

# Evaluating the Diffusion of Green Building Practices

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## EXECUTIVE SUMMARY

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The adoption and diffusion of green building designs, materials, and technologies has become an increasingly important topic in the real estate industry. However, the green building industry is currently in its nascent stages. Our goal with this project was to assess the topic by i) reviewing the existing body of literature in order to determine the perceived and realized benefits and costs associated with green building, ii) analyzing the adoption of LEED standards to identify patterns and trends, and iii) identifying barriers for adopting green building practices and ways to overcome those barriers. We did this based on a combination of literature research, statistical analysis of a database of certified projects, and a Green Building Workshop. Our findings in each of these three areas can be summarized as follows:

ISSUES	CONCLUSIONS
<b>Benefits &amp; Costs</b>	<ul style="list-style-type: none"><li>▪ Green building practices can create better buildings regardless of certification</li><li>▪ Operating costs are lower for green buildings</li><li>▪ The benefits of green building include productivity/health benefits but these benefits are difficult to quantify</li><li>▪ Construction cost premiums may be smaller than is often thought</li></ul>
<b>Opportunities &amp; Barriers</b>	<ul style="list-style-type: none"><li>▪ Majority of real estate professionals expect rapid growth in green building</li><li>▪ LEED is the dominant third-party certification in the commercial real estate market but the standard can be improved</li><li>▪ Government incentives should provide on-going catalysts for LEED adoption</li><li>▪ Residential green building adoption offers significant market opportunity</li><li>▪ The lack of education and institutional-quality market knowledge is a significant barrier for real estate lenders and investors</li><li>▪ Multiple standards are not comparable, create market confusion and may lead to slower adoption of LEED</li><li>▪ Real estate community is risk averse without a 3<sup>rd</sup> party economic case for adoption</li></ul>
<b>Patterns &amp; Trends in LEED Adoption</b>	<ul style="list-style-type: none"><li>▪ Government/public sectors have been the leading adopters of LEED standards and the top owners of LEED buildings</li><li>▪ The East and West Coast regions have been early adopters of LEED certification</li><li>▪ Some developers only meet minimum level of certification and “chase points” at the expense of high-quality building design and sustainability</li><li>▪ The allocation of points between categories and individual elements is often based on convenience, regulations, and price rather than sustainability and/or quality</li></ul>

While there are clear benefits to green building, one of the largest barriers to broader adoption is the lack of education and institutional-quality market information for the real estate industry. In short, the majority of real estate professionals are not yet convinced about the legitimacy and economic benefits of green building and LEED certification. Our project explores the benefits and costs of green building, obtained through research and real testimony, in order to provide recommendations for “bridging the gap” between early adopters of green building standards and the broader real estate community.

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## INTRODUCTION

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### Purpose

The purpose of our report is to provide a detailed review of the primary and secondary research we conducted to evaluate the diffusion of green building, including the methodology and analysis we used, the conclusions we generated, and the recommendations we proposed to broaden the adoption of green building practices.

The report will define green building, introduce the green building industry and analyze the historical adoption and diffusion of green building practices. In addition, it will give an overview of the United States Green Building Council (“USGBC”) and the USGBC Leadership in Energy and Environmental Design (“LEED”) initiative, as well as present the questions we seek to answer through our study and analysis of the green building industry and the USGBC LEED certification program.

### Final Report Structure

Following the introduction, this report is broken down into five primary areas: methodology, existing data and research, statistical analysis, green building workshop, and themes and recommendations. The combination of the five areas will give a thorough overview of our project:

- **Methodology:** Presents a description of the process we followed to define the scope of our project, gather information on the green building industry, and contribute to the existing body of knowledge.
- **Existing Data and Research:** Summarizes of the existing body of research on the benefits and costs of green building, as well as the opportunities for and threats against broader adoption of green building practices.
- **Statistical Analysis:** Analyzes LEED certified projects to identify trends and patterns in LEED adoption.
- **Green Building Workshop:** Provides feedback gathered from real estate professionals and green building advocates brought together to discuss green building adoption.
- **Themes & Recommendations:** Identifies themes and draws conclusions from our research.

### Scope

The scope of our research will encompass the USGBC LEED certification for commercial buildings due to its prominence as the leading and most widely-adopted green building standard. We recognize that the green building industry is rapidly expanding, the breadth of the USGBC initiative is evolving quickly, and LEED has encountered competition by other green building standards. However, our project research and findings focus specifically on United States LEED projects completed and certified under the LEED Green Building Rating System for New Commercial Construction and Major Renovations (“LEED-NC”). This LEED certification is the dominant third-party certification in commercial real estate and represents the largest number of completed LEED projects.

## Industry Analysis

Although green building seems more of a recent phenomenon, its roots date back more than 30 years. At that time, the industry was only a diverse mix of environmentalists, but is now recognized more broadly by individuals in all segments of the development and real estate community who are looking for ways to cut costs and improve worker productivity while also lowering the impact buildings have on the environment. According to the Office of the Federal Environmental Executive “green building” is defined as:

*“Increasing the efficiency with which buildings and their sites use energy, water and materials, and reducing building impacts on human health and the environment, through better siting, design, construction, operation, maintenance, and removal – the complete building life cycle.”<sup>1</sup>*

With this in mind, the green building industry blends real estate design and construction with an environmental initiative to provide a process of building structures that use fewer natural resources, provide a healthy and productive indoor environment and minimize the impact of buildings on their surrounding environment.

Americans spend 90% of their time indoors and commercial and residential buildings account for 36% of energy use and over 65% of electricity consumption in the United States<sup>2</sup>. Buildings also represent 30% of total U.S. greenhouse gas emissions and 40% of global raw materials, over three billion tons per year<sup>3</sup>. Traditional construction and development practices have used resources in an unsustainable practice that has taken a toll on the environment. Green building emerged as a sustainable alternative to traditional design and construction practices, and emphasizes sustainable site planning, water efficiency, energy efficiency (including renewable energy), and conservation.

Over the last twenty years, academic literature has found both economic and environmental benefits associated with green building. While green building’s positive impact on worker productivity and building costs have been well documented, little research has been done to understand its dispersion and adoption by real estate professionals. The emergence of a common green building rating system, the USGBC LEED certification, makes it possible to evaluate how, where, and why green building practices are being implemented.

The U.S. is making progress promoting the green building movement. City leaders in major metropolitan centers such as Portland, Seattle, Chicago, Los Angeles, and Boston have publicly supported green building efforts in their cities. State governments have also backed green building, with several states providing incentives, regulations and/or legislation based around LEED standards. According to the USGBC, “at least 43 cities and 14 states have adopted measures to encourage energy efficiency and use of environmentally-friendly materials and construction methods.<sup>4</sup>” The federal government is continually growing in its support of USGBC and LEED initiatives, with several existing LEED certified federal buildings, as well as many projects in progress. Federal agencies and departments are increasing their efforts in providing funding for studies, conferences and other initiatives supporting the growth of the green building industry.<sup>5</sup>

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<sup>1</sup> Building Design & Construction, 2003, “White Paper on Sustainability,” Illinois: Reed Business Information, available on the USGBC website, <<https://www.usgbc.org/Docs/Resources/BDCWhitePaperR2.pdf>>, accessed October 2005.

<sup>2</sup> U.S. Green Building Council, 2005, “An Introduction to the U.S. Green Building Council and the LEED Green Building Rating System,” Washington, DC: USGBC, company presentation, <[https://www.usgbc.org/FileHandling/show\\_general\\_file.asp?DocumentID=742#279,1,AnIntroductiontotheU.S.GreenBuildingCouncilandtheLEEDGreenBuildingRatingSystem@>](https://www.usgbc.org/FileHandling/show_general_file.asp?DocumentID=742#279,1,AnIntroductiontotheU.S.GreenBuildingCouncilandtheLEEDGreenBuildingRatingSystem@>), accessed October 20, 2005.

<sup>3</sup> U.S. Green Building Council, 2005, “An Introduction to the U.S. Green Building Council and the LEED Green Building Rating System,” Washington, DC: USGBC, company presentation, <[https://www.usgbc.org/FileHandling/show\\_general\\_file.asp?DocumentID=742#279,1,AnIntroductiontotheU.S.GreenBuildingCouncilandtheLEEDGreenBuildingRatingSystem@>](https://www.usgbc.org/FileHandling/show_general_file.asp?DocumentID=742#279,1,AnIntroductiontotheU.S.GreenBuildingCouncilandtheLEEDGreenBuildingRatingSystem@>), accessed October 20, 2005.

<sup>4</sup> Hudgins, Matt, February 23, 2006, “Seeing Red Over Green Buildings in Washington,” *National Real Estate Newsletter*, available from NREI Online, <[http://nreionline.com/news/Seeing\\_Red\\_Over\\_Green\\_Buildings\\_in\\_Washington/](http://nreionline.com/news/Seeing_Red_Over_Green_Buildings_in_Washington/)>, accessed March 2006.

<sup>5</sup> Building Design & Construction, 2003, “White Paper on Sustainability,” Illinois: Reed Business Information,

## Industry Organizations and Standards

### United States Green Building Council (USGBC)

*“The U.S. Green Building Council is the nation’s foremost coalition of leaders from across the building industry working to promote buildings that are environmentally responsible, profitable and healthy places to live and work.”<sup>6</sup>*

Founded in 1993, the USGBC is an organization that is dedicated to promoting and supporting efforts in building high performance, environmentally friendly buildings and educating society on environmental building matters. The USGBC consists of a diverse group of members from all sectors of the building industry, including 6,000 companies and organizations, over 20,000 LEED Accredited Professionals, and a network of 67 local chapters, affiliates and organizing groups.<sup>7</sup> Through building strategic alliances with its members and government agencies, the council programs are the driving force behind uncovering new research and creating awareness for the green building industry.

Each year the council has two main outreach events, Greenbuild and the USGBC Federal Summit. Greenbuild is an internationally marketed annual conference exhibiting the newest green technologies, and presenting the latest issues and findings in the industry through speakers and information sessions. The USGBC Federal Summit is also held annually specifically for USGBC members to gain an understanding of the latest public policy initiatives related to the green building effort.<sup>8</sup>

### Leadership in Energy and Environmental Design (LEED)

Launched in 1998, LEED was created by the members of the USGBC to establish a common framework for defining, measuring and assessing green building performance and standards. As outlined on the LEED website there are six main goals of this effort:<sup>9</sup>

- define “green building” by establishing a common standard of measurement;
- promote integrated, whole-building design practices;
- recognize environmental leadership in the building industry;
- stimulate green competition;
- raise consumer awareness of green building benefits; and
- transform the building market.

Each goal contributes to education and achievement of the green building industry, and emphasizes the development of buildings that reduce the impact on the environment by focusing on key elements such as “sustainable site development, water savings, energy efficiency, materials selection, and indoor environmental quality.”<sup>10</sup>

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available on the USGBC website, <<https://www.usgbc.org/Docs/Resources/BDCWhitePaperR2.pdf>>, accessed October 2005.

<sup>6</sup> US Green Building Council (2005), “About USGBC,” available from USGBC website,

<http://www.usgbc.org/DisplayPage.aspx?CategoryID=1>, accessed October 18, 2005.

<sup>7</sup> Administrator of Virtual Information Pipeline, 2005, “Green Building Council Seeks ANSI Approval as Standards Developer,” available from Virtual Information Pipeline, <[http://www.afe.org/vip/portal/index.php?option=com\\_content&task=view&id=2311&Itemid=2](http://www.afe.org/vip/portal/index.php?option=com_content&task=view&id=2311&Itemid=2)>, accessed October 18, 2005.

<sup>8</sup> US Green Building Council, 2005, “About USGBC: Programs,” available from USGBC website, <<http://www.usgbc.org/DisplayPage.aspx?CMSPageID=40&>>>, accessed October 18, 2005.

<sup>9</sup> US Green Building Council, 2005, “LEED: Leadership in Energy and Environmental Design,” available from USGBC: LEED website, <<http://www.usgbc.org/DisplayPage.aspx?CategoryID=19>>, accessed October 17, 2005.

