GREEN BUILDINGS IN DELAWARE: CHALLENGES AND OPPORTUNITIES

FINAL REPORT

A Renewable Energy Applications for Delaware Yearly (READY) Project

Center for Energy and Environmental Policy
University of Delaware

September 2008

Center for Energy and Environmental Policy

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Mailing Address:

John Byrne
Director
Center for Energy and Environmental Policy
University of Delaware
Newark, DE 19716-7381

Email: jbbyrne@udel.edu
Telephone: (302) 831-8405
Telefax: (302) 831-3098
Website: http://ceep.udel.edu

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A Renewable Energy Applications for Delaware Yearly (READY) Project

Project Team
Bahareh Van Boekhold, Research Assistant, CEEP
Michael Salisbury, Research Assistant, CEEP

Project Advisors
John Byrne, Director, CEEP
Cecilia Martinez, Policy Fellow, CEEP
Gerard Alleng, Policy Fellow, CEEP

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Executive Summary

Concerns over the energy and environmental impacts of resource intensive building and development are growing. As a result, state and local government initiatives to support reduced consumption and improvements in resource efficiency are on the rise. For the most part, policy efforts to deal with these issues have focused on renewable energy and efficiency in the energy sector. There is however, increased attention to the built environment as an important strategy for addressing these issues as well.

According to the Department of Energy (DOE), buildings in the U.S. account for as much as 30% of raw materials extraction. Construction and demolition waste accounts for approximately 24% of the municipal solid waste stream annually, of which 95% is recyclable. In addition, the building sector accounts for 39% of the nation's energy consumption (38.8 Quadrillion BTUs) and 71% of its electricity consumption. The impact of the building sector on the environment is equally as significant on an international level. Globally, buildings consume 40% of land, water, energy, and raw materials (DOE, 2007).

The design and construction of buildings in accordance with principles of energy and resource efficiency, minimum waste, and indoor air quality has become an accepted and widely used building practice. Green building design is the production of high performance buildings that utilize resources such as energy, water, materials and land more efficiently than conventional designs. In addition, green buildings offer an array of social benefits such as improved health, comfort, and productivity of occupants (Kats, et al., 2003). Economic benefits include reduction of building materials and operations (water and energy) costs; increased value of green buildings; and local economic development through increased business and employment of an expanding green industry. Social benefits include improvements in quality of life and equitable access to infrastructure services such as transportation, healthy indoor environments, and other social and economic amenities. Lastly, green buildings conserve vital natural resources and help to preserve fragile ecosystems, by reducing pollution and waste generation. The benefits associated with green buildings are increasing as national, state and local governments seek to address the problem of climate change and develop strategies to reduce greenhouse gas (GHG) emissions. Over the last several decades, a series of consensus-based principles have evolved within the building industry to assess the performance of green buildings.

Approximately seventeen states have adopted legislation of various types to promote green building and design. This study highlights five of these states (California, Maryland, Nevada, New York, and Oregon) to provide a survey of policy instruments in existence across the U.S. Each of the states reviewed has established green building standards for public sector buildings; developed tax incentive packages to promote private sector green buildings; and/or introduced a set of other building efficiency programs and standards (Table ES1). In addition to state-based initiative, there are a number of municipalities that are also establishing their own green building programs. This report highlights the efforts of New York City, Portland, and Seattle.

The State of Delaware has a number of programs and policies that support some component of green buildings and sustainable practices. The recent formation of the Delaware Sustainable Energy Utility (SEU) also has elements that advance the state's green building program. The SEU will use incentive funds to encourage whole-building strategies to improve energy performance with a 30% energy savings goal. Its Green Building Initiative will work with architects and building developers to identify special projects that merit SEU investment consistent with the *2030 Challenge* adopted by the American Institute of Architects.[1] In addition, the SEU includes equity considerations focusing on affordable energy efficiency for low and moderate-income households.

This study conducted a survey of stakeholders from the building sector and from state and local governments to assess the status of green buildings in Delaware. The study revealed several important findings. Approximately half of those surveyed were unaware of any green building programs in the state. Of those who were aware, the majority identified Delaware Natural Resources and Environmental Control's Green Energy Program as one with which they were most familiar. In general, survey participants cited the following as obstacles or challenges to green building in Delaware: lack of awareness; absence of training and education programs; lack of appropriate incentives; perception of high capital costs; the state's conservative orientation toward change; and lack of leadership. Respondents also identified the most promising incentives to stimulate growth of green buildings in Delaware as tax incentives and credits; grant programs; low-interest loans; and government cost-sharing.

[1] http://www.architecture2030.org/2030_challenge/index.html

Table ES1. Summary of State Green Building Programs

		California	New York	Maryland	Oregon	Nevada
LEED certification		LEED certification	LEED certification	LEED certification	Must meet LEED standards but LEED certified is not required	LEED certification
Mandates	**Public**	New construction and renovation of government buildings must meet LEED Silver level	It is encouraged for State projects but are not required to seek LEED certification	All state projects are mandated to approximate LEED Silver level	N/A	All state projects are mandated to approximate LEED Silver level
Private Incentives	**Commercial**	*[*]	Buildings with >20,000 sq ft	Buildings with >20,000 sq ft	All commercial buildings	All commercial buildings
			Corporate tax credit	Corporate tax credit	Tax credit	Property tax abatement
			$50 million total, limited to $2 million per project	$25 million total (currently not accepting further applications)	No overall limit, $3.5 million per project, amount of credit based on square feet of building and level of LEED certification	Property tax abatement based on level of LEED certification
	Residential	*	Multi-family buildings with >12 units	Multi-family buildings with >12 units	N/A	N/A
			personal income tax credit	personal income tax credit	N/A	N/A
			$50 million total, limited to $2 million per project	$25 million total (currently not accepting further applications)	N/A	N/A
	Developer	*	Low interest loans (4% below market) for EE measures and building materials that meet LEED standards	Local option for Property Tax Exemption for High Performance Buildings	N/A	N/A
Regulators		Green Building Action Team	NYSERDA & DEC	MD Energy Administration and Dept of Environment	OR Dept of Energy	Department of Energy Commission on Economic Development
Year Adopted		2004	2000	2001	2001	2005

[*] Although California does not offer any private incentives for specifically green buildings, there are number of programs which target different components of green buildings which are discussed in California section of the report.

1.0 INTRODUCTION

There is a growing concern over resource intensive development patterns and the attending environmental consequences that ensue from such development. As a result, the need to reduce consumption and improve conservation and efficiency as a means of alleviating these destructive impacts is gaining greater acceptance. Moreover, acknowledgement of the environmental impact from continued dependence on fossil-fuel energy systems and their impacts on the atmosphere is one of the leading policy concerns today. For the most part, policy efforts to deal with these issues have focused on developments in the energy sector through the promotion of renewable energy sources and improved efficiency. There is however, growing attention on the built environment as an important strategy for addressing these issues as well. Green buildings, or sustainably designed buildings, offer substantial potential for efficiencies in energy and natural resource consumption, and for greatly reducing generation of waste. Green buildings can be an effective option for addressing the environmental impacts of development, and have the additional benefit of providing healthier indoor environments for homes and public buildings.

In the U.S., thirty-five states have passed or proposed legislation promoting design and construction of green buildings.[2] By all accounts, the trend of increasing public sector initiatives will continue as other states and local communities join this growing effort. In Delaware, promotion of green buildings has been somewhat limited, although there are notable examples of programs that support green buildings. One such initiative is the Delaware Green Energy Program which provides incentives for installation of renewable energy systems. Also, in its report *Bright Ideas for Delaware's Energy Future*, the Delaware Energy Task Force calls for recognition of outstanding energy efficient design and construction in accordance with U.S. EPA Energy Star and U.S. Green Building Council (USGBC) standards (Delaware Energy Task Force, 2003). The Task Force also recommends an evaluation of the USGBC Leadership in Energy and Environmental Design (LEED) standards for application in Delaware. However, there has not been any legislation to advance these recommendations. This report examines the present context for the promotion of Green Buildings in Delaware.

[2] Determined from AIA Green Buildings Legislation website.
https://www.trendtrack.com/texis/tt/new_search/showreport.html?id=460acba8198&gi=450dbfbca

2.0 BACKGROUND

In the United States, as in other industrialized countries, the building sector has a significant impact on the social and physical environment. It is a major producer and consumer of energy and materials, and when coupled with urban sprawl potentially disrupts natural habitat areas, green spaces, and results in loss of agricultural land. Such development practices utilize large amounts of natural resources and virgin raw materials, and generate substantial waste material. According to the Department of Energy (DOE), buildings in the U.S. account for as much as 30% of raw materials extraction and can use up to five billion gallons of potable water a day to flush toilets (DOE, 2007). Construction and demolition waste accounts for approximately 24% of the municipal solid waste stream annually, of which 95% is recyclable (DOE, 2007). In addition, according to the 2007 Buildings Energy Data Book, the building sector accounts for 39% of the nation's energy consumption (38.8 Quadrillion BTUs) and 71% of its electricity consumption. The impact of the building sector on the environment is equally as significant on an international level. Globally, buildings consume 40% of land, water, energy, and raw materials.

In addition to its consumption of natural resources and generation of waste, the building sector is a sizeable contributor to the problems of urban air quality and climate change. The DOE estimates that U.S. buildings accounted for 51% of sulfur oxide, 19% of nitrous oxide, and 16% of particulate emissions in 2002, and 38% of national CO_2 emissions in 2000 (DOE, 2007). The impact on human health is also of concern from an indoor air quality standpoint. The U.S. Environmental Protection Agency (EPA) estimates that almost 90% of the 24-hour day is spent indoors where pollutants may be two to five times higher than outdoor levels[3]. This unhealthy indoor environment contributes to asthma and other illnesses, which in turn results in reduced productivity and increased absenteeism from both work and school (Fisk, 2000).

Transforming the design, construction and maintenance of buildings offers substantial potential for energy and resource efficiency, pollution and waste reduction, and ultimately results in a more healthy and viable environment for residents. Sustainable urban development and green building design are integrative approaches to improve the quality and performance efficiencies of buildings in order to reduce environmental waste and pollution and improve the quality of life.

2.1 Green Buildings

Although the concept and practice of sustainable design has gained considerable attention in the last decade, its conceptual origin derives from the centuries old historical practice of vernacular architecture (USGBC, 2003). Vernacular architecture refers to methods of design and construction that emphasize use of local resources, and reflect local

[3] "Healthy Buildings, Healthy People: A Vision for the 21st Century," U.S. Environmental Protection Agency. http://www.epa.gov/iaq/hbhp/index.html

environmental, cultural and historical contexts. Contemporary sustainable designers content that this architectural tradition is "important to the future provision of culturally appropriate and sustainable architecture."[4] Prior to the 20th century, building technology, material accessibility, and local environmental conditions heavily influenced architecture and building construction. By 1930 however, technological innovations resulted in substantial changes in architectural design. The advent of new building materials such as steel and glass; developments in heating, ventilation and air conditioning (HVAC) systems; and increasing access to continuous, abundant and inexpensive energy for heating and cooling transformed the way in which buildings were designed and constructed. These innovations enabled architects to manipulate and control indoor conditions which then led to building designs unconstrained by environmental climate and resource limitations. The result was the development of a high-energy consumption and resource-intensive building sector. This trend began to change in the 1970s energy prices skyrocketed and public concerns about environmental impacts challenged the future sustainability of resource-intensive building and design.

More recently, the global sustainable development movement has furthered interest in green building design. In 1993, on the heels of the Earth Summit in Rio de Janeiro, the World Congress of Architects selected sustainability as the theme for its annual convention, and both presidents of the International Union of Architects and the American Institute of Architects signed the *Declaration of Interdependence for a Sustainable Future*. On Earth Day of the same year, President Clinton announced his "Greening the White House Initiative" which was intended to promote energy efficiency, and provide public education and visibility to technological advances in sustainable design.[5] The purpose of the Initiative was to implement a comprehensive analysis, design and implementation program to improve the energy and environmental performance of the White House and Old Executive Office Building. The program resulted in an annual $300,000 savings in energy, water, landscaping and solid waste costs, and the reduction of 845 tons of carbon dioxide emissions. Its success catalyzed other federal building greening initiatives including the Pentagon, the Presidio, and U.S. Department of Energy headquarters, all of which eventually received green treatments. This effort was subsequently compiled into "Greening Federal Facilities," a resource guide on energy and resource efficiency, waste reduction and performance improvement of federal buildings and facilities developed by the Federal Energy Management Program. (Building Green, Inc., 2001).

