

# WHAT ARE OUR GOALS?

## WHY SHOULD WE ATTEMPT TO IMPACT BUILDING CONSTRUCTION AND DEMOLITION?

### THE FACTS: BUILDINGS AND THEIR IMPACT ON THE ENVIRONMENT

- The average household spends at least \$2,000 a year on energy bills—over half of which goes to heating and cooling.
- Urban Heat Island Effect: the annual mean air temperature of a city with 1 million people or more can be 1.8 - 5.4°F warmer than its surroundings, increasing summertime peak energy demand.
- Although population in the U.S. doubled between 1950 and 2000, public demand for water has tripled.
- Urban land area quadrupled from 1945 to 2002. Estimated acreage of rural land used for residential purposes increase by 21 million acres (29%) from 1997 to 2002.
- Americans spend 90% or more of their time indoors, and indoor levels of pollutants are two to five times higher than outdoor levels.
- Building-related construction and demolition waste accounts for 48% of the waste stream (48% demolition, 44% renovation, 8% new construction).
- 35% of impervious surface area is due to roofs of offices, homes, stores, and patios and urban runoff is the sixth leading source of impairment in rivers, ninth in lakes, and fifth in estuaries.

### BUILDINGS IN THE US ARE RESPONSIBLE FOR:

- 39% of total energy use
  - 53.7% Residential (50% space heating, 27% appliances, 19% hot water, 4% air conditioning)
  - 46.3% Commercial
- 72% of electricity use
- 38% of CO2 emissions
- 45% of total GHG emissions
- 13% of water use
  - 74.4% Residential
  - 25.6% Commercial
- 60% of non-industrial waste
- 40% of all raw materials use

<http://www.epa.gov/greenbuilding/pubs/gbstats.pdf>

## REVIEW OF PREVIOUSLY ESTABLISHED GOALS

### ***Resolution 944: Declaration of the Borough of State College as a Climate Protection Community***

Resolution 944 was adopted after the Borough commissioned a greenhouse gas (GHG) inventory and a series of focus groups in which informed community stakeholders proposed 79 potential GHG reduction options. After the adoption of Resolution 944 another series of focus groups were conducted to prioritize the 79 options. When individually ranked the introduction of new building codes and regulations to promote and or enforce more efficient lighting was ranked 6<sup>th</sup> among energy options. Multiple options ranked highly involved setting standards for rental properties, challenges for businesses, and leading by example in municipal facilities.

The goals in Resolution 944 address both issues surrounding buildings as they pertain to energy use, stormwater management and waste as well as issues addressed through smart growth policies towards compact, walkable, mixed use cities.

- *Green Building Related 944 Goals:*
  - All municipally owned construction shall be LEED Gold or Silver Certified
  - Incorporate sustainable construction and demolition practices into Borough ordinances, including the requirement of LEED certifications
  - Establish incentives for the installation of green roofs, rainwater cisterns, and other best management practices
  - Reduce Borough-wide electricity usage by 10% by 2000 levels
  - Community-wide purchase 20% of all electricity from “green power sources”
  - Reduce residual waste to 35% of the total waste stream
- *Smart Growth Related 944 Goals:*
  - Complete a review and implement changes to land use policies as necessary to reduce urban sprawl, preserve open space, and create a compact, walkable community
  - Reduce existing impervious area within the Borough by 2% through zoning incentives, innovative surface treatments, street narrowing
  - As a community increase the percentage of residents walking, biking, or using transit to commute to work by 10% over 2007 levels

## EVALUATION OF PREVIOUSLY ESTABLISHED GOALS (FROM LAST MEETING)

### SHOULD WE REQUIRE A HIGHER STANDARD THAN LEED SILVER FOR MUNICIPAL BUILDINGS?

*Other Options:*

- Equivalent or better than LEED Gold & Platinum
- Net Zero Energy Buildings ([Zero Energy Buildings Database](#))
- Carbon Neutral Buildings (e.g. [Aldo Leopold Legacy Center](#), also LEED Platinum)
- Carbon & Water Neutral Buildings( e.g. [Oberlin’s Adam Joseph Lewis Center](#), attempt with observable metrics)
- Zero Waste Buildings ([ReDi Index](#))

*How do we best market our commitment to green building?*

- [Dashboard](#)
- Publications
- Tours & Awards

### WAS LEED EVER MEANT TO BE A ZONING TOOL?

In all reality, the U.S. Green Building Council’s Leadership and Energy and Environmental Design rating system was not designed to be a zoning tool. However, LEED has greatly influenced the whole sustainable design community, as was the USGBC’s aim when it was formed in 1993. In *The Necessary Revolution* Peter Senge outlines the development of the USGBC and subsequently LEED. The founders of USGBC new from the outset that to succeed in developing a green building standard they would need to get the entire building industry involved from the outset: real estate owners, developers, financiers, engineers, architects, construction companies, environmental

organizations, government, and the media. In addition they would need to establish consensus among the stakeholders. With the mantra, 'seek agreement and go,' they pushed forward without a grand overarching vision.