<sup>10</sup> US Green Building Council (2005), “About USGBC,” available from USGBC website, <http://www.usgbc.org/DisplayPage.aspx?CategoryID=1>, accessed October 18, 2005.

LEED promotes its efforts through several different avenues, including, an accredited exam for professionals to become certified in green building practices and principles, committees to charter and manage the LEED resources, and a LEED rating system to facilitate and track green building projects through the full development life cycle. The rating system is a performance and consensus-based national standard for developing green buildings. Projects must register with the USGBC, earn enough points to achieve LEED certification, and prove compliance through an independent audit. LEED remains the foremost guide in current and future green building projects with:

- Over 235 million gross square feet in 50 states and 13 countries<sup>11</sup>
- 300+ LEED certified projects
- More than 2,000 LEED projects in the pipeline<sup>12</sup>

### LEED-NC Certification<sup>13</sup>

The LEED Rating System for New Commercial Construction and Major Renovations (LEED-NC) is a part of the vast LEED product portfolio (as shown below) that is meant to address all segments of the building industry.

LEED Products	Segment Description
LEED-NC	New commercial construction and major renovation projects
LEED-EB	Existing building operations
LEED-CI	Commercial interior projects
LEED-CS	Core and shell projects
LEED-H	Homes (in pilot phase; targeted release in 2006)
LEED-ND	Neighborhood development (in pilot phase; targeted release in 2006)

Any commercial occupancy or residential building with four or more habitans can be certified under LEED-NC. To be eligible for certification a LEED-NC project must earn a minimum of 26 points and meet certain prerequisites defined by the LEED-NC reference guide. The number of total points earned will determine the certification level of the project. Below shows the number of points needed to meet each certification level.

Certification Levels	Point Range
Certified	26 to 32
Silver	33 to 38
Gold	39 to 51
Platinum	52 to 69

In LEED-NC the standards fall into five categories: sustainable sites, materials and resources, water efficiency, indoor environmental quality, energy and atmosphere, and innovation and design. Points are earned for meeting requirements in each of the categories. Below is a description of each category and the possible points attainable:

<sup>11</sup> Fedrizzi, S. Richard, October 2005, "Redefining How LEED Works," *GreenTech Urban Land Institute Magazine*, p. 16-21.

<sup>12</sup> US Green Building Council, 2005, "LEED: Certification Process," available from USGBC: LEED website, <<http://www.usgbc.org/DisplayPage.aspx?CMSPageID=64>>, accessed November 2005.

<sup>13</sup> US Green Building Council, 2005, "LEED: Certification Process," available from USGBC: LEED website, <<http://www.usgbc.org/DisplayPage.aspx?CMSPageID=64>>, accessed October 19, 2005.

Category	Possible Points	Description
Sustainable Sites	14	Instead of continuing to damage and disrupt the habitat and wildlife, the idea is to develop buildings that seamlessly integrate with its natural surroundings and reduce environmental impact. The sustainable sites category includes activities that preserve and restore the local ecosystem. Reducing pollution by encouraging alternative or “green” transportation, maximizing open space, using storm water management to prevent water pollution are all examples of items that would fall under the sustainable sites category.
Materials and Resources	13	The materials and resources category supports recyclable and reuse of renewable materials to reduce the depletion of natural resources. Additionally, keeping occupancy rates up in existing building versus developing new structures helps reduce construction waste.
Water Efficiency	5	Water efficiency focuses mainly on the water conservation, which has a secondary benefit of reduced water costs. Through the use of automatic fixtures in commercial building restrooms, innovative wastewater technologies, or water efficient landscaping, water usage can be reduced by a significant amount with little effort.
Indoor Environmental Quality	15	Indoor environmental quality promotes a healthy environment for the occupants of buildings. Increased air quality and ventilation rates, managing moisture, and controlling air contaminants, light and thermal systems all contribute to creating a quality indoor environment. Through this initiative occupant well-being and productivity can be increased.
Energy and Atmosphere	17	Misuse of energy can have many adverse impacts on the environment and the atmosphere. Natural gas contributes to raising the greenhouse gas emissions and hydroelectric power disrupts natural water flows and water habitat. With this in mind, the energy and atmosphere category encourages energy efficiency through “reducing the amount of energy required, and by using more benign forms” of energy.
Innovation and Design Process	Open	Innovation and design process category is the most flexible of all the categories. The LEED system strives for constant improvement so the innovation and design process category allows project teams to be creative in their efforts and rewards them for increased “green” knowledge, building performance, and building features that are not already recognized in other categories. This encourages LEED design teams to use new technologies and push the market place into new and innovative areas of the green building industry.

Source: LEED-NC for New Construction, Reference Guide: Version 2.2

The large and growing pipeline of 2,000+ registered LEED projects clearly indicates a demand for green building practices and standards. However, the “SmartMarket Report” from McGraw Hill Construction estimates that green building will only represent 5-10% of new non-residential construction starts by 2010. Given the measurable benefits of green building, our project seeks to understand why more developers are not planning on “building green.”

## Research Overview

### Research Questions

The overarching research questions for this project were:

- 1) What are the perceptions of the opportunities for and barriers to broadening LEED adoption, and how do they compare to reality/data?
- 2) What are the patterns and trends in LEED standard adoption, if any?
- 3) Are there additional non-monetary and/or secondary benefits, such as increased workforce productivity, generated from developing LEED certified buildings?
- 4) Why are the benefits and costs (including financial impact) of LEED certified buildings still questioned by skeptics and misunderstood by the broader real estate community, despite studies showing promising figures?
- 5) What is the market outlook when evaluating the diffusion of LEED certification?

### Hypothesis

Given our research questions, we created the following hypotheses.

- 1) *The lack of education regarding the benefits and costs of green building creates a significant barrier and opportunity to broaden LEED adoption.*

Green building and LEED is becoming more popular, but there is a relatively small amount of institutional-quality market information and 3<sup>rd</sup> party validation to identify the obstacles and opportunities. Therefore, unsupported conclusions and generalities create misperceptions regarding the legitimacy and benefits of LEED certification.

- 2) *Certain patterns and trends exist in the adoption of LEED standards.*

Given a high-level overview of each the five categories in LEED-NC certified projects, we believe certain LEED elements are more frequently adopted than others, and often adopted in bundles depending on certification level, cost, point level, geographic region, or other various factors affecting the LEED certified project. Furthermore, we believe that the low adoption rate of certain standards may result from inequalities in the point system and cost premiums.

- 3) *The adoption of LEED standards results in a few non-monetary and/or secondary benefits as compared to otherwise similar non-LEED projects.*

Preliminary evidence tends to support this hypothesis, but all non-monetary/secondary benefits are not known at this time and difficult to measure accurately. Casual observation and anecdotal evidence indicates a few promising non-monetary/secondary benefits:

- faster completion with fewer delays and more on-time deliveries
  - faster sales and absorption rates of green product
  - greater overall satisfaction and quality of construction
  - higher worker satisfaction and productivity
- 4) *Despite the increasing number of studies, the infancy of the USGBC and its LEED initiative, and the perception that LEED projects are abandoned due to cost premiums generates continued skepticism by the real estate industry of the benefits and costs of LEED certification.*

Regardless of the amount of articles, research or studies published since the creation of the USGBC and LEED standards, we believe that there is disconnect and a miscommunication between real estate professionals and green building advocates that is creating on-going skepticism. In addition, our general knowledge of real estate development makes us believe that there is little incentive for developers to adopt green practices, since most of the long-term benefits and cost savings would be passed on to the owner and/or tenants of the buildings.

- 5) *The green building movement, and LEED specifically, is expanding and evolving quickly.*

We suspect there is a large learning curve to the design and construction of green buildings. Nevertheless, we believe that social responsibility and concern for the environment is becoming a popular movement within various industries and the public sector. This sentiment may indicate that it will not be long before the green building movement evolves past its early stages of diffusion.

### **Benefits and Risks**

The benefits of analyzing our hypotheses and understanding the answers to our questions include:

- Identifying what LEED standards “work” (and which don’t)
- Building a relationship with USGBC and other green building advocates and helping them understand the perspective of the broader real estate community
- Helping to strengthen communication between USGBC and the real estate industry
- Establishing a relationship between UCLA and USGBC for future collaboration
- Identifying ways to accelerate the adoption of green building/LEED

The risks in solving this problem include:

- Exposing inefficiencies within USGBC and the LEED Rating System that could potentially hurt the growth of the organization.
- Highlighting too many problems and obstacles while ignoring the progress and ongoing improvement efforts made by the USGBC and the green building industry
- Broadening adoption of green building practices that would likely increase costs for real estate developers in the short-term

### **Importance and Impact**

The importance of sustainable real estate development and green building cannot be overstated from a business and environmental perspective. Relevant information and communication to the “for profit” world of real estate development about the efforts of green building is lacking. If our study serves its purpose, it will help the USGBC understand how to improve the LEED program and broaden its adoption. More importantly, it will educate real estate professionals to the benefits of green building and help them overcome their opposition towards this important trend. It will also provide a baseline and lay a foundation for future research from the UCLA Anderson community.

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## **METHODOLOGY**

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### **Overview**

Studying an industry that is fairly young in its formal initiatives and spans across a broad range of industry professionals and sectors required a unique research approach. Using the scope of our project as a guide to narrow our research, it was essential that our research addressed both qualitative and quantitative areas.

Our methodology was a three step process. First, we looked at existing data and research to gather all the information that was already presented. This allowed us to identify gaps in industry research, find both supportive evidence and contradictions to our hypotheses, and ensure that we did not overlap with existing studies. Second, we tested our hypotheses by performing a statistical analysis of a database of LEED certified projects, and by conducting a workshop for green building and real estate professionals. The statistical analysis allowed us to look at actual data and draw quantitative conclusions. Conversely, the workshop focused on the study of LEED adoption and diffusion through sharing the practical experience of industry experts and “bridging the gap” between green building advocates and the real estate community – the workshop included both experts and non-experts in the green building industry, as well as representatives from all areas of the real estate community. Lastly, to complete our research, we collaborated with organizations that have a significant impact on the green building industry and the real estate community.

Each section within the methodology discusses our detailed approach to the separate steps in our project life cycle.

### **Existing Industry Data and Research**

In order to evaluate the state of the green building industry, we reviewed the existing body of literature. For the purposes of our study, we have selected the USGBC LEED certification as a proxy for green building in many cases. However, when evaluating the existing body of literature, we reviewed current literature addressing all green building, broadly defined.

The existing literature falls into three categories: i) surveys evaluating the current perceptions and building practices of green and non-green representatives from the real estate community (including architects, engineers, or construction professionals); ii) popular publications addressing green building; and iii) academic studies evaluating the empirical evidence that either proves or disproves the impact of green building on project benefits and costs.

In the “Existing Data and Research” section below, we outline several themes common throughout the existing literature. We highlight how real estate professionals perceive the costs and benefits of green building as outlined in recent surveys. We then compare these perceptions to the empirical evidence detailed in several academic studies and surveys of recent green building projects. By comparing perceptions to real data, we develop brief conclusions to explain any inconsistencies. Finally, we highlight several potential barriers to the burgeoning green building industry and outline opportunities to accelerate the adoption and diffusion of green building and LEED certification throughout the real estate industry.

## Statistical Analysis

In order to better understand the adoption and diffusion of LEED, we created a database of all LEED certified projects. The database covers all LEED certified projects that were listed on the USGBC website as of December 2005. By aggregating the individual project summaries posted to the USGBC website, we were able to capture detailed certification characteristics on 310 LEED certified projects.

Although LEED certification can be achieved through any one of six different program types, as of December 2005, the USGBC website did not have any projects listed for either the LEED-H (homes) program or the LEED-ND (neighborhood development) program—as both are still in various stages of pilot testing. The table below summarizes the data contained in our database by program type.