The design and construction of buildings in accordance with principles of energy and resource efficiency, minimum waste, and indoor air quality has become an accepted and widely used practice. The production of high performance buildings that utilize resources such as energy, water, materials and land more efficiently not only address energy and environmental concerns, they also produce an array of social benefits such as improved

[4] Marcel Vellinga, "Anthropology and the challenges of sustainable architecture". Anthropology Today, Volume 21, Number 3, July 2005, pp 3-7.
[5] US Department of Energy, 1999. *Greening of the White House: Six Year Report*. Federal Energy Management Program. http://clinton4.nara.gov/media/pdf/greening.pdf

health, comfort, and productivity of occupants.[6] Over the last several decades, a series of consensus-based principles have evolved within the building industry to characterize and guide green building designs. These principles are organized around five major categories related to the life cycle performance of green buildings:[7]

a. *Sustainable siting*. A sustainable site approach optimizes land use and development density using site compatibility, infill and brown-field development, protection of wetlands and natural habitats, transportation access and proximity to amenities in the decision-making process. In combination, these factors can significantly reduce adverse development impacts and minimize the building's ecological footprint.
b. *Water efficiency*. Green building designs emphasize water efficiency through landscaping, efficient operational technologies, and reduced wastewater generation. Some examples include integration of rainwater catchments, gray water recycling and wastewater treatment systems. These sustainable technologies significantly decrease the fresh water demands on local aquifers and at the same time reduce generation of wastewater compared to conventional building designs.
c. *Energy efficiency*. A major element of green building design is increased energy efficiency through incorporation of passive design, efficient lighting, renewable energy technologies, and improved thermal performance of building shells. The goal is optimization of energy performance and integration of renewable energy options. Green buildings also emphasize monitoring and quality assurance of building operations through building commissioning (the process of verifying and documenting performance of energy efficiency and environmental considerations).
d. *Building materials*. Green buildings use sustainable construction materials and resources with low environmental impact minimizing consumption and depletion of material resources. This includes reduction, re-use and recycling of construction materials and generated waste, rehabilitation of existing structures, and explicit attention to building durability, adaptability and disassembly. The result is a reduction of extraction, processing, transportation, and solid waste.
e. *Healthy indoor environmental quality*. Green buildings utilize adequate ventilation, efficient heating, ventilation and cooling systems (HVAC), low or zero emissions paints and materials, and maximize use of natural day lighting to enhance indoor environmental quality. The result is improved health and comfort for green building occupants. (Adapted from USGBC, 2005).

Green building principles represent an integrated and multi-functional design approach that encompasses the entire building life cycle from construction, to operations and

[6] Kats et al, 2003. The Costs and Financial Benefits of Green Buildings: A Report to California's Sustainable Building Task Force. October 2003. Available at: http://www.ciwmb.ca.gov/greenbuilding/Design/CostBenefit/Report.pdf

[7] California's definition of a green building specifically includes a reference to constructing buildings to reduce their impact on climate change. http://www.green.ca.gov/GreenBuildings/default.htm

maintenance, to decommissioning. Green design produces high performance, environmentally sound and resource-efficient buildings, and is a critical component of sustainable development. Moreover, green buildings also complement and support other important social issues related to development such as historic preservation, farmland preservation, green spaces, and social equity (vis-à-vis the emphasis on access to public transportation and other community infrastructure systems, lower energy costs, etc.). In sum, the green building framework represents a shift from the conventional business-as-usual building paradigm to one based on economy, equity and environment (E3). Table 1 compares green building with conventional designs.

Table 1. Comparison of conventional and green building models

Economy		**Environment**		**Equity**	
Conventional Building Model	**Sustainable / Green Building Model**	**Conventional Building Model**	**Sustainable / Green Building Model**	**Conventional Building Model**	**Sustainable / Green Building Model**
Lower upfront cost but higher operation and maintenance costs.	Higher upfront cost but lower operation and maintenance, utility costs	Fossil fuel based.	Greater use of alternative energy sources.	Segregated design approach.	Close collaboration between design team, stakeholders and community.
Based on short term decision-making. Short life expectancy.	Based on long term decision-making. High life expectancy.	Heavily dependent on grid energy.	Use onsite energy generation technologies and integrate into building.	Sick Building Syndrome.	Occupant comfort and well-being and improved indoor air quality.
Resource intensive.	Energy efficient with life cycle benefits.	Energy and electricity intensive.	Demand reduction and high energy efficiency.	Access to traditional transportation options.	Inclusion of alternative transportation.
Depreciating market value loss of productivity due to employee absenteeism and turn over.	Higher market value and non monetary benefits such as improved occupant productivity.	Energy-technology focused.	Energy-environmental conservation focused.	Ignores utility costs and health of low-income occupants.	Minimization of utility costs and health effects on low-income occupants.
		Environmental impact external to economic choice.	Environmental impact central and important as economical choice.		
		Rely on virgin material, resource intensive.	Promote re-use, recycling and resource conservation.		

2.1.1 Green Building Rating Systems

Green building rating systems are designed to evaluate energy and environmental performance along a spectrum of sustainability criteria (Gowri, 2004). These rating systems provide standardized indicators on performance or expected performance of buildings based on design, construction and operation of buildings,[8] and establish an evaluative framework for measuring sustainability. Such indicators provide data on life cycle assessment, life cycle costing, energy systems design, performance evaluation, productivity analysis, indoor environmental quality, operations and maintenance optimization, whole building design and operations. Greater than two dozen green building rating systems have been developed by states and localities in the U.S. alone, including the Minnesota Sustainable Building Guide;[9] Built Green Colorado Guidelines;[10] Santa Monica Residential Green Building Guide;[11] Austin (Texas) Green Building program;[12] and Scottsdale (Arizona) Green Building Program[13]. In addition to these state and local tools, there are also national and international rating systems.

a. LEED Rating System

The most widely used and accepted rating system in the U.S. is the Leadership in Energy and Environmental Design (LEED) administered by the U.S. Green Building Council (USGBC), a national non-profit membership organization representing engineers, real estate developers, contractors, architects, and other sectors of the building industry. The LEED system was developed through a voluntary, consensus-based process and is based upon five general categories. Building projects are rated against a series of performance criteria within each of the categories, and can qualify for one of four LEED certifications: Certified Basic; Certified Silver; Certified Gold; or Certified Platinum (the highest possible rating). The five LEED categories are:

(i) Sustainable site development;
(ii) Water savings;
(iii) Energy efficiency
(iv) Materials selection
(v) Indoor environmental quality.

LEED was originally developed for use in the commercial building sector, but has since expanded its application to numerous other building sectors and projects including:

- New Commercial Construction and Major Renovation Projects

[8] http://www.usgbc.org/DisplayPage.aspx?CMSPageID=222),
[9] The State of Minnesota Sustainable Building Guidelines (MSBG). http://www.msbg.umn.edu/index.html
[10] About Built Green. http://www.builtgreen.org/about/default.htm
[11] City of Santa Monica Green Building Guide. http://www.greenbuildings.santa-monica.org/mainpages/green-building-guide-web.pdf
[12] City of Austin's Green Building Program. http://www.austinenergy.com/Energy%20Efficiency/Programs/Green%20Building/index.htm
[13] City of Scottsdale's Green Building Program. http://www.scottsdaleaz.gov/greenbuilding/

- Existing Building Operations and Maintenance
- Commercial Interiors Projects
- Core and Shell Development Projects
- Homes
- Neighborhood Development
- Guidelines for Multiple Buildings and On-Campus Building Projects
- Schools
- Retail buildings[14]

b. Green Globes Rating System

The Green Globes rating system was developed in Canada and introduced in the U.S. in 2004 by the Green Building Initiative (GBI) the goal of which is to assist local Home Builder Associations (HBAs) to develop green building standards in concert with the National Association of Homebuilders' Model Green Home Building Guidelines. The Green Globes rating system includes an assessment protocol, rating system and a guide for integrating environmentally friendly design into commercial buildings. The performance evaluation generates numerical scores based on the percentage of total points possible, and assigns projects one of four green globe ratings: one globe (36%-55% of total points); two globes (56%-70%); three globes (71%-85%); and four globes (86% or more).[15] The Green Globes rating system uses seven general categories:

- Project Management Policies and Practices
- Site Assessment. Assesses the reduction of ecological impacts, enhancement of watershed features, site ecology improvements, etc.
- Energy Assessment. Evaluates energy consumption, energy demand minimization, use of day-lighting, thermal efficiencies of building envelope, building controls and energy metering, systems, energy efficient transportation.
- Water Assessment. Assesses water conserving features, use of water for cooling towers and for irrigation and off-site treatment of water
- Resources, Building Materials and Solid Waste. Examines the use of material with low environmental impact, consumption/depletion of material resources, re-use of existing structures, reduction re-use and recycling of waste, etc.
- Emissions and Effluents. Assesses building air emissions, ozone depletion and global warming, contamination of sewers or waterways, storage of hazardous materials, etc.
- Indoor Environment. Assesses ventilation systems and control of indoor pollutants, thermal and acoustic comfort, etc.

[14] Leadership in Energy and Environmental Design.
http://www.usgbc.org/DisplayPage.aspx?CategoryID=19
[15] Green Globes Ratings.
http://www.thegbi.org/greenglobes/greenglobesratings.asp

c. Other Green Building Rating and Evaluation Tools

In addition to these rating systems, there are several other evaluation and guidance tools that have been developed for assessing and promoting sustainable building practices. The National Association of Home Builders (NAHB) developed its Green Home Building Guidelines to assist builders integrate environmental solutions and green building concepts into new projects (NAHB, 2006). Green Home Building Guidelines assess projects in terms of lot design, preparation and development; resource efficiency, energy efficiency, water efficiency, and indoor environmental quality; operation, maintenance and homeowner education; and global impact. Under the NAHB rating system, projects are eligible for one of three ratings (Bronze, Silver or Gold).

The Energy Star Program is a guide and rating system for energy efficiency implemented by the U.S. Environmental Protection Agency. Established in 1992, the Energy Star Program was originally created as a voluntary energy efficiency-labeling program for appliances. Since then the program has expanded to include ratings for new homes, and commercial and industrial buildings. Building owners can apply for the "Designed to Earn the ENERGY STAR"[16] designation based on performance of Energy Star Program energy efficiency standards.

2.2 Benefits of Green Buildings

Green buildings provide important environmental, economic and social benefits. Among the economic benefits attributed to green buildings are reduced building materials and operations (water and energy) costs; added market value of buildings; and increased local economic development through increased business and employment of an expanding green industry. Social benefits include improvements in quality of life and equitable access to infrastructure services such as transportation, healthy indoor environments, and other social and economic amenities. Lastly, green buildings conserve vital natural resources and help to preserve fragile ecosystems, reduce pollution and waste generation. The benefits associated with green buildings are increasing as national, state and local governments seek to address the problem of climate change and develop strategies to reduce greenhouse gas (GHG) emissions. An example of this trend is the case of New York City. The City conducted a comprehensive city-wide GHG inventory and created a GHG emission-reduction plan in conjunction with its participation in the Cities for Climate Protection Campaign (CCP) as a member of the International Council for Local Environmental Initiatives (ICLEI). According to the inventory report, New York City's 2005 GHG emissions totaled 58.3 million metric tons of carbon dioxide equivalent (CO_2e), with 79% coming from energy consumption in buildings.[17] City-wide electricity use for residential and transit sectors comprised 23%, and heating fuels 23.6% of the city's total CO_2e. The city's energy use in buildings was cited as the largest GHG emitting sector, accounting for

[16] Benefits and Recognition: Energy Star.
http://www.energystar.gov/index.cfm?c=new_bldg_design.new_bldg_design_benefits

[17] PLANYC, 2007. Inventory of New York City Greenhouse Gas Emissions. Mayor of New York City's Office of Operations Office of Long-term Planning and Sustainability. P. 65

64% of emissions.[18] New York City included in its GHG reduction plan the requirement of LEED-Silver certification on all new and renovated city buildings. A 2007 United Nation Environmental Program (UNEP) study conducted through the Sustainable Building and Construction Initiative reported a potential 2/3 reduction in New York City's residential and commercial buildings through green design and other efficiency measures[19]. The UNEP report concluded that the "building sector has a considerable potential for positive change, to become more efficient in terms of resource use, less environmentally intensive and more profitable" (UNEP, 2007: 14). Improving energy efficiency in buildings provides a significant contribution to climate stabilization efforts. It is estimated that sustainable design and green buildings could result in as much as 1.8 billion tones/year of averted carbon dioxide emissions worldwide.[20] A more aggressive energy efficiency approach could further reduce emissions 2 billion tones/year or close to three times the Kyoto Protocol reduction goal.

The triad of benefits or E^3 (economic, equity and environment) are realized at the individual, community and societal levels. Table 2 summarizes benefits for each of six building design and operations categories drawn from various studies (Wilson *et al*, 1998; Steve Winter Associates, 2004; and Matthiessen and Morris, 2004).

