Greening the Metropolitan Washington Region's Built Environment

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A Report to the Metropolitan Washington Council of Governments Board of Directors

Technical Report

COG Intergovernmental Green Building Group

December 12, 2007

Metropolitan Washington Council of Governments

COG is a regional association comprised of 21 local governments surrounding our nation's capital, plus members of the Maryland and Virginia legislatures, the U.S. Senate, and the U.S. House of Representatives. COG provides a focus for action and develops sound regional responses to such issues as the environment, affordable housing, economic development, health and family concerns, human services, population growth, public safety, and transportation.

www.mwcog.org

COG Mission

Enhance the quality of life and competitive advantages of the metropolitan Washington region in the global economy by providing a forum for consensus building and policy-making; implementing intergovernmental policies, plans, and programs; and supporting the region as an expert information resource.

Intergovernmental Green Building Group

"Promoting cooperation on green building in the metropolitan Washington region"

The IGBG, a standing technical committee of COG, is a cross-jurisdictional group of local government staff and interested nongovernmental participants who are committed to green building as a sustainable development strategy for the metropolitan Washington region.

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Cover images left to right: National Association of Realtors Washington Legislative building, District of Columbia; National Rural Electric Cooperative Association (NRECA) headquarters, Arlington, VA; 1101 New York Avenue office building, District of Columbia; Eastern Village Cohousing, Silver Spring, MD. All have achieved U.S. Green Building Council LEED certification.

Vision

The National Capital Region is a national leader in green building. The region's local governments lead in innovation and stewardship of the environment through green building design and construction, and support for innovation in the private sector.

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I. Introduction and Background

The common adage "think globally act locally" is especially true when it comes to development and building. Building activity in metropolitan Washington jurisdictions has local, regional, and even global impact. Yet while the environmental impacts of our region's building decisions are indeed global in their reach, how and where we build are fundamentally local decisions—largely determined by local markets and local government policy.

Overall, buildings have a tremendous impact on the environment. As tracked by the U.S. Environmental Protection Agency, in the United States, building construction, maintenance, and disposal account for[1]:

- 12 percent of potable water use;
- 39 percent of primary energy use;
- 70 percent of electricity consumption;
- 40 percent of raw materials extraction;
- 38 percent of carbon dioxide emissions;
- 60 percent of total non-industrial waste generation

Local governments are in a pivotal position to make a difference, whether it is stewardship of a region's environmental health, changing market expectations, or setting an example for best practices.

This report will examine the impact of building planning, design, construction, and management decisions on the region's environment, and to climate change. It will consider the contribution that green building practices can make to improving the region's environmental health, to municipal infrastructure management, and to the growth of a green economy. The report will consider regional green building activity in the private and public sectors, and how COG member governments can support ongoing innovation. The report will review best practices in green building nation wide and consider available green building rating systems for potential policy application at the local and regional level. Costs and operations issues of green building policy implementation will be considered from a local government perspective. Finally, the report will make recommendations for how local governments can make innovative and strategic choices for making green building common practice—and make the Metropolitan Washington region a national leader for green building.

In this report, the committee has assessed the environmental impacts of all development while focusing recommendations on municipal buildings and new commercial projects that stand to have a strong impact. In the future, the committee will also consider green building options for existing and historic buildings, small-scale residential projects, schools, and affordable housing projects. General policy guidelines are currently provided for these project types in the report, with recommendations for future action.

[1] US EPA 2007, Green Buildings. www.epa.gov/greenbuilding/pubs/gbstats.pdf, and U.S. DOE 2003, Annual Energy Review. DOE/EIA-0384 (2003). Energy Information Administration, U.S. http://tonto.eia.doe.gov/FTPROOT/multifuel/038402.pdf.

What is Green Building?

Green building is an approach to building design, construction, and management that reduces or eliminates negative environmental impacts while it promotes high building performance and occupant health. Relying on natural sunlight during peak hours, using recycled construction materials and designing green roofs covered with vegetation are all examples of green building practices. Designers and engineers of green buildings take a whole-building approach that considers how building systems react with one another and with the natural environment. As a result, green buildings use less energy, consume less water, generate fewer air pollutants, and provide healthier indoor environments. Green buildings generally incorporate the following practices:

- Integrated, whole building design choices;
- Environmentally responsible site practices;
- Energy conservation and use of renewable energy resources;
- Water conservation and reuse;
- Materials selected for environmental sustainability and human health;
- Waste reduction during construction and operations;
- Measures to ensure good ventilation and indoor air quality.

Green building can be implemented in a variety of ways, but the overall benefits of a well-designed and constructed green building remain generally the same. The U.S. Green Building Council (USGBC)[2], a non-profit national organization dedicated to green building estimates that green buildings:

- Use 30 to 50 percent less energy;
- Emit 35 percent less carbon dioxide;
- Consume 40 percent less water;
- Produce 70 percent less solid waste.

Green building practices are being adopted at an increasing rate by the public and private sector throughout the country. Over 8,000 building projects have been registered under the USGBC's Leadership in Energy and Environmental Design (LEED) green building rating system, with nearly 1,000 achieving certification—compared to just a few hundred registered projects five years ago. Leading cities such as Chicago, Seattle, and New York City are making green building an integral component of resource conservation, sustainable development strategies, climate protection, and the development of local green economies.

[2] www.usgbc.org

Current COG Activity

In 2006 the Metropolitan Washington Council of Governments (COG) Board of Directors passed a resolution supporting green building in the Metropolitan Washington region. ***Resolution R55-06***[3], presented at the September 29, 2006 ***Regional Leadership Conference on Green Building*** and adopted by the COG Board on November 8, 2006 called for regional co-operation on green building among COG-member jurisdictions, and created a technical working committee to further the goals of the resolution. COG resolved to:

- Support the application of coordinated Green Building practices throughout the region;
- Encourage each member jurisdiction to incorporate Green Building practices into the planning, design, construction, and operation of public sector development projects;
- Encourage each member jurisdiction to develop incentives, policies and/or regulatory approaches supporting the application of Green Building practices in private sector development projects;
- Encourage each member jurisdiction to provide public education and staff training promoting Green Building practices;
- Establish a committee to recommend regional Green Building policies and guidelines, identify opportunities, and encourage coordination and leveraging of resources.

The COG technical committee, known as the Intergovernmental Green Building Group (IGBG)' was charged with preparing a report that will provide the COG Board with:

- Options and recommendations to develop and adopt Green Building guidelines and implementation strategies that consider use of existing standards, such as LEED, ENERGY STAR, or other nationally recognized Green Building programs, and which address issues of particular regional importance and interest;
- Options and recommendations for approaches to measure regional progress in the application of Green Building practices.

[3] **COG Board Resolution R55-06** Supporting the Development of Regional Green Building Initiative and Adoption of Existing Intergovernmental Green Building Working Group as a Technical Committee under COG's Committee Structure, Nov. 8, 2006 .

Intergovernmental Green Building Group (IGBG)

The Intergovernmental Green Building Group (IGBG) began meeting on an ad hoc basis during the summer of 2005. Participants included local government staff with shared interest and commitment to green building and environmental protection. Several participants were working in sustainable development aspects of comprehensive and environmental planning. Others were fortunate enough to already be working on green building implementation. All saw potential benefit to the region's environment, to our jurisdictions, and to quality of life for residents in the region through application of green building practices. Many of the issues that IGBG members were interested in were being explored concurrently by COG through its air, water, solid waste and energy programs. IGBG members and COG recognized that there was a natural meeting ground for considering these issues in the context of green building.

The Metropolitan Washington Council of Governments, in collaboration with IGBG and other partners organized the September 29, 2006 ***Regional Leadership Conference on Green Building: Best Practices and Policies for Local Government and the Region***.[4] The conference, hosted by then COG Board Chair Jay Fisette and held at the University of Maryland Conference Center, drew over 300 participants. In addition to presenting the draft COG Board resolution, the conference offered presentations from national experts and regional leaders on outstanding practices in green building, and affirmed the group's conviction that the Metropolitan Washington region has the opportunity to become a national leader for green building and sustainable development.

With a highly educated population, a favored economy, enlightened municipal leadership, and valuable natural resources at stake, the Metropolitan Washington region is poised to become a national model for interjurisdictional cooperation on green building and related practices.

The Intergovernmental Green Building Group became an official technical committee of COG in November 2006, with a responsibility to offer professional expertise, identify opportunities, and consider the issues of green building adaptation in the region. The committee offers this report as a resource to Washington area municipalities and others who want to make green building practice standard practice in their jurisdictions and in the region.

[4] COG: Environment, www.mwcog.org

II. Buildings and the Region's Environment

The Metropolitan Washington region is growing. From condominium loft conversions in the District of Columbia to the housing boom in Loudoun and Prince William counties, the region's prosperity is expressed through building activity that surpasses virtually every region in the country. Despite the recent real estate slowdown, the region's strong federal sector and healthy commercial markets point toward ongoing prosperity.

Regional economic forecasts predict that between 2005 and 2030 the region will gain 1.6 million new residents and 1.2 million new jobs.[5] The region's growth will bring with it increased demand for housing, schools, commercial and office buildings, parks and recreation facilities, and for transit services and roads. How we choose to build in response to this demand will profoundly affect the future environmental health of the region, and its quality of life.

Forecasts for future national building activity shed light on the physical change that the region's built environment will undergo. By 2035, based on the last decade of building activity, 75 percent of the nation's building stock is expected to be new or rebuilt[6]. Regional building activity is well above average, and will likely exceed national forecasts.

The region's political and business leaders have begun to address some of the difficult questions posed by future development through visioning exercises such as ***Reality Check***, held in 2005. Smart growth strategies are being considered to mitigate the social, economic, and environmental impacts of sprawl. But the quality of the region's environment will be based not just on *where* we build, but *how* we choose to do so. Building practices have specific and far-reaching effects on the region's environment and thus on the region's municipalities. This chapter explores those effects and examines potential regional benefits if green building practices are adopted.

Impact of Buildings on the Region's Environment

Building activity—from construction to operations to ultimate disposal—has immediate and ongoing impacts on the region's environment. Initial site activity affects land, trees, and local ecologies, while building operations continue to impact the region's energy systems, water, soil, and air. Demolition and waste from discarded buildings then impacts the region's environment as municipalities search for safe disposal. Building codes and environmental regulations help to manage some of these environmental impacts, but many remain "externalized" to interact with the regional and global environment.

Land and Habitat Impact

Between 1986 and 2000, developed land areas in the region expanded by 40 percent, from 12.2 percent to 17.8 percent of total regional surface[7]. As Map 1 shows, this development cor-

[5] COG regional economic forecast, www.mwcog.org

[6] Architecture 2030 analysis of Energy Information Administration's Commercial Building Energy Consumption Survey (CBECS) and FW Dodge building activity data. www.architecture2030.org

relates with the expansion of impervious surfaces and the loss of green space and wildlife habitat.[8] The rate of physical expansion and pervious land loss has dramatically outpaced population growth. The region's population grew only by 8 percent during this same period.

Tree Canopy Loss

Tree canopy loss has accompanied regional development and impervious surface expansion. A study conducted by American Forests for the nonprofit Casey Trees in 2002 estimated that the District of Columbia alone lost two thirds of its heavy tree canopy in the 25 years prior to the study—even while population decreased.[9]

Trees have been shown to improve regional air quality[10] and protect water resources[11] by:

- Reducing air temperatures and reducing energy used for cooling;
- Removing ozone and nitrogen oxides (NOx) from the air;
- Absorbing and filtering stormwater.

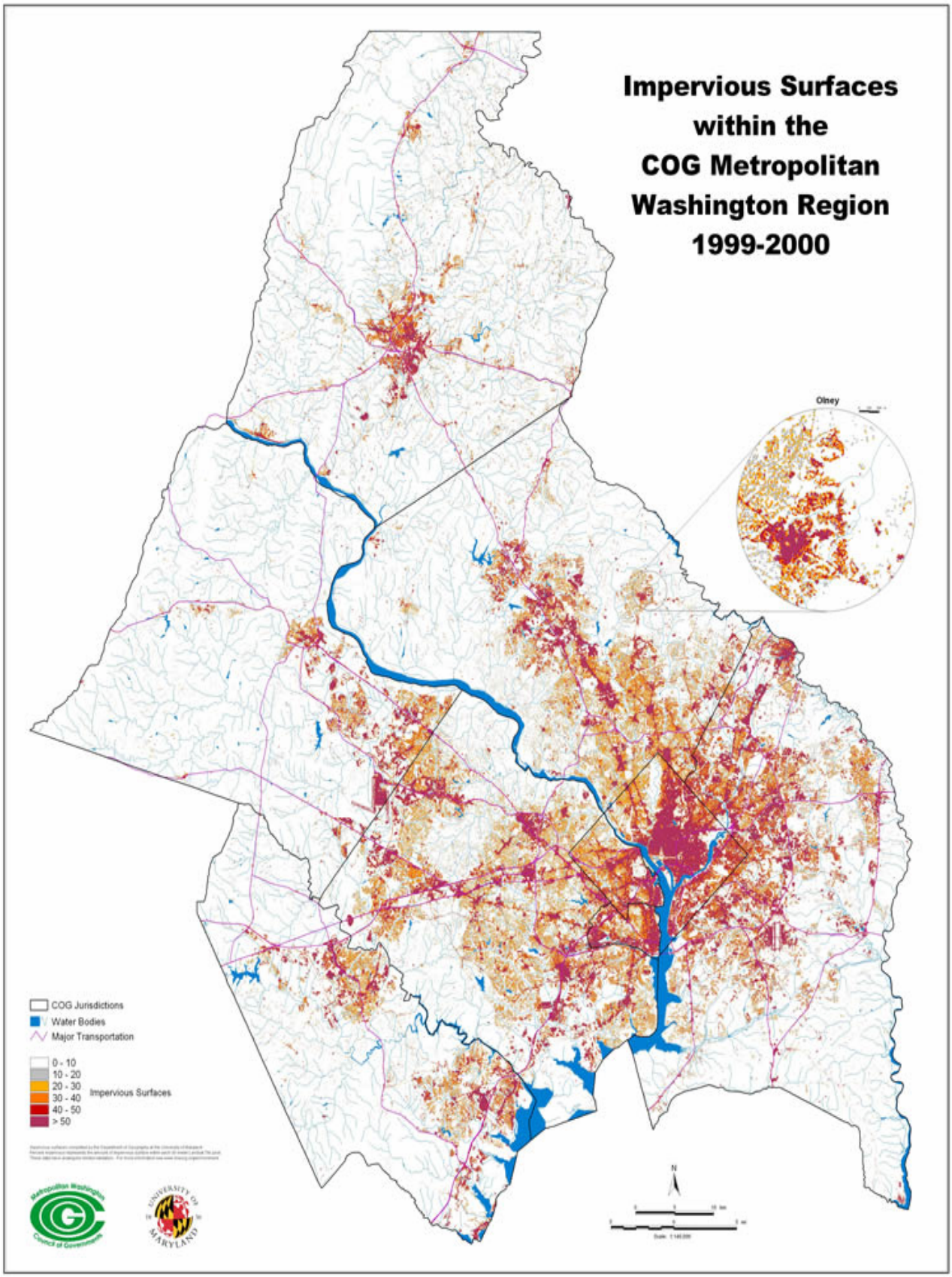
Further, trees absorb and utilize CO_2, keeping it out of the atmosphere. Building activity that reduces tree cover and vegetation removes these positive effects at a time when the region needs them most. Research for COG's ***Plan to Improve Air Quality in the Washington, DC-MD-VA Region, State Implementation Plan (SIP) for 8-hour Ozone Standard*** found that "the current canopy is composed of mixed native hardwoods and urban plantings. On average these species require 30 years to mature.[12]"

Impervious Surfaces and Stormwater Runoff

The cumulative impact of impervious surfaces across the region has made stormwater management one of the region's pressing environmental and municipal challenges. Rainfall, rather than being absorbed into soil and by plants and trees, instead runs off roofs, down paved driveways and sidewalks, parking lots, and roadways and into storm drains, rushing into the region's streams, rivers, and bays. The increased volume of water entering streams causes bank erosion, loss of habitat, and in some cases, loss of property. Stormwater runoff also picks up pollutants, sediment, and sometimes sewage and trash, and conducts heat from developed areas. Temperatures in the region's streams are sometimes as much as 10° to 12° F[13] higher following a storm event, compromising their capacity to sustain life.

[7] COG: Environment, www.mwcog.org/environment/green/maps.asp
[8] COG: Environment, www.mwcog.org/environment/green/maps.asp
[9] American Forests, Urban Ecosystem Analysis for the Washington DC Metropolitan Area, February, 2002
[10] Plan to Improve Air Quality in the Washington, DC-MD-VA Region, State Implementation Plan (SIP) for 8-hour Ozone Standard, May 23, 2007
[11] American Forests, Urban Ecosystem Analysis for the Washington DC Metropolitan Area, February, 2002
[12] Plan to Improve Air Quality in the Washington, DC-MD-VA Region, State Implementation Plan (SIP) for 8-hour Ozone Standard, May 23, 2007
[13] US EPA: Urbanization and Streams, 2007 http://www.epa.gov/owow/nps/urbanize/report.html

Map 1

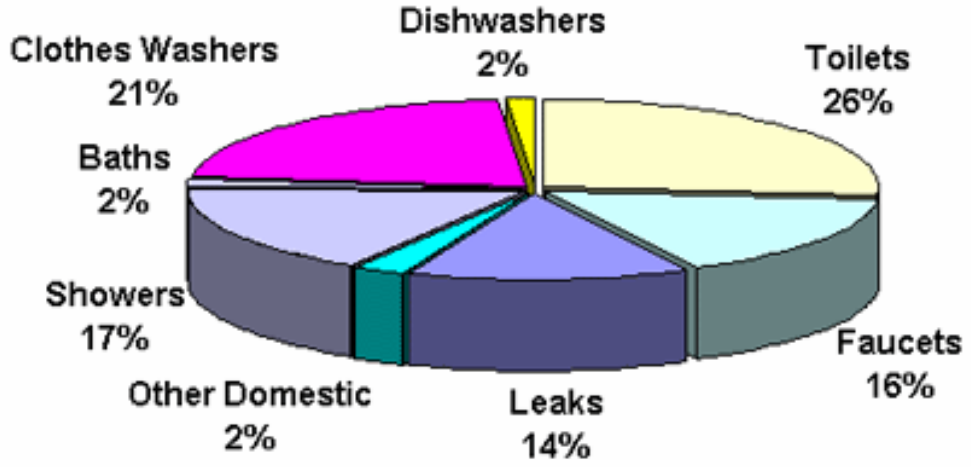

Impervious Surfaces
within the
COG Metropolitan
Washington Region
1999-2000
Olney
COG Jurisdictions
Water Bodies
Major Transportation
0 - 10
10 - 20
20 - 30
30 - 40
40 - 50
> 50
Impervious Surfaces
N

Water Quality and Resources

Little work has been done regionally to understand the direct impact of buildings and building site practices on the region's waterways and most notably the Chesapeake Bay. But national statistics offer some insight. The U.S. Geological Survey[14] estimates that the direct share of potable water used in buildings is 12 percent. As the case of stormwater impact illustrates, however, buildings' impacts on the region's water resources go beyond direct water use. Expansion of impervious surfaces correlates with increased toxicity of the region's water; the high velocity of runoff and lack of site perviousness reduce recharge of regional groundwater tables. Although ours is a water-rich area, periodic droughts such as those experienced this summer have put a strain on the region's water resources and have led to a drawdown of regional water supply reservoirs.

The graph below shows water use percentages for an average U.S. home. It is worth noting that 26 percent of the average American home's potable water is used for the sole purpose of flushing toilets.

Typical Water Use in an American Home



Source: America Water Works Association

[14] Estimated Water Use in the United States in 1995. U.S. Geological Survey. http://water.usgs.gov/watuse/pdf1995/html

Construction and Building Operations Impact

Building and other construction activities regularly release sediment into the region's waterways because of poor site management practices. Building operations such as cleaning, painting, and maintenance release a variety of organic solvents and other petroleum products into regional watersheds. Downstream jurisdictions are often the recipients of upstream contributions, which can dramatically impact local water quality as well as stormwater volume. Building materials that leach over time may release arsenic, formaldehyde, and lead onto ground surfaces, to be washed into the region's waterways by rain. Grounds maintenance contributes nitrogen and phosphorus from fertilizers, causing algae blooms downstream and robbing the Chesapeake Bay of essential oxygen. According to the Chesapeake Bay Program[15], over 90 percent of the Chesapeake Bay and its tributaries fail to meet water quality standards for dissolved oxygen and water clarity, conditions directly attributable to nutrients and sediment. In spreading "dead zones" there is no longer sufficient oxygen in Bay water to support life.