<b>Program Type</b>	<b>Program Description</b>	<b>Number of Projects</b>
LEED-NC	New commercial construction and major renovation projects	255
LEED-EB	Existing building operations	24
LEED-CI	Commercial interiors projects	30
LEED-CS	Core and shell projects	1
LEED-H	Homes	N/A
LEED-ND	Neighborhood development	N/A

While our database contains information on four of the six LEED program types, we limited our analysis to LEED-NC for the purpose of our study. We did this because projects are not directly comparable among different program-types and this particular program-type, with 255 certified projects, affords a large and robust population for investigation. Additionally, LEED-NC has been and continues to attract the largest proportion of interest among the real estate community.

Once the focus was narrowed to the LEED-NC program, we then had to decide between three different versions (NC 1.0, NC 2.0, and NC 2.1) of the same standard. Both versions NC 2.0 and NC 2.1 were comparable and thus combinable. However, NC 1.0 was not comparable with either of its successors, and the ten projects which carried this designation were excluded from our analysis. Finally, after combining the NC 2.0 and NC 2.1 projects, we further removed ten projects due to incomplete individual project information, and were left with a total of 235 projects—160 of which were NC 2.0 and 75 of which were NC 2.1.

Within the NC 2.0 and 2.1 programs, projects can earn potential certification points across 64 project elements, grouped into six major categories. For our analysis, we consolidated the project elements in the sixth category, Innovation & Design Process, reducing the number of total elements for each project to sixty. We then captured where each project earned certification points among the sixty elements.

Next, we combined this data with additional project and classification information, which included the: LEED rating (platinum, gold, silver, certified), version (2.0, 2.1), certification date, owner name, and geographic information (country, region, sub-region, state, city). By combining this information, we were then able to run various analyses (minimums, maximums, averages, standard deviations, and correlations) on each element and/or each major category based on any of the above mentioned classifications.

## Green Building Workshop

In order to evaluate qualitative information regarding the adoption of green building practices, initially, we planned to distribute a survey to LEED accredited professionals. As we were unable to secure USGBC sponsorship within the time constraint of our project, we organized a “Green Building Workshop”<sup>14</sup>. (See Appendix C for an example of the planned survey)

We re-focused our efforts on organizing a Green Building Workshop with the purpose of gathering qualitative information regarding the benefits, costs, and criticisms of green building across a range of disciplines. We initially planned to invite 12-15 people to a joint initiative by UCLA Anderson and the Ziman Center to create an interactive workshop where those with green building experience could exchange ideas with those without any green building experience, but with a knowledge of or desire to learn more about the subject. After the initial planning, we followed these steps:

- 1) Established a relationship with the USGBC national and local (Los Angeles) chapter through various event participation, networking and outreach.
- 2) Secured participation from local USGBC chapter board members through collaboration with Lance Williams, Executive Director of USGBC Los Angeles Chapter.
- 3) Leveraged our relationship with the Ziman Center and their relationship with the real estate community in Southern California, and sent out a notice to their broad distribution list to attract interest in the event
- 4) Collected confirmations of attendance from the Ziman Center while specifically researching local LEED certified projects to find the firms associated with the project and contact representatives from those firms with green building experience.
- 5) Leveraged the UCLA Anderson alumni network and our own professional contacts to attract real estate professionals to the event and get referrals to other relevant contacts.
- 6) Selected a cross-section of disciplines to attend the event, including architects, engineers, consultants, real estate developers, diversified real estate investors, and public institutions.

These efforts generated a list of approximately 30 participants, including representatives from the USGBC, the public sector, and the real estate development business. Attendees included representatives from CBRE, City of Santa Monica, CTG Energetics, Douglas Emmett, Gensler, JP Morgan, KB Homes, Swinerton, The Olson Company, Toyota, Turner Construction, and Wells Fargo. Our two-hour Green Building Workshop agenda included the following (see Appendix D for more detail):

- 10-15 minutes: Overview of USGBC and LEED certification
- 10-15 minutes: Presentation by Green Building Project team
- 30 minutes: Panel discussion with facilitator
- 30-45 minutes: Group discussions with facilitated breakout sessions
- 10-15 minutes: Q & A with conclusions from group discussions

Materials from the Green Building Workshop can be found in Appendix D.

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<sup>14</sup> Initially, Richard Fedrizzi, USGBC CEO and President, referred us to Peter Templeton, USGBC Vice President of Education and Research, in order to collaborate on the survey that would reach 20,000 LEED accredited professionals. While Mr. Templeton seemed interested in our ideas we were ultimately unable to coordinate the survey due to tight project timeline and we decided to pursue an alternative method to gather qualitative info from green building representatives and real estate professionals.

## **Additional Resources**

### **Richard S. Ziman Center for Real Estate**

The Richard S. Ziman Center for Real Estate was created to support continuing education, research and activities within the topic of real estate. With the help of Ziman Center founding members, Ziman Center associates, faculty, students, and alumni the Ziman Center has become a global leader in real estate teaching and has had continued success in its on-going effort in research in the real estate industry. Moreover, its several outreach events have brought together a large and distinguished network of real estate professionals.

As the main supporter and sole sponsor of our project, the Ziman Center served as a key resource for communicating with the local real estate community. They were also an important resource in our efforts to “bridge the gap” between green building professionals and the real estate industry. The associates in the Ziman Center, including Tim Kawahara, Managing Director, Sharon Nakmura-Brown, Director of Outreach, and Sanam Dabiri, also assisted with the logistics of the Green Building Workshop.

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## REVIEW OF EXISTING LITERATURE

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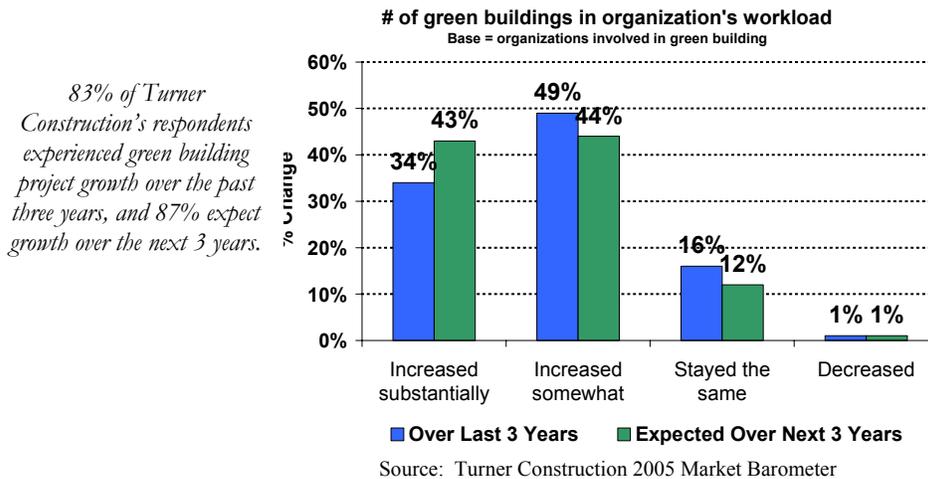
### Overview

A significant component of our project consisted of reviewing the existing body of literature on green building and LEED certification. The topics discussed in the existing literature fall into several categories: benefits of green building, costs of green building, opportunities to broaden the adoption of green building and LEED standards and potential threats to the adoption of these standards. We believe that a broad understanding of the existing body of work is necessary in order to position our primary research, i.e., the statistical analysis on the adoption of LEED-NC and the Green Building Workshop, within the context of the green building industry. The discussion below outlines the common themes we uncovered in the articles, surveys, interviews, and academic surveys on green building.

### Benefits and Costs – Perceptions

Several recent, comprehensive surveys capture the real estate community's perception of the costs and benefits of green building. The most recent surveys we used include the "2005 Market Barometer" from Turner Construction and the "SmartMarket Report" from McGraw Hill Construction (in conjunction with the USGBC). Each surveyed a broad and diverse sample of architects, engineers, contractors, and property owners. Furthermore, both surveys provided insight into the real estate professionals' current perceptions of green building from those with experience in green building projects and those without.

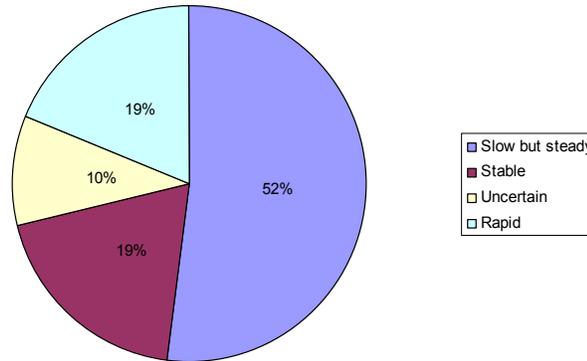
The Turner Construction and McGraw Hill surveys each independently confirm the recent growth trend in green building and strong support for building green: 86% of the Architect, Engineer, and Contractor community (AEC) surveyed by McGraw-Hill reported participation in some form of green building practices while 57% of the Turner survey respondents confirmed participation in green building. This compares favorably with a 2003 survey by Building Design & Construction where only 49% of respondents worked for firms that had attempted at least one green project<sup>15</sup>. Moreover, both the Turner and McGraw Hill surveys suggest that respondents expect continued growth in green building (See figures below).



<sup>15</sup> Building Design & Construction, 2003, "White Paper on Sustainability," Illinois: Reed Business Information, available on the USGBC website, <<https://www.usgbc.org/Docs/Resources/BDCWhitePaperR2.pdf>>.

**Sales Growth Projections: Overall AEC/Owner Community**

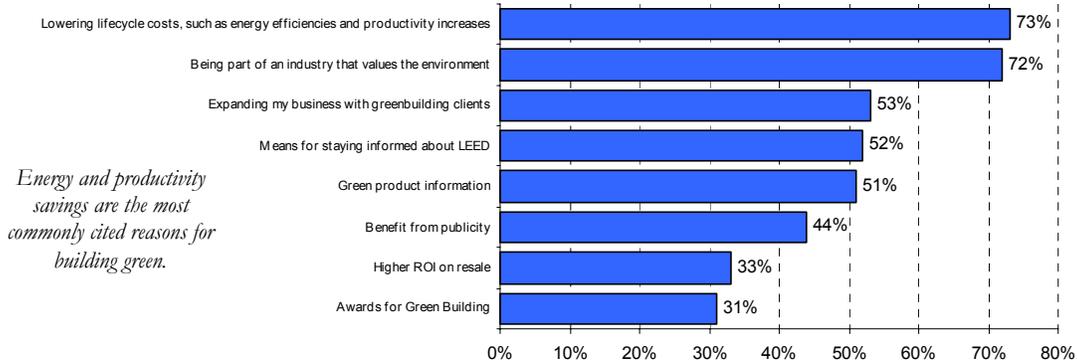
*19% of McGraw Hill's AEC respondents expect "rapid" growth in green building sales industry-wide, and 52% expect slow but steady growth.*



Source: McGraw Hill Construction, 2005

The Turner and McGraw Hill surveys also provide insight into real estate professionals' reasons for building green. The studies find that business reasons are given as often as environmental reasons for green building. McGraw Hill found that the three most often cited reasons for green building included "lowering lifecycle costs such as energy efficiencies and productivity increases," "being part of an industry that values the environment," and "expanding my business with green building clients"<sup>16</sup>.

