rain barrels are beneficial because they are not only used to recycle water, but also prevent excessive amounts of it from becoming stormwater and causing flooding.

A rain garden is a natural or designed planted basin that collects rain runoff from roofs, driveways, walkways, and other surfaces. These gardens are planted at a lower level than the surrounding ground so that water naturally flows into them. They can be made of various soil, plants, and even tree types, all of which can be chosen based on location and climate. For more information on these types of green

building strategies, called “green infrastructure,” refer to The Institute’s 2015 Sustainability Toolkit on Green Infrastructure.¹⁰

CASE STUDY

Below is a case study that shows successful green building planning and implementation. Though Greensburg is not close in proximity to Northeastern Pennsylvania, this case still shows the possible application of green building designs and their economic benefits that can assist Northeastern Pennsylvania.

Rebuilding a Community with Green Design - A case study of Greensburg, Kansas

On May 4, 2007, Greensburg was hit by an EF-5 tornado. The tragedy took 11 lives and destroyed 95 percent of the city. In an effort to rebuild their city, the Greensburg residents choose to embrace green building, sustainable design, and renewable energy. In December 2007 as a part of its recovery plan, Greensburg passed a resolution requiring all new public buildings to achieve a LEED Platinum rating. These buildings utilize wind turbines, solar panels, high-efficiency windows, recycled materials, and other techniques which reduce energy consumption and save hundreds of thousands of dollars in energy bills. The city now receives its power from a ten turbine wind farm, providing enough energy to Greensburg and nearby communities. Greensburg had been facing some economic challenges prior to the 2007 tornado. In 2000, the agricultural industry faced setbacks and with a struggling population of 1,500 people with a per capita income of around \$18,000, the community continued to deteriorate. After the destruction of the city, residents and local officials saw an opportunity to rebuild in a way that was “stronger, better, greener” – now Greensburg’s new motto. The assistance Greensburg received from many federal and state agencies allowed the community to move towards sustainability as it rebuilt. Once the green building resolution guidelines were established in 2007, the community began to thrive again. Greensburg has now built schools, city halls, hospitals, county buildings, courthouses, and art centers that incorporate green building techniques.¹¹



PUBLIC POLICY & PLANNING

At the local level, it is important to plan for green building as well as promote policies that support green building by private individuals, businesses, and institutions. As shown above, institutions like hospitals, colleges, and universities are often leaders in adopting sustainability practices.

Municipal Codes and Cost Issues

In some cases, local zoning and building regulations may stand in the way of sustainable development. In particular, there may be barriers in zoning ordinances that prevent property owners from installing solar panels, wind turbines, rain gardens, or other green building elements. A municipality can help foster

sustainability by amending codes to address these items. For example, in 2013, The City of Baltimore adopted a new zoning ordinance that is considered to be among the most “green building friendly” in the nation. Among other general sustainability measures, the code broadly permits solar power (roof and ground mounted panels) and wind power. It also allows rain barrels, compost piles, and greenhouses to encroach into required setback areas, and encourages green roofs in commercial and industrial zoning districts. Many other cities nationwide, including Albuquerque, New Mexico, Boulder, Colorado, and Seattle, Washington have also revised codes to promote green building and other sustainability principles.

Baltimore also has a mandatory green building law (in place since 2007) that mandates a LEED Silver rating or equivalent LEED-like local certification for all new nonresidential buildings and some new multifamily residential buildings. While mandating green building in this way presents an added cost to developers and a potential barrier to economic development, municipalities can also consider offering optional local green building certifications.

Cost issues have also been a challenge to the acceptance of green building. Builders have noted a lack of data in the long term yearly operating costs, because they have not been linked or largely discussed in relation to the initial cost of building or renovating. Despite this, it has been shown that green building save 10 times as much as the cost of construction, and so energy savings alone are greater than the average increase in cost. Further, the characteristics of an eco-friendly building such as increases in ventilation, light, and temperature-control benefit the occupants of a building, and lead to increased productivity overall.