The federal 1972 Clean Water Act and the regional 1983 Chesapeake Bay Program, followed by the 2000 Chesapeake Bay Agreement, are being used to address these and other water quality issues. The region has nearly achieved its phosphorus reduction goals—yet despite billions of dollars of investment in state-of-the art wastewater treatment plants, it has not met water quality goals for reducing nitrogen levels. "Non-point" source pollution comprised of urban and suburban stormwater, together with agriculture-related runoff, are key contributors. Thousands of cumulative decisions made by building developers, managers, and users continue to compromise the quality of the region's waterways and, most acutely, of the Chesapeake Bay.

Air Quality

The Metropolitan Washington region continues to make progress on air quality, but remains a federal "nonattainment" area. This is due primarily to the high levels of ground-level ozone and fine particulates in the region's air, caused by burning of fossil fuels. Buildings and building-related activities are in the top ten list of sources for air pollutants because so much of the electricity they consume is generated by fossil fueled power plants[16]. Buildings also contribute to air pollution through operations, site development, and site management practices. The U.S. Environmental Protection Agency[17] estimates that nationally, building and building-associated activities account for:

- 49 percent of sulfur dioxide (SO_2) emissions;
- 25 percent of nitrogen oxide (NOx) emissions;
- 10 percent of particulate (PM_{10}) emissions.

All of these contribute to poor air quality and associated health problems. Nitrogen oxide is a principal component of smog and a contributor to ground level ozone formation. Sulfur dioxide is a precursor to fine particulate pollution. Additionally, volatile organic compounds (VOCs) are

[15] www.chesapeakebay.net

[16] Plan to Improve Air Quality in the Washington, DC-MD-VA Region, State Implementation Plan (SIP) for 8-hour Ozone Standard, May 23, 2007

[17] US EPA 2007. An Introduction to Indoor Air Quality: organic Gases. http://www.epa.gov/iaq/voc.html#Health%20Effects

released regularly from building materials, finishes, solvents, and paints. Pollutant releases such as these are conveyed regionally across air sheds, impacting local jurisdictions and their neighbors—and beyond.

COG's ***Plan to Improve Air Quality in the Washington, DC-MD-VA Region***, developed in conjunction with local jurisdictions, the District of Columbia and state air agencies to meet federal ozone health standards identified management of emissions from electric power plants is a key strategy.

Buildings and Ground-Level Ozone

Ground-level ozone is formed when NOx and VOCs react with one another in the presence of heat and sunlight—typical hot summer day conditions in the Washington area. Regional building electricity consumption is directly related to the formation of unhealthy, ground-level ozone due to emissions of NOx from power plants and on-site emissions of NOx and VOCs. On-site oil and natural gas combustion, construction equipment idling, and grounds maintenance equipment emissions contribute to this problem, as do VOC emissions from building materials and products. Research by the Connecticut Department of Environmental Protection[18] indicates that the highest days of electric demand in the Northeast and Mid-Atlantic states correlate strongly with the worst quality air days in those regions.

The American Lung Association[19] reports that approximately one third of children in the Metropolitan Washington region and one third of residents over 65 have chronic respiratory problems exacerbated by excess ground-level ozone. A Johns Hopkins University study correlates increased deaths from asthma with rises in local ground-level ozone.[20]

Heat Island Effect

The region's air quality problems are exacerbated by heat island effect—the heating of rooftops and paved areas. These surfaces absorb heat from sunlight and release it back into the atmosphere over time. Ambient air temperatures in built-up areas and parking lots can be 2° to 5° F hotter than in vegetated areas, and rooftop temperatures can reach temperatures of 150° to 190° F on hot summer days[21]. This in turn promotes increased use of air conditioning during peak loads of the day. Urban heat islands not only make life less comfortable, they contribute directly to unhealthy ozone production as heated air catalyzes reactions between NOx and VOCs.

The illustration below shows the reflectance values of various built environment surfaces, and illustrates the effect that building materials choices have on ambient air. The higher the reflectance value, the cooler the surface remains. The coolest surfaces are objects painted white and the reflective roof. As is illustrated, building materials choices can exacerbate or help mitigate heat island impact on the local environment.

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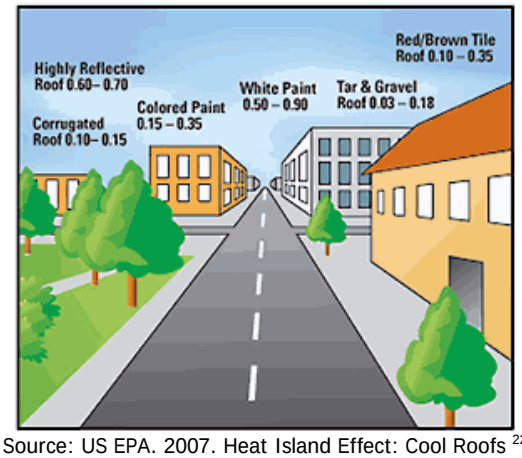
[18] US EPA 2007. An Introduction to Indoor Air Quality: Organic Gases. http://www.epa.gov/iaq/voc.html#Health%20Effects

[19] *American Lung Association, State of the Air Report, 2006, www.lungusa.org*

[20] Bell M, Peng R, Dominici F (2006) The Exposure-Response Curve for Ozone and Risk of Mortality and the Adequacy of Current Ozone Regulations, Environmental Health Perspectives,114: 532-536.

[21] US EPA. 2007. Heat Island Effect: Vegetation & Air Quality. Most recent update Jan 16, 2007. http://epa.gov/heatisland/strategies/level3_vegairquality.html.

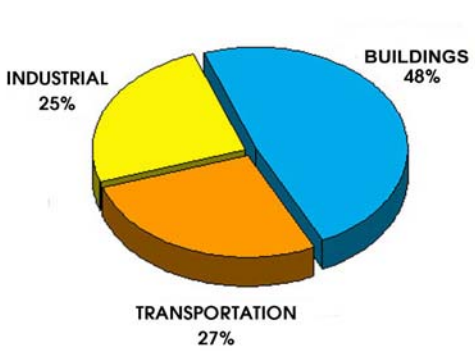
Various Roof Albedos: Reflectance of Built Environment Materials



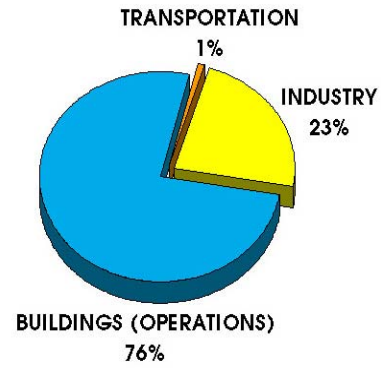
Source: US EPA. 2007. Heat Island Effect: Cool Roofs [22]

Energy and Climate Change

Buildings use a major share of the nation's energy. Analysis of U.S. Energy Information Administration[23] and U.S. Energy Research Development Administration data on building construction and operations the ***2030 Challenge*** suggests that when all building-related activities are accounted for and the embodied energy of building materials is considered, buildings are responsible for 48 percent.[24] of U.S. energy use, rather than the 39 percent primary energy use reported by U.S. EPA and calculated by the U.S. Department of Energy.[25]



U.S. ENERGY CONSUMPTION



U.S. ELECTRICITY CONSUMPTION

Source: 2030 Challenge Analysis, Energy Information Administration Statistics
(energy consumption figures include primary and embodied energy use – see Footnotes 24 and 25)

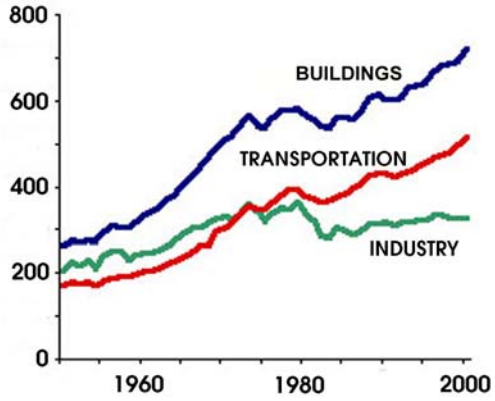
[22] http://www.epa.gov/heatisland/strategies/coolroofs.html
[23] www.eia.doe.gov
[24] The total building sector figure is derived from U.S. Energy Information Administration 2000 figures for residential building operations, commercial buildings operations, industrial building operations, and U.S. Energy Research and Development Administration 2000 annual building construction and materials embodied energy estimates. Figures were compiled and analyzed by Ed Mazria, 2030 Challenge. See www.architecture2030.org/current_situation/building_sector.html.
[25] The term "primary energy use" refers to energy that is used on site, plus losses that occur in its generation, transmission, and distribution. www.eia.doe.gov/emeu/efficiency/ee_gloss.htm

Building operations account for up to 76 percent[26] of the country's electricity consumption. The energy use of buildings accounts for much of their environmental impact—from air pollution generated at fossil fuel power plants to emissions from on-site operations to CO_2 emissions and other green house gas releases from all these sources, contributing significantly to climate change.

Beyond its contribution to environmental pollution, fossil fuel-based energy itself is a limited natural resource that will affect the sustainability of the region's building stock. The region's energy supply is highly dependent on rising global demand, tight global supplies, and high global energy prices. Multiple jurisdictions in the region would likely be impacted by supply shortages or utility infrastructure disruptions and failures caused by excessive loads.

Building Energy Use and Climate Change

As national energy consumption has gone up, so has the emission of CO_2 gasses, especially in the building sector. The accompanying graph shows the growth in CO_2 emissions from the building sector as compared to that of both industrial and transportation activities. The U.S. Green Building Council estimates, based on primary energy use alone, that buildings account for 38 percent of U.S. share of global carbon emissions.



Source: Energy Information Administration Statistics (Architecture 2030)

Most of this release is directly attributable to the burning of fossil fuels in power plants that provide electricity to buildings, and combustion of fossil fuels for heating and cooling on building sites. There is now consensus in the scientific community that CO_2 emission and other related greenhouse gasses are responsible for global warming and other associated climate changes.[27]

[26] U.S. DOE 2007 Buildings Energy Data Book, http://buildingsdatabook.eren.doe.gov/docs/1.1.6.pdf
[27] United Nations Intergovernmental Panel on Climate Change, www.ipcc.ch. For the purpose of discussion all greenhouse gasses are generally grouped under "CO_2 emissions."

Global Impacts of Carbon Emissions

The United Nations Intergovernmental Panel on Climate Change (IPCC) reviewed leading scientific reports on human activity and climate change, and concluded that between 1990 and 2000, the burning of fossil fuels globally accounted for a .7 degrees Celsius surface temperature increase.[28] The IPCC concluded that global surface temperatures will rise by 1.8° C to 4.0° C by the end of the century if action is not taken to reduce global CO_2 emissions. Estimates for sea level rise by the year 2100 as a result of global warming range from two to more than ten feet.

Scientists suggest that 10 to 50 percent of animal species on the planet are in danger of extinction depending on the rate of warming in the coming century.[29] Human communities will not be immune. More frequent and intense storms—another effect of climate change—will impact human settlements throughout the country. Waters from sea level rises will inundate communities along the nation's coasts. While there is some remaining debate about the accuracy of climate change projections, information from the environment supports the climate change consensus. The National Weather Service reports that nine of the past ten years have been the hottest years on record in the U.S.[30]

Regional Impact of Climate Change

Climate change is already being felt in the Metropolitan Washington region. Washington's celebrated harbingers of spring, the tidal basin cherry blossoms, are flowering a week earlier than they were just 30 years ago.[31] The regional agricultural planting zone chart was revised recently to account for warming trends. Hotter days in summer are likely to increase the region's Code Orange and Code Red days, as heat exacerbates formation of ground-level ozone. Human health impacts from high temperatures and increased air pollution are expected.

If regional trends will follow the rest of the country, then it can be expected that the Metropolitan Washington region will be more susceptible to frequent and intense storm event such as the rainstorm in June 2006. The two-day event delivered seven inches of rain to the area after the ground had already been saturated by a two-inch rainfall in the course of five minutes. Arlington County estimates that $ 1.7 mil of damage to public infrastructure was caused by the storm. Repairs are still ongoing.[32] The region's small agricultural sector will likely be impacted by heating trends and erratic weather patterns, as will wildlife and regional ecosystems.

Many of the impacts of regional climate change will likely fall on the shoulders of local government, testing the resilience and capacity of municipal systems. An October 2006 article published by the U.S. Conference of Mayors observes that the accelerated impact of climate change "will have a major impact on local governments including how to deal with vulnerable populations during heat waves, air quality problems, and infrastructure issues." [33] The Mayors Water

[28] United Nations Intergovernmental Panel on Climate Change, Climate Change 2001: Synthesis Report and Climate Change 2007 – IPCC Fourth Assessment Report, www.ipcc.ch
[29] Dr. James Hansen, Presentation to the 2010 Imperative Global Emergency Teach-In, February 20, 2007. www.2010imperative.com
[30] Climate Protection Center, National Weather Service, www.cpc.ncep.noaa.gov
[31] Smithsonian Institution, National Museum of Natural History www.mnh.si.edu
[32] Arlington County Department of Environmental Services, www.arlingtonva.us
[33] U.S. Conference of Mayors, www.usmayors.org

Council identified water quality and water infrastructure as the most vulnerable municipal infrastructure system.[34]

Human Health

Buildings provide the vital function of protecting occupants from the elements, helping to keep them safe and healthy. Unfortunately, buildings can also compromise human health through poor design, materials, and management choices. Historically, lead and asbestos in buildings have caused significant health issues. Today, human health risks of buildings come primarily from:

- Off-gassing of materials and finishes in buildings;
- Poor ventilation;
- Moisture build-up leading to mold growth.

The U.S. EPA estimates that Americans spend, on average, 90 percent of their time indoors, and that indoor environments can be up to 50 times more toxic than outdoor air—even in congested urban areas[35]. EPA research further indicates that up to 30 percent of new and remodeled buildings have acute indoor air quality problems.[36] The Harvard School of Public Health consistently documents 25 to 30 known airborne carcinogens and other substances known to be harmful to living organisms in the U.S. homes it tests.[37]

In the Metropolitan Washington region residents suffer from a representative share of respiratory and immune disorders—and for certain environment-related diseases such as asthma, area residents have a higher than average incidence of disease. As noted earlier, one third of the region's children and one third of the area's residents over 65 suffer from asthma and other respiratory problems[38]. Exposure to indoor air pollutants, outdoor air particulates, and ground-level ozone are associated with higher levels of asthma[39].

Common indoor air pollutants include VOCs which offgas from indoor paints, floor and surface finishes, appliance plastics, furniture, and carpets. VOC exposure can lead to nausea, headaches, and skin irritation, and prolonged exposure has been linked with nervous system and kidney damage.[40] Formaldehyde used in cabinetry is a known carcinogen and has been linked to asthma and multiple chemical sensitivity. Polyvinyl chloride (PVC) products are of special concern because of potentially toxic offgassing. When PVC smokes and burns, it releases hydrogen chloride and dioxin, a severe danger to humans. In 1998, the International Association of Fire

[34] U.S. Conference of Mayors, www.usmayors.org
[35] US EPA 2007. An Introduction to Indoor Air Quality: organic Gases. http://www.epa.gov/iaq/voc.html#Health%20Effects
[36] US EPA 2006, Indoor Air Facts No. 4 (revised): Sick Building Syndrome (SBS) http://www.epa.gov/iaq/pubs/sbs.html
[37] Interview with John Spengler, senior researcher at the Harvard School of Public Health, for articles "Healthy Buildings. Healthy people, by Stella Tarnay. Apartment Professional Magazine, January/February 2005. www.aparmentpro.com
[38] *American Lung Association, State of the Air Report, 2006, www.lungusa.org*
[39] US EPA 2007, Children's Health Protection, Respiratory Diseases http://yosemite.epa.gov/ochp/ochpweb.nsf/content/respiratory_diseases
[40] U.S. EPA 2007. An Introduction to Indoor Air Quality: organic Gases. http://www.epa.gov/iaq/voc.html#Health%20Effects

Fighters cautioned that PVC materials burning in buildings during fires "present acute and chronic hazards to fire fighters, building occupants, and the surrounding community."[41]

Poor ventilation design and construction practices exacerbate indoor air quality problems by trapping carbon monoxide (CO), exhaled carbon dioxide (CO_2), mold spores, moisture, bacteria, viruses, toxins, and dust inside occupied spaces. CO emissions can be life threatening. CO_2 accumulation is often the unacknowledged culprit in "sick building syndrome" and the familiar mid-afternoon fatigue experienced by workers and school children. Improper window installation, combined with inadequate ventilation is a classic scenario for indoor moisture and mold build-up. Mold has been linked to allergies, asthma and other respiratory problems[42].

Implications for Local Government

As primary stewards of the region's environment, Washington area local governments shoulder many of the "externalized" impacts of development. Building decisions in the private and public sector impact stormwater systems management, transportation network requirements, local medical network costs, and major investments in waste management and water treatment. Buildings—and the human activity they support—are primary drivers for public infrastructure, and of public spending.

Conventional building development, construction, and operations practices impact local government infrastructure and operations in at least the following ways:

- Vulnerability of existing public infrastructure due to increased runoff and increased intensity of storm events;
- Significant investment in large-scale stormwater management systems, including major infrastructure construction and ongoing mitigation of stormwater damage;
- Excess utility costs in public sector buildings that are not energy- and water-efficient;
- Instability of regional energy grid;
- Local emergencies and infrastructure pressure from brownouts and the growing demand on the region's energy grid;
- Absenteeism among area school children being treated for asthma and other respiratory symptoms;
- Reduced productivity in the region's economy and among public sector workers due to sick building syndrome and environment-related health impacts;
- Strain on local heath care systems due to environment-related illnesses;
- Compromised ecosystems and lower quality of life in local communities.

The stakes are high from a federal regulatory perspective as well. If the Metropolitan Washington region does not meet its 2000 Chesapeake Bay Agreement goals, reaffirmed in 2003, the U.S. Environmental Protection Agency can implement regulatory mechanisms under Section 303(d) of the Clean Water Act and enforcing Total Daily Maximum Loads (TMDL) throughout the Chesapeake Bay watershed. This could dramatically affect not only wastewater treatment plant discharge permits, but also municipal storm sewer system practices throughout the region. The implications of noncompliance with U.S. EPA ozone health standards under the Clean Air Act include loss of state transportation funds.

[41] Healthy Building Network, www.healthybuilding.net
[42] U.S. EPA, Mold. www.epa.gov/mold

Regional Environmental Benefits of Green Building

Green building practices provide site-specific and regional benefits through savings in energy, resource use, and through reduction of outdoor and indoor pollutants.

Improved Regional Air Quality

The ***Plan to Improve Air Quality in the Washington, DC-MD-VA Region*** to meet EPA's air quality standards targets[43] identifies green building as a strategy to reduce the ozone-forming pollutants VOCs and NOx and fine particulates through reduced energy demand in building operations, most notably for electricity. Because green buildings typically consume 30 to 50 percent less energy than conventionally constructed buildings, green building practices have the potential to cut buildings' share of regional ozone production substantially. Municipal efforts to improve building efficiency in Montgomery, Arlington, and Fairfax counties have to date generated annual electricity savings of approximately 15,000 MWh[44], with accompanying reduction of VOCs and NOx emissions. Reduced energy demand will also lead to reductions in SOx emissions, fine particulates, and greenhouse gases.

Other green building site practices can also assist in air quality improvement. Buildings with green and reflective roofs reduce heat island effect, reducing one more precursor to ground level ozone. Green building site practices that encourage tree preservation and enhance native ground cover will also support removal of air pollutants from the air.

Improved Water Quality and Water Supply

Green buildings that incorporate water conservation and on-site stormwater treatment reduce potable water demand and minimize stormwater runoff. Water conservation techniques inside green buildings may include water-saving faucets and showerheads, low-flow and dual-flush toilets, waterless urinals, and greywater and rainwater recycling for toilet flushing and irrigation. Green buildings practices can reduce potable water demand by 40 percent or more.

Stormwater management techniques in green buildings may include rain-collection cisterns and regionally appropriate plantings on the ground or on building roofs. Green building best management site practices that support regional water conservation, water quality, and stormwater management include:

- Green roofs that absorb stormwater, filter water pollution, and absorb heat;
- Green walls, raingardens, and regionally appropriate plantings that facilitate groundwater absorption and reduce runoff;
- Smaller building footprints that reduce cumulative impervious coverage;
- Pervious paving that helps absorb rainfall and recharge groundwater;
- Environmentally sensitive grounds management that reduces or eliminates the need for fertilizers and pesticides.