**Reasons for Green Buildings**



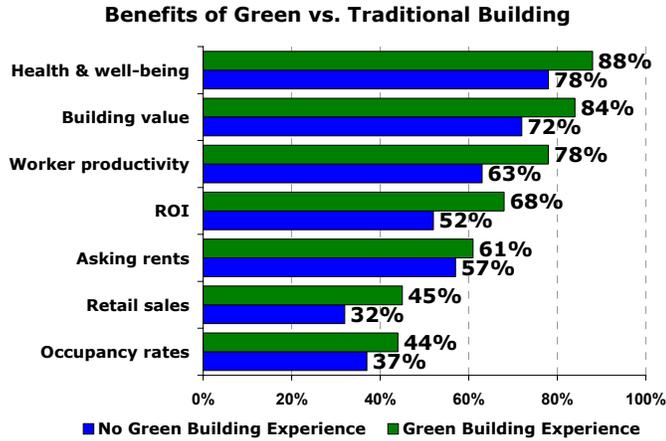
*Energy and productivity savings are the most commonly cited reasons for building green.*

Source: McGraw Hill Construction, 2005

Findings from the Turner Construction survey confirm the findings of the McGraw Hill study. The Turner study provides a more detailed list of the expected benefits of green building. Interestingly, more than half of the respondents, regardless of whether or not the respondent worked at a firm with green building experience, expected green building to result in improved health and well-being of occupants, increased building value, improved worker productivity, and improved return on investment.

<sup>16</sup> McGraw Hill Construction, 2005, "Green Building SmartMarket Report," 2006 Green Building Issue., McGraw Hill Construction.

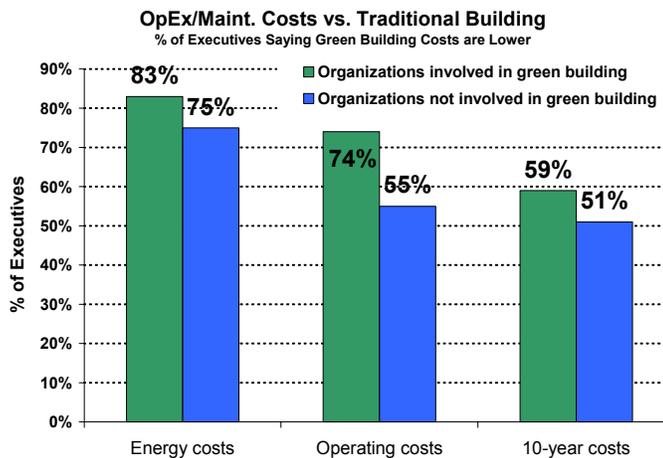
*Over 2/3 of real estate executives with green building experience expect improved health, productivity, and financial benefits relative to traditional construction..*



Source: Turner Construction 2005 Market Barometer

When asked about whether or not green building resulted in lower energy and operating costs, Turner survey respondents reiterated the results of the McGraw Hill survey. The majority of respondents believed that operating expenses and maintenance costs are less for green buildings versus traditional construction. As one might expect, respondents from firms not involved in green building were less likely to believe that green buildings have lower costs.

*The majority of real estate professionals believe that green buildings save costs relative to traditional buildings.*

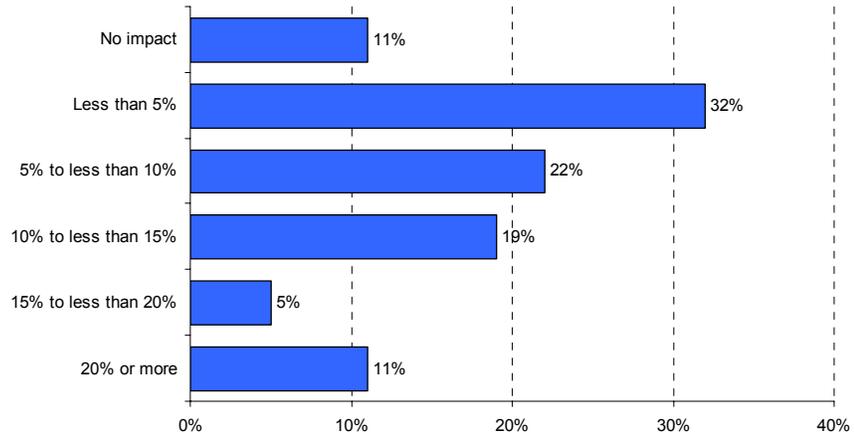


Source: Turner Construction 2005 Market Barometer

Respondents to the McGraw Hill study quantified the savings expectations from building green. On average, respondents expected operating costs to decrease between 8% and 9%. Interestingly, almost half of contractors believed green building standards would have less than a 5% impact on operating costs, which was less than the estimates provided by architects and engineers. A significant percentage of owners (15%) believed that building green decreased operating costs more than 20%.

### Impact of Green Building on Operating Costs

*57% of real estate professionals believe that green building will reduce operating costs by greater than 5%.*



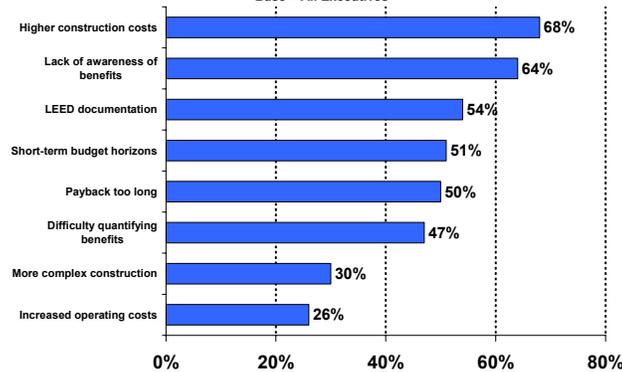
Source: McGraw Hill Construction, 2005

Surveys also suggest that real estate professionals perceive increased construction or initial development costs (“first costs”) associated with green building. In fact, increased development costs are cited as the number one obstacle to green building in surveys by Turner Construction, McGraw Hill Construction, and Building Design & Construction. As discussed below, recent literature does not detail the specific higher first costs that professionals expect. Surveys do, however, reveal other costs that may be slowing the diffusion of green building. These obstacles include lack of education or awareness of green standards (i.e., LEED) and budget authorization. The results of the Turner and McGraw Hill Construction studies can be found below.

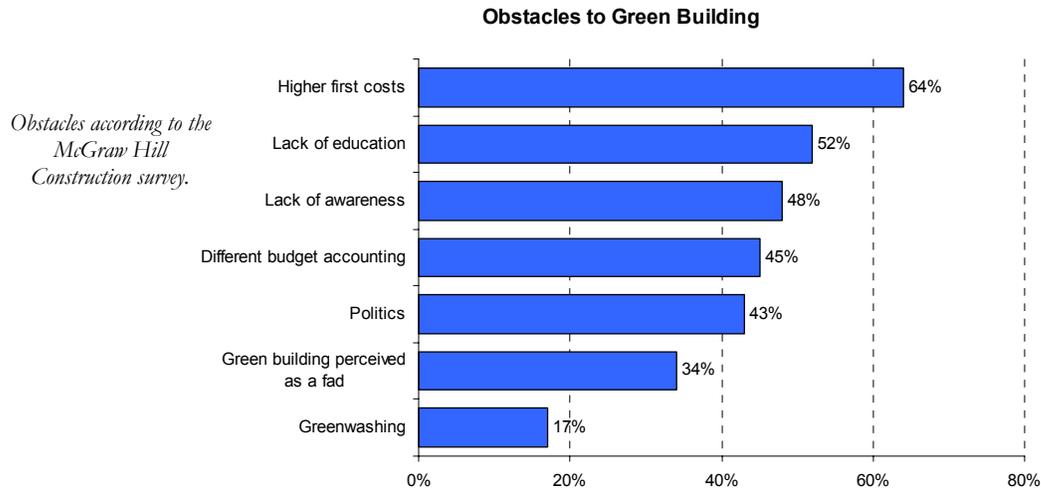
### Factors Discouraging Green Building

Base = All Executives

*Obstacles according to the Turner Construction survey.*



Source: Turner Construction 2005 Market Barometer



Source: McGraw Hill Construction, 2005

According to the Turner Construction survey, executives with green building experience estimated green construction costs to be 13% higher than traditional construction costs. Executives with no green building experience estimated the cost premium at 18%. Despite a bullish outlook for green building, the perception of a significant cost premium is clearly an obstacle to the diffusion of green building practices. The section below examines the true cost of green building and examines whether empirical evidence suggests that the benefits of green building outweigh the costs.

## Benefits and Costs – Reality

A body of literature documenting both the environmental and economic benefits of existing green/LEED projects has been growing in recent years. The environmental benefits of green building are beyond the scope of this paper; however, statistics presented above (i.e., the fact that buildings account for over 65% of electricity consumption in the United States; and that buildings account for 30% U.S. greenhouse gas emissions and 40% of global raw materials<sup>17</sup>) suggest that there is ample room for green building to reduce the environmental impact of construction projects.

The economic benefits of green building, the focus of our research, can broadly be categorized as either reduced lifecycle costs (such as energy costs) or productivity/health benefits (such as improved worker productivity and lower absenteeism).

Above, we showed that the real estate community expects the benefits of green building to include reduced energy and operating costs, higher building value, increased worker productivity, increased health and well-being of workers, and improved return on investment. In a 2003 landmark study, Greg Kats provided empirical evidence to evaluate how these perceptions compare to reality.

Kats analyzed a sample of existing LEED registered projects that included detailed budgets for both a green plan (i.e., LEED certified) and a non-green plan. The existence of both green and non-green budgets facilitated the cost comparison of green versus non-green building. After a careful analysis of energy, emissions, water, waste, and productivity savings over time, Kats found that “total financial

<sup>17</sup> U.S. Green Building Council, 2005, “An Introduction to the U.S. Green Building Council and the LEED Green Building Rating System,” Washington, DC: USGBC, company presentation, <[https://www.usgbc.org/FileHandling/show\\_general\\_file.asp?DocumentID=742#279,1,An Introduction to the U.S. Green Building Council and the LEED Green Building Rating System](https://www.usgbc.org/FileHandling/show_general_file.asp?DocumentID=742#279,1,An%20Introduction%20to%20the%20U.S.%20Green%20Building%20Council%20and%20the%20LEED%20Green%20Building%20Rating%20System%20%26%26%26)>, accessed October 20, 2005.

benefits of green buildings are over ten times the average initial investment required to design and construct a green building<sup>18</sup>. In fact, he found that energy savings alone more than off-set the increased costs associated with green building. The U.S. Environmental Protection Agency echoes the energy savings benefit of green building, stating that green building can result in energy cost savings of up to 40% with a pay-back period of first costs in 2.5 years<sup>19</sup>.

**Financial Benefits of Green Buildings  
Summary of Findings (per ft<sup>2</sup>)**

*Kats study of the costs and benefits of green building finds that energy savings alone off-set the increased cost premium to build a green building. Productivity and health benefits are by far the largest benefits of green building.*

Category	20-year NPV
Energy Value	\$5.79
Emissions Value	\$1.18
Water Value	\$0.51
Waste Value (construction only) - 1 year	\$0.03
Commissioning O&M Value	\$8.47
Productivity and Health Value (Certified and Silver)	\$36.89
Productivity and Health Value (Gold and Platinum)	\$55.33
Less Green Cost Premium	(\$4.00)
<b>Total 20-year NPV (Certified and Silver)</b>	<b>\$48.87</b>
<b>Total 20-year NPV (Gold and Platinum)</b>	<b>\$67.31</b>

Source: Kats, 2003

Kats' study provides a detailed analysis of the projected green building savings in lower energy consumption, lower emissions, lower water consumption, and more efficient disposal of waste; however, the largest contributor to the net present value of the green building decision is improvements in productivity and health due to green building. Kats notes that employee costs dwarf costs associated with real estate operating costs. In fact, in the State of California, the cost of state employees was ten times larger than the cost of property in 2003<sup>20</sup>. Therefore, a very small increase in the productivity of employees provides significant savings for green buildings relative to non-green buildings. For the purposes of his analysis, Kats conservatively assumes a 1% increase in productivity for green buildings relative to non-green buildings. Several studies support this estimate (while confirming its conservatism).