[18] Ibid, pg. 38.
[19] Buildings and Climate Change: Status, Challenge and Opportunities. 2007. United Nations Environment Program.
[20] Buildings Can Play a Key Role in Combating Climate Change. http://www.unep.org/Documents.Multilingual/Default.asp?DocumentID=502&ArticleID=5545&l=en

Table 2. Benefits of the use of green buildings

	Economic	Societal (Equity)	Environmental
Sustainable Siting	• Reduced costs for site preparation and clear-cutting for parking lots and roads. • Lower energy costs due to optimal orientation. • Less landscape maintenance cost.	• Improved aesthetics • Increased transportation options for employees.	• Land preservation. • Lower resource use. • Protection of ecological resources. • Soil and water conservation. • Reduced energy use and air pollution.
Water Efficiency	• Lower first cost (for some fixtures). • Reduced annual water costs. • Lower municipal costs for wastewater treatment.	• Preservation of water resources. • Fewer wastewater treatment plants and associated annoyances.	• Lower potable water use and pollution discharges to waterways. • Less strain on aquatic ecosystems in water-scarce areas. • Preservation of water resources for wildlife and agriculture.
Energy Efficiency	• Lower initial costs, when systems can be downsized due to integrated energy solutions. • Up to 70% lower annual fuel and electricity costs. • Reduced peak power demand. • Reduced demand for new energy infrastructure. • Lowering energy costs to consumers.	• Improved thermal conditions. • Better occupant comfort satisfaction. • Fewer new power plants and transmission lines and associated annoyances.	• Lower electricity and fossil fuel use, and the accompanying reductions in air pollution and carbon dioxide emissions. • Decreased impacts of fossil fuel production and distribution.
Materials & Resources	• Decreased costs due material re-use and recycling. • Lower costs for waste disposal. • Decreased replacement cost for more durable materials. • Lower municipal costs for new landfills.	• Fewer landfills and associated nuisances. • Expanded market for environmentally preferable products. • Decreased traffic due to use of local/regional materials.	• Reduced strain on landfills. • Reduced virgin resource use. • Healthier forests due to better management. • Lower energy use for material transportation. • Increase in local recycling market.
Indoor Environmental Quality	• Organizational productivity improvements due to improved worker performance. • Lower absenteeism and reduced staff turnover. • Lower disability/health insurance costs. • Reduced threat of litigation.	• Reduced adverse health impacts. • Improved occupant satisfaction and comfort. • Better individual productivity.	• Improved indoor air quality, including reduced volatile organic emissions, carbon dioxide and carbon monoxide.
Commissioning; Operation & Maintenance	• Energy cost reduction. • Reduced cost of dealing with complaints. • Longer building and equipment lifetimes.	• Occupant productivity, satisfaction, health and safety.	• Lower energy consumption, as well as air pollution and carbon dioxide emissions and other environmental impacts of energy production and use.

Source: US DOE, 2003.

2.3 Barriers to Green Buildings

While the benefits of green buildings and sustainable development continue to show promising results, there are a number of barriers affecting realization of their full environmental, economic and social potential. At the local, national and international levels, efforts are underway to systematically identify and address limitations to implementation of green buildings. Research suggests that economic perceptions, industry awareness, and availability of green design technical capacities are the most significant operational barriers to green building design and construction. Knowledge and familiarity about green building practices has spread relatively slowly across the industry. As more architects, engineers, planners, and builders engage in green practices, both time and cost savings will be reduced.

Perception of higher costs and increased upfront capital for green buildings relative to conventional building designs can also be a barrier. In fact, however, the average premium for green buildings is slightly less than 2% or \$3-5/ft^2 of the cost of conventional building (Kats *et al*, 2003). A 2003 study conducted for the California Sustainable Building Task Force found that an initial 2% increase in upfront costs yields lifecycle savings of 20% of total construction costs (based on a 20-year building life). Building codes and incentive policies can be instrumental in facilitating green building practices and technologies, and education and training programs can minimize misperceptions regarding the economics of green buildings design and construction.

3.0 GREEN BUILDING POLICIES: STATE AND MUNICIPALITIES

This section provides a survey of selected state and city green building polices across the United States. The CEEP research team conducted the review in order to provide baseline information about existing policy and legislative strategies currently employed to promote green buildings. It is clear that a surge in the development of green building policy and legislation at all levels of government is occurring. After a careful review of the range of state and local programs, the research team selected a sample of five states and three cities to highlight for this report. These state and local initiatives represent a cross-section of innovative strategies currently underway, and provide a useful baseline survey for guidance and comparison at the state and local level. The review provides information on the status of Green Building policies as well as other key initiatives that support components of green building design.

3.1 State Green Building Programs

Approximately seventeen states have adopted legislation of various types to promote green design to promote green building (Appendix I). The states highlighted in this study are California, Maryland, Nevada, New York, and Oregon. Each of these five states established green building standards for public sector buildings; developed tax incentive packages to promote private sector green buildings; and/or introduced a set of other building efficiency programs and standards.

3.1.1 California

Executive Order (EO) S-20-04, signed into effect in December 2004, sets the goal of reducing energy use in California state buildings by 20 percent by 2015 (using 2003 as the baseline). Compliance guidelines for the EO are set forth in the State of California Green Building Action Plan.[21]. The EO also encourages the private commercial sector to set the same goal. In California, state-owned buildings consume $500 million in electricity annually, and it an estimated $100 million in savings is achievable through implementation of the Green Building Action Plan. The EO sets energy and resource efficiency as a priority for all new construction (NC) and existing (EB) government buildings, and mandates assessment and benchmarking of all state-owned buildings by the end of 2007. Buildings receiving low performance ratings are required to develop retrofitting plans with appropriate efficiency strategies and benchmarks. Major renovation on buildings over 10,000 square feet are required to meet the LEED-NC Silver certification level or higher.[22] The same standard applies to buildings less than 10,000 square feet, although official certification is not required. Existing government buildings over 50,000 square feet must meet LEED Existing Building standards to the maximum extent cost effective by 2015 (using methodology developed by the California Sustainable Building Task Force (SBTF)

[21] http://www.documents.dgs.ca.gov/green/GreenBuildingActionPlan.pdf
[22] State of California Executive Order S-20-04. Available at: http://www.dot.ca.gov/hq/energy/ExecOrderS-20-04.htm

in consultation with the Department of General Services (DGS), Department of Finance (DoF), and the California Energy Commission (CEC)). These buildings will be retro-commissioned and re-commissioned every five years on a recurring cycle or in the event of major energy technology modifications in order to assure continued optimal performance efficiency.

The Sustainable Building Education and Outreach program provides workshops on sustainable design and offers competitive grants to promote green building programs and practices for localities (California Integrated Waste Management Board, 2007a). Under the grant program, seventeen municipalities have received grants totaling $780,000 to develop green building guidelines, establish green building training programs and workshops, and expanded educational resources available on green buildings (California Integrated Waste Management Board, 2007b).

California has also implemented energy policies which support components of Green Buildings. In promotion of green initiatives in the private sector, California developed a number of aggressive and innovative programs. In 2006, the state launched its Million Solar Roofs Initiative committing up to $3.3 billion and the goal of 3,000 MW of solar power by 2017. The Initiative provides incentives for installation of solar systems on one million California rooftops in new and existing homes, commercial and industrial buildings, farms and schools. The targeted 3,000 MW of solar power would constitute approximately 3-5% of peak electricity demand, (the equivalent of a 500 MW coal-fired plant) by 2017. An equity measure reserves 10% of program funds for low-income households in existing structures. To encourage solar in new construction, California established the New Solar Homes Partnership (NSHP), a 10-year, $400 million program to encourage solar in new home developments.[23] At least 50% of homes in the subdivision must meet the program standards to qualify for rebates and equity incentives include a 25% higher rebate for developers of low and moderate-income housing. In addition, the California Public Utilities Commission provides technical assistance and education services to private sector building owners and operators about the economic benefits of energy efficiency.

3.1.2 Nevada

Nevada Assembly Bill 3 (AB3), signed into effect in June 2005, mandated all Nevada state buildings to meet the LEED-Base certification equivalent or higher (Nevada Legislature, 2005). The legislation also increased the Renewable Portfolio Standard (RPS) from 15% to 20% by the year 2015, and stipulated 50% must come from the residential sector. Another component of the legislation extended the Solar Energy Program Demonstration Program Act,[24] which provides incentives for solar energy installations in schools, public buildings, residences and businesses by providing renewable energy credits. In addition,

[23] California Solar Initiative Low Income Incentive Programs. Available at: http://www.cpuc.ca.gov/puc/energy/solar/.

[24] The Solar Energy Systems Demonstration Program was created in 2003 and provides incentives to participants who install solar panels on their homes, businesses, public buildings and schools.

the legislation authorized annual selection of at least two state buildings as demonstration projects for retrofitting at the LEED-Silver certification level or higher. Under AB3, all new construction and renovation state buildings over 20,000 square feet are required to undertake a detailed water and energy analysis. Alternative energy options must be included in the analysis using a 10-year payback referent. The Nevada legislation also established a number of incentive programs to promote green building construction in the private sector.

In 2007, the state passed Assembly Bill 621 amending the previous legislation.[25] Under the current legislation (Table 3) private sector commercial and multi-family buildings qualify for a 25% tax abatement if certified at the LEED-Silver level, 30% for those certified at LEED-Gold, and 35% for buildings certified at LEED-Platinum (each not to exceed 10 years, or 50% of total tax). The abatement applies only to the portion of the tax on improvements, not to the full tax assessment and does not include the portion of the tax supporting the public education system.[26] Similar tax credits are also available to businesses engaged in the production, processing or fabrication of raw materials in which at least 50% of the material or product on site is recycled.

Table 3. Property Tax Abatement Requirements for LEED in Nevada

Requirements	Real Property Tax Abatement Percentage	Abatement Duration (consecutive years)
All Buildings		
• LEED Silver standard • Minimum energy efficiency component: 3 LEED points	25%	10 Years
• LEED Gold Standard • Minimum energy efficiency component: 5 LEED points	30%	10 Years
• LEED Platinum Standard • Minimum energy efficiency component: 8 LEED points	35%	10 Years

Sources: Nevada Legislature, 2007. *Assembly Bill No.621 Committee on Commerce and Labor* Available at: http://www.leg.state.nv.us/74th/Bills/AB/AB621_EN.pdf; Database for State Incentives for Renewables and Efficiency (DSIRE), 2007. *Nevada Incentives for Renewables and Efficiency.* http://www.dsireusa.org/library/includes/incentive2.cfm?Incentive_Code=NV10F&state=NV&CurrentPageID=1&RE=1&EE=1

[25] In one sense, AB3 was highly successful and due to the participation of very large projects, the state forecasted approximately $1 billion in tax credits over ten years for ten projects Assembly Bill 621 reduces the total tax credit eligibility for each project.

[26] Only commercial buildings or multi family homes over three stories in height are eligible for the abatement.

3.1.3 New York

In 2000, New York passed the Green Building Tax Credit for eligible owners and tenants of buildings and tenant spaces that meet "green" standards related to energy efficiency, indoor air quality, and local environmental impact. The legislation initially authorized $25 million in tax credits, and an additional $25 million was added in 2005.[27] The credit applies to certain commercial and residential multi-family buildings over 20,000 square feet which meet green building standards established by the New York State Energy Research and Development Authority (NYSERDA) and the New York Department of Environmental Conservation (DEC). An eligibility certification from an architect or professional engineer verifying green standards and performance is required each year. Initially, seven projects qualified for the program and in 2005 a $2 million cap was instituted (New York State, 2007). The credit applies to up to 7% of the total capital costs of new building construction or rehabilitation (8% if the building is in an economic development zone). The DEC is currently updating the tax credit regulations (Ibid.). Projects can qualify under the following six components:[28]

1. *Whole Building Credit* (owner or tenant), where base building and all tenant space are green;
2. *Base Building Credit* (owner), for non-dwelling spaces;
3. *Tenant Space Credit* (owner or tenant), where the base building must be green to qualify if the tenant space is under 10,000 square feet;
4. *Fuel Cell Credit*, for systems fueled by a "qualifying alternate energy source";
5. *Photovoltaic Module Credit*; and
6. *Green Refrigerant Credit*, for new air conditioning equipment using an EPA-approved non-ozone depleting refrigerant.

In addition to the Green Building Tax Credit, New York Governor Eliot Spitzer issued Executive Order No. 111 (2007) directing state agencies to require green building standards in the design, construction, operation, and maintenance of both new construction and renovation state buildings (New York State, 2001). Targets were set for at least 20% improvement in energy efficiency performance for new construction, and 10% improvement for renovation relative to standards established in the State's Energy Conservation Code. Other New York incentives include the Department of Environmental Conservation Environmental Excellence Award which recognizes leaders in the field of sustainable design; and low interest loans provided by NYSERDA (4% below market rate) for energy efficiency measures and building materials that meet LEED or other generally accepted green building standards.