[43] Plan to Improve Air Quality in the Washington, DC-MD-VA Region, State Implementation Plan (SIP) for 8-hour Ozone Standard, May 23, 2007

[44] Plan to Improve Air Quality in the Washington, DC-MD-VA Region, State Implementation Plan (SIP) for 8-hour Ozone Standard, May 23, 2007

The quantitative benefits of green building practices on the region's water quality and the Chesapeake Bay have not been systematically considered. However, reduction of non-point source pollution and the need to strengthen stormwater management efforts have been identified as critical shared issues by COG member municipalities, particularly in regard to Chesapeake Bay restoration efforts.

With a combination of green building and comprehensive (Low Impact Development (LID)[45]techniques which employ water protection measures such as bioretention facilities, bioswales, vegetated roofs, and pervious paving, it may be possible to achieve near-zero water discharge from building sites, as is being demonstrated at the recently completed Louis Dreyfus green office building on New York Avenue in the District of Columbia.[46] A recent analysis by Casey Tree and LimnoTech concluded that if one fifth of all buildings over 10,000 square feet in the District of Columbia had green roofs, combined sewer overflow events could be reduced by 15 percent.[47] A greater understanding of building site practices and related regional water issues will help COG members better assess the potential regional benefits of green building and LID to improvement of water quality and the restoration of the Chesapeake Bay Agreement goals.

Green Building Contribution to Regional Energy Conservation and Security

The COG 2006 ***Energy Strategic Plan***,[48] endorsed by the COG Board, calls for three parallel approaches to managing the region's energy resources:

1. Developing policies and adopting best practices that significantly increase the energy efficiency of vehicles, appliances, and buildings;
2. Diversifying the region's energy sources to include an increased use of "green energy" and renewables;
3. Raising awareness of energy users so that they can make wise energy choices by creating a "culture of conservation."

The plan also recommends three best management practices for promoting energy efficient buildings:

1. Insure that building and conservation choices reflect the latest advances in building energy efficiency;
2. Promote and adopt USGBC LEED or similar standards for renovation and new construction;
3. Promote incentives for business and households to use the most energy efficient building practices when renovating or building new.

As noted in the plan, green building practices are integral to the region's strategy for conserving energy and reducing energy dependence. Green building also provides opportunities to invest in green energy, and to produce energy on site. Integration of solar and geothermal technology in

[45] Low Impact Development (LID) is a new comprehensive land planning and engineering design approach with a goal of maintaining and enhancing the pre-development hydrologic regime of urban and developing watersheds. www.lowimpactdevelopment.org
[46] www.1101newyorkavenue.com/main.html
[47] Casey Trees, www.caseytrees.org
[48] COG: Environment, www.mwcog.org

green buildings will be especially useful in taking pressure off the energy grid during peak demand hours. Green buildings can *return* power to the grid.

Green Building Contribution to Climate Protection

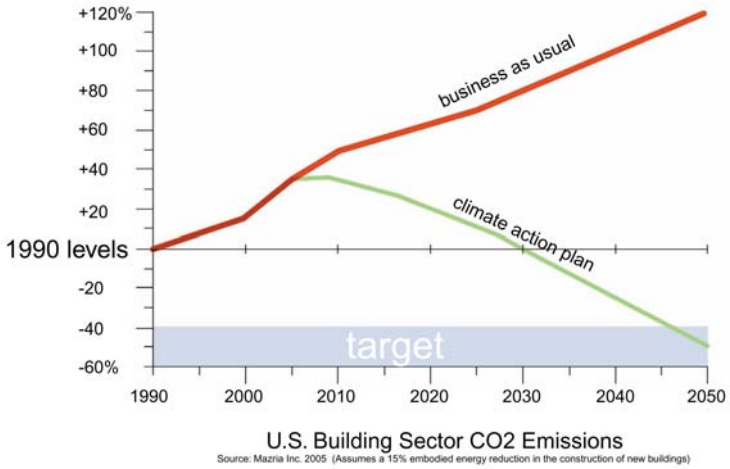
Local governments in the COG region have been implementing climate protection measures to a modest extent since the 1990s, when COG and local partners created a partnership with ICLEI-Local Governments for Sustainability,[49] a nonpartisan organization that promotes climate protection and provides technical assistance. Energy conservation efforts for public buildings in COG municipalities have reduced carbon emissions as energy use has decreased. In 2004 COG joined the ENERGY STAR program to promote energy efficiency in the region. More recently, local government initiatives have specifically targeted climate emissions as part of its 2007 agenda. COG Climate Change Initiative will soon be considering options for reducing greenhouse gas emissions. Regional adoption of green building policies will figure prominently in this effort.

Buildings' contribution to climate change is significant—and therefore so are the opportunities for improvement. As noted previously, conservative estimates of buildings energy use by the U.S. Green Building Council indicate that buildings account for an estimated 38 percent of U.S. global CO_2 emissions. In dense urbanized areas with little industry, such as the District of Columbia and Washington's inner ring suburbs, the building share of CO_2 emissions may be even higher. New building construction and renovation that incorporates energy conservation can significantly reduce this impact.

The ***2030 Challenge***[50] a national initiative to reduce carbon emissions from buildings, proposes that buildings should integrate energy conservation measures and green, renewable energy strategies to become carbon neutral by 2030. With 75 percent of the nation's building stock forecast to be built new or renovated by 2035, the nation—and the region—have an opportunity to significantly reduce buildings contribution to climate change. What share of overall climate emission reduction can be achieved through buildings practice remains to be studied and better understood.

[49] www.iclei.org
[50] www.architecture2030.org

2030 Challenge
Projected Climate Emission Reductions through Green Building Activity



Green Building Contribution to LID and Smart Growth

Smart growth strategies help conserve land and preserve the environment on a regional scale and have many social and economic benefits. However, the increased density associated with smart growth in designated areas may have negative impacts on local air quality, noise, water quality, and quality of life. Green building strategies can help mitigate these problems, most notably through integration of green and reflective roofs, native plants, tree canopy improvement, and pervious surfaces in developed areas.

As noted earlier, green building is a compatible strategy with Low Impact Development (LID), through incorporation of green roofs, bioretention facilities, bioswales, and pervious paving on green building project sites. Many of these measures are already being used in concert with green building in other parts of the country. Regionally, Prince George's County was a pioneer of LID in the 1990s. Green roofs and pervious paving contribute to certification points under the US Green Building Council's LEED rating system.

Human Health and Wellbeing Benefits

Human health benefits of green building result from improvements made to indoor environments and from improved outdoor air and water quality as a result of decreased pollution. Indoor benefits are most readily felt because so many of us in the region, as in other parts of the country, spend up to 90 percent of our time indoors.[51]

Green building indoor air quality (IAQ), also called indoor environmental quality (IEQ) can be greatly improved through better ventilation, use of low and non-toxic materials, better management of building moisture, and greater reliance on natural lighting. A Carnegie Mellon University (CMU) review of 17 studies on the link between health and indoor air quality found that building occupants reported on average a 41 percent improvement in health symptoms—from the common cold to the flu, allergies, other respiratory symptoms, headaches and dizziness—

[51] US EPA, "Indoor Air Quality," January 6, 2003. www.epa.gov/iaq

as a result of IAQ improvements.[52] Asthma rates in buildings with improved IAQ measures were reduced on average by 38 percent.[53]

Long-term health benefits of green buildings include lowered cumulative exposures to VOCs, dioxins, and other toxins that have been linked to cancer, neurological disorders, and endocrine disruption. Improvements to the region's outdoor environment through reductions in buildings-related fossil fuel burning, reduced pollutants discharge into waterways, and lowered waste-related emissions, should lead to overall healthier populations. Research that produces quantitative region-based information on the health benefits of green buildings will be helpful to understanding the full positive impact that is possible.

[52] Carnegie Mellon University Center for Building Performance, 2005. wwwarc.cmu.edu/cbpd/index.html
[53] Carnegie Mellon University Center for Building Performance, 2005. wwwarc.cmu.edu/cbpd/index.html

III. Economic Opportunities for the Region

A positive and stable economic outlook is resulting in strong job and population growth in the Metropolitan Washington region. This growth, however, can only be sustained if the region harnesses its current success and leverages policies to preserve and improve the region's quality of life. Green building practices can support the growth of a regional green economy that furthers regional goals for ongoing sustainability.

Economic Opportunities through Green Building

Green businesses and industries are still in the formative stages in the region, but this new sector is growing. In October 2007 the Greater Washington Board of Trade hosted the ***Potomac Conference: Green as a Competitive Advantage*** demonstrating the growing interest in green approaches by the region's business community. Economic opportunities though green building fall generally into the following areas:

- Green consulting and design services including LEED consulting, architecture and design, engineering, and energy consulting services;
- Green products and building materials development and sales;
- Green technology services including solar energy and geothermal systems, and energy conservation systems. May include development, design, and installation;
- Green construction practices and construction-related contracting, including HVAC and green utilities installation, plumbing, carpentry, specialized green product installation, deconstruction, and green roof installation;
- Green education and research.

Together, these areas create the potential for significant job opportunities, from trades jobs to specialized opportunities in the knowledge sector, that promote economic development and a healthy regional environment.

Green entrepreneurs are responding regionally to demand particularly for commercial green building project services, green building products for small-scale residential projects, energy performance evaluation and conservation services, alternative methods for managing waste, and green roof expertise. Opportunities for design firms and construction companies with green design and LEED expertise are growing rapidly.

The Metropolitan Washington region is well positioned to develop a green economy because of its strong financial resources, strong real estate market, and its creative and intellectual capacity. Federal, state, and local government can play a pivotal role in moving this sector forward because of the large number of public facilities being built in the region. Further, targeted incentive programs as well as regulatory approaches for private green development can offer early support and markets that will help the green sector thrive. Green businesses in the region can benefit from direct assistance and entrepreneurial incentive programs, such as grants, low interest loans, or the creation of Green Opportunity Zones where preference is given to green builders and service providers. The District of Columbia is leading the way on green jobs development with the hiring of new staff to promote green employment opportunities. Montgomery County is supporting vibrant clean energy markets in the region through wind power purchases and a clean energy rewards program Similarly, in the District and in Arlington County, energy

efficiency programs and publicly sponsored energy audits in residential buildings are building demand and employment opportunities for energy services in the region.

One often unexplored aspect of green building and economic opportunity is the positive economic impact green building practices have for low- and moderate-income residents. Green housing that significantly cuts home utilities enables low- and moderate-income residents to extend their earnings into other areas where they have need. In Chicago, Bethel New Life, a faith-based community development corporation, expanded on economic opportunity further by creating training for low-income residents in nascent new green businesses such as recycling and indoor air quality protection.[54] A recent report by the Apollo Alliance, ***Community Jobs in the Green Economy: A Vision for a Green Economy and Equitable Development*** highlights the potential job opportunities of a green economy especially for urban and minority communities.[55]

[54] Stella Tarnay and Jesa Damora, Environmental Justice and Green Building: New Links for a Just and Healthy Environment, NCCED resources, Winter 2003, www.ncced.org
[55] http://home.apolloalliance.org/community-jobs-report/

IN FOCUS:
Learning from Green Entrepreneurs

Small green businesses face unique challenges in the region that will have to be addressed if this sector is going to grow. There are also opportunities for local government support. At the ***Regional Leadership Conference in Green Building***, green entrepreneurs Jim Schulman and Paul Hughes offered feedback on some of the risks and opportunities they face. Mr. Schulman recently opened Community Forklift, a surplus, salvage, and green building materials store that sells non-virgin building materials. Mr. Hughes' business, Deconstruction Services LLP, started two years ago, deconstructs homes and small commercial projects to remove useable wood, metals, shingles, cabinetry, roofs, flooring, tiles, and masonry for recycling or new uses. His company also removes toxins like mercury and Freon for safe disposal. Some of the challenges they face include:

- The materials reuse business runs hand in hand with deconstruction, they noted, and up-to-the minute market information is crucial. There are yet no clear lines of communication between salvage re-sellers and builders who may be deconstructing buildings;
- The waste hauling industry is vertically integrated, with landfills, transfer stations, etc. all under the same ownership;
- Builders don't know how to use recycled materials;
- Municipal RFP processes do not support small, alternative green businesses.

Mr. Hughes and Mr. Schulman recommended a number of steps that local governments can take to support innovative green businesses such as theirs:

- Recognize the potential of used materials and help create regional facilities for recycling and reuse;
- Create markets by requiring recycling and reuse of materials through a salvage ordinance or through policy. Requiring recycled content in roads, for example, creates a market for recycled roof shingles;
- State building codes that allow for use of recycled 2 by 4's in non-support walls to strengthen the reuse market;
- Public contracts requesting deconstruction and recycling plans to create competition to the demolition industry;

- A public requirement that a certain percentage of public projects undergo deconstruction and materials recycling;
- Build capacity for green practices in traditional industries as well as public awareness about the benefits of green business practices.

This kind of a review of green building business niches will help COG members understand how they can be most helpful in supporting the region's green entrepreneurs. Several new regional resources are worth noting in the context of green building business development. In 2006 COG published the **Builders' Guide to Reuse and Recycling**[56], a directory for construction and demolition sources and service providers in the Metropolitan Washington region, in collaboration with the Construction Material Recovery Coalition-National Capital Region. This publication is helping to bridge the information gap in the nascent industry. Also in 2006, the nonprofit Arlingtonians for a Clean Environment (ACE) published the **Green Home Building and Remodeling Resource Directory**[57] with information about green products and services for homeowners and small-scale builders

[56] www.mwcog.org
[57] www.arlingtonenvironment.org

IV. Green Building Standards

Buildings in the United State are generally regulated by building codes that insure safety and basic physical integrity and in many jurisdictions by master plan guidelines and zoning and other site design and development requirements that address a project's broader community impact. In the 1990s local governments and independent organizations began to identify and quantify practices that promote building environmental performance. Today, Metropolitan Washington region's municipalities have a range of options for defining and verifying green building performance.

Codes and Building Performance

The baseline for building performance is regulated by building codes. Building design and construction codes are supported by internationally recognized code systems specifically written to be readily adaptable to building in any region of the United States. Commercial building construction is regulated by the International Building Code (IBC), and one and two-family dwelling construction is regulated by the International Residential Code (IRC). Both codes are updated on a three-year cycle undertaken by the International Code Council (ICC). The cycle includes routine solicitation for recommended updates, technical committee review, public input, and formalized adoption every eighteen months. A revised code is published every three years, which is typically adopted by the implementing jurisdictions within their own amend- and adopt-cycle. The building code adoption rate of Washington area jurisdictions varies widely.

Building codes are written in relation to a series of recognized reference standards that govern specialized building functions. The American Society of Heating, Refrigerating and Air Conditioning Engineers (ASHRAE), Illuminating Engineering Society of North America (IESNA), and the American National Standards Institute (ANSI) are all code-referenced standards. Development of new standards is undertaken the same way the building code is updated. Once a standard is official, it is integrated into the building code as a reference, and thus becomes part of the code.

Green Building Guidelines and Certification Standards

Green building performance is generally defined by voluntary guidelines that are an overlay to building codes. Green building practices are often referred to as "high performance" building practices because they reach for the "ceiling" of best practice, while codes establish the minimum baseline. Green building guidelines generally take the following areas of building impact into consideration:

- Site planning and management;
- Energy performance;
- Indoor and outdoor water use;
- Resources use and building materials impact;
- Indoor environmental quality;
- Waste management;
- Relationship to transportation infrastructure.

A number of independent organizations, industry groups, and public agencies have quantified building performance in these areas through standardized certification systems for green build-

ing. Systems are generally point-based, with a combination of required and discretionary points earned in each area, leading to certification. Verification methods for performance vary widely, from voluntary reporting to rigorous third-party review.

The following green building rating systems are among the most prominent in use or being promoted in the U.S. They are described in greater detail in Tables 1 and 2.

LEED (Leadership for Energy and Environmental Design)
This voluntary guidance and certification system was developed by the U.S. Green Building Council through a cross-sector stakeholder consensus process. Starting with LEED for New Construction (NC) for commercial buildings, the USGBC continues to develop green standards for various building types. LEED certification is now available for new and existing commercial buildings, commercial interiors, and schools. Standards for homes and neighborhoods are in pilot. Certification through third-party review.

Green Globes
Green Globes is a voluntary on-line building assessment tool and rating system developed in Canada based on BREEAM, and supported by the Green Building Initiative, a cross-sector private industry coalition. New commercial projects are self-assessed and certified, with third-party certification available.

ENERGY STAR
This federally sponsored certification and labeling program rewards energy conservation in buildings and products with the widely recognized ENERGY STAR logo. New and existing commercial projects and new homes can earn the ENERGY STAR logo through verifiable energy performance of at least 15 percent better than 2004 energy codes.

EarthCraft
Developed collaboratively by the Greater Atlanta Homebuilders Association and Southface Institute, this contractor-oriented regional standard is now available in many parts of the U.S. EarthCraft certification systems have been developed for new single family and multifamily homes, home remodeling, affordable housing, and communities. Certification is tied to ENERGY STAR level performance and third-party verification.

Green Communities
The Green Communities guidance and certification system was developed by affordable housing lender Enterprise and partners to promote environmental performance, affordability, and healthy indoor environments in affordable housing. Participation is accompanied by loan and grant support. Compliance verified by Enterprise.

NAHB Model Green Home Building Guidelines
This new homes standard was developed by the National Association of Homebuilders to encourage mainstream builders to adopt greener building practices. Voluntary self-certification. Adaptable by local homebuilders associations to regional markets.

Regional Green Home Building Programs - Colorado Built Green
Representative of a number of regional green home programs and certification systems, Colorado Built Green was developed by the Homebuilders Association of Metro Denver and state agencies in the 1990s to promote green home construction in their region. Voluntary self-certification is verified randomly by program inspectors.

Jurisdiction-specific Green Home Programs – Austin and Arlington County

Representative of a number of local jurisdictions nationwide, the City of Austin and Arlington County each developed guidance and certification systems for green homes construction and renovation. Voluntary compliance with Arlington County's **Green Home Choice** program is verified by County building inspectors, and Austin's **Green Homes** program performance is verified by trained third-party inspectors. Certification systems are accompanied by program support and public education workshops.

Standards Application for Commercial[58] Buildings

LEED NC, developed in 2000, was the first comprehensive green building standard developed in the U.S. for the commercial building market. It has been widely adopted by the private and public sectors, with over 8,000 building projects registered with LEED in the United States, and nearly 1,000 certified. Federal, state, and local government agencies are proportionately the highest users of LEED. The USGBC's LEED for commercial interiors (CI), commercial existing buildings (EB) and speculative core and shell (CS) development standards are broadening the range of possibility for greening commercial projects through a verifiable, comprehensive green building system. LEED NC is being successfully applied to new office buildings, municipal facilities, large multifamily buildings and until recently, schools, which now have their own standard. Private developers and public agencies often use ENERGY STAR as a complimentary standard.

Several other standards have applicability in the commercial sector, especially in multifamily residential buildings. Green Globe's web-based self-assessment standard is applicable to a wide range of commercial projects. Introduced in 2004, the standard has not been widely applied. EarthCraft and Green Communities offer standards that are applicable to multifamily projects. They are receiving strong interest in the affordable housing sector. Green renovation standards for commercial buildings are in their early phase of development, with the U.S. Green Building Council offering the only existing building certification system, LEED EB.

Green building—and green building standards--continue to evolve. Local governments face the question of which standard will best meet their goals for green building performance in public buildings and for promoting private sector adaptation. As most of the regional environmental and climate impact comes from existing buildings, COG and local jurisdictions will need to take a close look at how the region can meaningfully address this impact through application of LEED EB or other approaches. For new commercial projects, the applicability of guidelines for specific building types needs to be evaluated and applied appropriately—for example, while LEED NC has been successfully applied to a variety of commercial building types, new LEED guidelines for schools and developing LEED guidelines for health care facilities are likely to be more appropriate for new projects of that type in the future. The California Collaborative of High Performance Schools (CHPS)[59] green building criteria as well as LEED for Schools deserve examination as COG considers a regional green schools standard.

Table 1 provides a more in-depth overview of available green building standards that incorporate guidelines for commercial and multifamily structures. **Table 2** focuses on green building standards for single-family and small-scale residential projects. There is overlap between the

[58] The designation "commercial building" generally applies to commercial buildings and high-rise multifamily buildings

[59] www.chps.net

tables, as some standards such as LEED and EarthCraft have guidelines for both commercial, residential and neighborhood projects

GSA Green Building Commercial Standards Evaluative Study

In 2006 the General Services Administration asked similar questions to those posed by Metropolitan Washington governments. Like many local and state agencies, GSA had started using LEED in 2003, when there were few competing systems on the horizon. In 2006, GSA and the U.S. Congress wanted to take a second look. The GSA asked the Pacific Northwest National Laboratory[60] to conduct a review of available rating systems for their applicability to GSA projects.