The early USGBC participants did not need a grand vision, but they did need to address the question, "What is a green building?" Thus the LEED rating system was born, after four year collaborative process, as a set of objective criteria to determining the key characteristics of a green building. Jim Hartzfeld, former president of USGBC, put it this way,

*As the LEED rating system began to get articulated people grabbed the system and said, 'Here are all the different ways you can gain points. The more points you gain, the greener the building.' That took the vague concept of green and created some objective steps so people could actually do something. It was never intended to be the ultimate guide to the green building. But it helped people make sense of an otherwise complex and amorphous concept. Even if they didn't know a lot about it, they could start taking steps in that common direction. (Senge, et al. 2008, p. 72)*

LEED has shifted an entire industry and local governments have responded to this shift by adopting LEED as the standard. Peter Senge points out that the USGBC has benefited most from building shared visions and establishing an ongoing collaborative learning as the norm. In deference to the USGBCs proven methods to success, the municipality in developing a zoning policy, should not stamp LEED certified requirements into a zoning ordinance, instead through a collaborative process the municipality should address the issue of green building as a whole.

*Questions to ask when adopting a green building rating system?*

- Is the rating scheme itself transparent?
- Did it arise from a process of collaboration among a meaningful cross section of key players in the respective industry?
- Does it continually lead to more demanding standards, through a process that garners the support of a critical mass of the key private sector interests?
- Did the certification system arise as a way to fix an important problem rather than in an effort to see the larger system and define commons that need to be collectively managed?

Zoning ordinances are put in place as an effort to see the larger system and define commons that need to be collectively managed. Peter Senge points out that if the focus of a certification system is to fix an important problem only small groups will devise systems that embody standards they see as meaningful, but they may end up trying to needlessly impose them on others. Then someone else will come along with a different set of standards and competition will wreak havoc and thwart rather than encourage innovation. Although green building rating systems were not intentionally designed to be a zoning tool, they may help meet the goals and functions of zoning if the questions above are addressed.

[Philadelphia Zoning Code Commission addresses the issue of LEED](#)

### **IS A GREEN BUILDING ZONING ORDINANCE THE BEST WAY TO ADDRESS OUR GOALS?**

Some of the goals listed in Resolution 944 are not best addressed through regulations others may be more so. For example, issues regarding impervious surface area may be addressed through a green building ordinance or through additional criteria (e.g. [Seattle Green Factor](#)) whereas decreasing energy use may be more of a behavior

modification issue that should be addressed through education, prompts, community leadership, and local competitions.

**WHAT DO WE CARE ABOUT MOST?**

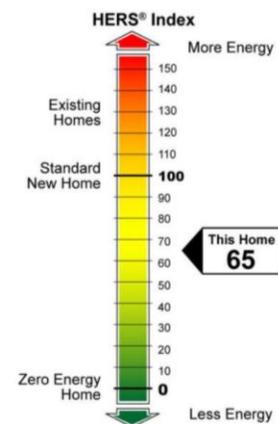
**ENERGY EFFICIENCY VS. CARBON FOOTPRINT**

Energy Efficiency	Carbon Footprint
<ul style="list-style-type: none"> <li>In conversations with other municipalities in the region, implementation of programs based on mitigating the effects of Climate Change were not welcome whereas energy efficiency was an acceptable basis for municipal action.</li> </ul>	<ul style="list-style-type: none"> <li>Borough Council specifically addresses the importance of reducing carbon emissions in Resolution 944 by designated the Borough Government a key stakeholder in any community GHG reduction effort.</li> </ul>
<ul style="list-style-type: none"> <li>Green Point Rated Climate Calculator points out: “In the building’s design, the most important CO2e reduction strategies are building energy efficiency, reduced home size, photovoltaic systems, energy efficient appliances (including non-HCFC refrigerants), construction waste recycling, and water savings from efficient landscapes and plumbing fixtures.</li> </ul>	<ul style="list-style-type: none"> <li><a href="#">Green Point Rated Climate Calculator</a> from California’s Build It Green certification program best exemplifies the connection between green homes and GHG emissions reductions. The rating system is divided into the usual green building criteria categories. In addition, avoided CO2e emissions are calculated for construction and operations as well as other estimated benefits.</li> </ul>
<ul style="list-style-type: none"> <li>Proven significant cost savings for energy efficiency improvements.</li> <li><a href="#">McKinsey Report on Energy Efficiency</a></li> </ul>	<ul style="list-style-type: none"> <li>Focusing on significantly reducing GHG emissions necessitates promoting “green power” either through installation or purchase on the grid—a significant cost (2.5 cent premium per kWh)</li> </ul>