[27] Part 638: Green Building Tax Credit. Available at: http://www.dec.ny.gov/regs/4475.html

[28] www.dec.ny.gov/energy/1540.html; (Database of State Incentives for Renewable Energy; www.dsireusa.org/library/includes/incentive2.cfm?Incentive_Code=NY05F&state=NY&CurrentPageID=1)

3.1.4 Maryland

Maryland has instituted green building initiatives for both the public and private sector. The State Buildings Energy Efficiency and Conservation Act mandates all state agencies to reduce energy consumption 5% by 2009 and 10% by 2010 (2005 baseline). State agencies are required to submit Energy Conservation Plans by July of 2008, which must include proposed Energy Conservation Measures (ECM) to achieve the reduction goals. Possible ECMs are energy performance contracting, energy efficient lighting retrofits, water conservation devices, weatherization, efficient heating and cooling devices, and employee training. In 2001, the Maryland General Assembly enacted the Green Building Tax Credit, a tax incentive program similar to the New York initiative which promotes the construction and operation of buildings that are "energy efficient, minimize site disturbance, provide high quality indoor environments, conserve water, incorporate recycled and recyclable materials, and incorporate renewable and energy efficient power generation" (Maryland Energy Administration, 2001). The state provided $25 million in tax credits for 14 projects during the period 2002 through 2006. Like the New York program, the tax credit applies to commercial and multi-family residential (comprised of at least 12 units) buildings with a minimum of 20,000 square feet in interior space. Maryland elected to utilize the LEED rating system and included a measure requiring all new buildings must be 35% more efficient than the standards established by the American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE). Eligible projects must be located in either a designated priority funding area (i.e., identified by local governments as a priority area for development), or a brownfield and not on wetlands (Comptroller of Maryland, 2007).

Under the Maryland legislation, tax credits can be applied to installation of three types of alternative energy sources: photovoltaics (up to 25%), wind turbines (25%) and fuel cells (30%) in green whole or base buildings, or green tenant spaces. In addition, credits can be applied up to 8% of the costs for construction or rehabilitation of a green building (Brown *et al*, 2002). The green building incentive is part of the Maryland Energy Administration (MEA) plan to improve energy-efficiency, promote economic development and reduce damage to the environment (MEA, 2007). As of August 2007, all tax credits have been allocated.

Additional incentives provided by the state include the Local Option - Property Tax Exemption for High Performance Buildings. The statute permits counties and municipalities to provide property tax credits for buildings achieving a LEED-Silver rating or comparable standards approved by the state. Counties or municipalities electing to participate in this incentive program may determine the amount, duration, and criteria for eligibility of the property tax credit under this section.[29] Lastly, Maryland has mandated efficiency standards for a range of products such as torchiere lighting fixtures, unit heaters, commercial refrigeration cabinets, large packaged air-conditioning equipment and

[29] Maryland Code: Property Tax § 9-203. Available at: http://mlis.state.md.us/asp/statutes_Respond.asp?article=gtp&section=9-203&Extension=HTML

commercial clothes washers, commercial hot food holding cabinets, residential furnaces and walk-in refrigerators and freezers.

3.1.5 Oregon

The State of Oregon has established a "green" building policy requiring all new state buildings to meet, at a minimum, the U.S. Green Building Council's Leadership in Energy and Environmental Design ("LEED") silver equivalency status, with major renovations also requiring LEED certification.[30] In addition, Oregon has implemented a Residential Energy Tax Credit and a Business Energy Tax Credit (BETC) for trade, business and rental property owners. The BETC applies and includes tax credits for energy efficiency, renewable energy, appliance efficiency, transportation projects and buildings. For homebuilders, Oregon offers two tax credit programs: the High Performance Home program which offers tax credits of up to $12,000; and the Homebuilder Installed Renewable Facilities Program with credits of up to $9,000 for homebuilder installed renewable energy systems. Each must be certified through the Energy Star Homes Northwest Program.

Oregon also offers the BETC for commercial buildings. The commercial sustainable building tax credit system is based on a formula that combines LEED ratings and building square footage to determine the amount of credit (Table 4). In addition, Oregon offers BETCs for weatherization and efficiency appliances, HVAC systems and lighting retrofitting for commercial and industrial buildings. (Oregon Department of Energy, 2004).

Table 4. Eligible Costs for Green Buildings in Oregon

Building Area	Silver	Gold	Platinum
LEED-NC™			
First 10,000 sq. ft.	$10.00/sq. ft.	$13.57/sq. ft	$17.86/sq. ft.
Next 40,000 sq. ft.	$5.00/sq. ft	$5.71/sq. ft	$9.29/sq. ft.
>50,000 sq. ft.	$2.00/sq. ft.	$2.86/sq. ft	$5.71/sq. ft.
LEED-CS™			
First 10,000 sq. ft.	$7.00/sq. ft.	$9.50/sq. ft	$12.50/sq. ft.
Next 40,000 sq. ft	$3.50/sq. ft.	$4.00/sq. ft.	$6.50/sq. ft.
>50,000 sq. ft.	$1.40/sq. ft.	$2.00/sq. ft.	$4.00/sq. ft.
LEED-CI™			
First 10,000 sq. ft.	$3.00/sq. ft.	$4.07/sq. ft.	$5.76/sq. ft.
Next 40,000 sq. ft	$1.50/sq. ft.	$1.71/sq. ft.	$2.79/sq. ft.
>50,000 sq. ft.	$0.60/sq. ft.	$0.86/sq. ft.	$1.71/sq. ft.

Overall, the BETC program provides tax credits to businesses and homebuilders that conserve energy, improve energy efficiency, weatherize rental housing, increase recycling,

[30] Department of Administrative Services Policy Manual. Sustainable Facilities Standards and Guidelines. Available at: http://egov.oregon.gov/DAS/FAC/docs/1256010.pdf

generate renewable energy, use alternative transportation fuels and reduce employees vehicle miles traveled. As of 2006, over 13,000 of credits were awarded (Oregon Department of Energy, 2004). In addition to the Business Energy Tax Credit, the Oregon Department of Energy promotes energy conservation and renewable energy options for end users through low-interest loans. Oregon also offers a Residential Energy Tax Credit (RETC), a property tax exemption for the value added of a property resulting from installation of a qualifying renewable energy system. The tax credit applies to solar technologies including photovoltaic systems ($3 per watt up to $6,000), active and passive space heating ($0.60 per kWh saved up to $1,500), and water heating (($0.60 per kWh saved up to $1,500). Active space heating must result in at least a 15% reduction and passive space heating a 20% reduction in energy needs.

In 2007, Oregon passed legislation requiring public sector buildings spend a minimum of 1.5% of new construction or renovation investments on solar technology. This includes state and local government buildings, universities and colleges, and public schools.

Table 5. Summary of State Green Building Programs

		California	New York	Maryland	Oregon	Nevada
LEED certification		LEED certification	LEED certification	LEED certification	Must meet LEED standards but LEED certified is not required	LEED certification
Mandates	**Public**	New construction and renovation of government buildings must meet LEED Silver level	It is encouraged for State projects but are not required to seek LEED certification	All state projects are mandated to approximate LEED Silver level	N/A	All state projects are mandated to approximate LEED Silver level
Incentives	**Commercial**	*[*]	Buildings with >20,000 sq ft	Buildings with >20,000 sq ft	All commercial buildings	All commercial buildings
			Corporate tax credit	Corporate tax credit	Tax credit	Property tax abatement
			$50 million total, limited to $2 million per project	$25 million total (currently not accepting further applications)	No overall limit, $3.5 million per project, amount of credit based on square feet of building and level of LEED certification	Property tax abatement based on level of LEED certification
	Residential	*	Multi-family buildings with >12 units	Multi-family buildings with >12 units	N/A	N/A
			personal income tax credit	personal income tax credit	N/A	N/A
			$50 million total, limited to $2 million per project	$25 million total (currently not accepting further applications)	N/A	N/A
	Developer	*	Low interest loans (4% below market) for EE measures and building materials that meet LEED standards	Local option for Property Tax Exemption for High Performance Buildings	N/A	N/A
Regulators		Green Building Action Team	NYSERDA & DEC	MD Energy Administration and Dept of Environment	OR Dept of Energy	Department of Energy Commission on Economic Development
Year Adopted		2004	2000	2001	2001	2005

[*] Although California does not offer any private incentives for specifically green buildings, there are number of programs which target different components of green buildings which are discussed in California section of the report.

3.2 Municipalities

3.2.1 New York City, New York

Local Law 86, also referred to as the Green City Buildings Act, took effect in New York City in January 2007.[31] The law requires most municipal projects (new construction, additions and rehabilitation) with an estimated cost of $2 million or more to meet a LEED-Silver rating or higher. Certain public buildings such as hospitals and schools are required to meet the basic LEED certification. Rehabilitation projects between $12 million and $30 million are to reduce energy costs by at least 20%, and projects over $30 million are to reduce their costs by at least 25% using methodology determined by the New York state conservation code. New York City owns and/or leases approximately 1,300 buildings with over 12.8 million square feet and Local Law 86 is expected to apply to about $12 billion in city construction projects over the next ten years. An annual report is required detailing each project's expected or achieved rating level, including an assessment of costs, health impacts, energy savings, and environmental benefits.

In addition, New York City has instituted Environmentally Preferably Purchasing municipal laws (EPP laws) which require many projects to use recycled and low toxicity materials. The green building mandate is only one part of the city's efforts to address its energy issues. In 2004, the New York City Energy Policy Taskforce produced twenty-eight recommendations for reducing energy demand, increasing energy efficiency, promoting distributed generation and cleaner fuels such as natural gas.[32] The city has also developed a city plan entitled *PlaNYC* that lays out the goals for a sustainable development future including transit oriented development, housing, open spaces, brownfields, water quality, transportation infrastructure, energy, air quality and climate change (NYC, 2007).

3.2.2 Portland, Oregon

In 1994, the Sustainable Portland Commission, a volunteer citizens coalition developed a green building policy platform which eventually led to its Green Building Policy (2000) and creation of the Green Building Program called G/Rated (City of Portland, 2007a). G/Rated develops policies related to green buildings, supports demonstration projects, and provides financial incentives and technical assistance for residential and commercial green development. The program is funded primarily from residential and commercial solid waste fees, grants and contracts.[33]

Portland's Green Building Policy requires all city-owned new construction and major retrofit projects to achieve LEED certification. In 2005, the policy was amended to require

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[31] Local laws of the City of New York For the Year 2005. Available at: http://www.nyc.gov/html/dob/downloads/pdf/ll_86of2005.pdf

[32] NYC Energy Policy Task Force. 2006 Status Report. http://www.nycedc.com/Web/Marketing/Newsletters/Documents/2006StatusReportEPTF.pdf

[33] City of Portland. Office of Sustainable Development. Program History. http://www.portlandonline.com/osd/index.cfm?c=42248&a=126515

all new city construction projects to meet LEED-Gold certification. It also instituted higher standards in several areas including water and energy savings, and called for at least 75% of all construction and demolition (C&D) waste be recycled. Furthermore, the Green Building Policy requires that tenant improvements to city owned facilities meet the LEED-Silver rating and/or G/Rated certification; all Portland Development Commission funded projects under LEED certified requirements upgrade to LEED-Silver standards; and design and construction of all new City-owned facilities include an eco-roof with at least 70% coverage of Energy Star rated roof material where practical.

The City of Portland also offers a competitive grant program called the Green Investment Fund (GIF) which provides funds for innovative green building projects in the city. The GIF supports early building and site-related project activities and offsets the incremental costs of green building strategies (City of Portland, 2007b). In addition, the city has also developed a sustainable best practices manual and requires city operators and contractors to conform to the *Green Building Operations and Maintenance Guidelines,* which synchronize with the LEED rating system. Lastly, Portland's ReThink program provides education on a wide range of topics relating to sustainable design, green buildings, and sponsors tours of the city's green buildings (City of Portland, 2007c).

3.2.3 Seattle, Washington

In 1998-99, Seattle participated in a collaborative effort to create a Sustainable Building Action Plan. The Plan lays out the steps necessary to standardize sustainable buildings in the Northwest. In 2000, the city adopted a Sustainable Building Policy for city buildings and in 2002 it was updated to require LEED Silver certification of all city-owned projects and renovations over 5,000 square feet. Recent zoning legislation[34] gives a height or density bonus to commercial or residential projects in the downtown area that achieve a minimum LEED-Silver certification and contribute to affordable housing. In addition, Seattle offers a variety of incentives for homeowners and developers to maximize energy efficiency, conserve water, recycle more municipal solid waste and preserve local environments. Technical assistance, education programs and recognition of top green building projects are also used to further the spread of sustainable design practices (Seattle Department of Planning and Development, 2006). The city also assisted in the creation of Urban Green, a non-profit organization, to promote green building practices. Urban Green brings interested parties together to learn about sustainable buildings and provides technical assistance for incorporating green elements into building projects.