The GSA research team reviewed over 30 national and international green building standards for possible applicability to the federal buildings under development and control of the GSA. The federal agency's criteria for building performance are similar to those of local government. As long-term owners of buildings and stewards of the environment and the public purse, GSA is focused on long-term quality and durability, operating costs over the life of the building, environmental impact during construction and lifecycle of buildings, operations performance, and health of occupants.

The GSA report initially reviewed and screened all 30 rating systems based on the criteria of relevance, measurability, applicability, and availability to GSA projects. The team then selected five systems for further evaluation: BREEAM, a British rating system[61] for residential and commercial projects; CASBEE, a Japanese lifecycle assessment tool[62] for buildings; Green Globes;[63] LEED; and GBTool, an international evaluation system for buildings developed for the Green Building Challenge[64]

[60] Pacific Northwest National Laboratory, **Sustainable Building Rating Systems Summary**, conducted for GSA by the Pacific Northwest National Laboratory, July, 2006. PNNL-15858
[61] www.breeam.org
[62] www.ibec.or.jp/CASBEE/english
[63] www.greenglobes.com
[64] www. greenbuilding.ca/gbc2k/gbc-start.htm

TABLE 1. *Green Building Standards for Commercial and Multiple Building Types*

LEED (Leadership for Energy and Environmental Design)

LEED is a voluntary point-based rating and certification system developed by the U.S. Green Building Council (USGBC) in 2000 through a cross-sector stakeholder consensus process. Prerequisite and volunteer points are earned in:

- Sustainable Site Planning;
- Water Management/Efficiency;
- Energy Management/Energy and Atmosphere;
- Materials and Resources/Material Use;
- Indoor Environmental Air Quality;
- Innovation and Design Process.

Certification at Platinum, Gold, Silver, and Certified levels of certification level, based on green strategies. Certification process includes registration, ongoing documentation, third-party review, and commissioning. Rating and certification for:

- Commercial New Construction (LEED NC);
- Commercial Existing Buildings (LEED EB);
- Commercial Interiors (LEED CI);
- Core and Shell Development (LEED CS);
- Schools (LEED S);
- Homes (LEED H) – in pilot;
- Neighb. Development (LEED ND) – in pilot;
- Retail – in development;
- Health Care – in development.

Over 8,000 U.S. projects are currently registered with LEED, and over 1,000 are certified.

Green Globes

Green Globes is an on-line building assessment tool and rating system for commercial buildings adapted from the British BREEAM and Canadian Green Globes, and brought to U.S. market in 2004 by the Green Building Initiative, a cross-sector private industry coalition. The web-based tool allows project professionals to self-assess project environmental performance at various stages of development. Points are earned in:

- Project management and integrated design;
- Site development;
- Energy reduction and renewable sources;
- Water conservation/treatment;
- Indoor environment;
- Resource, building materials and solid waste.

Self-assessment and certification at one to four Globes based on green strategies. Third-party certification available.

ENERGY STAR

ENERGY STAR is a certification and labeling program developed by U.S. EPA and co-managed with U.S. DOE. Buildings, building components, appliances, and lighting that meet federal certification requirements for energy efficiency can carry the ENERGY STAR label.

- *Commercial Projects* – certification is achieved through energy modeling and testing that demonstrates at least 15 percent improved energy performance over the 2004 energy code.
- *Residential Projects* –certification is achieved by scoring at least 15 percent above the 2004 International Residential Code (IRC) on HERS performance test.

Statement of energy performance includes CO_2 emissions. EPA and DOE are in pilot phase of an ENERGY STAR indoor air quality standard.

Green Communities

Green Communities is a voluntary rating and certification standard launched in 2004 by the Enterprise Foundation and partners to support green affordable housing and mixed-use development. Green Communities criteria address:

- Sustainable building materials;
- Materials for human health;
- Water-and energy conservation;
- Site improvement;
- Owner and resident training/education;
- Proximity to transportation.

Builders earn certification by complying with mandatory criteria in each area and voluntary measures. Third-party verification by Enterprise.

EarthCraft

Developed in 1999 by the Greater Atlanta Homebuilders Association and the Southface Energy Institute as a regional green building standard for homes, EarthCraft now has point-based guidance and certification standards for:

- New single-family homes;
- Home remodeling;
- Multifamily projects;
- Communities;
- Affordable housing.

Prerequisites for 30 percent improved energy performance over Energy Code and indoor air measures, with flexible points in other areas.

Certification by EarthCraft inspector. ENERGY STAR certification is mandatory for new home and multifamily projects

TABLE 2. *Green Building Standards for Homes*

National Association of Home Builders (NAHB) Model Green Home Building Guidelines

Voluntary self-certifying new home standard aimed at mainstream homebuilders. Required and flexible points in six guidance areas:

- Lot designs, preparation, and development;
- Resource efficiency;
- Energy efficiency;
- Water efficiency/conservation;
- Occupant comfort and indoor environmental quality;
- Operation, maintenance and homeowner education.

Certification at Gold, Bronze, and Silver level. Extensive participation from building industry and manufacturer groups. Adaptable by local homebuilder associations. NAHB is working with the International Code Council to create a standard for all residential types based on the Model Green Home Guidelines. Release expected in 2008.

LEED for Homes

Voluntary point-based standard for residential projects under four stories. Compliance areas similar to those of commercial LEED. Currently in pilot

EarthCraft

Developed in 1999 by Greater Atlanta Homebuilders Association and Southface Energy Institute. Point-based guidance and certification standards for: new homes and remodels. Prerequisites for 30 percent improved energy performance over Energy Code and indoor air measures, with additional flexible points in:

- Site;
- Energy-efficiency;
- Durability;
- Indoor air quality;
- Resource efficiency;
- Waste management;
- Water conservation.

Certification by third-party EarthCraft inspector. Energy Star certification mandatory for new homes.

Colorado Green Builder Program

Developed jointly in 1995 by Home Builders Association of Metro Denver, the Governor's Office of Energy Efficiency and Conservation and others. Over 30,000 homes have registered. Built Green certification for builder practices that:

Provide greater energy efficiency and reduce pollution;
Provide healthier indoor air;
Reduce water usage;
Preserve natural resources;
Improve durability and reduce maintenance.

Standard includes energy efficiency prerequisite and flexibility additional points. Self-certification program, with 5 percent random verification by third-party inspectors. The Colorado Green Builder Program, like other homebuilder association-based programs, provides technical support and workshops, including Realtor training.

Austin Green Homes

Voluntary point based program managed by City of Austin staff. Builders earn from one to five Green Home stars based on measures for:

- Energy efficiency;
- Testing;
- Water efficiency;
- Materials efficiency;
- Health and safety;
- Community.

Performance is verified by a certified SMART HOUSE inspectors.

Arlington Green Home Choice

Voluntary point based program managed by Arlington County, VA staff. Based on EarthCraft and adapted for urban conditions. County building inspectors verify performance.

After thorough evaluation and analysis, GSA confirmed the initial decision to use LEED as a green building standard and evaluation tool for its building stock. LEED's strengths lie in its recognized, widely understood tracking and evaluation system, its technical content, compatibility with GSA building types and performance goals, its relative maturity, its commissioning and verification process, and the consensus, cross-sector basis of its development. To date, over 1,000 public building projects have been registered with LEED by local, state, and federal agencies.

The City of Seattle web site[65] assesses the value of LEED as follows:

Using a national standard such as LEED helps establish minimum performance levels, creates a common dialogue for discussion, and allows Seattle to measure its building performance relative to other jurisdictions using the same system. In addition, technical rulings, training, networking and marketing support are provided by the USGBC.

The U.S. Green Building Council continues to develop LEED criteria for building and project types, and to update and improve existing certification standards. LEED commercial standards are well developed, with enough of a track record to be valuable as a regional standard for green building. Energy performance was previously identified as a LEED shortfall because, under LEED's flexible points system, required "prerequisite" points for energy conservation were modest. The cities of Portland, OR and Seattle responded to this deficiency by supplementing LEED with localized requirements for energy performance, as well as localized requirements for stormwater management and waste recycling. In the summer of 2007 USGBC responded to this criticism and growing concerns about climate change by adding two additional "prerequisites" to the energy section of LEED. ENERGY STAR also has proven to be a useful tool in support of energy performance—on its own, and in combination with LEED.

Certification remains an important component of the LEED process. With its third-party review and commissioning requirement, certification under LEED ensures that planned green building features are actually incorporated and successfully carried through to completion. Regional storm water issues and continuing problems with Chesapeake Bay water quality suggest that the Metropolitan Washington region may benefit from a customized regional LEED standard that takes these concerns into consideration.

Green Homes Standards

At least four national organizations offer green building standards for single and small-scale multifamily homes. No one standard dominates the residential sector. NAHB's Model Green Home Building Guidelines, targeted at mainstream builders, received a strong release in 2004 from the Green Building Initiative, the industry organization that also launched Green Globes in the U.S. Homebuilder associations in many parts of the country are considering adopting the standard for local markets. EarthCraft, developed in the 1990s for new single-family homes, now has a comprehensive program that includes renovations, multifamily projects, and affordable housing. The standard is supported by a technical assistance and training program, with third-party verification. Regions in Colorado and Washington State have made excellent progress with collaborative cross-sector green home programs. Builders in Colorado have registered over 30,000 homes with the Green Built certification program. LEED for Homes, due for release from pilot later in 2007, will no doubt impact the field.

Homebuilding is a dispersed industry, and third-party certification of each individual home not always logistically feasible. This is one reason why developers of several standards have chosen voluntary compliance. Colorado's Built Green program randomly checks 5 percent of registered projects to verify compliance. Individual project budgets for residential projects are also generally lower than those for large commercial buildings. Keeping costs low has been another reason for developing voluntary, self-assessment standards. Nevertheless, standards that incorporate a third party verification process offer the best assurance of performance.

[65] www.seattle.gov/sustainablebuilding

The City of Austin and Arlington County responded to these issues by creating publicly funded green home programs. Standards are managed by municipal staff, and publicly funded inspectors verify compliance. Further, both programs support builder and homeowner education, and provide some level of technical assistance. Each has been well-received by building contractors and the public. The USGBC is currently considering a partnering certification system that may involve local municipalities and private providers to manage certification of LEED for Homes.

Appropriate application of green home guidelines for the Metropolitan Washington region will require further consideration as the residential green building field develops.

Greening the Codes

In 2006 the US Green Building Council launched a collaborative process with the American Society of Heating, Refrigerating and Air Conditioning Engineers (ASHRAE), the Illuminating Engineering Society of North America (IESNA) and the American National Standards Institute (ANSI) to develop code-based reference standards for green building. **Standard 189P**, *Standard for Design of High-Performance Green Buildings Except Low-Rise Residential Buildings*,[66] is currently in development following an initial public comment period in the summer of 2007. Green building program staff from Austin and Seattle has been actively engaged in the process. **Standard 189P** will address minimum requirements for the design of sustainable buildings, and compliance with 189P is expected to become a prerequisite for future LEED certification. The International Code Council is also considering incorporation of green building components into its standards. The International Energy Code has become the international standard for energy performance, adopted by leading jurisdictions in the U.S. that are moving ahead on green building and climate protection.

Green building reference codes will help to address the questions of broad application and compliance for green building. Because new code adoption is accompanied by inspector training, the greening of codes will also build capacity in local building departments where such codes are adopted.

Standards for Green Neighborhoods and Communities

Along with the recognition that codes are an essential component of broad green building adoption, green building advocates have begun to look beyond individual buildings to promote environmental sustainability. Neighborhood-based solutions offer advantages of scale and opportunities to integrate green building practices with LID, community planning, and smart growth. Enterprise linked green building standards for environmental performance with requirements for occupant health, and location standards that take walking and public transportation access into consideration. This type of integrated strategy supports communities while it protects the environment. Enterprise released its Green Communities standards in 2004. EarthCraft's green communities standards followed, and USGBC is currently piloting the LEED neighborhood development (ND) standard, developed in partnership with the Natural Resources Defense Council, the Urban Land Institute, and the Congress for New Urbanism.

[66] www.usgbc.org/News and www.ashrae.org/publicreviews

Green Building Across Jurisdictional Boundaries

Developers and contractors who build across the region often speak of wanting a level "playing field" of expectations. Varying code applications and permitting processes currently make that a challenge in the Metropolitan Washington region, even for conventional development. A successful green building policy and accompanying programs will need to address the following issues:

- Because jurisdictions in the Metropolitan Washington region operate in different state legislative contexts, they have varying rates of flexibility in adopting progressive codes and adopt codes at different rates. Some are behind base performance reference codes in green rating systems such as LEED and ENERGY STAR.
- A regional green building standard will need to be widely understood and accepted by jurisdictions with very different development realities—from the most urban to rural communities.
- Appropriate and verifiable green home standards for new projects and renovations;
- Guidelines for green building management and operations for existing buildings. Much of the environmental impact from buildings in the region comes from existing buildings;
- Integration of selected green building standards with complimentary LID, smart growth, community development, and transportation strategies.

These issues will require more than a singular policy statement or rating standard for green building in Metropolitan Washington, but rather, a coordinated approach to policy development and education for sustainable development.

V. Trends and Best Practices in Green Building

National Overview

Green building practices are being adopted at an accelerated rate nationwide as awareness of the need for environmental protection and of the performance benefits of green buildings grows. From federal agencies such as the General Services Administration and the Department of Defense, to corporations such as Bank of America, Hines Corporation, and Herman Miller, to educational, industry, and nonprofit organizations, leaders in the private and public sector are turning to green building techniques to improve the long-term performance of their facilities. Speculative developers are following with market products that offer greener, healthier commercial spaces and homes. In a 2006 New York Times article, Douglas Durst, developer of the green Four Times Square office tower and also of Bank of America's green headquarters building in Manhattan said, "We think that other buildings that don't do this will become obsolete and our buildings will continue to maintain their value."[67]

Over 8,000 projects are currently registered under the US Green Building Council LEED certification system. This compares to just several hundred five years ago. Nearly 1,000 registered projects have been certified. Additionally, tens of thousands of new homes are being built under a range of green home building guidelines that improve energy performance, durability, and indoor air environments. Public agencies and local governments have been leading with the highest proportional share of green building projects registered under LEED.

Local Government Programs for Green Building

Local government agencies, like their state and federal counterparts, have been early adopters of green building, most notably in western states such as California, Oregon, and Washington, where green building programs have existed for five years and longer. Today, municipal executives and elected officials in every region of the country are recognizing the environmental, health, and economic benefits of high performance buildings. Municipal green building pioneer Seattle's city council and mayor may have articulated it best when they set out to "lead by example" for green building and:

- Demonstrate the City's commitment to environmental, economic, and social stewardship:
- Yield cost savings to the City taxpayers through reduced operating costs;
- Provide healthy work environments for staff and visitors;
- Contribute to the City's goals of protecting, conserving, and enhancing the region's environmental resources.[68]

Municipal activity for green building ranges from informal staff advocacy in small jurisdictions to general policies and guidelines for green building, to ambitious programs that have a clearly defined mission and dedicated funding stream. The U.S. Green Building Council estimates that close to 100 municipalities in the U.S. have green building policies or programs in place. The cites of Portland, Seattle, Austin, and Chicago are among the nation's acknowledged leaders in

[67] William Neuman, It's Getting Easier To Be Green, New York Times, August 13, 2006
[68] City of Seattle web site, www.seattle.gov/environment/

the field, demonstrating green building in their own public projects and working collaboratively with the private sector and citizens to promote widespread adoption.

Seattle, WA

Seattle has the largest number of registered LEED buildings in the U.S. The City's green building program is part of an ambitious public sustainability agenda that incorporates climate protection, watershed and water quality protection, urban forestry, clean air, green infrastructure planning, and partnerships for green business. Strong citizen engagement and Mayor Greg Nickel's leadership on environmental issues have propelled the city to national and international prominence, most notably through the launch of the U.S. Mayors Climate Protection Agreement in 2005.

Since 2000 a legislated City **Sustainable Building Policy** has required LEED Silver certification for new City-funded projects and renovations with over 5,000 sq ft of occupied space. The policy applies to all City departments and offices, and the contractors responsible for financing, planning, designing, constructing, and managing City-owned facilities and buildings. A ***Seattle Supplements to the LEED Rating System for City CIP Managers***, updated annually, provides guidance for applying LEED within the City's codes, practices, and policies, and identifies prerequisites for energy conservation and sustainable grounds management. Housed in the Department of Planning and Development with oversight from the Office of Sustainability and Environment, the green building program is a resource to other agencies and the city at large. The program supports public and private projects in all sectors through:

- ***Incentives*** - financial and code-based incentive packages and a referral service to utility conservation programs;
- ***Technical Assistance*** - design team coaching, code assistance, design charrettes, and referrals to resources, materials, and technologies;
- ***Education programs*** - workshops, lecture series, and continuing education targeted to developers, design professionals, CEO's, building managers, homeowners, and real estate agents;
- ***Recognition*** - awards programs and publicity for successful projects.

The green building program's content-rich web page features customized information, case studies, and well-developed reference guides for homeowners. City agencies work across boundaries to support green building in the private sector. For example, Seattle City Light's BUILT SMART certification program supports green market-rate and affordable multifamily housing. Seattle Public Utilities and the greater Seattle Chamber of Commerce collaborate on industry education and job-site training.

The City expanded the scope of its green building program to include greening of the overall built environment, as reflected in the Mayor's **Environmental Action Agenda 2006-2007**. The City has a strong commitment to reducing carbon emissions. In 2007 Mayor Nickels released the Seattle Climate Action Plan with a $37 mil budget.

Portland, OR

Portland has one of the nation's most innovative green building programs, distinguished by inventive municipal toolmaking and active private sector engagement. City projects are guided by the **Green Building Policy**, legislated in 2000, which requires green building performance of all facilities constructed, owned, and managed by the City. Portland city leaders adopted the U.S. Green Building Council's LEED standard to meet regional environmental needs. The **Portland LEED Green Building Rating System** incorporates local requirements for:

- Erosion and water pollution prevention;
- Energy conservation;
- Preservation of existing building materials and reduction of construction waste;
- Measures counteracting the impact of automobiles.

The 2000 **Green Building Policy** established a Green Investment Fund (GIF) to support the work of the G/Rated green building program, which is housed in the Office of Sustainable Development. The Office also oversees programs for energy and biofuels, trash and recycling, sustainable food, global warming, and sustainable government, and hosts the Sustainable Development Commission. The G/Rated program acts as a centralized resource and oversees organizational and policy development, demonstration projects, technical assistance, permitting advice, education, classes and tours, financial assistance, projects guidance, innovation grants, and web resources for industry and homeowners.

The City has employed voluntary and regulatory green building guidelines, with incentives, to promote green building in the private sector throughout the city. Portland LEED requirements apply to private commercial projects receiving public funding, and to projects in designated city areas. Requirements are consistently matched with technical assistance and an expedited public process that supported builders who are going green. Private sector requirements and incentives were focused during early years on Portland's downtown, which was undergoing a multi-year redevelopment process. The incentive program was developed in collaboration with citizens and business leaders.

Chicago, IL

It is Mayor Richard Daley's express goal to make Chicago the greenest city in the nation. Starting with the planting of 5,000 urban trees in 1989, the City's green programs have matured to incorporate green building, 3 million square feet of green roofs, and targeted performance guidelines. **The Chicago Standard** guides facility operations and requires that all facilities meet LEED certification. The **Environmental Action Agenda 2006: Building the Sustainable City** developed with participation from 13 City agencies, outlines a comprehensive vision for the City's future and public policies to support it.

Chicago's program staff employs research, outreach, and demonstration projects to develop the City's green building programs. In 2000 the City launched a Green Homes for Chicago competition to explore innovations in homebuilding, followed by the Green Bungalow Initiative—both informing the recently released **Chicago Green Residential Standard**. In 2002 the City

completed the Chicago Center for Green Technology in partnership with the American Institute of Architect (AIA) Committee on the Environment. This pilot rehabilitation and green building on a former brownfield site was the first LEED platinum municipal building in the U.S. and now serves as a popular green education and resource center.

Chicago's green vision continues to be implemented through policies, codes, and programs that leverage both incentives and mandates including:

- ***Green Residential Standard*** – with voluntary criteria and assistance for green renovation and new construction;
- ***Green Permit Program*** – an expedited permit process that partners with private industry to reward green innovation and LEED certification;
- ***Stormwater Management Ordinance*** – requiring mitigation of stormwater flow and land disturbance from buildings, and demonstration of best practices.
- ***Energy Conservation Code*** – requiring improved energy efficiency in new building construction;
- ***Green Roof Initiative*** – partnering and facilitation for development projects that integrate green roofs and reflective roofs. Some grants are available;
- ***Construction and Demolition Recycling Ordinance*** – requires a 25 percent recycling rate for construction waste by 2006 and a 50 percent recycling rate by 2007.