**HISTORIC PRESERVATION VS. NEW DEVELOPMENT**

Historic Preservation and Green Building can go hand and hand by enhancing renovation projects and improving energy efficiency of older buildings. Jean Carroon, AIA, a LEED accredited preservation principle estimates that nearly two dozen old and historic buildings have been certified through the LEED system. However, unwarranted demolition of historic structures would certainly produce negative effects such as embodied energy loss. Therefore a green building policy which favors new construction over renovation or without careful consideration for existing structures would defeat the purpose of our goals.

As for the energy efficiency of older homes, the average new American residences have a Home Energy Rating System (HERS) index of 100. The average existing building rates around 130. In a case study for the Sustainability Institute of five historic structures ranging in age from the mid-18<sup>th</sup> century to the early 20<sup>th</sup> century for the average was 149, which is 49% less efficient than a typical American home. However Lin Team points out that the difference between average energy consumption of a pre 1920s commercial building and one constructed since 2000 is only 0.5%. According to studies by the Energy Research and Development Administration, historic buildings built between 1940 and 1975 are the least energy efficient. Why the decline after 1940? It is theorized that buildings older than 1940 use less energy for heating and cooling simply because they were built with a well-developed sense of physical comfort and because they maximized the natural



sources of heating, lighting, and ventilation.

Independent of a building's energy efficiency, the energy costs of building new structures and demolishing old ones is worth our consideration. Mike Jackson of the Illinois Historic Preservation Agency states, "If the embodied energy is worked into the equation, even a new, energy-efficient office building doesn't actually start saving energy for about 40 years. And if it replaces an older building that was knocked down and hauled away, the break-even period stretches to some 65 years."

*Resources:*

- [Carl Elefante. \(Summer 2007\) "The Greenest Building Is...One that is Already Built.](#)
- [Blog: The Greenest Building is the One Already Built](#)
- [Green Building Alliance and Pittsburgh History & Landmarks Foundation. "The Greening of Historic Properties National Summit White Paper"](#)
- [Patrice Frey. \(September 2008\) "Building Reuse: Finding a Place on American Climate Policy Agendas"](#)
- [Patrice Frey. \(October 2007\) "Making the Case: Historic Preservation as Sustainable Development"](#)
- [Benjamin Leigh and Sarah Welniak. \(May 2010\) "Energy Efficiency in Historic Residences: A Case Study"](#)
- [Lin Team. "Preservation: As Green As It Gets: Part 1"](#)
- [Baird Smith. \(1998\) "Conserving Energy in Historic Buildings"](#)

#### **COST: WHAT IS ACCEPTABLE?**

LEED and other green building guidelines do not necessarily guarantee particular results. Designers are given a wide range of options to implement, therefore project benefits and costs vary widely by project.

A 2003 study of 38 LEED-NC buildings points out that of the total points possible in the 38 buildings more points were achieved in the categories of Sustainable Sites, Water Efficiency, Innovation & Design Process, and Indoor Environmental Quality. Less than 40 percent of the points available in both the Energy & Atmosphere and Materials & Resources categories were achieved. Among the least-employed LEED points were greater energy efficiency and green energy points (EA 1, EA 2.1, EA 2.2, and EA 2.3), the use of salvaged/reused materials and rapidly renewable materials (MR 3.2 and MR 6), and meeting local urban development density goals (SS2). LEED now requires designs to achieve a theoretical energy efficiency level of 14% above the baseline for certification, guaranteeing some energy efficiency improvement.

On average LEED buildings cost more, on average 1.8% more than conventional buildings, however the cost premium vary widely by project and similar costs may be realized for a certified and silver building as compared to a gold or platinum building project. In "Managing the Cost of Green Building," Geof Syphers et al., estimates that the investment of an additional 3% of project costs in the design phase can reduce construction costs by 10%. In addition, the USGBC estimates that energy and water savings allow for an average green premium recovery of 3 to 5 years.