The Heschong Mahone Group has done extensive research on the impact of physical conditions on employee performance, and the results are notable:

- Call center employees with better views out of a window (gauged by the size of the window and the amount of vegetation) processed calls 6% to 12% faster, and office workers performed 10% to 15% better on mental function and memory recall tests<sup>21</sup>.
- A study of classrooms and daylighting showed that students with the most daylighting had test scores 7% to 18% higher than those with the least. The study also found that students with the most daylighting progressed 20% faster on math tests and 26% faster on reading tests<sup>22</sup>.
- A study of daylighting on retail sales found a strong, positive statistical relationship between increased hours of daylight and increased sales. The average increase in sales for the daylit stores

<sup>18</sup> Kats, Greg, 2003, "The Costs and Financial Benefits of Green Buildings: A Report to California's Sustainable Building Task Force," available from the USGBC website, <<https://www.usgbc.org/b2c/b2c/mainFS.jsp>>, accessed November 2005.

<sup>19</sup> Pivo, Gary, October 2005, "Promising Economics," *GreenTech Urban Land Institute Magazine*, p. 34-39.

<sup>20</sup> Kats, Greg, 2003, "The Costs and Financial Benefits of Green Buildings: A Report to California's Sustainable Building Task Force," available from the USGBC website, <<https://www.usgbc.org/b2c/b2c/mainFS.jsp>>, accessed November 2005, p. 54.

<sup>21</sup> Heschong Mahone Group, Inc., 2003, "Windows and Offices: A Study of Office Worker Performance and the Indoor Environment," available from Heschong Mahone Group website, <<http://www.h-m-g.com/projects/daylighting/summaries%20on%20daylighting.htm#Windows%20and%20Offices:%20A%20Study%20of%20Office%20Worker%20Performance%20and%20the%20Indoor%20Environment%20-%20CEC%20PIER%202003>>, accessed January 2006.

<sup>22</sup> Heschong Mahone Group, Inc., 2003, "Windows and Classrooms: A Study of Student Performance and the Indoor Environment," available from Heschong Mahone Group website, <<http://www.h-m-g.com/projects/daylighting/summaries%20on%20daylighting.htm#Windows%20and%20Classrooms:%20A%20Study%20of%20Student%20Performance%20and%20the%20Indoor%20Environment%20-%20CEC%20PIER%202003>>, accessed January 2006.

of a particular retailer ranged from 0% to 6%. Moreover, the authors note that the store owners implemented increased day-lighting in order to save on energy costs; however, the decrease in energy costs “is far overshadowed by the value of the predicted increase in sales due to daylighting. By the most conservative estimate, the profit from increased sales associated with daylight is worth at least 19 times more than the energy savings, and more likely, may be worth 45 – 100 times more than the energy savings”<sup>23</sup>.

A study by the Carnegie Mellon Building Investment Decision Support program confirms the Heschong Mahone findings and notes that increases in “tenant control over ventilation, temperature and lighting each provide measured benefits from 0.5% up to 34%”<sup>24</sup>.

Empirical studies confirm the perceptions of many real estate executives. Green buildings do provide many benefits relative to traditional buildings. While extensive work has been done analyzing lifecycle costs and productivity benefits, more work must be done to confirm that green buildings result in a valuation premium and an increased return on investment. As the industry matures, it will be important to collect and distribute data on these issues.

Significant work has also been done analyzing the empirical evidence on the costs associated with green building. In the perceptions section above, we showed that real estate executives believe that green building results in significantly higher development costs. However, empirical evidence suggests that green buildings can be built for little or no cost premium relative to traditional buildings.

A 2003 study by Building Design & Construction provides a mixed picture of the construction costs associated with green building. The study of the costs associated with LEED certification of various levels showed costs ranging widely from a low of \$13 to a high of \$425 per square foot.<sup>25</sup> The authors suggest that the likely “explanation for these differentials is that different building types cost more per square foot to construct than others.” As this statement suggests, comparisons of first-costs across projects are challenging, given differences in project type, geographic price differences, and regional/weather impacts on costs.

A 2004 Davis Langdon study confirms this hypothesis by examining cost premiums in multiple regions. The study finds significant differences in green building cost premiums in various regions. This geographic variation complicates any analysis of the “average” cost of green building and suggests that further research should examine the possibility that green certifications should include adjustments for geographic variation. The Davis Langdon study also concludes that there will be cost premiums related to building LEED certified buildings in rural locations versus urban locations because some LEED qualifying points are not practical for rural projects (e.g., urban redevelopment, alternative transportation, siting, etc.).

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<sup>23</sup> Heschong Mahone Group, Inc., 2003, “Daylight and Retail Sales,” available from Heschong Mahone Group website, <<http://www.h-m-g.com/projects/daylighting/summaries%20on%20daylighting.htm#Daylight%20and%20Retail%20Sales%20-%20CEC%20PIER%202003>>, accessed January 2006.

<sup>24</sup> Kats, Greg, 2003, “The Costs and Financial Benefits of Green Buildings: A Report to California’s Sustainable Building Task Force,” available from the USGBC website, <<https://www.usgbc.org/b2c/b2c/mainFS.jsp>>, accessed November 2005, p. 31.

<sup>25</sup> Building Design & Construction, 2003, “White Paper on Sustainability,” Illinois: Reed Business Information, available on the USGBC website, <<https://www.usgbc.org/Docs/Resources/BDCWhitePaperR2.pdf>>.

*Green building cost premiums vary significantly by geographic location.*

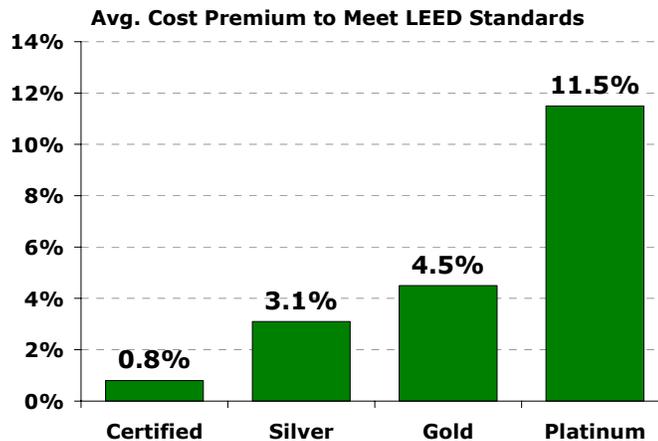
	Platinum*	Gold*	Silver*
UCSB	7.8 %	2.7 %	1.0 %
San Francisco	7.8 %	2.7 %	1.0 %
Merced	10.3 %	5.3 %	3.7 %
Denver	7.6 %	2.8 %	1.2 %
Boston	8.8 %	4.2 %	2.6 %
Houston	9.1 %	6.3 %	1.7 %

Source: Davis Langdon, 2004

The evaluation of construction costs for green buildings is further complicated because evidence suggests that a significant learning curve exists in green building and any cross-sectional study will include projects run by experienced teams and projects run by inexperienced teams, which will likely incur higher costs due to poor planning, costly reengineering, etc.<sup>26</sup>.

Despite these complications, evidence suggests that many green buildings can be built for no premium over traditional construction<sup>27</sup>. This has been proved in multiple studies over the past several years. First, Greg Kats' 2003 study found that "on average, the premium for green buildings is about 2%"<sup>28</sup>. More recently, a 2004 Davis Langdon study found no statistically significant difference (measured in dollars per square foot) between a population of LEED projects and comparable non-LEED projects of otherwise similar quality. Finally, the Turner Construction 2005 Market Barometer evaluated the evidence on cost premiums from multiple studies and found that cost premiums for LEED certified projects will range from 0.8% for certified to 11.5% for platinum-level projects.

*Multiple empirical studies suggest that green building cost premiums are small relative to traditional building.*



Source: Turner Construction 2005 Market Barometer

A 2004 survey of green building participants confirms the empirical evidence that the cost premium for green building is immaterial. The 2004 Green Building Alliance survey interviewed green building practitioners in Pittsburgh (a leader in green building) with the intention of evaluating the LEED-NC certification five years after its inception. Approximately 65% of the respondents, the majority of whom had worked on three to four LEED projects, replied that LEED certified buildings cost only slightly

<sup>26</sup> Kats, Greg, 2003, "The Costs and Financial Benefits of Green Buildings: A Report to California's Sustainable Building Task Force," available from the USGBC website, <<https://www.usgbc.org/b2c/b2c/mainFS.jsp>>, accessed November 2005, p. 13.

<sup>27</sup> Building Design & Construction, 2003, "White Paper on Sustainability," Reed Business Information, available on the USGBC website, <<https://www.usgbc.org/Docs/Resources/BDCWhitePaperR2.pdf>>, p. 30.

<sup>28</sup> McGraw Hill Construction, 2005, "Green Building SmartMarket Report," 2006 *Green Building Issue.*, McGraw Hill Construction, p. 15.

more than traditional buildings, while 25% replied that LEED certified buildings are comparable or less expensive than traditional buildings.<sup>29</sup>

*Green Building Alliance found that real estate executives, the majority of whom had worked on 3 – 4 LEED projects, confirm the benign premium of LEED certified buildings relative to traditional buildings.*

"Compared to the costs of constructing conventional buildings, LEED buildings are:"		
	Response Percent	Response Total
A lot cheaper	1.30%	1
Slightly cheaper	0.00%	0
Comparable	23.40%	18
<b>Slightly more expensive</b>	<b>64.90%</b>	<b>50</b>
A lot more expensive	10.40%	8
<b>Total Respondents</b>		<b>77</b>

Source: Green Building Alliance, 2004

Anecdotal evidence from participants in green building confirms the small green cost premium found in academic studies and surveys. Gary Saulson, the Director of Corporate Real Estate for PNC Financial Services (the leading private sector owner of LEED certified buildings), and himself an experienced green building professional, reiterates the conclusion in a recent interview:

“Sure, we [saw cost increases]. Some things were astronomically priced, but we offset them with some value engineering things that we could do to have the project not cost more than a typical building. It’s the same with the bank branches.... It’s going to be \$150,000 less than our competition is building non green buildings”<sup>30</sup>.

Gerdling/Edlen, an experienced LEED developer better known by their joint venture The South Group, also confirms that LEED certified projects should cost only slightly more than traditional projects:

“Cost depends on project specifics and the LEED level targeted, said Dennis Wilde, senior project manager at Gerdling/Edlen. Gold ratings can increase hard construction costs between 1 percent and 2 percent, he said, while attempts at platinum can be upward of 5 percent. But LEED certified or silver certified projects should see no increase, especially if the participants have experience, he said.

‘If you’ve been to this party before, and you know what you’re doing, there should be no material cost increase,’ Wilde said.”<sup>31</sup>

In conclusion, both empirical and anecdotal evidence outlined in the existing body of literature overwhelmingly contradicts the perception of real estate executives that green buildings cost significantly more than traditional buildings. Moreover, research has found that the benefits of lifecycle cost savings (energy, water, etc.) and productivity gains more than off-set the small premium required to build green. This assessment of existing research and data lead us to identify several opportunities for and barriers against the broader adoption of green building standards and practices.

<sup>29</sup> Green Building Alliance, 2004, “LEED-NC: The First Five Years, Report on the Greater Pittsburgh region’s experience using Leadership in Energy & Environment Design for New Construction,” p. 8.

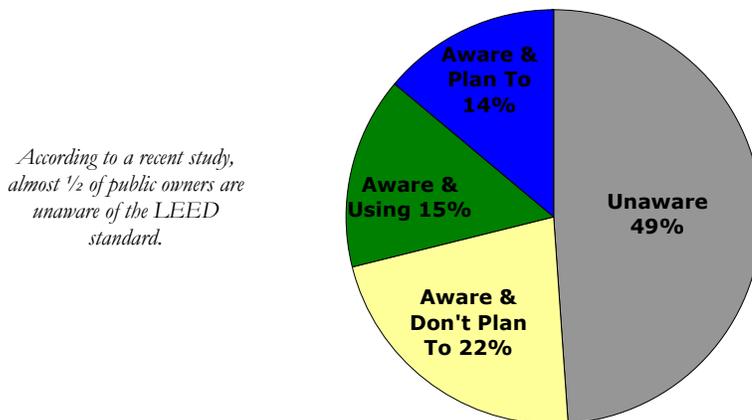
<sup>30</sup> McGraw Hill Construction, 2005, “Green Building SmartMarket Report,” *2006 Green Building Issue.*, McGraw Hill Construction, p. 38.