The City works with private industry in a collaborative manner to promote, educate, and inspire for green building. The City's **Green Business Strategy** promotes green products, green processes, and green building in support of business.

Austin, TX

Austin's green building program is the oldest in the country, having its start as an energy conservation program fifteen years ago through Austin Energy, the City's public utility. Complementary City environmental programs include water and air conservation, environmental health, urban heat island prevention, a sustainable communities initiative, and climate protection. The program today can boast 6,500 single family homes, 13,000 multifamily units, and 12 million square feet of "green rated" commercial space. The City implements green building through:

- A locality-specific green rating system for single family and multifamily residential projects;
- LEED rating for commercial buildings;
- Legislated LEED Silver requirement for all City buildings.

The program is funded primarily through a fee assessed by the city's public utility, assuring a continual source of funding. Staff employs a series of innovative strategies and tools to work with consumers and the building industry. These include:

- Targeted collaboration with industry leaders;
- Direct technical assistance;
- Building performance testing;
- Green building phone assistance;
- Web site resources and print publications;
- Educations programs;

- Active media, community, and homeowner outreach.

Austin recently achieved its 25 percent market saturation goal. The City continues to work with industry leaders and homeowners to raise the bar for high performance, and simultaneously works to raise the floor for green building industry wide by collaborating with ASHRAE, IESNA, and the USGBC on the development of code reference **Standard 189P**.

Policies and Tools for Green Building

Local governments implement green building programs in many different ways. Green building is established in municipalities through legislative action, such as in Seattle and Portland, by executive order, such as in Chicago, and through internally developed policies. A clear vision on the part of elected leaders, active citizen engagement, and a willingness to implement and innovate by municipal staff have been hallmarks of local government success for green building.

Municipalities with the most successful green building initiatives tend to have clearly defined policies, such as the **Portland Green Building Policy** and the **Chicago Standard**. Green building programs in these jurisdictions are visible, with clear lines of authority and communication to other departments. Program staff acts as a central resource for internal education and training—for example, of building inspectors, facilities managers, and for organization-wide LEED standards training. Green building policies are supported by timely adoption of new building codes and reference standards. The City of Chicago is notable for its progressive code-based requirements for energy performance.

Greening Public Buildings

Improving the environmental performance of local government buildings is the first step toward broader jurisdictional adoption. Municipalities like Seattle, Portland, and Chicago are notable for "leading by example" for green building—demonstrating best practices in public buildings to encourage wider adoption and implementation. Most jurisdictions that have adopted green building practices for their public buildings have selected LEED as their performance standard and rating system. The LEED Silver level of certification generally supports the level of performance that most jurisdictions are seeking, with national leaders opting for Gold. Scottsdale, AZ has set LEED Gold as the performance goal for public buildings. The City of Portland adapted LEED to local priorities for water, land, and air conservation, thus creating a localized LEED rating standard. Selection of a public building standard is generally followed by staff training and capacity building to support implementation, such as that implemented regionally by the City of Alexandria, the District of Columbia, and Montgomery County.

Private Sector Incentives

Local governments engage with the private sector through a variety of means to support green building. Mandates and incentive tools that are in use include:

- Legislated or mandated guidelines that require private developers and builders to meet a high-performance standard such as LEED for commercial buildings or the Green Communities standard for affordable housing. Regulated green building guidelines are generally reserved for special development districts, targeted building types, or projects seeking variance, rezoning, or special permits;
- Green building performance tracking requirements that are part of the project review process;

- Development density/intensity bonuses that reward green building performance. Levels of density may coincide with levels of certification to be achieved. These programs are generally bonded or enforced with a regulatory mechanism to ensure compliance with anticipated performance. Failure to reach the claimed performance goal may incur a fine or failure to receive certificate of occupancy;
- Tax rebates or abatement for buildings that achieve green building certification;
- Expedited permitting for projects integrating green building;
- Grants that support green innovation, such as geothermal energy, solar panels, or registration and certification fees for a green project.

Outreach, Education, and Technical Assistance

In addition to direct incentives for private green development, many local governments employ education, outreach, and technical assistance as effective tools for promoting green building and market innovation. These have proven especially effective with homeowners and homebuilders, who historically have not had the benefit of a defined green building standard such as LEED. Outreach and education tools may include:

- Permitting advice and technical assistance for projects seeking green building goals, such as that provided by Portland's G/Rated program;
- Web and publication resources such as Seattle's green home remodeling series.
- Competitions and demonstration projects with high-profile education components, such as Chicago's Green Homes for Chicago competition and the Chicago Green Technology Center;
- Ongoing public education and outreach that promotes the benefits of green building while providing practical information, such as Arlington County's Hands On Green series and Montgomery County's Going Green at Home program;
- Links and information to outside resources such as grants, product directories, and service providers;
- Recognition for success.

Partnering for Success

Municipal leaders in green building employ a dual strategy of greening public buildings and actively engaging the private sector to promote widespread adoption of green building. Developers and builders are seen as partners in the market transformation toward sustainable development. The City of Austin has employed an ongoing strategy of work ing with industry leaders and homeowners to advance green building, thereby reaching its 25 percent market saturation goal in 2006. The City of Portland has made private industry an active partner in green market transformation, collaborating with developers to create effective incentive programs and pilot projects. The Brewery Blocks mixed-use project described in the adjoining feature box is a notable example pf public/private collaboration for green building.

IN FOCUS:
Public/Private Partnership for Green Building Innovation

Brewery Blocks
Portland, OR

The privately developed Brewery Blocks project is an example of the results that can be achieved through private innovation and a creative public sector incentive program supporting green building.

The Brewery Blocks covers a five-block area formerly the site of a brewery complex and other historic structures. Its developer Gerding Edlen[69] preserved the site's historic structures and integrated them with state-of-the-art high performance buildings. Buildings on all five blocks have earned LEED certification, with the Henry high-rise earning the first LEED Gold certification for a condominium project. The historic Armory building, now the home of a performing arts center, is the first historic preservation project to have earned a LEED Platinum rating.

All five blocks of the Brewery Blocks incorporate street-level retail with commercial or residential uses above. The developer reconnected the site to Portland's free downtown trolley and provided space for 1,300 cars underground. The project's green innovations include rooftop and facade-integrated solar panels, green roofs, and an efficient centralized chiller plant that serves all buildings and has capacity to serve the wider neighborhood. The company recycled 94 percent of the site construction waste. Buildings finished by Gerding Edlen were completed to green indoor environmental standards, and properties to be finished out by tenants or new owners were provided with green guidelines. This project has commanded some of the highest rents in the city.

Gerding Edlen sought out partnerships with the City of Portland Office of Sustainable Development and other City and State agencies, utilities, and nonprofit and educational institutions. The developer benefited from a series of public and utility grants that supported their project goals:

- $6 million low interest loan from the City of Portland for underground parking;

- $2 million grant for streetscape improvements from the City of Portland, contingent on LEED certification;
- $40,000 grant from the City of Portland Green Investment Fund in support of LEED certification;
- $160,000 grant from the Oregon Energy Trust to support a solar demonstration project;
- 45-foot height extension for LEED certification;
- 35 percent business energy innovation credits from the State of Oregon;
- Utility grants for energy efficiency measures.

"Partnerships and collaboration between public and private sector interests are very important if you want to succeed in green building. You have to raise the bar together to create livable and sustainable communities," said the company's sustainability manager Renee Worme at last fall's ***Regional Leadership Conference on Green Building***. Gerding Edlen is currently working with partners including The Natural Step[70] to reduce the carbon footprint of its projects. The firm supports sustainability intern positions for students in the department of planning at Portland State University, and seeks out the advice of faculty during design charrettes and education events.

[69] www.gerdingedlen.com

[70] www.naturalstep.org

The City of Chicago works with private industry in a collaborative manner to promote, educate, and inspire for green building. The Chicago Center for Green Technology supports the development of green businesses and provides training, such as that for building trades and homeowners. The City's **Green Business Strategy** promotes green products, green processes, and green building in support of business. The City of Seattle's department of public works collaborates with the greater Seattle Chamber of Commerce on industry education and jobsite training for green building.

Innovative regional and state-level partnerships also have supported local adoption of green building. In 1995 the Home Builders Association of Metro Denver took the lead with the Governor's Office of Energy Efficiency and Conservation to develop the Colorado Green Built program. To date, 30,000 homes have been registered with the program.

Nonprofit and educational organizations have played a vital role in promoting green building throughout the country, with benefits to municipalities and local communities. In Atlanta, the independent nonprofit Southface Institute partnered with the Atlanta Homebuilders Association to develop the EarthCraft green building rating system for homes. It is now in use throughout Atlanta and is spreading to other jurisdictions. The National Resources Defense Council was a vital partner in development of Enterprise's Green Communities, which supports green affordable housing development in many communities. The Neighborhood Technology Center in Chicago has been a local leader for sustainable urban development strategies, partnering with City of Chicago departments on innovative projects.

State and Utility Context

Local governments operate in the context of a variety of state and utility environments, which can significantly affect the applicable tools and resources for green building. Municipalities like Seattle and Austin are in the fortunate position of owning power utilities, making it easier to employ utility grants and incentives. States including Oregon, California, Washington, and Maryland, have strong energy programs that support local green building efforts and that raise the regulatory bar for conservation. The Oregon Energy Trust is a major supporter of energy innovation for Portland's green buildings.

Local governments in the Metropolitan Washington Region operate within the governance of three different state-level jurisdictions, each with unique restrictions and programs. Further, utilities in the region are privately owned and operated, creating a set of challenges for conservation and energy innovation. These conditions must be taken into account as each municipality within the region develops green building programs and incentives. It is worth noting that the Maryland Energy Administration, the Maryland Department of Natural Resources Environmental Design program, the Maryland Green Building Council, the Virginia Department of Environmental Quality, and the new District of Columbia Department of the Environment all have programs and policies that may support regional green building goals. A very recent development suggests that the utility picture may be shifting somewhat in the region. On October 16th Pepco Energy Services announced the Energy Efficiency Partnership of Greater Washington with Virginia Tech and Hannon Armstrong, a program that will bring $500 million in retrofit and energy services to the region's existing buildings.

Learning from Experience

The nation's municipal green building pioneers continue to learn through implementation, research, and reflection. In 2005 the City of Seattle reviewed the first five years of its green building activities. The **Five-Year Report: Building a Better City** noted that great progress had been made with the number of green City buildings under development and construction, and with the growth of a Seattle green market. The report addressed some of the financial structural challenges that City departments faced in applying LEED, and also recommended a high-profile communication campaign to reach deeper into local commercial and residential industries. In 2006 the City expanded its green building programs to incorporate the built environment. Austin's city council took the step to legislate public LEED standards because, between 1994 and 2000, environmental program staff found that several City departments were not sufficiently engaged in the process.

In 2004 Portland's sustainability commissioner requested a study of the Portland's green building policy and program. The study concluded that indeed, the City had "provided a pragmatic and effective framework for accelerating the pace of market transformation," pointing out that since 2001, 49 Portland buildings were registered or certified with LEED. Further, the study found that Portland was an incubator for green development, design, and planning firms, and intellectual expertise in green building. The study also identified areas for improvement, including a lack of familiarity with green building standards and processes at relevant City departments. In response the City issued a **Green Building Resolution** in 2005 that strengthens the policy by:

- Increasing requirements of new City-owned facilities to LEED Gold certification and LEED Silver for existing buildings and tenant improvements;
- Increasing the threshold for public funding of private green projects;
- Updating affordable housing guidelines to incorporate more green;
- Requiring that all new City-owned facilities incorporate an eco-roof and reflective materials;
- Requiring that all operations and maintenance at City-owned facilities follow new City guidelines for environmental performance;
- Creating baseline sustainability requirements and best practice manual for all public infrastructure including roads, pipes, sewers, and utilities;
- Strengthening green contracting requirements for all city-funded projects;
- Requiring green building training of all appropriate City project managers as well as zoning, permitting, and inspection staff;
- Improving code, permitting, and inspection processes in support of green building;
- Creating an integrated marketing effort to promote the City's green building services.

In Chicago, executive leadership and staff have employed research and education initiatives and project pilots to develop their green building programs. In 2001 Mayor Daley visited Germany on the advice of his environmental commissioner and was inspired to install the City's first green roof on City Hall, a historic public building. Today, Chicago has over 3 million square feet of green roofs on its buildings, with the purposed of reducing heat island effect, improving energy efficiency, and mitigating stormwater impact.

Richard Morgan, manager of Austin's green building program, shared his experiences at the COG ***Regional Leadership in Green Building Conference*** last September. He noted that the City had achieved its goal of 25 percent green building market saturation by engag-

ing industry leaders and homeowners.[71] Program staff encountered a high level of enthusiasm for green building among homeowners, with interest and some resistance from the private building sector. To address the participation gap, Austin decided to continue working with leaders, but is simultaneously working to raise the regulatory floor for green building industry-wide by collaborating with ASHRAE, IESNA, ANSI, and the USGBC on green building code reference **Standard 189P**.

Response to Climate Change: The 2030 Challenge

In late 2005 Architect Ed Mazria of Architecture 2030 challenged his colleagues in the architectural community to take concrete action to reduce carbon emissions from buildings. He advocated that American Institute of Architect (AIA) members reduce fossil fuel energy use in buildings by 50 percent by the year 2010 through integrated design strategies for energy conservation and use of renewable energy technologies. Further, he challenged the building industry to make all new buildings carbon neutral by 2030. Mr. Mazria's initiative has had reverberations throughout the architecture community, and has galvanized action in non-profit and local government sectors.

The **2030 Challenge** offers a model for how building design, construction, and management practices can reduce climate emissions. A shorter-term **2010 Imperative** specifically challenges building design educators to lead for climate protection through green building. The U.S. Green Building Council has committed to making climate protection a top organizational priority, with new LEED prerequisites for energy conservation passed in 2007 and CO_2 reduction benchmarks in development. The accompanying table outlines some of the national climate protection initiatives that will be relevant to the region's green building policies and climate protection efforts.

In early 2007 the AIA, ASHRAE, IESNA, Architecture 2030, and the USGBC finalized a memorandum of understanding (MOU), "establishing a common starting point and goal for net zero energy buildings." The ultimate goal of the MOU is to lay the groundwork for achieving carbon-neutral buildings by 2030.

The U.S. Conference of Mayors (USCM), the National Association of Counties (NACO) and ICLEI-Local Governments for Sustainability, and independent efforts such as the Sierra Club's Cool Cities and Cool Counties initiatives all have relevance for green building practices in the region, namely for making building practices one of the cornerstones for climate protection. The Clinton Climate Initiative is setting international benchmarks for building renovation and performance in large urban areas. ENERGY STAR benchmarking tools and ICLEI's inventory development methodology are expected to be helpful in regional efforts.

[71] "We are not there yet," said Mr. Morgan of his acclaimed residential program. "We will consider the market transformed when a home built to standard practice is so efficient that it is cost effective to install a PV system and make it a zero energy home."

TABLE 3. *National Initiatives for Climate Protection*

2030 Challenge Goals

- All new buildings, developments, and major renovations designed to meet a fossil fuel, greenhouse gas (GHG), energy consumption performance standard of 50 percent of the regional average for building type.
- At a minimum, an equal amount of existing building area being renovated annually to meet a fossil-fuel, GHG, energy-consumption performance standard of 50 percent of regional average for building type through innovative design strategies, application of renewable technologies and/or 20 percent maximum purchase of renewable energy.
- Fossil fuel reduction standards for all new buildings be increased to:
  - 60% in 2010
  - 70% in 2015
  - 80% in 2020
  - 90% in 2025
  - **Carbon-neutral by 2030** (using no fossil-fuel, GHG-emitting energy to operate)

2005 US Conference of Mayors Climate Protections Endorsement

In June 2005 the U.S. Conference of Mayors unanimously endorsed the Mayors Climate Protection Agreement launched by Seattle Mayor Greg Nickels and signed by over 400 mayors to reducing U.S. greenhouse gas emissions to 7 percent below 1990 levels by 2012. Four of the Conference's proposed actions by local governments and their communities focused on building-related decisions:

- Adopt and enforce land-use policies that reduce sprawl, preserve open space, and create compact, walkable urban communities;
- Make energy efficiency a priority through building code improvements, retrofitting city facilities with energy efficient lighting and urging employees to conserve energy and save money;
- Purchase only ENERGY STAR equipment and appliances for City use;
- Practice and promote sustainable building practices using the US Green Building Council's LEED program or a similar system.

Clinton Climate Initiative

In August 2006 the Clinton Foundation announced the Clinton Climate Initiative with 24 of the world's largest cities to develop common measurement tools, access technical expertise, and create a purchasing consortium for clean energy.

2006 AIA and US Conference of Mayors Adoption of 2030 Challenge

In June 2006 the U.S. Conference of Mayors, with the AIA, adopted the **2030 Challenge** and in a joint statement said:

> ***The US Conference of Mayors and its partner, The American Institute of Architects recognize that creating energy-efficient, high performance buildings is a central part of the climate solution. To that end, the USCM and AIA promote integrated, sustainable building design, with a goal of reaching 50 percent fossil fuel reduction by 2010 and carbon neutral buildings by 2030.***

USCM is working with ICLEI-Local Governments for Sustainability and AIA to implement these actions.

Cool Cities and Cool Counties

Sierra Club's campaign to combat global warming works with cities through the U.S. Mayors' Climate Protection Agreement and counties with a program to reduce greenhouse gas emission by 80 percent by 2050.

ICLEI

ICELI Cities for Climate protection assists municipal governments in developing and implementing local approaches to climate protection based on Kyoto Protocol goals. ICLEI provides an inventory development methodology and other assistance.

US Green Building Council Commitment to Climate Protection

In November 2006, the USGBC committed to reducing CO_2 emissions from LEED-certified buildings by:

- Requiring 50 percent CO_2 reduction for all new commercial LEED projects;
- Increasing energy reduction prerequisites;
- Initiating a CO_2 offset program based on LEED performance data;
- Providing free LEED for Existing Buildings registration for all certified commercial projects;
- Eliminating certification fees for all LEED Platinum projects;
- Making USGBC 100 percent carbon neutral by end of 2007;
- Offering "portfolio performance" program for large landlords;
- Providing professional education curriculum on reducing CO_2 emissions;
- Increasing target number for certified homes and commercial buildings.

Green Building Activity in the Metropolitan Washington Region

The Metropolitan Washington Region is an active center of green building activity, led by federal agencies and local governments renovating and building new green facilities, non-profit organizations, creative architects and developers, and citizens advocating for residential and community-scale innovation. Until two years ago, only a handful of pioneering private developers attempted green building, but the landscape has changed dramatically over the interim. The Greater Washington Board of Trade reports that there are currently 480 LEED registered projects in the Metropolitan Washington region, with 35 of the region's buildings achieving certification.[72] In September 2006 over 300 participants from across the region attended COG's ***Regional Leadership Conference on Green Building***, held at the University of Maryland. Industry and civic events related to green building are now held almost weekly in the region.

Market Activity

Markets in the Metropolitan Washington region are responding to the growing interest in green building. Commercial developers, design firms, and product and service providers are seeing business opportunities that were not evident just a few years ago.

Private Commercial and Multifamily Development

"Elevation 314 incorporates the highest standards of environmental construction, and joins them with beauty, comfort and convenience."

Russell Katz, developer of Takoma mixed use green project

Innovative developers in the District of Columbia, in Maryland, and in Northern Virginia are undertaking green building projects at an accelerated rate. Notable completed projects include:

- Tower Companies green office building in Rockville, MD and the 78-unit Blair Towns apartments, the first LEED-certified multifamily project in the country, in Silver Spring, MD;
- Elevation 314 mixed use project in Takoma, DC developed by IMOMA, incorporating 52 green rental units, three storefronts, and advanced green building systems including geothermal energy and natural stormwater retention, next to the Takoma Red Line Metro stop;
- 1101 New York Avenue in the District of Columbia, a 393,000 square foot office building registered for LEED Gold certification. Developer Louis Dreyfus has over 1 million square feet of green commercial space in development and construction;
- Turnberry Towers, a 26-story, condominium building in Arlington, VA meeting LEED certification standards.