Planning and Strategies

In addition to changing local regulations, local governments are empowering consumers to make smart energy choices and developing the market for energy efficiency by embracing energy disclosure and building performance rating policies. In addition, innovative local governments are developing creative financing models to help residents and other building owners invest in green building by lowering real or perceived cost barriers to green building and to achieve even greater market penetration. Though sometimes a complicated endeavor, leading local governments are also adopting, implementing, and enforcing better building codes to support their sustainability goals.

DRIVING DEMAND FOR ENERGY EFFICIENCY THROUGH BUILDING ENERGY RATING AND DISCLOSURE

The Department of Energy developed a National Home Energy Score Program (2011) to create a credible and consistent way of informing homeowners and home occupants on how to improve their home’s energy performance. State and local governments are encouraging energy conservation and building upgrades through localized energy disclosure and building energy rating policies. These are some examples of the states that are encouraging energy conservation:

- New York, New York (8,363,710 pop.) – New York requires large commercial and multifamily buildings to benchmark their energy and water consumption with ENERGY STAR. The city provides it benchmarking data is posted online to track the progress. The provision is part of the city’s

Greener, Greater Buildings Plan, which also requires periodic energy audit, lighting upgrades and sub-metering in commercial buildings.

- Austin, Texas (786,382 pop.) – Austin’s Energy Conservation and Disclosure ordinance requires ENERGY STAR benchmarking for commercial buildings and the disclosure of benchmarking data to prospective buyers. The law also requires energy audits for homes and multifamily buildings, and mandatory replacement of old technologies with new technologies in “high energy-use” multifamily buildings.

COST EFFECTIVE HOME ENERGY EFFICIENCY FINANCING

Whenever energy efficiency savings is provided to a home or building, it always improves the financial state of the community. A number of local jurisdictions are finding creative ways to motivate consumers to make investments in energy efficiency. Some of the ways programs can be managed financially includes local utility providers, city agencies, or special tax assessment districts. Property Assessed Clean Energy (PACE) has proven to be a highly-effective mechanism of financing for delivering building energy efficiency in many U.S. communities. Here are some energy efficient programs that are specific to the region:

- The Town of Babylon, New York under the Long Island Green Homes (LIGH) initiative, offers residents low-interest loans for retrofitting their homes at no cost to the homeowner. Through a two million revolving loan fund, the town subsidizes up to twelve thousand dollar of upgrades per home; obliging the homeowner to pay a monthly benefit assessment fee which is generally lower than the monthly energy savings realized from the improvements. Should the monthly obligation be in arrears, it is assigned to the property tax. The Town levies a three percent administrative fee incorporated into the monthly payments. Should the homeowner move before the obligation is satisfied, the obligation stays with the home.
- Racine, Wisconsin (82,196 pop.) – Wisconsin offers upfront financing for energy and water saving improvements for owner-occupied homes. Overtime homeowners pay for the improvements through small payment installment which lessens the cost. The program is open to residents who own homes built between 1946 and 1975 to maximize energy savings potential.
- Sonoma County, California (466,741 pop.) – The Sonoma County Energy Independence Program gives commercial and residential property owners the opportunity to borrow funds to increase their property’s energy efficiency. Those who qualify for the funds will have access to insulation, cool roofing, heating and air conditioning systems, waterless urinals, solar panels and energy efficient windows. The money is then paid back as an assessment on the property which is due at the same time as the property taxes.

RESOURCES

One of the biggest obstacles to overcome is how these projects will be funded. While many green building strategies yield cost savings due to decreased energy use, there can be a significant upfront cost. Many municipalities have tight budgets due to fiscal challenges and others are small and do not

have a very large budget to begin with. Through proper research and proposal preparation, any business, institution, or municipality can apply for numerous federal and state funds to incorporate green building techniques into its facilities.

Financial Assistance

The Pennsylvania Department of Community and Economic Development (DCED) offers an array of different funding programs, grants, loans. DCED has made it a goal to foster opportunities for businesses to grow and for communities to succeed and thrive in a global economy. Their primary focus is to improve the quality of life for Pennsylvania citizens' while assuring transparency and accountability in the expenditure of public funds.