<sup>31</sup> Ryan, Allison, October 1, 2005, “Experts disagree on whether green construction costs more,” *Daily Journal of Commerce.*

## Opportunities

The perception of benefits and costs discussed above in surveys and existing literature serves to frame our assessment of the opportunities for and barriers to broader adoption of the LEED standard. Furthermore, these studies provide valuable insight into the perceptions of real estate professionals who must be persuaded about the benefits of green building if LEED standards are ever going to gain widespread acceptance.

Despite the results of the Turner Construction Survey that suggest participation rates as high as 57% in green projects, there is clearly an opportunity to expand awareness of green building. A survey of public owners conducted in August 2005 by PinnacleOne indicates that 49% of public property owners were unfamiliar with LEED standards.<sup>32</sup> However, the PinnacleOne survey also indicated that 29% of owners have used LEED standards or plan to use LEED standards within one year.<sup>33</sup> Of those with no plans to use LEED, 26% cited cost as the driving factor behind their lack of interest.<sup>34</sup> These results, when combined with the supporting research discussed above, suggest that educational opportunities exist for the USGBC to inform real estate professionals about LEED standards and the associated benefits of becoming LEED certified. LEED has taken a step in the right direction with the annual USGBC Conference; but more needs to be accomplished and communication must be improved to drive adoption of LEED standards among real estate professionals with no previous LEED project experience or exposure.



In order for the USGBC to succeed and further solidify LEED as the dominant green building standard, the organization must also leverage government legislation and incentives as stimulus for the broader adoption of green building practices. To date, at least 43 cities and 14 states have adopted measures to promote green building.<sup>35</sup> Most of these measures have been targeted towards government-owned or government-funded buildings. However, many municipalities are also offering incentives to meet LEED standards. These incentives include waived permitting fees, accelerated depreciation, tax deductions and

<sup>32</sup> PinnacleOne, 2005, "Majority of Public Owners Are Turning to Energy Efficiency Designs." Phoenix, AZ: Walsh Communications, press release, available from PinnacleOne website, <[http://www.pinnacleone.com/press\\_releases\\_pdf/2005%20Pulse%20-%20Energy%20Efficiency%FINAL.pdf](http://www.pinnacleone.com/press_releases_pdf/2005%20Pulse%20-%20Energy%20Efficiency%FINAL.pdf)>, accessed January 2006.

<sup>33</sup> PinnacleOne, 2005, "Majority of Public Owners Are Turning to Energy Efficiency Designs." Phoenix, AZ: Walsh Communications, press release, available from PinnacleOne website, <[http://www.pinnacleone.com/press\\_releases\\_pdf/2005%20Pulse%20-%20Energy%20Efficiency%FINAL.pdf](http://www.pinnacleone.com/press_releases_pdf/2005%20Pulse%20-%20Energy%20Efficiency%FINAL.pdf)>, accessed January 2006.

<sup>34</sup> PinnacleOne, 2005, "Majority of Public Owners Are Turning to Energy Efficiency Designs." Phoenix, AZ: Walsh Communications, press release, available from PinnacleOne website, <[http://www.pinnacleone.com/press\\_releases\\_pdf/2005%20Pulse%20-%20Energy%20Efficiency%FINAL.pdf](http://www.pinnacleone.com/press_releases_pdf/2005%20Pulse%20-%20Energy%20Efficiency%FINAL.pdf)>, accessed January 2006.

<sup>35</sup> Hudgins, Matt, February 23, 2006, "Seeing Red Over Green Buildings in Washington," *National Real Estate Newsletter*, available from NREI Online, <[http://nreionline.com/news/Seeing\\_Red\\_Over\\_Green\\_Buildings\\_in\\_Washington/](http://nreionline.com/news/Seeing_Red_Over_Green_Buildings_in_Washington/)>, accessed March 2006.

credits, renewable energy credits, utility incentives and stipends for green building consultants. One such example was a tax credit signed into law in August 2005 when the U.S. Department of Energy signed legislation that would provide a 30% tax credit for the installation of qualifying solar panel equipment on buildings. The USGBC and real estate industry must be prepared to leverage these government initiatives, recognize the associated economic benefits, and market these benefits to private real estate developers.

Many locales have already established legislation requiring government-owned or government-funded projects over a pre-determined size, usually 5,000 square feet, to attain LEED certification. Some locales, however, have taken this practice a step further and targeted private development as well. For example, Washington, D.C. is considering a proposal that would require any new development or renovations involving space in excess of 20,000 square feet to meet green building standards. This bill would follow in the footsteps of California cities such as Calabasas, Pasadena, and Pleasanton that have already adopted measures that require all new commercial and residential projects to meet LEED certification standards (see table below for a representative sample of existing legislation).

<b>LEED Certification Requirements by City</b>		
<b>City</b>	<b>Legislation</b>	<b>Minimum Requirements</b>
Atlanta, GA	City-funded projects larger than 5,000 sq. ft. or costing \$2M+	LEED-Silver rating
Austin, TX	All public projects larger than 5,000 sq. ft.	LEED
Berkeley, CA	Municipal buildings larger than 5,000 sq. ft.	LEED (Silver after 2006)
Boston, MA	Goal for city-owned projects	LEED-Silver rating
Boulder, CO	New or significantly renovated city facilities	LEED-Silver rating
Chicago, IL	New city-funded construction and major renovation projects	LEED-Silver rating
Dallas, TX	All city buildings larger than 10,000 sq. ft.	LEED-Silver rating
Houston, TX	All city-owned buildings/facilities larger than 10,000 sq. ft.	LEED (target silver)
Kansas City, MO	All new city buildings	LEED-Silver rating
Los Angeles, CA	All building projects funded by the city	LEED
Portland, OR	All public projects	LEED
San Diego, CA	All municipal projects	LEED-Silver rating
San Francisco, CA	All municipal projects larger than 5,000 sq. ft.	LEED-Silver rating
Scottsdale, AZ	All new public buildings	LEED-Gold rating
Seattle, WA	City-owned projects larger than 5,000 sq. ft.	LEED-Silver rating

Source: Stamats Communications, Inc

Despite these efforts to approve legislation and encourage projects to incorporate green design, a 2004 survey by PinnacleOne indicated that 44% of respondents were unaware of incentives offered by the government or local utilities for green design.<sup>36</sup> Additionally, the federal government's spending on research lags that of other regions, primarily Europe. As of 2002, expenditures by the European Union on research related to buildings and their impact on the environment have outpaced that of the U.S. by 600%.<sup>37</sup> Moreover, as the largest landowner in the United States, the federal government can significantly impact the adoption of green building practices while saving taxpayers' dollars.

The USGBC should also look to educational institutions to lead the way with regard to green building, as this sector has been at the forefront of adopting green building design into their projects. The results of the PinnacleOne survey suggest that 73% of projects in the education sector in the last year have

<sup>36</sup> Dahill, Chuck, January 2005, "Construction Industry Survey," *California Builder & Engineer*.

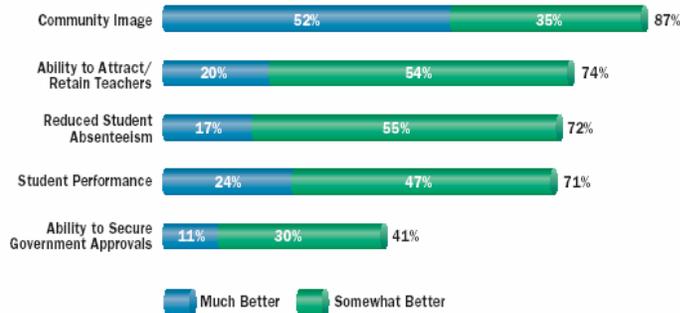
<sup>37</sup> U.S. Green Building Council. 2003, "Building Momentum: National Trends and Prospects for High-Performance Green Buildings," U.S. Green Building Council.

implemented energy-efficient design.<sup>38</sup> Furthermore, the Turner Construction survey suggests that educational institutions are particularly interested in green buildings due to multiple studies indicating their positive effect on the productivity of teachers and students, and on long-term operating costs. Research commissioned by the USGBC indicates that children attending green schools have 20% higher test scores, and that productivity increased 2%-16% on average in green buildings.<sup>39</sup> In fact, the green projects that are forgone are usually the result of these institutions ignoring lifecycle cost savings and focusing solely on initial development costs (see figures below).

### Benefits of Green Facilities-K-12

Base=Executives at Organizations Involved with Green K-12 Facilities

*Education executives cite community image, teacher retention, reduced student absenteeism, and improved student performance as the top benefits of green building.*

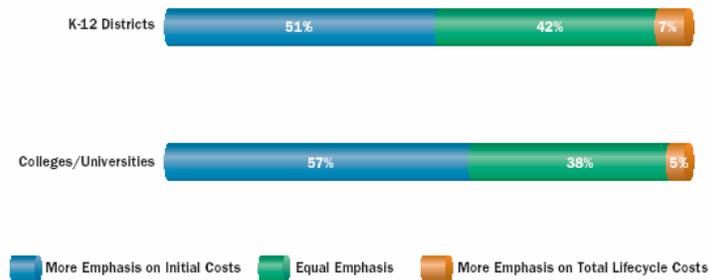


Source: Turner Construction 2005 Market Barometer

### Emphasis on Initial Project Costs vs. Total Lifecycle Costs

Base=Executives from Organizations Involved with Each Type of Educational Facility Who Said Total Costs Were Typically Considered

*Education executives tend to focus more on initial costs of green building than on lifecycle cost savings.*



Source: Turner Construction 2005 Market Barometer

Another significant opportunity to broaden the adoption of green building exists within the residential market, which makes up a large portion of the built environment. While local legislation often targets public land use and development, several locales, including Austin, TX and Pleasanton, CA, have adopted early green building initiatives by providing a set of standards for residential building. However, there is

<sup>38</sup> PinnacleOne, 2005, "Majority of Public Owners Are Turning to Energy Efficiency Designs." Phoenix, AZ: Walsh Communications, press release, available from PinnacleOne website, <[http://www.pinnacleone.com/press\\_releases\\_pdf/2005%20Pulse%20-20Energy%20Efficiency%FINAL.pdf](http://www.pinnacleone.com/press_releases_pdf/2005%20Pulse%20-20Energy%20Efficiency%FINAL.pdf)>, accessed January 2006.

<sup>39</sup> Turner Construction Company, 2005, "Turner Green Building Survey Reveals That More Than 70% of Executives Believe That Green Buildings Enhance Student Performance and Ability to Retain Teachers," New York: Turner Construction Company, available from Turner Construction website, <<http://www.turnerconstruction.com/corporate/content.asp?d=4919&p=4008>>, accessed March 2006.

still a lack of legislation enacted to address this huge market opportunity. The USGBC has taken the first step in this direction with the introduction of the LEED for Homes (LEED-H) initiative in Summer 2005. This standard is currently in the pilot stage and targets homebuilders and local governments, as well as homeowners. We believe that builders will increasingly look to green building as a competitive advantage, especially if the market value of homes continues to level-off. Being able to sell potential homeowners on better indoor air quality and cost savings due to an energy-efficient design will provide homebuilders with an added level of differentiation.

As discussed above when analyzing the inconsistency between the perception and reality of green building benefits and costs, the lack of reliable and institutional-quality information presents another opportunity to broaden green building adoption. The Building Design & Construction's ("BDC") "White Paper on Sustainability" indicates that the lack of information is one of the leading factors as it relates to barriers to adoption of green building design. A member survey conducted by the USGBC in 2003 indicates that 93% of members were interested in research related to green building, while 65% were interested in LEED workshops tailored to different markets/customers. The data from this survey indicates that real estate professionals would benefit from wider promotion of green building and the associated benefits and costs. Providing accurate and impartial information to real estate developers, building owners and occupants, and decision-makers is essential to encourage broader adoption of green building standards and realize the benefits that green buildings provide.