Recent meetings of the D.C. Building Industry Association (DCBIA) in Washington DC make it clear that the Metropolitan Washington region's building industry is taking green building seriously. The BIA was an active partner in crafting the District of Columbia's 2006 Green Building Ordinance. On the construction side of commercial development, Turner Construc-

[72] As reported at the Potomac Conference, Oct. 29-30, 2007. www.bot.org

tion has made a national commitment to green building, stating: "We believe green buildings are not only good for the environment, they also provide immediate and long-term economic benefits for developers, building owners, and occupants."[73] During each of the past two years, Turner has doubled the number of LEED accredited professionals in the organization.

One challenge that commercial project developers are facing is that commercial tenants are not asking for green building features, despite their proven value. However, the shift toward green commercial development is likely to be pushed from the regulatory and public incentive side. Arlington County's green plan requirements and incentive program are "greening" hundreds of thousands of square feet of commercial space. The District of Columbia's 2006 Green Building Ordinance will require that all commercial projects over 50,000 square feet be designed and built to LEED certification standards by 2012. Montgomery County's Green Building Legislation requires the equivalent of LEED certification of all private commercial buildings over 10,000 square feet by 2008.

Nonprofits and Associations

"Our members love the building …."

National Association of Realtors executive

The nonprofit and association sector has been an early regional adapter of green building, seeking benefits for staff, for the long-term value of facilities, and for the environment. Notable projects in the region include:

- NRDC headquarters building, in the District of Columbia;
- National Association of Realtors Washington legislative building, in the District of Columbia;
- Human Rights Campaign building, in the District of Columbia;
- 1425 K Street Green Roof, spearheaded by Casey Trees and partners, in the District of Columbia;
- Chesapeake Bay Foundation headquarters, in Annapolis, MD;
- The Navy League headquarters, in Arlington, VA;
- Rural Electric Association headquarters, in Arlington, VA.

These buildings, while serving the needs of their owners also support green design, construction, and products providers, helping to build a regional market.

Non-Governmental Educational Institutions

Higher education institutions in the region are beginning to adapt green building practices on their campuses, and are offering relevant environmental courses, namely University of Maryland, George Washington University, George Mason University, Virginia Tech, and Catholic University. The Sidwell Friends School, a private middle and high school in the Dis-

[73] www.turnerconstruction.com

trict of Columbia recently completed a LEED Platinum addition. As described in the local government section of this chapter, Montgomery County is a regional and national leader in the greening of public schools.

Residential Markets

"I want to make mine a model green home that everyone would want to live in."

JD Doliner, Arlington County owner of home remodeled to be green, and host of many open houses

The residential single-family and small-scale multifamily markets in the Metropolitan Washington region are generally exhibiting inverse trends from commercial development. Where innovative green commercial developers are ahead of their prospective tenants, homeowners and residents are leading the region's housing providers in moving towards green. For many years, residents of Takoma Park, MD have been integrating green features into their homes with little support from builders. Arlington County's experience with its Green Home Choice Program is also illustrative. Established as a voluntary new homes program targeted at small-scale homebuilders, 30 of the Program's 40 participating projects, are green home renovations initiated by homeowners. The last year has seen an upswing in homebuilder participation in the County's outreach programs and in participating projects. Turning large-scale suburban developers toward green building practices remains one of the region's challenges.

Some empowered residents have turned to self-developed projects as a way of achieving their community and sustainability goals. The region is home to five cohousing communities, all of them based on pedestrian-friendly sustainable site development and green building principles. Takoma Village Cohousing, a pioneering green residential project completed in the District of Columbia in 2001, boasts state-of-the-art energy conservation measures and a ground source heat pump system, along with many community amenities. Eastern Village Cohousing transformed an outdated commercial building into green multifamily homes with community facilities and a green roof. Blueberry Hill Cohousing in Vienna, VA helped preserve Northern Virginia's only organic farm while creating a clustered residential community.

If national trends are any indication, the shift to green residential building is about to accelerate. A June 2006 survey of NAHB homebuilders conducted by McGraw-Hill Construction and NAHB[74] concluded that green homebuilding will grow by 30 percent nationwide in the coming year, and that by 2010, 40 and 50 percent of all homes built will incorporate significant green building elements.

[74] McGraw-Hill/NAHB, Residential Green Building Smart Market Report, June 2006, www.nahb.org/news

IN FOCUS:
Small Green Business Development in the Metropolitan Washington Region

Localized small businesses are blossoming in the region in response to a still nascent, but growing green marketplace:

- Green materials and home building products suppliers Amicus in Kensington, MD and EcoGreen Living in the District of Columbia. Charlottesville-based green retailer Nature Neutral, formerly the only greater regional source of green home building products now has a retail outlet at Washington Metropolitan-based Community Forklift. Dominion Floors in Arlington has opened a green show room.
- Community Forklift, a reseller of rescued and refurbished green building products in Edmonston, MD and Habitat Restore have joined high-end used architectural products seller Brass Knob in the resale of architectural and building components.
- Deconstruction Services LLP, a business that deconstructs residences and small commercial buildings, providing a flow of materials to Community Forklift and Habitat Restore. The company has been joined by a division of Tysons Demolition as a competitor in the marketplace.
- Energy rating and improvement companies such as NSpects, based in Chantilly, VA, EMO Energy Solutions, based in Falls Church, and GreenHome/BlueSky in University Park, MD.
- Single practitioner and small architectural firms such as Inscape Studio in the District of Columbia, Helicon Works in Takoma Park, MD, and Peabody Architects in Alexandria, VA specializing in green residential design.
- Family-run residential contractors and remodelers with a green building product line, such as Cook Brothers and Greenbuilt Homes in Arlington, GBO Construction in the District of Columbia, and Sagatov Associates in Vienna, VA.
- LEED certification specialists and consultants serving large commercial projects and the public sector, notably Sustainable Design Consulting in Silver Spring, MD and GreenShape, in the District of Columbia.
- HVAC contractor Harvey Hottel, Inc. in Gaithersburg, MD, specializing in geothermal heat pumps and radiant heating systems, and Foley Mechanical, in Alexandria, VA, specializing in radiant heat systems and energy efficient HVAC.
- Green roof contracting and design specialist Capitol Green Roofs in Arlington, VA.
- Small-scale recyclers and waste materials sorters who serve both small and large-scale projects qualifying for green LEED certification.
- The region's first green realty company, Green DC Realty, in the District of Columbia.

Established regional business with an international clientele, such as Scott Sklar's Stella Group, a solar innovation and consulting firm, are seeing resurgence in regional business as Washington area residents once again see the value of energy conservation and renewable energy.

The Arlington-based citizens non-profit Arlingtonians for a Clean Environment (ACE) recently published a guidebook for the growing number of residents who are seeking out green building products and services. The ACE **Homeowners Green Homebuilding and Remodeling Resource Directory**[75] is a valuable new regional resource, as is COG's **Builders' Guide to Reuse & Recycling**[76], published in 2006.

Many of the Washington Metropolitan Region's new green businesses are family-run and have deep community roots. Like all market leaders, they face the challenges of fluid marketplace that is just starting to recognize the value of their services.

[75] www.mwcog.org
[76] www.arlingtonenvironment.org

Local Government Programs

Metropolitan Washington region's municipalities began implementing green building practices in 2000, when Arlington County established the area's first green building program. Arlington County's program includes LEED components for large commercial and multifamily projects coupled with an incentive program. The City of Alexandria began initiating a sustainable building policy for municipal buildings in 2002, and formalized it in 2004.

The last year has seen a surge of legislative and executive action for green building. As of October 2007, twelve COG jurisdictions have developed or are in process of developing policies for green building. The District of Columbia and Montgomery County each passed comprehensive green building legislation with requirements for both public and private buildings. The City of Rockville plans to have a green building ordinance in place by the end of this year, and the City of Gaithersburg adopted LEED Silver for public buildings in 2007.

Where executive and legislative orders are not in place, Washington area jurisdictions have been addressing green building through master plan policies. Fairfax County is currently considering an amendment to its master plan in support of green building. Throughout the region, planning staff encourages sustainable green building practices and LID during project review. In Falls Church, planning staff and City Council successfully negotiated for the incorporation of green roofs on three private projects, for example.

Leadership for green building has also come from within municipal departments. In Fairfax County, staff initiative has lead to successful green building pilot projects, notably the new green Crosspointe Fire Station and the Thomas Jefferson Community Library. Although not as far along as municipalities on the West Coast or leaders like Austin or Chicago, Metropolitan Washington municipalities implementing best practices for green building such as:

- Arlington County's site plan review process, tracking, and green building incentive program using the LEED green building rating system;
- Alexandria's green building policy implementation for municipal buildings and organizational implementation plan;
- Montgomery County's green schools program and piloting of the USGBC LEED Neighborhood standard;
- Fairfax County's and Prince George's County demonstration projects for green building and LID;
- Arlington and Montgomery counties' green homes outreach programs.

Many COG-area jurisdictions have implemented energy management and conservation programs in public buildings, making them greener and more cost efficient. A January 2007 COG review[77] of regional building projects engaged in the U.S. Green Building Council's LEED program found 44 municipal projects registered with USGBC. This number has no doubt grown. Gaithersburg, Greenbelt, the District of Columbia, Alexandria, Arlington, and Fairfax County all have completed LEED-certified projects, with more on the way. Montgomery County Public

[77] Plan to Improve Air Quality in the Washington, DC-MD-VA Region, State Implementation Plan (SIP) for 8-hour Ozone Standard, May 23, 2007

Schools in Maryland established a Green Building Program[78] for the County's 20 million square feet of school facilities in 2003. As a result of the program Montgomery County recently completed a pilot for the first LEED certified public School in Maryland, Great Seneca Creek Elementary School in Germantown[79]. The building received a LEED Gold certification and is the first of a series of ten new schools to be designed and built to LEED standards in the coming five years.

COG Activity

As noted in Chapter I, COG has identified green building as a strategy for meeting regional air quality and energy conservation goals. On September 29, 2006, COG and the ad hoc Intergovernmental Green Building Group (IGBG), with partners, hosted the ***Regional Leadership Conference on Green Building*** at the University of Maryland, drawing over 300 participants and introducing **Resolution R55-06**[80] in support of green building. On November 8, 2006, the COG Board of Directors adopted the resolution, making IGBG a technical committee of COG, and resolving to:

- Support the application of coordinated Green Building practices throughout region;
- Encourage each member jurisdiction to incorporate Green Building practices into the planning, design, construction, and operation of public sector development projects;
- Encourage each member jurisdiction to develop incentives, policies and/or regulatory approaches supporting the application of Green Building practices in private sector development projects;
- Encourage each member jurisdiction to provide public education and staff training promoting Green Building practices;
- Establish a committee to recommend regional Green Building policies and guidelines, identify opportunities, and encourage coordination and leveraging of resources.

IGBG was charged with preparing a report, which would provide the COG Board with:

- Options and recommendations to develop and adopt Green Building guidelines and implementation strategies that consider use of existing standards, such as LEED, ENERGY STAR, or other nationally recognized Green Building programs, and which address issues of particular regional importance and interest;
- Options and recommendations for approaches to measure regional progress in the application pf Green Building practices.

Table 4 summarizes COG-member policy and program initiatives for green building. This report responds to the COG Board request. Ongoing IGBG activities continue through the COG environmental program, with continuing work being undertaken for regional green building policy development and implementation. In 2008 IGBG plans to take residential standards and existing building approaches under consideration, and to make standards recommendations for schools. The committee and COG staff will reach out across sectors to promote innovation and knowledge sharing for green building.

[78] www.Schools2Green.org
[79] www.GreatSenecaCreekES.org
[80] **COG Board Resolution R55-06** Supporting the Development of Regional Green Building Initiative and Adoption of Existing Intergovernmental Green Building Working Group as a Technical Committee under COG's Committee Structure, Nov. 8, 2006 . www.mwcog.org

Table 4.
Regional Green Building Policies and Programs Overview: COG Members
November 2007

Jurisdiction and Green Building Contact Information	Policies for Public Facilities	Policies for Private Development
VIRGINIA		
City of Alexandria, VA www.alexandriava.gov Jeremy McPike jeremy.mcpike@alexandriava.gov Erica Bannerman erica.bannerman@alexandriava.gov	Green Building Policy for City facilities. Requires: • Analysis procedures for LEED feasibility for facilities 5,000 or greater • Staff green building training • Procurement practices for green Architectural/ Engineering services, buildings maintenance, and supplies • LEED-registered projects in planning and construction.12, 000 sq ft green roofs. • LID demonstration projects • Participation in Energy Star, Rebuild America, and the USGBC. • Public Schools incorporate energy conservation and green measures Green public projects in construction include TC Williams High School - LEED certification pending (Awarded Virginia Sustainable Building Network's Green Innovation Award), and the Charles Houston Recreation Center. LEED registered projects include the new DASH Bus Facility, Police Department, and Human Services under LEED Existing Building. A 5,000 square foot green roof and 5,000 square foot bioretention area will be installed at Coral Kelly Magnet Elementary School by 2009. Additionally, the Station at the Yard project is a mixed-use building with a LEED registered fire station and retail for the first floor and four stories of EarthCraft affordable/ workforce housing units above.	Checklist that tracks green building/ sustainable development practices Contractors of new developments required to complete LEED assessment checklist explaining how the development will voluntarily comply with LEED. Private Development includes the first LEED - Gold certified condo Project in Virginia at the Cromley Lofts. Ongoing public education to encourage the implementation of green building practices. Planning staff is developing possible incentives, appropriate standards, submission requirements, and the City's review process for green buildings.
Arlington County, VA www.arlingtonva.us	Internal working policy supporting sustainable practices. Formalized policy requiring LEED Silver certi-	1. LEED Scorecard for site plan projects. Expectation 26+ credits. Staff oversight.

Jurisdiction and Green Building Contact Information	Policies for Public Facilities	Policies for Private Development
VIRGINIA		
Joan Kelsch jkelsch@arlingtonva.us	fication of all public buildings over 5,000 sq ft. in development. Demonstration green roof on County office building. Green public buildings include LEED certified Langston Brown School and Community Center; LEED certification pending for Walter Reed Community Center, the Parks Operations building, and Shirlington Library.	2. Density Incentive of .15-.35 FAR for LEED certification (ranging from certified to platinum). Bond to ensure compliance. 3. $0.03/sq ft contribution to Green Building Fund for projects not seeking LEED certification. 4. Energy Star requirement for appliances and fixtures in multifamily buildings. 5. Voluntary Green Home Choice program based on EarthCraft.
Fairfax County, VA www.fairfaxcounty.gov	Amendment to Policy Plan volume of Comprehensive Plan for green building under consideration. Departmental and staff leadership for green building. Department of Public Works and Environmental Services pilot green projects include fire stations and libraries. Expected to receive LEED certification or silver-level. Twenty County projects designed with green building approach in development. Select LEED certification. Energy Management Control Systems into all new county buildings and retrofits. LID demonstration projects.	Amendment to Policy Plan volume of Comprehensive Plan for green building under consideration. Policy Plan support for better site design, LID, and energy/water conservation Proffer commitments negotiated during zoning process for variety of green building and LID practices. Ongoing public education to encourage LID techniques, including LID demonstration projects
City of Falls Church, VA	City Council 2007 Vision and Strategic Plan promotes green building and LID. Directs staff to create green building program for public and private buildings. 2006 Comprehensive Plan incorporates policies for green building. Pursuing use of recycled carpets in City building renovations. Energy management system in City Hall. LID demonstration project in City Hall area.	City Council 2007 Vision and Strategic Plan promotes green building and LID. Directs staff to create green building program for public and private buildings. 2006 Comprehensive Plan incorporates policies for green building. Successful negotiations for LEED and green roofs on four private projects.
Town of Leesburg, VA	Leesburg Town Plan promotes energy efficiency and use of green building standards such as LEED	Leesburg Town Plan promotes energy efficiency and use of green building standards such as LEED
Loudoun County, VA www.loudoun.gov	Green building practices currently being implemented. Energy efficiency and green design in current RFPs. ENERGY STAR appliances, tankless	

Jurisdiction and Green Building Contact Information	Policies for Public Facilities	Policies for Private Development
VIRGINIA		
	water heaters, dual flush toilets, waterless urinals, programmable thermostats, and ultraviolet lighting in ductwork are a County standard. LEED accredited professionals on staff. Energy manager on staff since 2001. Energy accounting software in use for public buildings. Undertaking lighting retrofits.	
Prince William County, VA www.pwcgov.org Lou Ann Purkins lpurkins@pwcgov.org	Internal policy for green building under consideration Recently completed green police station and development services building to meet LEED certification Energy management control systems being implemented in all new buildings and building upgrades	Green building for private development under review by senior staff -Amendment to the Environmental Chapter of the Comprehensive Plan for green building to be considered during 2008 update. Policy support for better site design, LID, and energy/water conservation in the Comprehensive Plan. Proffer commitments and SUIP conditions negotiated during zoning process for a variety of green building and LID practices.

Jurisdiction and Green Building Contact Information	Policies for Public Facilities	Policies for Private Development
MARYLAND		
City of Gaithersburg, MD www.gaithersburgmd.gov Erica Shingara eshingara@gaithersburgmd.gov	Master Plan Environment Element states following goals and strategies: • Municipal facilities, City funded projects, and infrastructure projects be constructed, renovated, operated, maintained and deconstructed using green building, LID, waste management, and conservation landscaping principles and practices to the fullest extent possible. • Incorporate sustainable requirements in bid requests for new building projects or renovations, when feasible, and utilize construction consultants with green experience. • Perform energy audits of existing City facilities and implement energy retrofits when appropriate. Green building education of City officials and staff City considering legislation requiring LEED Silver certification for municipal buildings. New LEED certified Youth Center	Green building education and outreach to residents, and development community. Partner in M-NCPPC Going Green at Home program with M-NCPPC. Green residential building code standards in development. Development Review: Requires new commercial, institutional, or multi-family development to complete and submit a LEED checklist as part of the site plan and building permit application process. Commercial Incentive Program with tiered incentives discounting City building permit fee according to levels of LEED certification: • LEED Platinum: 50% refund; • LEED Gold: 40% refund; • LEED Silver: 30% refund; and • LEED Certified: 20% refund.
Greenbelt, MD	City requires LEED Silver certification for public buildings	
Montgomery County, MD www.goinggreenathome.org Contacts: Marion Clark, M-NCPPC marion.clark@mncppc-mc.org Anja Caldwell, MCPS Anja_S_Caldwell@mcpsmd.org	Green Building Bill of 2007 requires all new County buildings, additions and major renovations greater than 10,000 square feet, and all building projects receiving County funding of 30% or more meet LEED Silver and Energy Design Standards. Includes life-cycle-cost analysis of alternative systems and components. Required written certification of compliance to energy standards. Senior staff developing green building implementation plan. Energy conservation practices in all County buildings The Green Building Program for Montgomery County Public Schools (MCPS) works with students, staff and the community to establish MCPS as a model for	Green Building Bill of 2007 requires that all private commercial and multifamily development projects over 10,000 sq ft meet LEED certification. Senior staff developing green building implementation plan, including tax incentive package. Going Green at Home outreach and education program for homeowners, builders, and contractors. Master and Sector Plans language encourages green building technology. White Flint and Glenmont redevelopment piloting LEED for Neighborhoods standard Development Review promotes and requests use of high performance measures.

Jurisdiction and Green Building Contact Information	Policies for Public Facilities	Policies for Private Development
MARYLAND		
	sustainable school design and operations. www.Schools2Green.org <http://www.Schools2Green.org>	
Prince George' County, MD	General guidelines for environmentally sustainable development. Green building program launch in mid-2007. Low VOC paint purchasing for all public buildings. Energy Manager to be hired. Energy audits of County buildings underway.	General guidelines for environmentally sustainable development. Green building program under development.
City of Rockville, MD www.rockvillemd.gov Nate Wall nwall@rockvillemd.gov	Environmental Commission studying green building programs from other jurisdictions, and will make recommendations to Mayor and City Council for program.	Environmental Commission studying green building programs from other jurisdictions, and will make recommendations to Mayor and City Council for program. City currently has a moratorium in place on most new construction activities. Would like to have green building program in place before moratorium expires in December 2007.