[34] City of Seattle Legislative Information Service. http://clerk.ci.seattle.wa.us/~scripts/nph-brs.exe?s1=LEED&s2=&s3=&s4=&s5=&Sect4=AND&l=20&Sect1=IMAGE&Sect2=THESON&Sect3=PLURON&Sect5=CBOR1&Sect6=HITOFF&d=CBOR&p=1&u=%2F%7Epublic%2Fcbor1.htm&r=1&f=G

4.0 DELAWARE AND GREEN BUILDINGS

4.1 Current Delaware Policies Relating to Green Buildings

The CEEP research team conducted a review of Delaware state policies relating to green buildings and sustainable development. A number of policies relating to some facet of green buildings currently exist, and provide a useful starting point for development of a comprehensive green building agenda.

4.1.1 Indoor Air Quality

The Delaware Clean Indoor Air Act (CIAA) prohibits smoking in public enclosed areas including workplaces regulated by the Delaware Department of Labor (State of Delaware, 2006). Information regarding the CIAA is available on the Delaware Health and Social Services website[35] and includes information about common indoor contaminants.

4.1.2 Water Conservation

The Delaware River Basin Commission, established in 1961, is the regional management body overseeing the Delaware River basin and includes the member states of Delaware, Pennsylvania, New Jersey, and New York. The purpose of the DRBC is to coordinate and manage Delaware River programs relating to water quality, allotment, conservation, recreation, flood control, and drought management. The DRBC has instituted several conservation measures including water metering, and minimum performance standards for plumbing fixtures and fittings. It also requires submission of water conservation plans when significant increases in water allotment are sought.[36]

4.1.3 Energy

In June 2006, the Delaware General Assembly passed Senate Concurrent Resolution No. 45, creating the Sustainable Energy Utility (SEU) Task Force[37] for conducting analyses leading to a policy agenda for a *sustainable energy utility.*[38] A key feature of the SEU Task Force is the organization of a utility to facilitate cost-effective, end-use energy

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[35] Delaware's Clean Indoor Air Act. Available at: www.dhss.delaware.gov/dhss/dph/dpc/ciaa_info.html

[36] Water conservation policies of the Delaware River Basin Commission. Available at: http://www.state.nj.us/drbc/policy.htm

[37] Documents, minutes, agendas, and presentations prepared for the Task Force. Available at: http://www.seude.org/index.html

[38] The *sustainable energy utility* (SEU) concept is defined in Section C on p. 1 of the Sustainable Energy Utility Task Force *Briefing Book.* Available at: http://www.seude.org/docs/Section_C.pdf

efficiency and conservation options and customer-sited renewable energy applications[39] across all sectors and fuels, including transportation. The utility covers the full incremental costs between standard and high-efficiency technologies and standard fuel services and those provided by distributed renewable energy applications. In creating the nation's first sustainable energy utility, Delaware supplements other existing energy related energy and environment policies and programs which include the Renewable Portfolio Standard (RPS) and participation in the Regional Greenhouse Gas Initiative (RGGI).

The SEU will use incentive funds to encourage whole-building strategies to improve energy performance with a 30% energy savings goal. Its Green Building Initiative will work with architects and building developers to identify special projects that merit SEU investment consistent with the *2030 Challenge* adopted by the American Institute of Architects[40] in collaboration with the American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE), Architecture 2030, the Illuminating Engineering Society of North America (IESNA), and the U.S. Green Building Council (USGBC), supported by representatives of the U.S. Department of Energy. The *Challenge* establishes a goal of "zero net energy" for buildings by the year 2030. .In addition, the SEU includes equity considerations focusing on affordable energy efficiency for low and moderate-income households. Significantly, low-income renters and homeowners tend to reside in homes that consume significantly more energy per square foot than other housing.[41] The SEU goal is to double the rate of low-income household weatherization in order to increase home energy efficiency in this sector. In addition, the Task Force set an initial *Distributed Renewable Energy Goal* of at least 300 MW of customer-sited renewable energy by 2019 using incentives and other policy measures. These renewable energy systems will include at least 100 MW of solar photovoltaics and at least 200 MW of solar thermal, wind, geothermal, and other renewable resources.

The SEU's promotion of renewable energy and efficiency will substantially reduce the state's CO_2, SO_2, NO_x, mercury and particulate matter, and together with its involvement in RGGI demonstrates its commitment to addressing energy and environmental issues. In

[39] Customer-sited renewables are often called "distributed renewable energy sources" or "distributed renewables" - see Center for Energy and Environmental Policy (CEEP), Policy Options to Supported Distributed Resources, 2005. http://ceep.udel.edu/publications/energysustainability/2005_es_policy_options_distributed%20resources%5B1%5D.pdf

[40] See the presentation by David Wrightson of the Green Buildings Advisory Group to the Task Force. Available at http://www.seu-de.org/docs/Wrightson_AIA_Presentation_2-20.pdf

[41] See, for example, the recent report of the Oak Ridge National Laboratory (2007) *National Evaluation of the Weatherization Assistance Program*. http://weatherization.ornl.gov/pdf/Prelim%20Eval%20Plan-Feb%202007.pdf; and for Delaware, CEEP (2006) *Energy, Economic, and Environmental Impacts of the Delaware Low-Income Weatherization Assistance Program*, http://ceep.udel.edu/energy/publications/2006_es_weatherization%20program_evaluation_Delaware.pdf

addition to existing programs, the Delaware Energy Task Force offered the following recommendations in support of green buildings in Delaware.

- Recognition of outstanding energy efficient design and construction with an award given to buildings in different sectors that demonstrate outstanding design (High Priority);
- Develop a pilot program for demonstrating Energy Star construction practices in residential construction (High Priority);
- Benchmark state buildings for energy efficiency (High Priority);
- Update energy efficiency standards for state owned buildings (High Priority):
    - Update to most current ASHRAE standards;
    - Evaluate LEED standards for incorporation into design of new construction and major renovation projects
- Expand training opportunities to state employees on identifying energy savings and promoting energy-efficient operation in state facilities;
- Develop commercial tax incentives and credits to encourage LEED certified buildings (Low Priority).

In addition to the SEU, several recent legislative updates regarding state procurement provisions also promote efficiency and sustainability in the public sector. For example, House Bill 435 requires state agencies to use Energy Star rated products and equipment where competitively available (State of Delaware, 2007a). Senate Bill 307 requires life cycle cost analysis in the purchase of equipment and in public work projects which makes sustainable building practices economically competitive in the long-term (Ibid). Other state programs include the Delaware Energy An$wers Program, administered by the Delaware Energy Office, which encourages energy efficiency among homeowners and businesses by providing energy audits and tax incentives for replacement of older appliances and equipment with efficient models.[42] The Delaware Green Energy Program provides grants to homeowners and businesses for installation of renewable energy technologies such as solar photovoltaic, solar water heating, wind, geothermal and fuel cells.[43] Lastly, the Energy Star for Builders program, (not yet funded), will support efficiency in new homes construction.[44]

4.1.4 Building Material Recycling/Waste Disposal

Municipal Solid Waste (MSW) is a major issue in Delaware. In 2005, the state generated 3,432,831 tons of waste and 2,092,860 tons were recycled or recovered, for an overall recovery rate of sixty-one percent (DSM Environmental Services, 2006). Construction and demolition waste made up 1,352,652 tons of the total waste generated (approximately

[42] Delaware-Energy An$wers Home Page. http://www.delaware-energy-com/energy_an$wers_program_home.htm
[43] Green Energy Home Page. http://www.delaware-energy.com/green-energy-program-home.htm
[44] Scott Lynch, Delaware Energy Office. Personal communication.

39%), of which 1,098,714 tons was recovered, leading to a recovery rate of 81% for this sector.

According to DOE, approximately 95% of a building's material is recyclable (2007). Applying the same formula to Delaware shows that approximately 186,000 additional tons (14%) of construction and demolition waste has recycling potential. Recycling and reuse of construction materials substantially reduces costs associated with manufacturing, transportation and energy in the building sector. The current recovery rate for construction and demolition waste in Delaware is almost entirely due to recovery of asphalt and concrete (Table 6), further supporting the potential cost and energy savings of building material recovery and reuse.

Table 6. Non-Residential Materials Recovery by Type

Material Recovered	(tons)
Asphalt	**478,165**
Concrete	**485,414**
Wood (e.g. stumps and limbs)	**28,490**
Soils	**101,933**
Stones	**4,457**
Mixed Construction Waste	**188**
Carpet	**66**
Subtotal	**1,098,714**

Source: Adapted from DSM, 2006

The Pollution Prevention Program administered by the Delaware Natural Resources and Environmental Control (DNREC) provides non-regulatory assistance to industries and companies seeking to reduce their generation of solid waste. The agency offers practical information about waste reduction and recycling-reuse of materials used in building construction and demolition (DNREC, 2002). In cooperation with the Delaware Economic Development Office (DEDO), a "Green Industries" program was also established providing financial incentives in the form of corporate income tax credits or gross receipts tax reductions to companies that voluntarily reduce their waste generation by using at least 25% recycled materials in production, collection, distribution or processing (DEDO, 2007).

Despite these programs, businesses accepting recycled building and demolition waste in Delaware are limited, although several Delaware municipalities are pursuing recycling programs for aluminum, plastic, paper, glass, electronic materials and cardboard. Current recycling operations include Habitat for Humanity, Townsend Building Supply, First State Community Action Agency, the Warehouse Project and Tilcon Delaware, Incorporated. The Delaware Solid Waste Authority (DSWA) currently charges $61.50 per ton of dumped material, and waste haulers receive a rebate after signing a contract with DSWA. These rates are comparable to those of other Mid-Atlantic and Northeastern states. The issue of

MSW is a significant one for Delaware as the Cherry Island landfill, which receives almost fifty percent of the state's solid waste, will not be able to expand indefinitely.

4.1.5 Planning

In 2001 Executive Order 14, also known as the Livable Delaware Agenda, was signed into effect and directed all state agencies to develop a Living Delaware Plan. The intent of the Executive Order is to guide and coordinate development, emphasizing "more intelligent growth goals" through management of urban sprawl, protection of green spaces and agricultural areas, and smart growth (State of Delaware, 2007b).[45] The Livable Delaware Agenda also promotes reduction of road congestion, air and water pollution and works in parallel with other efforts promoting sustainable economic growth such as the Preliminary Land Use Planning (PLUS). PLUS is an update to Delaware's Land Use Planning Act (LUPA) and became effective in early 2004.[46] It requires all major changes[47] in land use be reviewed by applicable state agencies before submission to the relevant local governmental unit. The intent of this additional procedure is to facilitate coordination among private sector developers, local governments, and state agencies; and to identify potential impacts on forest areas, wetlands, species preservation, water quality and infrastructure, and traffic early in the development process. [48]

Several programs provide incentives to meet Livable Delaware's goals. These include the following:

- The Office of State Planning Coordination offers matching grants up to $10,000 to municipalities and counties for implementation of Livable Delaware objectives.[49]
- The Brownfield Assistance Program coordinated by the Delaware Economic Development Office and DNREC offers matching grants up to $100,000 or 50% of the cost for investigation and redevelopment of sites underused or abandoned due to real or perceive environmental concerns. In addition, state tax credits are available for employers located on brownfield sites based on the amount of investment in the facility or the number of employees.[50]

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[45] State of Delaware. Livable Delaware. The Strategies for State Policies and Spending. http://www.stateplanning.delaware.gov/strategies/strategies.shtml

[46] State of Delaware. Land Use Planning Act Reviews. http://stateplanning.delaware.gov/lupa/

[47] Major changes include residential subdivisions with more than fifty units, non-residential subdivisions with a total area greater than 50,000 square feet and development in designated environmentally sensitive areas. See Office of State Planning Coordination, Preliminary Land Use Services (PLUS) Checklist. http://stateplanning.delaware.gov/plus/plus_checklist.pdf

[48] The Preliminary Land Use Service. http://stateplanning.delaware.gov/plus/plus.shtml#about

[49] State of Delaware. Livable Delaware Grant Funding. http://www.stateplanning.delaware.gov/services/grants.shtml

[50] State of Delaware. Brownfield Assistance Program. http://dedo.delaware.gov/business/brownfield/programs_and_resources.shtml

- DNREC's Delaware Land and Water Conservation Trust Fund offers grants that aid in the acquisition of land for parks and greenways.[51] The Open Space Program designates State Resource Areas and protects them from development.