*Lack of education and independent validation of costs and benefits are significant hurdles to the adoption of green building.*

**What could be done to more effectively promote sustainable design?**

Independent validation of the costs and benefits of green building	59%
More case-study descriptions of successful projects	59%
More training/education programs	57%
Greater reliance on life cycle analysis in evaluating products	48%
Directory of independently rated green products	45%
Better marketing materials	44%
Greater inclusion of building industry trade groups in setting standards	35%
No reforms or changes needed	2%

Source: Building Design & Construction,

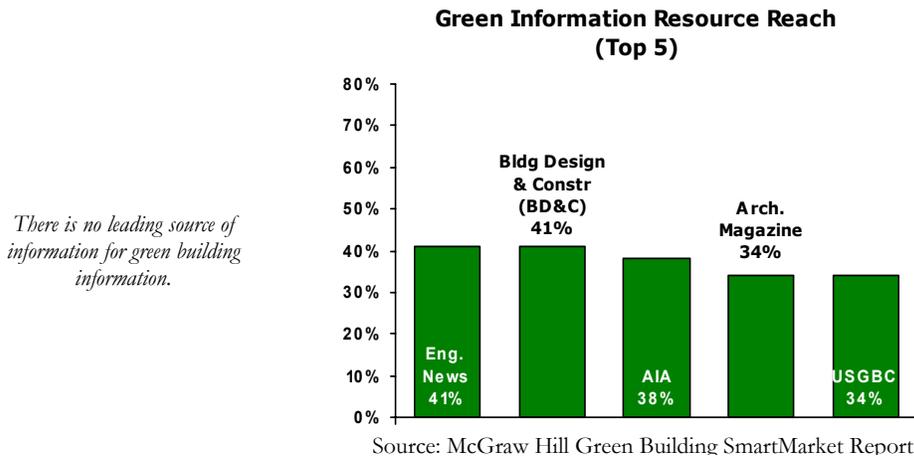
*The most valuable activity for the USGBC as selected by USGBC members would be additional research materials on the benefits and costs of green building.*

Number of Respondents Rating Potential New Activities as "Valuable" or "Very Valuable"		
Potential New Program	Number of Respondents	% of Total
Research materials on benefits/costs of green building	269	93.4%
Information briefs on selected topics	234	81.3%
Directory of regional and national green building services	193	67.0%
LEED workshop tailored to different markets/customers	188	65.3%
Online educational opportunities	168	58.3%
Advocacy efforts with Congress and state legislatures	155	53.8%
Speakers bureau	153	53.1%
Expanded chapter activities	135	46.9%
Regional member summits alternating with national	128	44.4%
Online meeting tools	116	40.3%
Organized buyers consortium	104	36.1%
Online discussion groups	90	31.3%

Source: USGBC Member Survey, 2003

## Threats

This lack of knowledge not only represents an opportunity to increase adoption, but also presents a significant threat to green building adoption as well. Presently, a knowledge gap exists between the information real estate professionals desire to substantiate the benefits and costs of green building, and what actually exists in the marketplace. Moreover, the lack of institutional-quality market research is magnified by a highly fragmented market for research on the subject of green building. This information becomes particularly important within the financial community. Lenders and investors typically provide capital to real estate developers only after a thorough analysis of the financial risks and expected returns associated with a given project. The lack of institutional information on green building projects makes it very difficult for lenders and their appraisers to accurately value green building features and certifications, and this may create problems for lenders in underwriting real estate transactions involving green building standards. The USGBC membership base is a clear indication of the lack of participation in green building on the behalf of financial institutions. The USGBC boasts membership of over 6,000 organizations, but the financial industry is only represented by 11 institutions, which is less than 1% of total membership.<sup>40</sup> A central information source that can provide credible research quantifying the benefits and costs of green building, as well as the value of green building standards, would equip architects, owners, developers, managers, lenders and investors with the information necessary to make informed business decisions.



In addition to the lack of available information, one of the largest threats posed to the adoption of green building is the availability of competing standards. Currently, three other organizations have independent standards designed to recognize green building practices: Green Globes, The National Association of Home Builders (“NAHB”), and the U.S. Environmental Protection Agency (“EPA”). Green Globes provides an online auditing tool that allows property owners and managers to benchmark their projects against industry best practices. The goal of the organization is to help these owners design buildings that are more resource efficient and healthier for the environment. When the online self-assessment is combined with third party verification, the building is provided with a certificate stating that it has achieved superior performance standards. Green Globes has gained more traction internationally,

<sup>40</sup> US Green Building Council. 2005, “About USGBC,” available from USGBC website, <<http://www.usgbc.org/DisplayPage.aspx?CategoryID=1>>, accessed October 18, 2005.

particularly in Canada where it was developed. Their standard was introduced to the U.S. market in 2004, but did not assess and certify its first building until November 2005.<sup>41</sup>

In January 2005, The National Association of Home Builders introduced their own set of national green building guidelines targeting residential development that will compete with LEED-H. Although the NAHB got a jumpstart on LEED through their early introduction, as of mid-2005, there was no record of any professional builders using the standard to complete new construction.<sup>42</sup> The standard is similar to LEED in that it is based on a point system awarded across several categories including lot preparation and design, resource efficiency, energy efficiency, water efficiency and indoor environmental quality. However, no third party certification is necessary.

In 1992, the EPA introduced ENERGY STAR® as a voluntary labeling program designed to identify and promote energy-efficient products to reduce greenhouse gas emissions. In 1996, EPA partnered with the US Department of Energy and has since extended the ENERGY STAR label to cover new homes and commercial and industrial buildings. Through its partnerships with more than 8,000 private and public sector organizations, the EPA's rating extends to 4,400 commercial buildings partners and Energy Service Providers representing 13% of building market. Through these partnerships, the ENERGY STAR rating has been used for more than 21,000 buildings across the country. Over the past decade, ENERGY STAR has been a driving force behind the more widespread use of such technological innovations as LED traffic lights, efficient fluorescent lighting, power management systems for office equipment, and low standby energy use. While the ENERGY STAR clearly helps lower operating/energy costs for real estate owners, it does not extend beyond energy-efficiency to encompass the USGBC's "whole building" LEED approach that focuses more on sustainability and design.

These competing standards have the potential to slow the adoption of LEED certification while real estate professionals wait for a dominant long-term standard to emerge for commercial and residential properties. While competing standards may help to strengthen the industry holistically, they can also drive the industry into a state of confusion. This situation can be compared to the adoption of new technology in the consumer electronics industry, which faced competing standards in the mid-1970's with the introduction of BETA and VHS, and today is facing a similar battle relating to high-definition television. The winner is often chosen based on buy-in from industry leaders and the availability of a product in the marketplace. Lack of clarity around which direction the market is headed serves as a significant barrier to adoption. When end-users do not have insight into which competing standard will be left standing, they tend to form a "wait-and-see" attitude before choosing a course of action.

## Conclusion

The existing body of literature on green building supports several conclusions. First, the majority of real estate executives expect the green building industry to continue growing. Second, the benefits of green building include lifecycle cost savings, productivity savings, and financial benefits such as higher building value and improved project return on investment. Third, the real estate community still perceives a significant cost premium associated with green building, although several empirical studies have argued that the cost premium is low relative to traditional construction. Fourth, there is a significant education gap in the real estate community. There is a real need for third-party, independent information about the costs and benefits associated with green building. Finally, many opportunities exist to broaden the adoption of green building, including growing awareness, the use of government incentives, continued success in the education market, the untapped residential market place, and the development of quality

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<sup>41</sup> Green Globes, November 2005, "Green Globes System Assesses and Certifies First U.S. Building," Washington: Walsh Communications, available from Green Building Initiative website. <http://www.thegbi.com/greenglobes/newsblakelyhall.asp>, accessed February 2006.

<sup>42</sup> Oliver, Felicia, September 2005, "Competing Green: Green building techniques result in better quality homes and provide market differentiation for builders, which is good for the environment – and their bottom line," *Professional Builder*.

industry resources and research. However, barriers threaten to slow the adoption of green building as well, including the perception of higher costs, competing green building standards, and the lack of education and institutional-quality market information.

In order to identify patterns and trends in adoption, we next analyzed the point adoption of the LEED-NC standard. The findings of this analysis follow.

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## STATISTICAL ANALYSIS

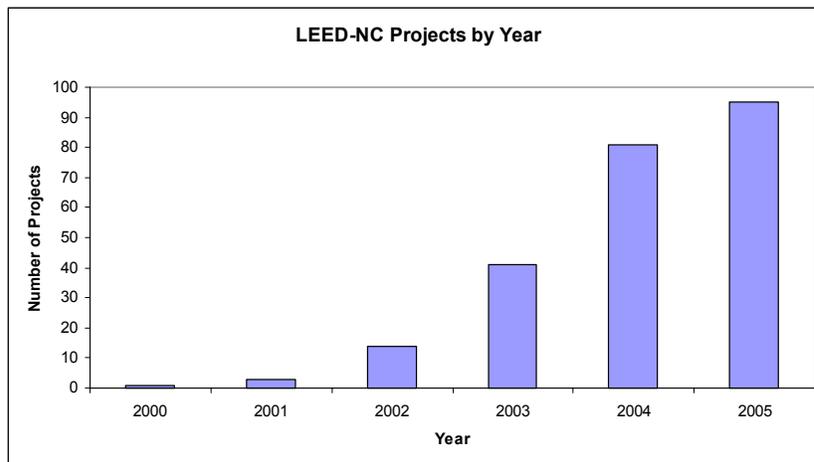
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### Overview

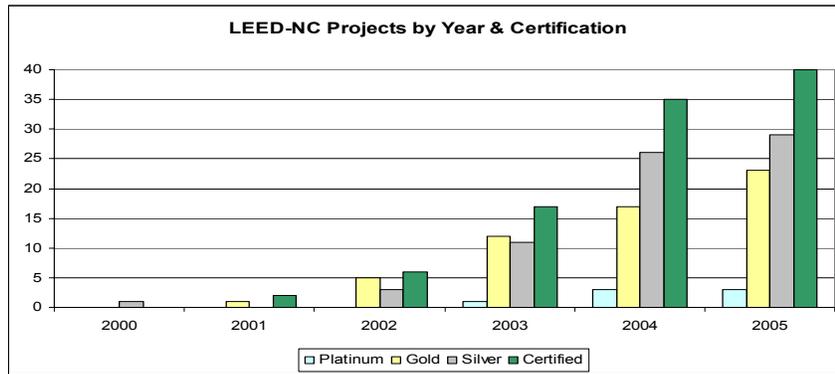
An additional component of our project consisted of analyzing the adoption of LEED to identify patterns and trends. For the purposes of our study, we limited our scope to the analysis of the LEED-NC standard – specifically version 2.0 and 2.1. In this context, we examined the overall growth of the NC standard on a regional, state, and city basis; the dispersion of points within certifications; the relative over- and under-usage of particular categories; and the incidence of adoption of individual points. The discussion below outlines the patterns and trends we uncovered in our analysis.

### Growth of LEED-NC Program

Since its launch in 2000, the growth in LEED-NC projects has been substantial. Driven by an ever-increasing understanding of the costs and benefits and a rapidly growing body of “green-friendly” state and local legislation, certified LEED-NC projects have grown from a single certified project in 2000 to 95 certified projects in 2005. To date, this represents a cumulative total of 235 projects that have earned either the Version 2.0 or 2.1 LEED-NC designations in the last five years.