Jurisdiction and Green Building Contact Information	Policies for Public Facilities	Policies for Private Development
DISTRICT OF COLUMBIA		
Washington, D.C. www.dc.gov Chris Shaheen, chris.shaheen@dc.gov	Green Building Act of 2006 legislates green building practices for government buildings: • Effective immediately, residential buildings over 10,000 sq ft and all commercial projects that result from lease of public property through disposition must meet Green Communities or LEED Silver certification standards. • Building projects first funded in FY08 budget, including interior renovations, residential, and commercial, must meet Green Communities or LEED Silver certification standards. • Starting in FY09 budget, all new construction or substantial improvement of projects receiving more that 15% of total costs through public financing must meet Green Communities or LEED certification standards. • District of Columbia building code to be updated to include green building practices Energy efficiency, green power, and environmentally preferable purchasing. ENERGY STAR and green design included in RFP's. LID demonstration projects.	Green Building Act of 2006 legislates green building practices for private buildings: • In January 2009, all commercial buildings over 50,000 sq ft must complete LEED checklist as part of permit process • In January 2010, commercial buildings greater than 50,000 sq ft and resulting from sale of public property through deposition must meet LEED certification standards • In January 2012, all commercial buildings over 50,000 q ft must meet LEED certification standard Expedited permitting of green building projects before policy implementation date Office of Planning Sustainable resource guide for development community Ongoing energy efficiency and conservation programs: • Free energy audits. • Renewable Energy Demonstration Project provides up to 50% of installation costs • District Solar Initiative • ENERGY STAR appliance and lighting rebates • Grants for small business energy efficiency measures • Support for energy efficiency/weatherization in low income homes and CDC projects
Anacostia Waterfront Corporation www.anacostiawaterfront.net	Draft green development standards for public and private development in review.	Draft green development standards for public and private development in review.

Federal Government in the Region

The federal government has been a regional leader in green building through its internal policies for building performance. The General Service Administration (GSA) and Department of Defense (DOD) have led the federal sector in applying green building principles to their facilities.

In 2006 nineteen federal agencies signed a groundbreaking **Memorandum of Understanding** (MOU)[81] to "minimize the environmental footprint" of their buildings, adopting five Guiding Principles:

- Employing integrated design;
- Optimizing energy performance;
- Protecting and conserving water;
- Enhancing indoor environmental quality;
- Reducing the environmental impact of materials.

Early federal building innovations were formalized through the **Energy Policy Act of 2005** and **Executive Order 13423** of January 2007, which requires all new federal buildings to achieve 30 percent improvement in energy cost to ASHRAE Standard 90.1-2004. The Executive Order requires federal agencies to follow guidelines of the Memorandum of Understanding. Federal agencies are also required to meet progressive energy use intensity reduction targets for their entire building stock. [82]

The GSA requires that all building projects meet LEED-certified level standards, with a target of LEED Silver, as do key Department of Defense agencies. Notable federal green buildings in the region include:

- Ronald Reagan Building and Convention Center, in the District of Columbia;
- The Pentagon, in Arlington, VA;
- Crystal City EPA Building, in Arlington, VA;
- The Food and Drug Administration (FDA) campus in Montgomery County, MD.

Historic federal buildings with natural light, air circulation, and massing for energy conservation remain excellent examples of buildings that collaborate with natural systems. Numerous clean energy, green building, and climate protection bills are currently under consideration on Capitol Hill. These may all affect regional policies and opportunities for green building.

[81] www.wbdg.org/pdfs/sustainable_mou.pdf

[82] Plan to Improve Air Quality in the Washington, DC-MD-VA Region, State Implementation Plan (SIP) for 8-hour Ozone Standard, May 23, 2007

VI. Green Building Costs and Operational Considerations

How much does a green building cost? This often asked question has many answers, depending on the scope of the project, the type of building being built, and many other factors that effect building budgets. Buildings accrue costs at the initial stage of construction and development, during operations, and in their final phase of disassembly and disposal. Green building practices are shedding new light on the familiar and the often unaccounted-for costs of developing and managing the built environment.

The First Costs of Green Building

Green building practices are applicable to affordable housing projects with tight budgets constraints as well as to Class A[83] commercial buildings with no expenses spared. The first cost "premium" for a green building can also vary widely. Project budgets for successful green projects have come in at below conventional costs to five to ten percent above standard budgets. A first generation of studies on the cost of green development has now made it possible to examine and compare the costs of green building projects as compared to conventional ones.

A 2003 study commissioned by the State of California, **The Costs and Benefits of Green Buildings**,[84] reviewing cost data from 33 green building projects across the nation found the average cost premium for green LEED-certified buildings to be:

First Cost Premium	Certification Level
+ .66%	LEED Certified
+ 2.11%	LEED Silver
+ 1.82%	LEED Gold
+ 6.50%	LEED Platinum

The average cost premium for all 33 buildings analyzed in the California study was just below 2 percent. In this relatively small sample, the more rigorous LEED Gold certified projects were actually less costly than those certified to LEED Silver. The U.S. Green Building Council soon thereafter commissioned a much larger comparative study of buildings to provide a more representative sample, with new cost data expected by the end of 2007. A study commissioned by the General Services Administration in 2004, titled **GSA LEED Cost Study, Final Report**,[85] found a range of first costs for typical federal facilities considered:

Green First Cost Compared to Conventional	Variables
Savings of .4% – 8.1 % premium	LEED Certified – LEED-Gold Low-cost options – high end options Expert consultant – design team approach

The GSA research team found that green building costs could be kept below conventional budgets when low-cost options for meeting LEED Certified and LEED Silver certification were

[83] As defined by the Urban Land Institute, Class A commercial buildings are characterized by excellent location and access, high quality materials and construction, and rents targeted at high-end tenants. They are generally professionally managed. www.uli.org

[84] Gregory Kats, The Costs and Benefits of Green Buildings," A Report to California's Sustainable Building Task Force, October 2003, www.cap-e.com

[85] Steven Winter Associates , GSA LEED Cost Study, Final Report, October, 2004 www.wbdg.org

selected. High-end options to meet the same certification requirements increased first costs from 1 and 4.4 percent respectively. Gold-level certification was achievable at a 1.4 to 8.1 percent premium. Building modernization costs using LEED were somewhat higher, ranging from a 1.4 to 7.8 percent cost premium. Costs modeled for projects using an experienced design team as compared to an expert consultant were generally lower, but by a small margin.

The California and GSA studies shed light on the range of first costs that can be expected for a green project. Final project costs within this range will hinge on a number of factors:

- Location, overall project costs and Class of project;
- Scale of the project;
- Project environmental goals;
- Energy modeling, commissioning, and testing costs;
- Adherence to integrated design and development process;
- Experience of the design, development, and construction team overall, and with green building techniques and processes;
- Point at which green innovations are introduced;
- Certification fees;
- Quality of project management;
- Unexpected events and cost increases related/unrelated to green features.

Project developers and builders are still learning how to produce green buildings in the most cost-effective manner. But there is much that has already been learned, as the studies suggest. The most cost-effective green buildings tend to be those managed by experienced project teams with previous green building experience, and where green features and goals are introduced early, as part of an integrated design and development process. An integrated design and development process is one that involves all relevant project professionals and trades in a collaborative planning and design process for green building. A well-integrated team of green designers can, for example, trade off the cost of building envelope improvements with equipment savings resulting from reduced heating and cooling loads.

Projects that are well managed overall also tend to have lower green building costs. Larger-scale projects benefit from scale efficiencies, especially with new, hard-to-order green technologies. Finally, teams that communicate and support each other in the course of what may be a new green building process also tend to come out ahead on costs.

At the 2006 ***Regional Leadership Conference on Green Building***, Robert Braunohler, Vice President for the Louis Dreyfus Property Group in Washington, D.C., and developer of several green commercial projects in the District of Columbia observed that green building costs were more dependant on team experience and specific technologies selected than on green practices overall. “Green building doesn’t have to cost more than conventional building,” he observed. Chris Van Arsdale, President of VNV Development and GBO Construction, also of Washington, D.C., noted a “learning curve” cost to green, and said that by his third project, he had reduced his green building premium to zero.

It is not productive to compare green building project costs to the base-line costs of minimal projects that barely meet code. Green building is generally associated with high quality and performance, and should be compared to buildings of a similar class.

Costs Related to Green Building Practice

Green building projects tend to have specific costs associated with practices that incorporate whole-building design, performance modeling, testing to ensure performance, and standards-related certification. These soft construction costs are generally part of the "green premium" but often lead to long-term costs savings through performance. Experienced design teams can often balance them off with first-cost savings based on integrated, systems-based design. Soft costs related to green building may include:

- Research and team training for builders/developers on a "learning curve" for green building;
- Hiring of green building consultant or experienced design team members who can oversee integrated green design process, participant education, and project certification;
- Organizing costs of a green "charrette" exercise that is a part of the integrated design process;
- Energy modeling to support energy performance and possible ENERGY STAR requirements;
- Green building commissioning and testing;
- Registration and certification fees with LEED or other certification rating system.

Building commissioning is an important investment for any building project, but especially for a green one. Building commissioning is the systematic process of ensuring that a building's complex array of systems is designed, installed, and tested to ensure performance according to the design intent and the building owner's operational needs.[86] LEED certification requires commissioning during and after construction, to verify and document that systems are working as intended. Building commissioning costs for new buildings typically range from $.50 to $1.50 per sq ft.[87] Although this is a cost that developers and public agencies may be reluctant to pay, commissioning usually pays for itself as inefficiencies and mistakes are corrected and the need for change orders and repairs are reduced.

Costs of LEED registration and certification for commercial projects over 50,000 square feet are generally $.035/sq ft. Certification ensures that the building has achieved its green goals and allows the owner to market the building as "LEED certified."[88]

Green building design, product, and technology costs can range from insignificant to major. It does not cost more, for example, to orient a building for maximum passive solar gain or to provide natural light. ENERGY STAR certified windows and low VOC paints are cost competitive with conventional products. Other costs, such as quality air sealing and building insulation/envelope treatment, may cost more, but can be balanced with savings on HVAC equipment due to lower heating and cooling loads. Higher-cost options in green building projects may include FSC-certified wood, products with a high-aesthetic appeal, renewable energy systems such as solar panels and geothermal heating and cooling, recycled content high-performance roof shingles, green roofs, on-site water treatment, and processes such as deconstruction. Many of these options reap long-term environmental, educational, and performance benefits, and may be appropriate for specific projects.

[86] Energy Design Resources, www.energydesignresources.com
[87] U.S. GSA, The Building Commissioning Guide, April, 2005, www.wbdg.org/ccb/GSAMAN/buildingcommissioningguide.pdf
[88] The U.S. Green Building Council has reduced or eliminated the certification fees for projects reaching Platinum-level certification, and has made registration of LEED Existing Building projects free.

Lifecycle Value: Green Building Performance and Cost Benefits

"This Building makes me proud of my tax dollars."

Donna Sagona, assistant principal at Great Seneca Creek Elementary School, Montgomery County, MD

When local governments invest in buildings, they invest in facilities that are built to serve for decades, or even hundreds of years. Up-front costs are just part of the story. Taken over a 30-year period, first costs account for only 2 percent of a building's overall expenses, while operations and maintenance costs account for 6 percent and personnel expenses account for 92 percent of a building's lifetime costs.[89] Up-front investment in green building can result in long-term savings through improved building operations and improved productivity and occupant wellbeing. Green building practices also help to reduce the "externalized" costs of conventional building practice, often shouldered by local government.

Green Building Performance Benefits

Green buildings are designed for durability, efficiency, and high performance. This translates into operational savings and performance benefits during the use phase of a building. Benefits include:

- Lower utility bills through energy and water consumption savings;
- Reduced replacement, maintenance and operating expenses resulting from durable, higher quality materials and efficient systems;
- Reduced waste costs;
- Fewer call-backs on new projects because of up-front integrated systems design and project commissioning;
- Reduced employee health costs because of healthier indoor environment;
- Reduced insurance risk on projects, with lower risk of component breakdowns, sick building syndrome, water damage, and risks from mold;
- Healthful, comfortable environments that translate into long-term building value and tenant satisfaction.

Cog member municipalities are starting to see the performance benefits of green building. Montgomery County Public School's Green Building Program expects to save $65,000 annually in utilities at the recently completed LEED Gold Elementary School Great Seneca Creek in Germantown.

Current utility bills at Great Seneca Creek Elementary School are running 39 percent below conventional school buildings in the County.[90] The National Association of Realtors is saving money in their green legislative office building in the District of Columbia by incorporating plentiful natural lighting. "At first, many staff thought the lighting was too dim, having been used to the

[89] Public Technology, Inc. for U.S. DOE and U.S. EPA, Sustainable Building Technical Manual, 1996. www.wbdg.org/design/sustainable.php

[90] Montgomery County Public Schools Green Building Program - www.Schools2Green.org

overlit office we had been in, but in about a week they became used to the daylight environment. Most people don't even use the task lighting now," says senior manager Joe Molinaro.

A 2005 Turner Construction Company survey[91] of 500 senior executives' satisfaction with green buildings found that

- 84 percent reported improved building value;
- 83 percent reported a reduction in energy costs;
- 74 percent reported a decrease in operating costs;
- 78 percent reported increased worker productivity;
- 68 percent reported an improved return on value;
- 88 percent reported improved health and wellbeing of occupants.

Productivity

Studies show that improved wellbeing and health in green building leads to better work productivity and student performance[92]. The 2003 ***Costs and Benefits of Green Building*** study completed for the State of California[93] found that green building features including improved daylighting, increased ventilation and lighting control, and increased temperature control for tenants correlate significantly with increased productivity of .5 to 34 percent. Improvements in these areas include:

- Fewer sick days and lower absenteeism from workplace and schools;
- Improved on-the-job productivity among workers in a variety of work settings;
- Improved test performance among children in green, day lit schools;
- Increased sales in retail environments.

The study points out that even a 1 percent increase in productivity translates to a $600 to $700 average value increase per employee. "Small changes in productivity and health translate into large financial benefits," notes study author Greg Kats. A 2005 Washington State study estimates that absenteeism in green schools was reduced by 15 percent and test score improved by 5 percent.[94]

Systems-wide Cost and Performance Benefits for the Public Sector

Green building performance benefits carry broader potential performance benefits to municipalities and residents when they are widely adopted. Local governments that systematically adopt green building practices may benefit from:

- Significant reductions in municipal building energy costs;
- Up to 40 percent reduction in municipal building water costs;
- Improved municipal employee and student productivity;
- Lower operations and maintenance costs in public buildings;
- Reduced waste management costs due to increased durability and recycling measures.

[91] Turner Construction, 2005 Survey of Green Buildings, www.turnerconstruction.com/greenbuildings
[92] Gregory Kats, Greening America's Schools: Costs and Benefits, October 2006. www.cap-e.com
[93] Gregory Kats, The Costs and Benefits of Green Buildings: A Report to California's Sustainable Building Task Force, October 2003. www.cap-e.com
[94] Paladino & Company, Washington High Performance School Buildings Report to Legislature, January 31, 2005. www.neep.org/HPSE/resources.html

The "externalized" costs of conventional building practices are hard to quantify. But sustainable building practices that incorporate green building will reduce the stress on many municipal systems, reducing cost burdens. Green building practices adopted throughout the region offer opportunities to:

- Reduce demand on public water supply and wastewater systems;
- Reduce stress on stormwater utility systems;
- Reduce demand on the regional energy grid—and lower peak demand loads;
- Reduce operating expenses for public facilities and operating budget burdens on key municipal departments, including libraries, public safety, and schools;
- Reduce regional air and water pollution mitigation costs;
- Reduce stress and expenses on public medical facilities due to asthma and other environmentally triggered illnesses;
- Improve productivity in schools, municipal offices and other workplaces;
- Provide better stewardship of public resources;
- Make the built environment more resilient in the event of climate change-induced increases in storm frequency and intensity, reducing repair costs.

Calculating Cost and Payback

Lifecycle analysis of building costs—from first-cost development and construction to building operations and finally to deconstruction and disposal—is a useful tool for managing the long-term costs of a building and for appropriate early investment.

Lifecycle analysis makes it possible for a municipal facilities planner to know, for example, that a $40,000 investment in air sealing and energy conservation in a new community center will be paid back in less than two years through operations savings. An affordable housing provider will want to know that the energy and water conservation measures they implemented and paid for will lower utility bills by 50 percent. Montgomery County and the City of Alexandria employ lifecycle analysis of public projects under their new green building policies.

There are times when the lifecycle cost-payback calculation is not helpful or appropriate. A municipality may choose to make an up-front building investment to counteract climate change, or may install a green roof or solar array as part of a high-profile demonstration project. A school district with a high proportion of children with asthma may choose to invest in higher cost indoor air quality measures. Affordability may be important, but payback calculations will be no more appropriate than for the cost of fire protection equipment. There are times when "payback" is measured in ecological sustainability, human health, and ongoing education, rather than dollars and cents.

Municipalities are just beginning to understand the public/private costs and paybacks of green building decisions. The deconstruction[95] of a private home is a case in point. A homeowner participating in a green remodeling program may choose to deconstruct rather than demolish a part of the original structure. The owner must be prepared to allow for additional time—generally several weeks—for the deconstruction process, incurring possible finance costs as well as additional costs for labor. But much of the cost can be earned back through reduced landfill fees and tax write-offs. The public environmental payback is significant as well. Deconstruction

[95] Deconstruction is a systematic method for taking apart an existing building and salvaging components for reuse and recycling. www.deconstructioninstitute.com

in a major remodel may reduce the number of dumpsters going to the municipal landfill by 70 percent.[96]

Investing in Green Building Management

Green building management costs are generally lower than those of conventional buildings because of improved durability and utility savings. But management of innovative green technologies and sustainable materials in a building requires training and participation. Including facilities managers and maintenance staff in an integrated design process enables them to take part in decisions and to become invested in materials and equipment choices—and maintenance down the line. Every green building budget should include training for effective green building management.

Operational Issues for Local Government

The region's municipalities are in a position to reap long-term benefits and costs savings through implementation of green building policies. Further, by adopting green building policies for their own facilities, local governments can "lead by example" for regional market transformation. The challenge in the transition to green building is organizational adaptation.

Organizational Adaptation

A green building policy for public buildings has implications for capital improvement budgeting, facilities planning and management, community planning and review, engineering, RFP and procurement practices, permitting, inspections, and environmental services. These are generally not well understood even among the nation's local government leaders for green building. Transformation toward successful green building practices at the local government level will likely involve:

- Restructuring budgets to account for early green investments, lifecycle costs, and operational savings;
- Adapting procurement practices to support green building;
- Improved communications across organizational departments;
- Updating of relevant building codes;
- Making building commissioning and performance tracking standard practice;
- Adopting green building management practices;
- Capacity-building and education of relevant staff;
- Institutionalizing the integrated design process to include all stakeholders from the very beginning of project planning;
- Supporting innovation;
- Believing that small cumulative difference for green building will make a difference.

Successful implementation will require knowledge about green building within relevant municipal departments and coordination across them. Standard practice may need to yield to a more flexible, integrated approach. Leadership in cities such as Chicago and Seattle has been key to the transition to green building practices, both at the elected level, which set clear vision and priorities, and at senior departmental/executive levels to ensure implementation.

[96] Arlington County, VA, Green Home Choice program, www.arlingtonva.us

The ***Sustainable Building Technical Manual***, developed by Public Technology, Inc. for the U.S. EPA and DOE, is a good source of information on costing, implementation issues, and technical approaches to green building within local government.[97]

Capacity Building and Education

The Metropolitan Washington region is on a "learning curve" for green building. Local governments are learning how to best manage green building project costs, how to maximize environmental and performance benefits over the long term, how to manage and implement new green building initiatives, and how best to spread knowledge and capacity about green building throughout the organization. Fortunately, green building principles are often intuitively understood by people, and do not require sophisticated explanation. Staff education can build on this basic understanding to develop organizational capacity to implement green building policies successfully. Knowledge in the following areas will assist municipal staff to green building goals:

- ***Elected Officials, Commissioners, and Review Boards*** – shared general understanding of what green building is and more in-depth knowledge of related planning and topical issues; general understanding of selected green building rating system and relevant code changes. General understanding of homeowner and private sector issues, and of regulatory and incentive tools.
- ***Managers and Executives*** – shared general understanding of what green building is, and of related organizational issues; general understanding of the integrated development and design process.
- ***Facilities Planning, Planning, and Plan Review Staff*** – shared general understanding of what green building is and of integrated development and design process; specific understanding of selected rating system and its requirements; understanding of related code issues and relation of green building requirements to LID, community planning, and smart growth goals; understanding of green building procurement and RFP practices.
- ***Project Management Staff*** – in-depth understanding of green building and relevant green building rating system. Functional understanding of the integrated development and design process. Understanding of green building procurement and RFP requirements and their management; general understanding of green building construction techniques, technologies, and code requirements. Understanding of the building commissioning process and its goals. Understanding of rating system certification process.
- ***Permitting and Inspections Staff*** – shared general understanding of green building and of relevant rating system. Functional understanding of green building construction and deconstruction techniques, technologies, and of relevant code requirements. Up-to-date knowledge of energy and green building code updates.
- ***Capital Budgeting, Procurement, and Accounting Staff*** – shared general understanding of green building, of the integrated design and development process, and selected rating system. Functional understanding of lifecycle cost analysis and budgeting, green building procurement, and RFP processes.
- ***Facilities Management Staff*** – In-depth understanding of green building practices for existing buildings. In-depth understanding of energy and green building improvement approaches, and relevant rating systems.
- ***Green Building Program Staff*** – In-depth understanding of green building and selected rating system. General understanding of organizational and budgeting issues. In-

[97] Public Technology, Inc. for U.S. DOE and U.S. EPA, Sustainable Building Technical Manual, 1996. www.wbdg.org/design/sustainable.php

depth understanding of private sector and homeowner issues related to green building. In-depth understanding of regulatory and incentive tools. Functional understanding of green building program development and management.