4.1.6 Public Transit

Delaware operates several programs to encourage the use of public transit. The Smart Commute program allows homebuyers purchasing a home within three-quarters of a mile of a DART rail station or bus stop to expand their mortgage qualifying income up to $250 a month.[52] In addition, participants receive up to six weeks of free DART bus passes The Business Partners in Transit program offers businesses and their employees a variety of tax credits and other incentives for using public transit.[53]

4.2 Green Buildings in Delaware

The State of Delaware is home to a number of accredited public and private sector green buildings. The most prominent examples include the I.J. Richard Carnell Building for PNC Financial Services Groups, the Blue Ball Dairy Barn, and the New Castle County Public Safety Building.

[51] State of Delaware. Delaware Land and Water Conservation Trust Fund http://www.destateparks.com/greenway/grants.htm
[52] Smart Commute. http://www.dartfirststate.com/information/programs/mortgage/index.shtml
[53] Business Partners in Transit. Available at: http://www.dartfirststate.com/information/programs/options/partners.shtml

Figure 1. 1. J. Richard Carnell Building for PNC Financial Services Groups

Place: Wilmington, DE

Certification Level: LEED Gold	**Designer:** Astorino Group, PA
Building Type: Office building and data center	**Total Square footage**: 113,000 sq.ft

Green Features

- **Reduced Site Disturbance** with subterranean parking garage to avoid extensive site disturbance and expansive surface parking.
- **Additional Commissioning**
- **Water Conservation** with water efficient landscaping.
- **Improved Indoor Air Quality and Low-Emitting Materials**
- **Regional and Recycled Materials**. 47% of the building materials are manufactured regional and 50% of total material used has recycle content.
- **Reduce Heat Island Effect** with the use of landscape and exterior design to 21% enhanced energy performance compare to ASHRAE 90.1.1999 standards.
- **Green Power** with a two year contract with Renewable Choice Energy to provide 100% of building electricity.
- **Natural Lighting** and view for 90% of employee.
- **Thermal Comfort and Controllability of Systems** with a raised access floor system and individual control over air flow.

Source: Catherine T. Sheane LEED AP from Astorino group.

Figure 2. Blue Ball Dairy Barn Renovation Project - DNREC

Place: Wilmington, Delaware

Certification Level: LEED Gold or Silver *(expected)*	**Designer:** Wallace Roberts & Todd, LLC, PA
Building Type: Renovation Project	**Total Square footage**: 14,000 sq.ft

Green Features

- **Site Location** near public transportation, which reduces the need for parking and creates more green space.
- **Regional Materials** to reduce the environmental impact caused by transporting them, and help support the local economy.
- **Water Conservation** with fixture sensors and waterless urinals conserve the use of potable water.
- **Ventilation** improved ventilation and air quality.
- **Indoor Air Quality** - use of low-emitting Adhesives, sealants and paints
- **Energy** - Energy-efficient design to cut energy costs by 24% in the new addition and by 40% in the existing barn.
- **Sun Shading** on the south side to help cool the new addition in the summer and harvest the sun's energy in the winter.
- **Recycled Materials;** with use of material with recycle content such as the concrete, steel, metal siding, roofing, paint, tile, ceilings, and toilet partitions.
- **Storm-water Management** with Innovative bio-swales was created with native plants to filter on-site water, reduce contaminants, and create habitat areas.
- **Rainwater** is collected, filtered, and used to flush toilets and water plants.
- **Re-use**- The "adaptive re-use" of old buildings like the Barn and the Milk House not only preserves cultural resources, but also reduces the need for new buildings.

Source: Department of Environment and Natural Resource Conservation (DNREC)

Figure 3. New Castle County Public Safety Building – New Castle County Government

Place: Wilmington, Delaware

Certification Level: LEED Gold or Silver *(expected)*	**Designer:** Tevebaugh Associates, DE
Building Type: Multiple Use	**Total Square footage**: 128,414 sq. ft.

Green Features

- **Water Conservation** with water-less urinals and drought resistant planting.
- **Rainwater** is collected from the roof gray water is used for toilets. The building captures 600,000 gallons/year.
- **Storm-water Management** with a combination of creative bio-swale and storm tech systems.
- **Regional and Recycled Materials** to reduce the environmental impact building material on the environment.
- **Improved Indoor Air Quality** with use of low VOC materials.
- **Reduce Heat Island Effect** with use of white collard roof.
- **Commissioning and Enhanced Commissioning**
- **25% Improved Energy Performance** compared to ASHRAE 90.1.1999 standards with improved building envelope and use of heat, light, and occupancy sensors.
- **Construction Waste Management** and the recycling of 95% of debris.
- **Light Pollution Reduction** measures in building site.
- **Harnessing renewable Energy** with use of geothermal power. 180 wells circulate water deep in the ground and use of earth's constant temperature for building's heating and cooling needs.
- **Alternative Transportation Mode** such as car pooling.
- **Measurement and Verification Plan** has been implemented for this project.

Source: Tevebaugh Associates

In addition to these completed projects, there are several proposed private, public and non-profit green buildings in the designing, planning and/or construction stages in Delaware.

Table 7. Proposed LEED certified buildings in Delaware

Project Title	City	Project Type	Owner Type	Occupant Type	Gross SF	LEED Status
Killens Pond Nature Center	Felton	Multi-Use	Public	Public	7,900	Registered
Itec Environmental Outpost	Smyrna	Interpretive Center	Non-profit	Non-profit	2,300	Registered
PNC Branch	Selbyville	Commercial Office	Private	Private	3,471	Registered
Astrazeneca Contractor Processing Center	Wilmington	Commercial Office	Profit Org.	Private.	3,500	Gold Certifed
Construction Training & Education Center	Wilmington	Industrial	Non-Profit	Not Available	4,985	Registered
Price Run Pool House	Wilmington	Recreation	Individual	Individual	5,000	Registered
Country Center Science & Technology Lodge	Hockessin	Multi-Use	Non-Profit	Non-Profit	5,088	Registered
Iron Hill New Learning Center	Newark	Multi-Use	Non-profit	Non-profit	10,900	Registered
426 North Market Street	Wilmington	Commercial	Private.	Private	11,000	Registered
Safe Haven Animal Sanctuary	Nassau	Retail/Other	Non-Profit	Non-Profit	19,000	Registered
Mt. Cuba Center	Hockessin	Interpretive Center	Non-Profit	Non-profit	29,000	Registered
South Coastal Health	Clarksville	Multi-Use	Non-Profit	Non-Profit	60,000	Registered
Pencader Office Building	New Castle	Commercial	Profit Org.	Mixed	65,734	Registered
Springer Middle School	Wilmington	Educational	Other	Other	139,000	Registered
P.S. DuPont School	Wilmington	Educational	Public	Other	206,151	Registered
Capital Health New Hospital	Wilmington	Healthcare	Non-Profit	NA	900,000	Registered
Not Available	NA	Multi-Use	Public	Federal	9,073	Registered
Not Available	Georgetown	Multi-Use	Public	State	4,234	Registered
Not Available	NA	Multi-Use	Public	Federal	68,500	Registered
Not Available	Wilmington	Multi-Use	Private	Private	95,000	Registered
Not Available	NA	Multi-Use	Private	Private	56,000	Registered
Not Available	NA	Multi-Use	Private	Mixed	280,000	Registered
Not Available	Wilmington	Multi-Use	Private	Private	43,260	Registered

4.3 Status of Green Buildings in Delaware – Stakeholder Interviews

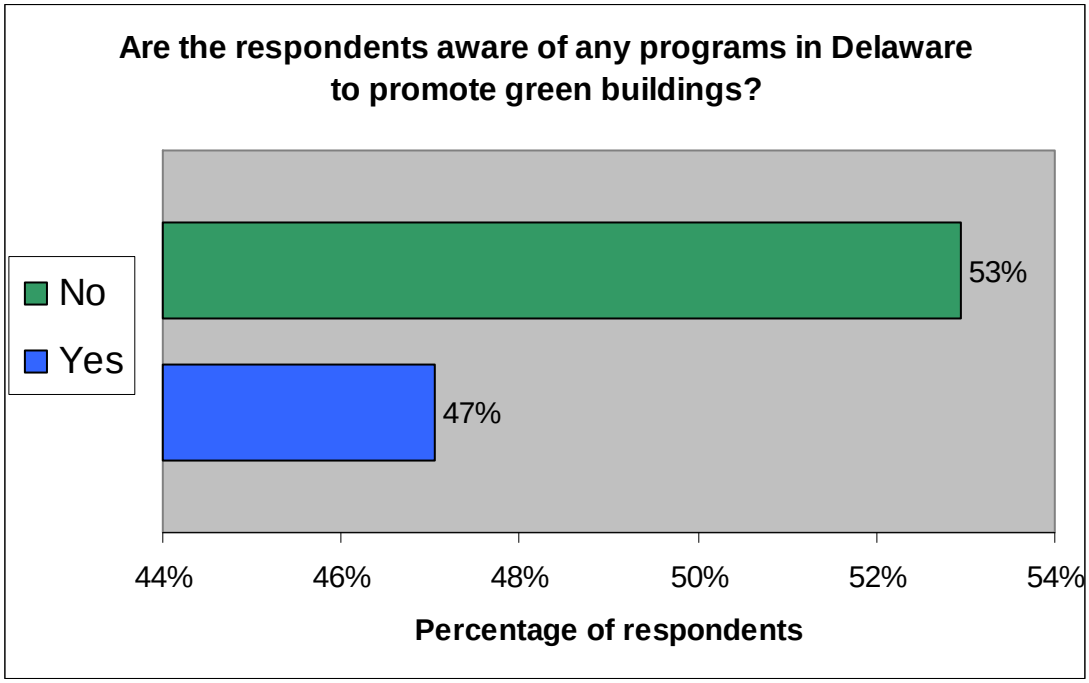
In order to assess awareness and status of green building design and practices in the State of Delaware, the Center for Energy and Environmental Policy (CEEP) conducted a survey of representatives from both the private and public sector. The purpose of the survey was to gather information on the present level of awareness of green building design and technology; practitioner perspectives on Delaware green building policies and programs; and to identify barriers impeding development and implementation of green building projects. The CEEP research team contacted the Executive Director of the Delaware Chapter of the American Institute of Architects (AIA) for recommendations of individuals from key Delaware stakeholder groups, including architects, engineers, contractors, developers, and interior designers. This provided the initial list of survey participants, each of whom was asked to recommend additional participants. The research team also placed an announcement in the USGBC newsletter requesting participation in the project and the CEEP team included representatives from public agencies with experience in sustainable design and green buildings. This list included the Wilmington City Commission, the Green Energy Program, Buildings and Grounds of the Seaford School District, and the Office of Design and Development for the Division of Parks and Recreation.

The survey instrument (Appendix II) was designed by CEEP researchers, and completed in face-to-face, teleconferencing and mail-in formats during the period of March-May 2007. Seventeen individuals completed the survey (Appendix III).

Summary of Findings

The intent of the survey was to solicit information regarding stakeholder perspectives about the status of green building practices in Delaware. Respondents were asked to identify what barriers, if any, exist to the development of green building, as well as their recommendations for promoting green building design and construction in Delaware. Findings from the survey are summarized.

Question 1: Are you aware of any state programs in Delaware that help to promote Green Buildings (Sustainable design practice)? Please explain.