Although, clearly the capital cost of different levels of certification remains an issue to be worked through with the community, there is a growing recognition that green building makes financial sense. For commercial buildings the benefits lie in enhanced financial performance of real estate asset/portfolios that arise from increased rents and greater occupancy along with energy, water, and waste removal cost reductions. In the residential market, it is recognized that the more that limited family income is eaten up by other expenses the less that remains to cover

the mortgage; therefore, sustainable development has a real financial return where it reduces the operational costs of a real estate asset regardless of whether it is tenanted or owner-occupied.



The question remains what is an acceptable cost/upfront cost burden of a local green building program? Students from Pennsylvania State University's Community, Environment, and Development major recently held a focus group of borough residents and community stakeholders on the topic of green and affordable housing. Of the participants, two were owners of State College Land Trust homes and were required to obtain an energy audit of their home. In their cases, upfront costs played a large role in their decision to add energy efficiency improvements or not, independent of their feelings regarding the environment and sustainability issues.

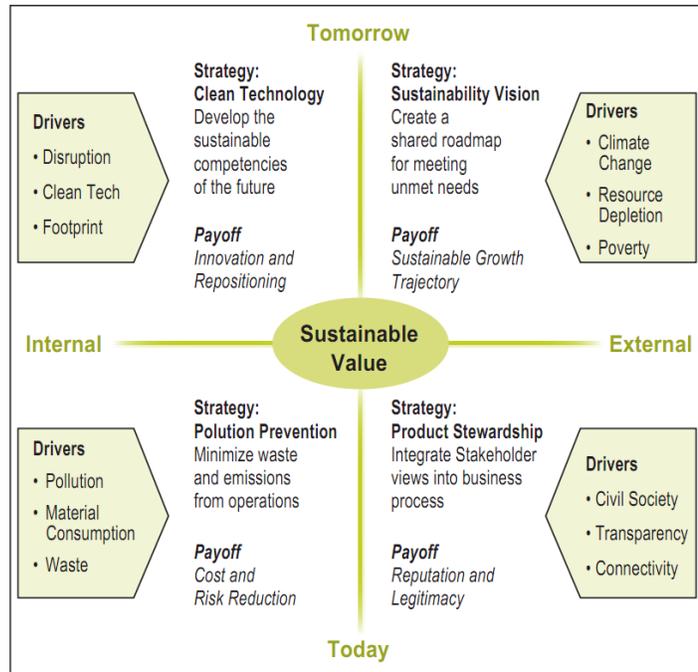
#### Resources:

- Nice description of LEED, its impact, and in what categories points are most likely earned [Robert Cassidy. \(2003\) "White Paper on Sustainability: A Report on the Green Building Movement." Building Design & Construction. 11.03.](#)
- [Davis Langdon. \(July 2007\) "Cost of Green Revisited: Reexamining the Feasibility and Cost Impact of Sustainable Design in the Light of Increased Market Adoption."](#)
- [Greg Kats. \(October 2003\) "The Costs and Financial Benefits of Green Buildings: A Report to California's Sustainable Building Task Force."](#)
- [Geof Syphers et al. \(2003\) "Managing the Costs of Green Buildings."](#)

## SUSTAINABLE VALUE CREATION AND THE SUSTAINABLE VALUE FRAMEWORK

An organization must balance its needs in the present while simultaneously creating technology and markets for the future. The organization must also grow and protect internal organizational capabilities while incorporating new perspectives and knowledge from the outside. The Borough will maximize its shareholder value over time by performing well in all four quadrants of Peter Senge's Sustainable Value Matrix, which juxtaposes these needs and reflects the tension between staying focused on core operations and remaining open to new potentially disruptive models and technologies.

When setting the goals of a green planning program the organization can vet goals and objectives by this value matrix. For example, when determining the answer the question of whether or not the Borough should have a higher standard than LEED Silver for municipal facility new construction we would determine which quadrant in the matrix best fits this decision. In municipal construction is our goal to minimize costs today or be ahead of the curve in mitigating climate change in the future? Are we pursuing a green building to satisfy internal stakeholders or to engage the community? Perhaps this goal falls in the second quadrant with the payoff of “innovation and repositioning.” In such our actions might be to require LEED silver, but pursues all cost-effective green building measures, possibly gaining a much higher level, yet not making it mandatory. If instead the goal fell in quadrant one, the borough would undoubtedly set a much higher goal than LEED silver and take every step to achieve it, independent of cost.



**Where do the individual Resolution 944 goals fit in this framework? What is the overarching strategy?**

Resources:

[Sustainable Value Creation Excerpt](#)