- ***Environmental, Stormwater Treatment and Waste Management Staff*** – shared general understanding of green building and requirements of selected rating system. In-depth understanding of related areas such as green building management techniques for stormwater and construction materials recycling.

The Metropolitan Washington region is fortunate in having a growing number of training opportunities available locally and via webcasts through organizations such as the U.S. Green Building Council National Capital Chapter www.usgbc-ncr.org, the National Association of Local Government Environmental Professionals www.nalgep.org, the Building Owners and Management Association www.boma.org, and others. COG can play a pivotal role in facilitating and distributing information about green building and about upcoming educational opportunities for member jurisdictions. It may also be appropriate for COG to host specialized workshops on topics of regional interest, such as green codes development, regional LEED policy implementation, green buildings and climate protection, and municipal staff education. Beyond capacity, green building thrives in a culture of innovation, such as those of local governments such as Chicago, Seattle, and Portland. Staff needs to be willing to learn, and executives and managers need to be willing to bring in fresh ideas, and staff to bridge the knowledge gap.

VII. Recommendations

Overview

COG's member jurisdictions agree that a regionally consistent set of policies and standards for green building will benefit the region. Metropolitan Washington faces an unprecedented period of opportunity for developing green building practices and markets. As the region faces many challenges related to air and water quality and climate change, coordinated public policies that promote green building will help overcome those issues while enabling innovators to take advantage of emerging economic opportunities.

LEED currently offers the most reliable and widely understood system for guiding and certifying green commercial projects. National trends point toward the LEED Silver rating as a standard requirement for public buildings, with many governments moving toward requiring a LEED Gold rating. ENERGY STAR energy performance guidelines and measurement tools are a valuable accompaniment. National green building codes, currently in development, will offer a viable option for raising base environmental performance of all buildings, while LEED will continue to push toward high performance. Regional leaders face the unenviable task of coordinating such standards in a tri-state area with varying policies. The District of Columbia has already stepped up to this challenge by establishing a process for reviewing and updating codes to support green building. In-depth analysis and evaluation will help determine how green building standards should be applied to small-scale residential projects, affordable housing, schools and existing and historic projects. As green building guidelines and incentives evolve nationally, COG members will need to follow developments closely. Unlike cities such as Seattle, Portland, and Austin, utilities in metropolitan Washington are privately owned, meaning the region's leaders will need to explore alternative options for funding-related incentive tools.

Green building policies and initiatives will be most effective when they are applied with complementary LID, smart growth, and community development practices, and in coordination with COG's existing environmental initiatives. Green building is a vital part of an integrated, coordinated approach to regional sustainable development and environmental stewardship. Most notably, opportunities for integration of green building policies with the region's new climate change initiative remain to be explored. COG's Climate Change Initiative will soon be considering options for reducing greenhouse gas emissions, and regional adoption of green building policies can figure prominently in this effort.

Building construction, management, and disposal practices have not been well tracked or analyzed at the regional scale. A quantitative tracking and evaluation system for green building in the region will help COG members measure progress and meet goals for improving the region's water, air, and land resources. Further analysis can also assist in creating targets for energy conservation and carbon dioxide (CO_2) emission reductions.

National experience indicates that the best and strongest municipal efforts for green building involve strong leadership, empowered staff, and strong engagement on the part of the private sector, education institutions, and nonprofit organizations. As the Metropolitan Washington region moves from public policy toward an integrated regional approach, such partners will have to be a vital part of the regional conversation. All will have to be engaged in an ongoing process of education and information sharing as we move toward best green building practices in the region.

The area is in a good position to adopt rigorous green building standards that will raise building performance and benefit the environment. National development in green building guidelines, green codes, and climate protection can support this effort. However, successful adoption and implementation of such regional policies will require:

- Consensus on widely accepted standards for public and private commercial buildings;
- Verifiable standards for green homes and small-scale residential projects;
- Guidelines for green building management and operations. Much of the environmental impact from buildings in the region comes from existing buildings.
- Integration of selected green building standards with complementary LID, smart growth, community development, and transportation strategies.
- For the longer-term, implementation of consistent building codes across the region, on schedule with international updates.

Guidelines that take these factors into consideration will “level the playing field” for developers and encourage adoption of green building practices.

COG member jurisdictions are in a pivotal position to demonstrate best practices and programs that support green building in the region. Education of staff and executives will be very important as programs are developed. Local and regional workshops, rating systems, and implementation tools can be very helpful. Senior level leaders who set priorities for green building and demonstrate a willingness to innovate throughout the organization will facilitate successful adoption of green building.

Policy Goals

The IGBG has identified several recommendations that will position the region's local governments as leaders in innovation and environmental stewardship. While green building innovations are evolving, there are some key policy directions that warrant priority while other recommendations are prioritized in the yearly program review and performance evaluation. It is essential to have a consistent region wide minimum green building standard. There must be continued integration of green building techniques into practical applications throughout the region. Finally, education and capacity must be built into the overall performance. Thus, key policy recommendations are:

- Establish a widely understood and rigorous region-wide standard for green building;
- Increase knowledge and capacity to implement green building throughout the region;
- Make facilities developed and built by COG member jurisdictions models of best green building practice;
- Promote and support green building innovation in the private sector through incentives, regulatory mechanisms, and information sharing;

- Promote cross-sector collaboration that supports regional goals for green building, environmental conservation, climate protection, and the growth of a regional green economy.

Key Recommendations and Rationale

Recommendation 1: Preferred Green building Rating Standards

Establish LEED as the region's preferred green building rating system for new commercial construction and high-rise residential projects using LEED New Construction (NC), Core and Shell (CS) or Commercial Interior (CI) rating systems. LEED building guidelines are also available or in development for specific commercial project types (schools, health care, retail, existing buildings, etc.) and should be evaluated for applicability as appropriate).

The following jurisdictions in the COG region use LEED as a guide and rating system for public and/or private projects: Arlington County, City of Alexandria, District of Columbia, Fairfax County, City of Gaithersburg, City of Greenbelt, Montgomery County, Prince George's County, City of Leesburg, Prince William County, City of Rockville, Takoma Park, and Falls Church.

Rationale

- **LEED is the most recognized and accepted green building guidance and rating system in use nation-wide.**
- **LEED is the system preferred by metropolitan Washington industry representatives.**
- **LEED is currently being used by many local governments in the metropolitan Washington region for public and private construction.**
- **As reported by the greater Washington Board of Trade, there are over 480 LEED registered buildings in the metropolitan Washington region.**
- **LEED has clearly defined standards and outlines specific requirements for compliance.**
- **LEED provides a rigorous, third-party certification process.**
- **LEED provides ongoing training as well as local technical support.**
- **GSA finds that the "USGBC's LEED rating system continues to be the most appropriate and credible sustainable building rating system available for evaluation of GSA projects."**

The policy rationale behind **Recommendation 1** is that the region will benefit from a consistent, rigorous, and widely understood standard for green building.

Recommendation 2: Green Building Standard for Local Government Public Projects

Establish LEED Silver as the goal for all local government facilities constructed in the metropolitan Washington region. The appropriate LEED rating system should be used for each specific project, and should incorporate at least 4 credits as required by the **COG Regional LEED Certified** standard for private commercial and high-rise residential development (see Recommendation #3). Local governments use ENERGY STAR tools where appropriate to maximize energy efficiency in public buildings.

This recommendation does not apply to schools and small-scale residential projects including affordable housing, policies for which are to be evaluated in 2008 and 2009.

Rationale

- **LEED Silver is the entry-level green building high performance standard among municipal leaders in the nation. Cutting edge municipalities are moving toward LEED Gold for public buildings.**
- **There are nearly 40 reported projects in the DC region that have achieved LEED ratings of Certified or higher.**
- **According to industry representatives, the LEED Certified rating – the baseline LEED ranking -- can easily be achieved in the metropolitan Washington region.**
- **A growing number of builders in the region strive for LEED Silver as part of their competitive strategy.**
- **Local government should set a higher bar for building sustainability as an example of their commitment to achieving a sustainable and energy efficiency environment.**
- **Currently about 10 COG member governments participate in EPA's ENERGY STAR program.**
- **ENERGY STAR and LEED programs complement one another. ENERGY STAR products can be used in LEED buildings. ENERGY STAR tools, such as Portfolio Manager, can be used to measure a LEED-rated building's ongoing energy performance.**
- **LEED recently enhanced the energy performance requirements. (Two Energy Optimization credits are now required on all projects).**

The policy rationale behind **Recommendation 2** is that programs with strong energy conservation and energy efficiency components provide the region with the greatest opportunities for overall economic and environmental sustainability. Recommendation 2 supports making public facilities models for best green building practices.

Recommendation 3: Develop "COG Regional Green Standard" for Private Development

Establish COG Regional LEED Certified standard for **private commercial and high-rise residential development**.

COG Regional LEED Certified is defined as LEED Certified with at least 4 credits from the following:

i. Additional EA1 credits
ii. SS7.1 – Heat Island, Non-roof
iii. SS7.2 – Heat Island, Roof
iv. EA 2 – On-site Renewable Energy
v. EA6 – Green Power
vi. MR2.2 – 75% Construction Waste Management
vii. SS 6.1 Stormwater Design – Quantity Control
viii. SS 6.1 Stormwater Design – Quality Control

Review and revise COG Regional LEED Certified recommendation no later than 2012 with the goal of increasing the standard in the future.)

Rationale

- **The metropolitan Washington region is diverse, with urban and non urban environments.**
- **A LEED Certified rating is easily attained in the region due to local expertise and services.**
- **The USGBC is currently developing criteria to make documentation less onerous in recognition of concerns regarding commissioning and documentation costs.**
- **The LEED Certified rating allows maximum flexibility in choosing environmental components for cost effective implementation.**
- **There are nearly 40 reported buildings in the region that have achieved LEED ratings of Certified or higher.**

The policy rationale behind **Recommendation 3** is that the region will benefit from establishing a region specific standard that focuses on environmental issues of regional concern (Chesapeake Bay protection, greenhouse gas emission reduction, and waste management) and respects the diversity of the region's urban and non-urban environments.

Recommendation 4: Education and Collaboration

COG collaborates and partners with **the private development community, nonprofit organizations, federal programs, educational institutions, financial institutions, and other interested parties** to maximize opportunities for education and innovation in the region

Rationale

- **Jurisdictions have successfully pioneered green building programs. They have actively involved the public and private sectors, nonprofit organizations, and financial institutions in the development and implementation of green building activities. Community action and market development create jobs and are vital to the success of green building.**

The policy rationale behind **Recommendation 4** is to promote cross-sector collaboration that supports regional goals for green building, environmental conservation, climate protection, and growth of a regional green economy.

Recommendation 5: Implement Actions to Insure the Success of the Regional Green Building Policy

COG ensures the success of regional green building goals through various specific actions, including a **2008 Green Building Work Plan**, that support implementation of IGBG recommendations and coordinate green building efforts with other COG programs.

IGBG will continue to work on supporting a regional LEED green building standard for the metropolitan Washington region. Local governments should use the IGBG summary report and technical report as a reference guide in developing and implementing Green Building initiatives.

IGBG activities will include:

- Continue to streamline the implementation of LEED, including working with the USGBC on a regional portfolio standard and other ways to help make LEED more efficient.
- Work with other COG committees (such as Energy and Climate Change) to develop efforts to train local government staff and facility managers in green building design and management, including a monitoring and tracking recommendation on the numbers, types and certification level of green buildings.
- Quantify the benefits of wide-spread implementation of the green building policy on energy use and greenhouse gas reduction.
- Develop regional guidance for green building standard for the residential sector, schools, hospitals, existing buildings, and major renovations.
- Develop regional guidance on Energy Star as a performance measure for Green Building.
- Assess the feasibility of establishing a **Green Building Program within the Department of Environmental Programs** to support green building policy development, education, and regional coordination. The Green Building program should coordinate with existing COG programs (Energy, Climate Change, Water Quality, Air Quality, Regional Growth and Development, Housing, Procurement, etc).

Rationale

- **Consistent regional implementation will insure a level playing field for private sector development.**
- **Collaboration with the US Green Building Council on streamlining implementation of the LEED certification process will insure wider acceptance of green building policies and promote efficient implementation.**
- **Education and training are essential for local government personnel to help speed implementation of green building policies, including those for local government facilities.**
- **Quantification of the benefits of green building will provide reinforcing data supporting the regional green building policy.**
- **COG's Department of Environmental Programs has the lead responsibility for environmental issues including air, water, energy, climate change, green building and solid waste. The key feature of green buildings is the integration of the various environmental media and sustainability practices in combination with traditional development policies, housing and procurement.**

The policy rationale behind **Recommendation 5** is to promote and support green building innovation in the private sector through incentives, regulatory mechanisms, and information sharing.

Conclusion

Metropolitan Washington faces an unprecedented period of opportunity for developing green building practices and markets. As the region faces many challenges related to air and water quality and climate change, coordinated public policies that promote green building will help overcome those issues while enabling innovators to take advantage of emerging economic opportunities.

LEED currently offers the most reliable and widely understood system for guiding and certifying green commercial projects. ENERGY STAR performance guidelines and measurement tools are a valuable accompaniment. National green building codes, currently in development, will offer a viable option for raising base environmental performance of all buildings, while LEED will continue to push toward high performance. Regional leaders face the challenge of coordinating green building standards in a tri-state area with varying political environments. The District of Columbia has started establishing a process for reviewing and updating codes to support green building. In-depth analysis and evaluation will help determine how green building standards should be applied to small-scale residential projects, affordable housing, schools and existing and historic projects.

As green building guidelines and incentives evolve nationally, COG members will need to follow developments closely. Unlike cities with public utilities such as Seattle, Portland, and Austin, utilities in metropolitan Washington are privately owned, and thus the region's leaders will need to explore alternative options for funding-related incentive tools.

Green building policies and initiatives will be most effective when they are applied with complementary low impact development (LID), smart growth, and community development practices, and in coordination with COG's existing environmental initiatives. Green building is a vital part of an integrated, coordinated approach to regional sustainable development and environmental stewardship. Most notably, opportunities for integration of green building policies with the region's new climate change initiative remain to be explored.

Building construction, management, and disposal practices have not been well tracked or analyzed at the regional scale. A quantitative tracking and evaluation system for green building in the region will help COG members measure progress and meet goals for improving the region's water, air, and land resources. Further analysis can also assist in creating targets for energy conservation and carbon dioxide (CO_2) emission reductions.

National experience indicates that the best and strongest municipal efforts for green building involve strong leadership, empowered staff, and strong engagement on the part of the private sector, education institutions, and nonprofit organizations. As the metropolitan Washington region moves toward an integrated regional approach to green building, all partners will play a vital role in the regional conversation. All will be engaged in an ongoing process of education and collaboration as we move toward implementation of best green building practices in the region.

Complete Report Recommendations

The following recommendations in **Table 5** represent the full set of recommendations that IGBG committee members propose for the next several years. These encompass key recommendations for new commercial buildings as well as next steps toward addressing important other buildings types, including small-scale residential development, schools, existing buildings, and affordable housing. The full set of recommendations also identifies important linkages between green building and related fields that will need to be made to take full advantage of green building's benefits for the region. The complete recommendations will form the basis for COG's green building work plan in fiscal years 2008 and 2009.

Table 5.
Complete IGBG Recommendations for the Metropolitan Washington Region

Key Recommendations	
1	**Establish LEED as the region's preferred green building rating system for new commercial construction and high-rise residential projects** using LEED New Construction (NC), Core and Shell (CS) or Commercial Interior (CI) rating systems. LEED building guidelines are also available or in development for specific commercial project types (schools, health care, retail, existing buildings, etc.) and should be evaluated for applicability as appropriate.
2	**Establish LEED Silver as the goal for all local government facilities* constructed in the metropolitan Washington region.** The appropriate LEED rating system should be used for each specific project, and should incorporate at least 4 credits as required by the **COG Regional LEED Certified** standard for private commercial and high-rise residential development (see Recommendation #3). Local governments to use ENERGY STAR tools where appropriate to maximize energy efficiency in public buildings. (*This recommendation does not apply to schools and small-scale residential projects including affordable housing, policies for which are to be evaluated by IGBG in 2008 and 2009.)
3	Establish COG Regional LEED Certified standard for **private commercial and high-rise residential development**. **COG Regional LEED Certified** is defined as LEED Certified with at least 4 credits from the following: ix. Additional EA1 credits x. SS7.1 – Heat Island, Non-roof xi. SS7.2 – Heat Island, Roof xii. EA 2 – On-site Renewable Energy xiii. EA6 – Green Power xiv. MR2.2 – 75% Construction Waste Management xv. SS 6.1 Stormwater Design – Quantity Control xvi. SS 6.1 Stormwater Design – Quality Control Review and revise COG Regional LEED Certified recommendation no later than 2012 with the goal of increasing the standard in the future.
4	COG collaborates and partners with **the private development community, nonprofit organizations, federal programs, educational institutions, financial institutions, and other interested parties** to maximize opportunities for education and innovation in the region.
5	COG ensures the success of regional green building goals through various specific actions, including a **2008 Green Building Work Plan**, that support implementation of IGBG recommendations and coordinate green building efforts with other COG programs.
In order to support regional green building policy goals and key recommendations 1-5, IGBG recommends that:	
6	COG members work to **upgrade the building codes** in a timely manner as green standards are developed (i.e., ASHRAE 189).
7	IGBG develops model language to assist COG members with implementing Recommendations 1-3.

8	IGBG evaluates and make recommendations for the development of **green building programs for single-family homes and small-scale residential projects**, including affordable housing. This will include comprehensive analysis of regional educational opportunities, program implementation tools, and green home rating systems.
9	IGBG and COG coordinate with local school districts to evaluate existing **green schools rating systems**. IGBG provides an overview of the most successful regional and national options and make recommendations for regional implementation.
10	IGBG evaluates and makes recommendations for **greening existing buildings** to support energy conservation, climate protection, and regional environmental goals. LEED-EB, specific ENERGY STAR tools, and other options should be considered.
11	COG members support green building goals by **evaluating their respective organizational capacity and by creating a green building implementation plan that will**: 1) Establish a green building program within local government. 2) Evaluate agency structure and staffing needs across the government: a. Evaluation may include staff in capital planning/design/construction, engineering, maintenance, Building Code inspectors, green building reviewers, planners, legal staff, management staff, etc. b. Overall coordination of a green building program should ensure that staff is trained, goals are clearly defined, oversight and enforcement are in place, communication and peer networking is maintained among staff and throughout the region. c. Evaluate the need for and develop as necessary: incentives, funding requirements, policy development, program development, ordinance/regulation development, etc.
12	IGBG and COG evaluate feasibility of establishing a **Green Building Partners program** to challenge COG members to meet the highest possible green building standards. COG members join the partnership and strive to meet the green building goals established.
13	COG coordinates **regional educational opportunities** related to green buildings including, but not limited to: a. Identify the most important educational needs for the region and provide recommendations for COG programs and resource development on an annual basis. b. Develop a website with regional green building information and resources. c. Coordinate and advertise local and regional green building events. d. Develop educational materials. e. Support educational green building pilot projects. f. Host tours of local green buildings for government staff and the development community g. Host an annual green building summit to address timely regional issues, foster cooperation and collaboration, and share information.
14	IGBG evaluates options for **complementing green building practices** with LID, land use planning, stormwater management, neighborhood development, and smart growth strategies.
15	COG develops a **regional green building tracking system** to collect data and monitor progress of the new regional green building efforts: (1) Coordinate with COG's Energy and Climate Change programs. (2) Develop performance measures to track progress.
16	IGBG coordinates with COG Climate Committee to evaluate **applicable energy and climate programs** such as ENERGY STAR, ICLEI, 2030 Challenge, etc. that will support regional climate protection goals through improved building perform-

	ance. COG and member jurisdictions join as appropriate.
17	IGBG and COG evaluate the feasibility of establishing specific **regional or jurisdictional targets** for regional renewable energy purchases, green roofs, and construction waste recycling.
18	COG examines options for **supporting green market innovation** through: (1) Green procurement. (2) Support of locally based small green businesses. (3) Evaluating feasibility of Green Entrepreneur Fund and Green Opportunity Zones.