One of the many programs that are being offered is the High Performance Building Program (HPB). The program provides financial assistance in the forms of grants and loan funds to underwrite the cost premiums associated with the design and construction of major renovation of high performance building in the state. The program is administered jointly by the Department of Community and Economic Development (DCED) and the department of Environmental Protection (DEP) under the direction of CFA.¹² In order to qualify for the program, one must be a small business or an individual. Loans for high performance building projects for small businesses shall not exceed \$2 million. Loans for individual resident projects shall not exceed \$100,000. Grants for high performance building projects shall not exceed \$500,000 or ten percent of the total eligible building construction/ renovation cost, whichever is less. Guarantees shall not exceed \$2 million for a small business and \$100,000 for an individual and have a term of not more than five years. Matching funds of \$1 for every \$1 of program funds are required.

There are also several federal tax credits that apply to businesses and homeowners that make green building investments. The first is the Business Energy Investment Tax Credit, which is in effect until



There are many cost benefits of green building such as:

- Consuming 26 percent less energy
- Having 13 percent lower maintenance costs
- Having 27 percent higher occupant satisfaction
- Having 33 percent less greenhouse gas emissions

December 31, 2016. It provides credits on solar energy, fuel cells, wind turbines, geothermal systems, and combined heat and power (CHP) systems. Business Owners may also recover green building investment costs in the form of depreciation deductions under MACRS – Modified Accelerated Cost Recovery System. Eligible green building investments, such as solar and wind power, geothermal systems, and fuel

cells, may be classified as having a reduced class life of five years, which increases the amount of depreciation that may be deducted for these systems. This is favored by users of solar arrays to increase their financial return.

Additionally, homeowners who invest in energy efficient HVAC systems may qualify for Residential Energy Efficiency Tax Credits.

Technical Assistance

EPA's Office of Sustainable Communities produce technical assistance to help communities achieve their development goals, improve their quality of life, and become more economically and environmentally sustainable. The following technical assistance programs help communities consider green building-related challenges:

- **Building Blocks for Sustainable Communities:** Provides quick, targeted technical assistance to selected communities using a variety of tools that have demonstrated results and widespread application. The purpose of delivering these tools is to stimulate a discussion about growth and development and strengthen local capacity to implement sustainable approaches.¹³
 - Tools Includes:
 - An agenda, presentations, and exercise that help facilitate discussion around a given topic.
 - Data or information from the community that can be analyzed, helping to drive conservation.
 - An action- oriented process that leads to a set of potential next steps.
 - Assistance from EPA:

Technical assistance is delivered by EPA staff and EPA- hired consultant teams. Each technical assistance project includes:

 - Public engagement through a one-to-two- day workshop.
 - Direct consultation with relevant decision – makers.
 - A memo outlining specific steps the community could take to implement the ideas generated during the workshop.
 - Tools Offered:

EPA offers a variety of tools through the building Blocks for Sustainable Communities Program. Not every tool is offered in every round. Once EPA has used a tool in several communities, the tool will be refined to create a product that any community can use with limited outside assistances.

 - Green Building Toolkit: Helps local governments identify policies that support compact development that features sustainably built homes and other buildings.
- **Smart Growth Implementation Assistance:** provides in-depth technical assistance form tribal, state, regional, and local governments that are seeking help with a smart growth-related challenge. EPA will work with regional staff to identify and select communities rather than issue a Request for Letters of Interest.¹⁴

Once selected, communities receive direct technical assistance from a team of national experts in one of two areas: policy analysis (e.g., reviewing state and local codes, school siting guidelines, transportation policies, etc.) or public participatory process (e.g., visioning , design workshops, alternative analysis, build- out analysis, etc.) The assistance tailored to community’s unique situation and priorities.

EPA provides the assistances through a contractor team- not a grant. Through a multiple – day site visit and a detailed final report, the multi – disciplinary teams provide information to help the community achieve its goal of encouraging growth that fosters economic progress and environmental protection.

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