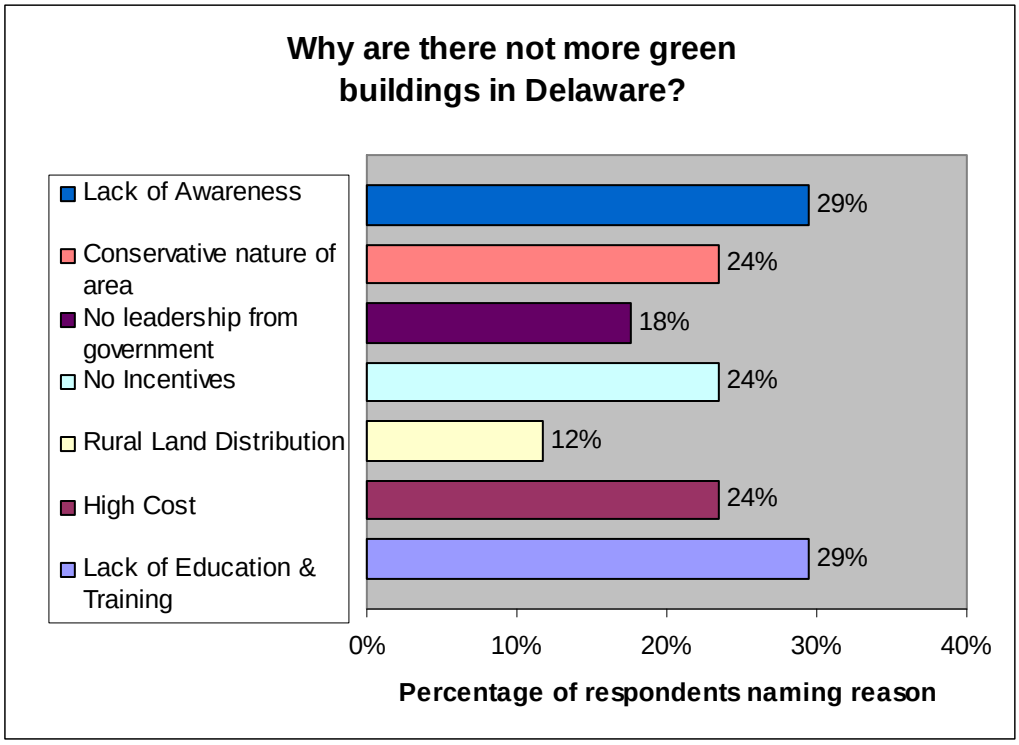
Fifty-three percent of survey respondents were unaware of any programs in Delaware that promote green buildings. Of the respondents who indicated awareness of such programs, 88% identified DNREC's Green Energy Program (provides a 50% rebate for installation of renewable energy applications). Other programs also mentioned by interviewees were:

- Updates to Title 29; Chapter 69 regarding State Procurement provisions.[54]
- The Delaware State Housing Authority provision that awards points for bids incorporating energy efficiency in the Low Income Tax Credit Housing Program.[55]
- The recent agreement of the International Code Council (ICC) and National Association of Home Builders (NAHB) to cooperate on development of an American National Standards Institute (ANSI) standard for green home building construction practices. The standard is expected to be completed in 2008 and would be applicable to homebuilders in Delaware.
- The Delaware Sustainable Energy Utility Task Force (SEU), and its promotion of energy efficiency in the building sector.
- The Delaware Energy Office's Energy An$wers Program which offers grants for existing buildings, and their non-funded program for new construction.

[54] HB 435 requires state agencies to use products and equipments designated as "Energy Star" when competitively available. SB 307 requires the use of life cycle cost analysis in the purchasing of equipment and in public work projects. Energy Performance Saving Contracts (EPSC) was amended in Title 29 Chp. 69.

[55] http://dfm.delaware.gov/docs/lifecycmemo.pdf

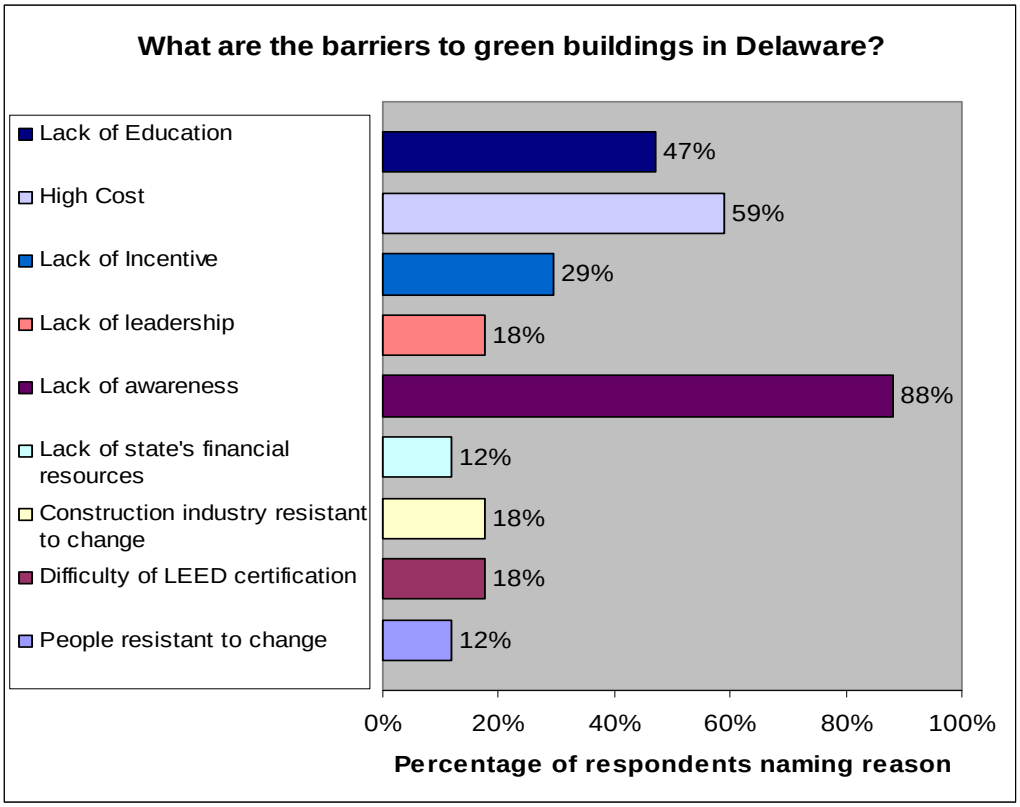
Question 2: Delaware has the smallest number of registered projects with U.S. Green Building Council compared to other states (DE has 14 whereas RI has 16, CT - 45, NJ - 97 and PA - 282).[56] Why do you think there have not been more green building initiatives in Delaware?



The reasons most cited for the lack of green building initiatives in Delaware were lack of awareness,[57] and training and education, each receiving 29% of the total responses.[58] Lack of appropriate incentives, high costs, and the state's conservative orientation toward change received the next highest number of responses (each with 24%). Other reasons that were cited were lack of leadership from state and local governments,[59] the large percentage of rural land within the state, the insufficient number of large commercial projects, lack of an architectural school in the state, and lack of market demand.

[56] U.S. Green Building Council
[57] Lack of awareness category includes: a) misperception of the costs and benefits of green buildings; and b) lack of knowledge about the existence of green building design and construction.
[58] Lack of education and training encompasses a lack of resources for public agency and private sector professionals to learn more about green building practices.
[59] There was no green building legislation in the state.

Question 3: What are the barriers in Delaware to the adaptation of green building or sustainable design practice?

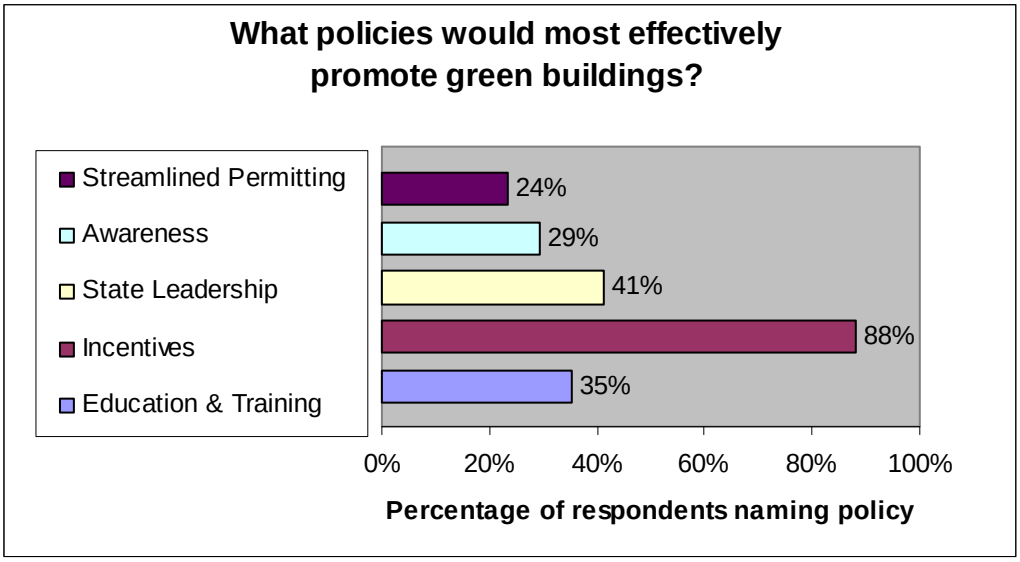


The majority of respondents (88%) indicated that a lack of awareness[60] was one of the main barriers to green building development in the state, followed by the higher costs of green buildings and the absence of incentives (59%), and a lack of education in green building practices (47%). Other barriers specifically noted were:

- The use of initial cost versus life-cycle cost analysis and state budget limitations.
- A general resistance by both contractors and the building industry to significant changes and unlikelihood of adopting green building practices without significant pressure from the state or private clients.

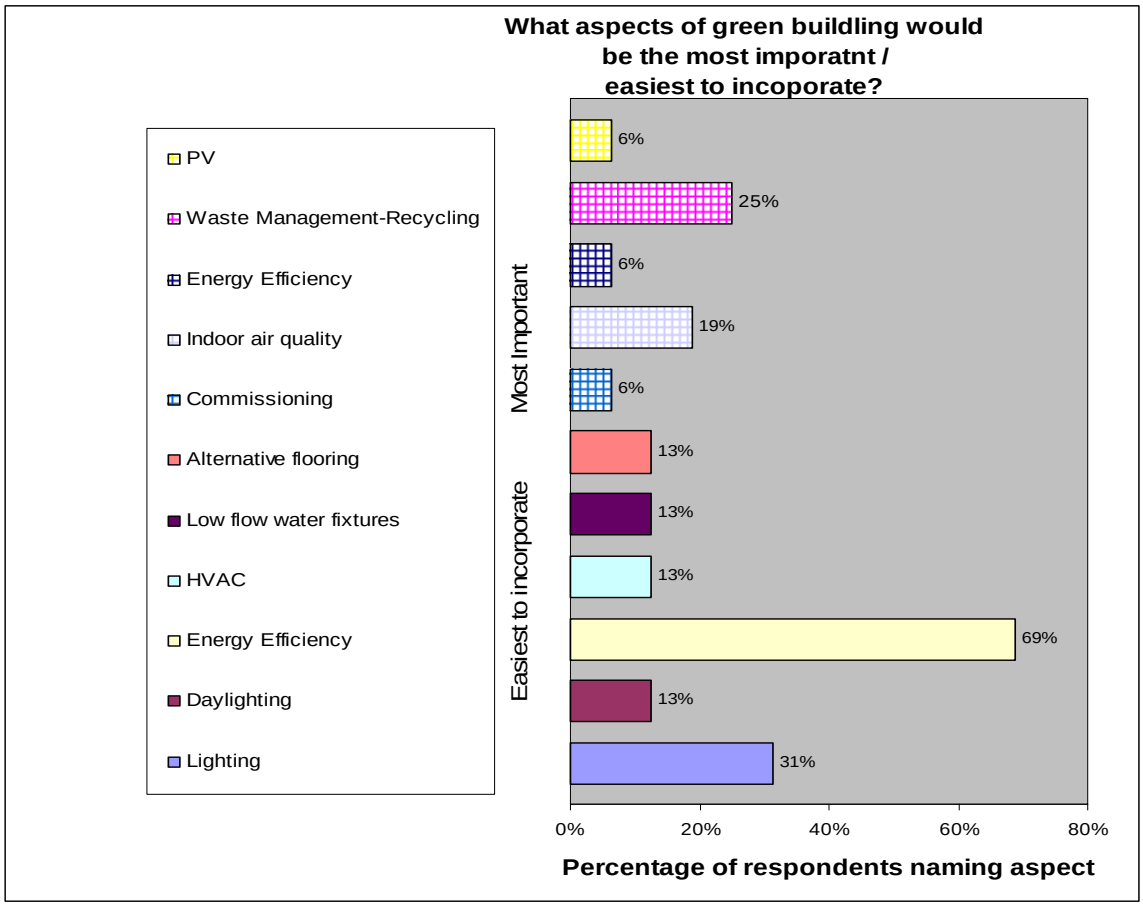
[60] A lack of awareness often leads to the perception that green buildings are significantly more expensive than conventional buildings.

Question 4: What policies would be most effective to rapidly advance/encourage their adaptation in Delaware?



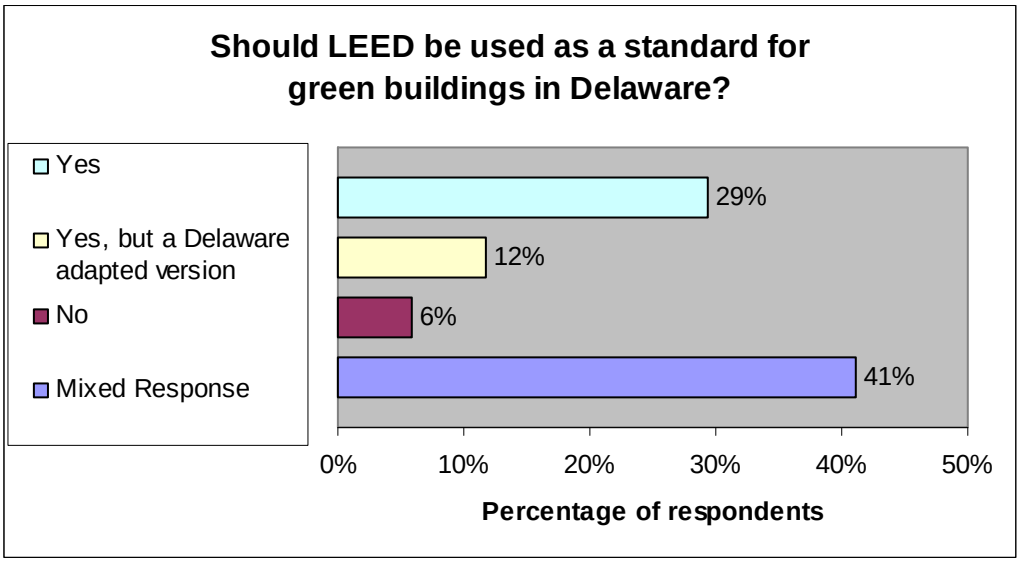
Eighty-eight percent of respondents identified incentives as the most effective policy to promote green buildings in Delaware. Noted incentives included tax breaks, grants, low-interest loans and government cost sharing as keys to stimulating the growth of the green building industry in Delaware. Three respondents also identified preferential permitting processes such as expedited permitting and floor area ratio (FAR) bonuses. Forty-one percent of interviewees also indicated that Delaware should take a leadership role by requiring standards for public buildings. Other actions noted by respondents included green building leadership recognition programs, education and technical assistance for developers, architects, engineers, contractors, state employees and the general public. Public awareness programs were also suggested as essential and effective ways to stimulate green building design and construction. One respondent also mentioned the importance of public awareness regarding the connection between energy efficiency and avoided pollution.

Question 5: In your view, which aspects of Green Buildings could be easily addressed and/or are of primary concern?



Respondents provided multiple responses, although approximately 69% of the responses named energy efficiency as the most primary elements of green building design. Many identified energy savings through efficient lighting (31%) and day-lighting (13%) as easy and inexpensive. Other easily adopted technologies cited were energy efficiency improvements from HVAC (Heating, Ventilation and Air Conditioning) and mechanical systems. Incorporating low Volatile Organic Compound (13%) products and improving indoor air quality (19%) were also named. Twenty-nine percent of responses identified the importance of recycling including the reuse of building and demolition materials in reducing the ecological footprint of the built environment. One respondent emphasized the commissioning and regular maintenance of buildings to insure high performance. In addition, solar heating and electricity, and geothermal energy were named by one respondent as important renewable sources to offset a building's CO_2 emissions. Also noted was the fact that many green building products such as cork and bamboo flooring are readily available in the market at competitive prices.

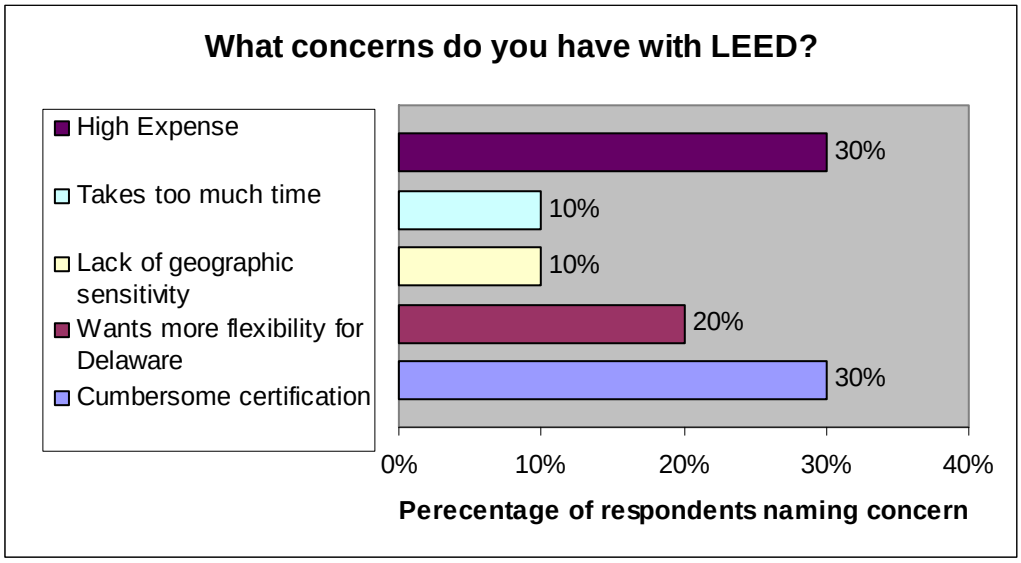
Question 6: States across the nation have adopted different Green Building rating systems. Some have adopted LEED or Energy Star criteria and other devised their own guidelines. In your opinion what should be used as a Green Building standard for Delaware?



The overwhelming majority of respondents (94%) favored the use of LEED in some format as the green building rating system for Delaware. Some respondents suggested a Delaware checklist adapted from the LEED system as recommended guidelines for the building industry instead of the actual requirement of LEED certification. [61] One interviewee suggested that the state could pursue discussion with the USGBC on ways to streamline the LEED registration process. There were also suggestions of using the US EPA Energy Star rating for buildings as a possible alternative where LEED was not applicable. If the LEED system was to be adopted, several respondents stated that the State needs to invest in education and training programs for building professionals and state agency personnel.

Some concerns of time and costs associated with state mandated LEED certifications were raised.

[61] There is precedence for that as the U.S. Air Force and Navy, and several state governments follow LEED guidelines but do not require certification.



Additional comments were also elicited regarding the incremental costs associated with registration and certification above and beyond the costs to meet LEED requirements, which would be difficult to justify. Further, different state and municipalities may have unique needs beyond what is addressed in the scope of LEED. Thirdly, there are concerns in scientific merit of LEED rating system, and finally they were concerns that considering costs and environmental benefits, some credits are inappropriately weighted. LEED's lack of geographic sensitivity of is another concern in adopting this rating system across the nation.[62]

[62] Despite these concerns, numerous agencies, states, and municipalities are finding LEED to be a useful tool in greening their buildings. In addition, the LEED rating system is an ongoing development process and has opportunities for federal and state officials to participate in LEED modifications and revisions.

5.0 CONCLUSIONS

Survey findings suggest that policies and programs promoting green buildings in the public and private sectors have significant potential in the state. The majority of stakeholders interviewed indicated that improvements in energy efficiency would be the first step in incorporating green building principles into the sector. One of the additional benefits associated with energy efficiency is the reduction in greenhouse gas emissions. As the research increasingly examines the impact of the building sector on climate change, green design is proving to be an important strategy for future environmental and economic viability. Green buildings offer the potential of a carbon neutral building sector. Survey findings suggest that stakeholders propose state adoption and implementation of a standard rating system in the state, and development of green building incentive programs. Among those interviewed, the LEED system was identified as the most generally accepted rating system.

In conclusion, state and local initiatives are effective tools for promotion of green buildings. A review of existing programs indicates that a range of standards and incentives exist in a number of states and localities that can serve as models for Delaware legislative action. This is supported by information gathered from surveys, which suggest that policy incentives are a primary catalyst for development of green building projects. Delaware has implemented path breaking legislation in creating the Sustainable Energy Utility and can further the goals of energy conservation and environmental sustainability through green building incentives and policies.

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APPENDIX I

States	Green Building Programs	Green Building Standards	Performance Initiatives	Construction Mandates	Energy Efficiency / Sustainable Energy	Financial incentives	Training Education	Climate Change	Public Awareness
AZ	X	X		X	X				
CA	X	X		X	X	X	X	X	X
CO	X			X					
CT	X	X		X		X		X	
DC	X	X			X	X	X		
DE					X				
FL	X	X		X		X			
GA			X	X					
HI	X	X				X			X
IA		X		X	X	X	X		
ID	X	X		X					
IL	X	X		X	X	X		X	
IN	X	X		X		X			
KY	X	X		X					
MA	X	X			X	X	X		X
MD	X	X		X	X	X			
MI		X				X			
MN	X					X		X	
MO	X	X		X	X	X			
MS		X		X					
MT	X	X		X	X	X			
NC			X		X	X			
NJ	X	X		X	X	X			X
NM	X					X	X		
NV	X			X	X	X			
NY	X	X	X	X	X	X			
OH			X			X			
OK			X	X					

OR	X	X	X	X	X	X			
PA	X	X	X	X		X			
RI	X			X					
SC	X	X		X	X	X			
SD			X	X					
TN			X						
TX	X	X		X		X			
VA	X	X	X	X	X	X			
VT	X	X	X			X			
WA	X		X	X		X		X	
WV		X							

Green Building Programs: Programs supporting sustainable design/green buildings, sustainable affordable housing, green buildings councils/committees.
Green building standards: Includes establishment of energy performance standards, sustainable and green buildings standards.
Performance Initiatives: Includes high performance buildings.
Construction Mandates: Includes green buildings construction, energy efficient building, establishment of LEED standards for new construction.
Energy Efficiency / Sustainable Energy: Includes energy conservation, inclusion of green buildings to energy efficiency legislation, energy plans with renewable energy sources.
Financial incentives: Includes rebates for energy efficiency technologies; excise tax exemption on energy efficiency technologies; green school construction loans/funds.
Training / Education: Green building certification training.
Climate Change: Monitoring and regulating of sources of GHG emissions; GHG construction limitations; climate and energy security considerations.
Public Awareness: Recognition and support for green buildings projects

APPENDIX II

Green buildings informational survey: Delaware

The Center for Energy and Environmental Policy (CEEP) at the University of Delaware is currently conducting a research on Strategies to Promote Green Buildings in Delaware. The purpose of this research is to identify social, political and economical barriers in the development of the Green Buildings industry in Delaware and provide recommendations on strategies to promote Green Buildings in this State. The research is being prepared for the Delaware General Assembly and will be available to the public upon completion.

It would be extremely helpful if you could assist us by completing this survey during the interview. If you have any questions, please feel free to call me, at (302)_____ or e-mail at _____.

Thank you for your time and attention. Please feel free to forward any additional names and addresses of other individuals who could provide valuable insight to these questions.

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1. Are you aware of any state programs in Delaware that help to promote Green Buildings (Sustainable design practice)? Please explain.

_____
_____
_____
_____

2. Delaware has the smallest number of registered projects with US Green Building Council compare to other states (DE has 14 whereas RI has 16, CT - 45, NJ - 97 and PA - 282)[63]. Why do you think there have not been more green building initiatives in Delaware?

_____
_____
_____
_____

3. What are the barriers in Delaware to the adaptation of GB or SD (Sustainable Design) practice?
   a. Barriers to design, construction, and development industries.

_____
_____
_____
_____
_____

[63] Source USGBC (US Green Building Council)

4. In your opinion what policies would be most effective to rapidly advance/encourage the adaptation of GB in Delaware?

    a. Policies to help the design and construction industries and developers.

_____
_____
_____
_____
_____

5. In your view, which aspects of GB could be easily addressed and/or are more important of primary concern?

_____
_____
_____
_____
_____

6. States across the nation have adopted different Green Building rating systems. Some have adopted LEED or Energy Star criteria and other devised their own guidelines. In your opinion what should be used as a Green Building standard for Delaware?

_____
_____
_____
_____

Any other comments?

_____
_____
_____
_____
_____

APPENDIX III

Names of Contact Persons Interviewed

Architects

Hue, AIA, LEED President-Elect Delaware Chapter of American Institute of Architects (AIA)	**Kevin W. Wilson**, AIA Vice President Delaware Chapter of American Institute of Architects (AIA) Firm: Architectural Alliance, Inc.
Bill Holloway, AIA Bernardon Haber Holloway Architects, PC	**Bryan Williams**, AIA Becker Morgan Group, Inc.
Gregory S. Kindig, AIA, LEED AP Park Architect Delaware State Parks DNREC	**Michael A. Falstad** Associate AIA Architecture and Historic Preservation John Milner Associates, Inc.

Engineers

Mark Devore
Chief of Engineering & Operations
OMB/Facilities Management, State of Delaware

Contractors

Michale M. Berardi President, Board Member and Principal Nason Construction, INC.	**Ed Capodanno** President ABC Associated Builders and Contractors.
Steve McCann Facilities Manager Mt. Cuba Center Web: www.mtcubacenter.org	**Anne Stacey** Executive Director Delaware Chapter of American Institute of Architects (AIA)

Developers

Scott Johnson
Partner
McConnell Johnson Real Estate LLC
McConnell Energy Solutions LLC

Interior Designers

Marsha Miedling
Interior Designer
Becker Morgan Group, Inc.

Government Officials	
Jeffrey J. Starkey Commissioner City of Wilmington	**Scott Lynch** Green Energy Program Planner Delaware Energy Office DNREC
Roy Whitaker Chief of Buildings and Grounds Seaford School District Seaford DE	**Britt Murray** Chief, Office of Design and Development Division of Parks and Recreation DNREC

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