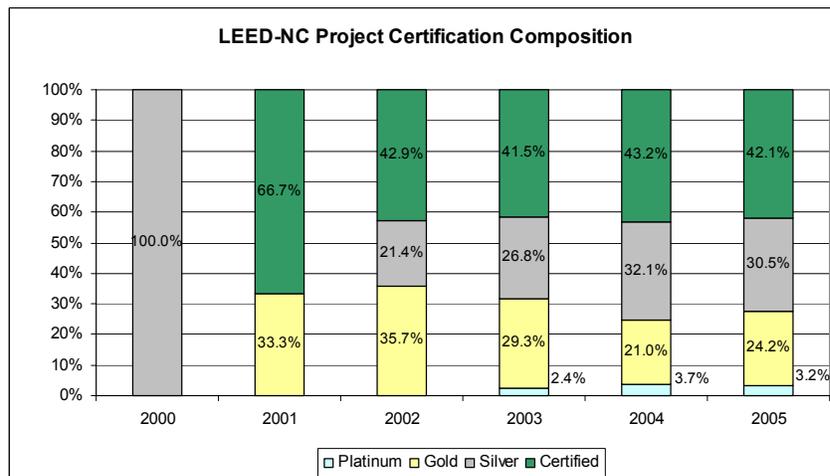


As with any new product, technology, or strategy, this growth stems from a combination of innovators, who are constantly pushing the envelope on green design/construction, and the early adopters and early majority which ultimately follow as successes and failures sort out what “works” and what “doesn’t work”. As LEED-NC adoption has increased, the original innovators continue to push the envelope and are now the most likely to seek Platinum level designation, the highest measure of green achievement under LEED-NC certification.



Nevertheless, all levels of the LEED-NC designation have grown since 2000. Not surprisingly, the majority of all LEED-NC projects still seek just the minimum certification level (“Certified”) followed in decreasing order by those seeking the Silver, Gold, and Platinum level certifications. Between 2000 and 2005, 100 projects had cumulatively achieved Certified status, while just 7 projects had achieved Platinum certification. The remaining 128 projects were spread out between the Silver and Gold certification at 70 and 58 projects, respectively.

With this growth in total project certifications, as illustrated below, over time the composition of certifications has also changed. Excluding the early years, specifically years 2000 and 2001, which only account for four projects, from 2002 through 2005, Platinum level certifications averaged 2% to 3% of certifications per year, while Certified projects have held steady at approximately 42% of certifications per year. Over this same period, however, Gold projects have fallen from approximately 36% to 24% of certifications per year, while Silver projects have risen from approximately 21% to 31% of certifications per year.



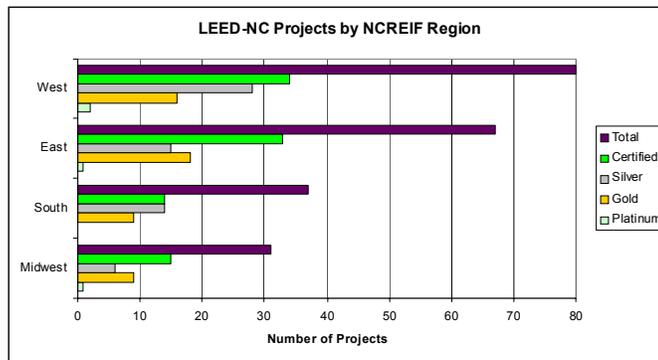
### Concentration of LEED-NC Projects by Region & Sub Region

Much like the various levels of certification, the growth in LEED-NC projects has not been evenly distributed throughout the United States. This uneven distribution stems from a multitude of underlying factors, yet undoubtedly the two largest factors driving this pattern of adoption are local and state legislation and individual and collective bidding environments of each state and municipality. Neither of

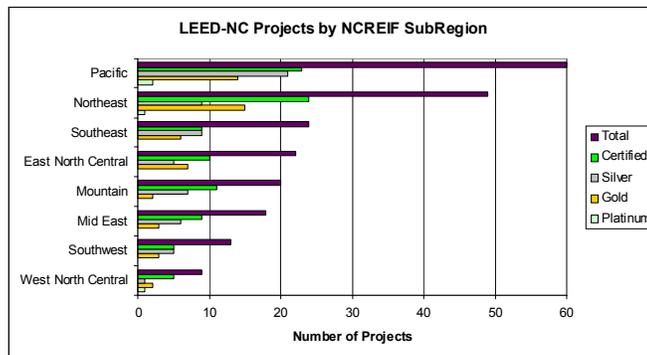
these factors is necessarily independent of one another. In fact, each factor tends to have a positive and reinforcing effect on the other.

As more localities and states enact legislation providing incentives and/or requiring minimum mandatory certification levels for both private and public buildings, an ever greater number of contractors are increasingly becoming familiar with, and thus far more willing to bid, on LEED certified projects. In many areas, this has had the desirable and positive effect of increasing the bid pool, which in turn, has created greater competition and decreased or entirely eliminated the risk premiums associated with green building projects.

As illustrated below, for LEED-NC projects, these two factors combine to produce the most pronounced effect in those states that fall into the West and East regions (as defined by the National Council of Real Estate Investment Fiduciaries, or “NCREIF”), of the United States. As of December 2005, the West region accounted for 80, or 37.2%, and the East region accounted for 67, or 31.2%, of the 215 US LEED-NC (version 2.0 and 2.1) projects.



Not surprisingly, by further subdividing these two regions into smaller NCREIF sub regions, also illustrated below, it becomes evident that the majority of LEED-NC projects are concentrated in a small minority of states. These states are addressed in the next section.

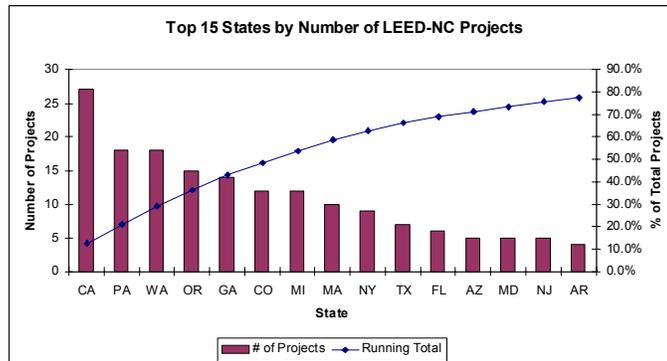


### Concentration of LEED-NC Projects by State & City

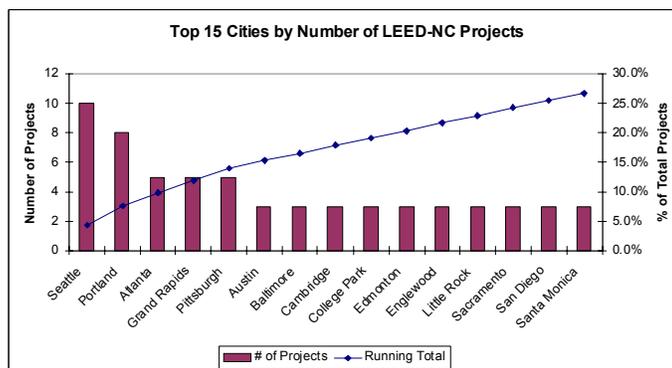
A handful of states and municipalities, largely driven by progressive state and local legislation, account for a large majority of LEED-NC projects. As indicated below, of the 215 U.S. projects, 15 states account for 167, or 77.7%, of LEED-NC projects while 15 cities account for 63, or 26.8%, of LEED-NC projects. Leading the Pacific sub region are: California, Washington, and Oregon with 27, 18, and 15

LEED-NC projects, respectively. While in the Northeast sub region, the leaders include: Pennsylvania, Massachusetts, and New York with 18, 10, and 9 LEED-NC projects, respectively.

Collectively, the three states from the Pacific and the three states from the Northeast sub region constitute 27.9% and 17.2% of all LEED-NC projects, respectively. Not surprisingly, with the exception of Massachusetts, which is actively considering LEED adoption for all state projects as well as a green building tax credit program, five of these six states currently either mandate or incentivize the use of LEED on some level.



On a local level, there is considerably less concentration within the top 15 municipalities as compared to the top 15 states. Whereas the top 15 states aggregate 167, or 77.7%, of LEED-NC projects, the top 15 municipalities, aggregate a much smaller 63, or 26.8%, of LEED-NC projects. This suggests that while a few states may dominate, these same states also tend to have projects spread throughout multiple municipalities. Although not investigated, analysis by metro area would certainly yield considerably more concentration. As a city, for example while Los Angeles does not make the top 15 cities by number of LEED-NC projects, when analyzed from a metro area standpoint, Los Angeles would score considerably higher as it aggregates projects in Claremont, Hawthorne, Irvine, Pasadena, Santa Monica, and Torrance.

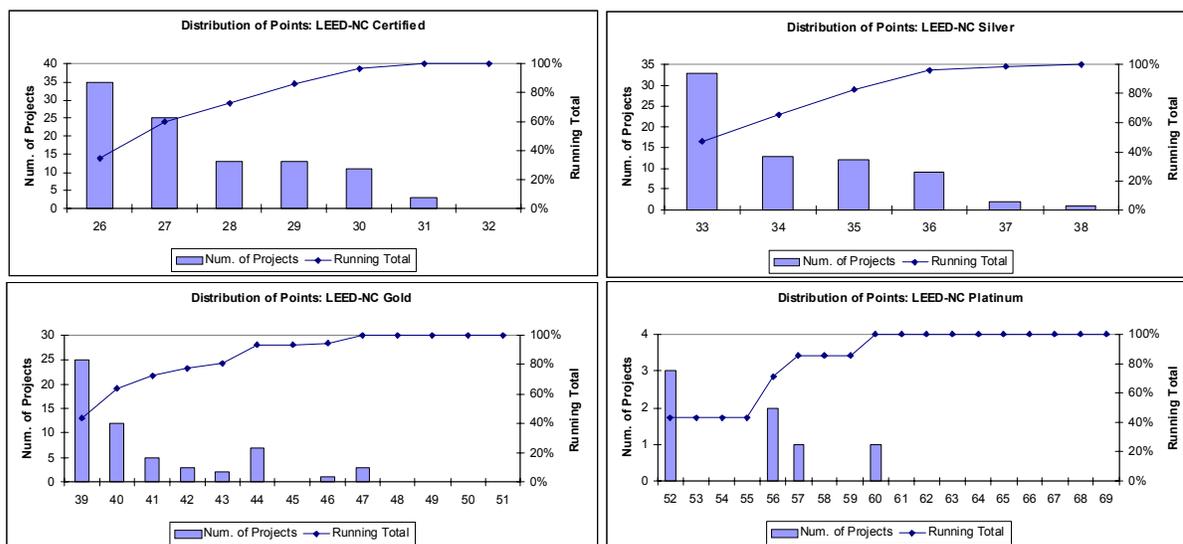


Nevertheless, a few municipalities are notable for the number of LEED-NC projects in their jurisdictions. Leading on the local forefront is Seattle with 10 LEED-NC projects and Portland with 8 LEED-NC projects, followed by Atlanta, Grand Rapids, and Pittsburgh with 5 projects each. Again, not surprisingly, with the exception of Pittsburgh, which has not used government regulation as a driver, four of these five municipalities currently either mandate or incentivize the use of LEED on some level.

## Range of Points Achieved by Certification Level

Each LEED-NC level requires a different number of minimum points to achieve certification. Projects attempting basic certification must earn a minimum of 26 points while Silver, Gold, and Platinum projects must earn a minimum of 33, 39, and 52 points, respectively. Upon examining the distribution of points for each certification level, a noticeable and interesting pattern emerges. As illustrated below, with the exception of Platinum, the general trend is for projects to just meet the minimum point requirements of their particular certification level.

Of the 100 Certified projects, 35.0% earn the bare minimum number of points needed for basic level certification. This pattern continues, too, with 47.1% of Silver projects and 43.1% of Gold projects each earning the bare minimum number of points needed for certification. Platinum projects, however, do not appear to follow this trend to the same degree. As compared to the other levels of certification, different project goals and motivations are probably largely at play within this group. Projects that build Platinum are more than likely to do so because of the intrinsic value that the owner or occupants place on building green, as opposed to valuing the designation or “stamp of approval” from certification. Often these projects are designed to serve as showcases of green design with more costly “extras” and less concern over cost premiums.



## LEED-NC Category Analysis

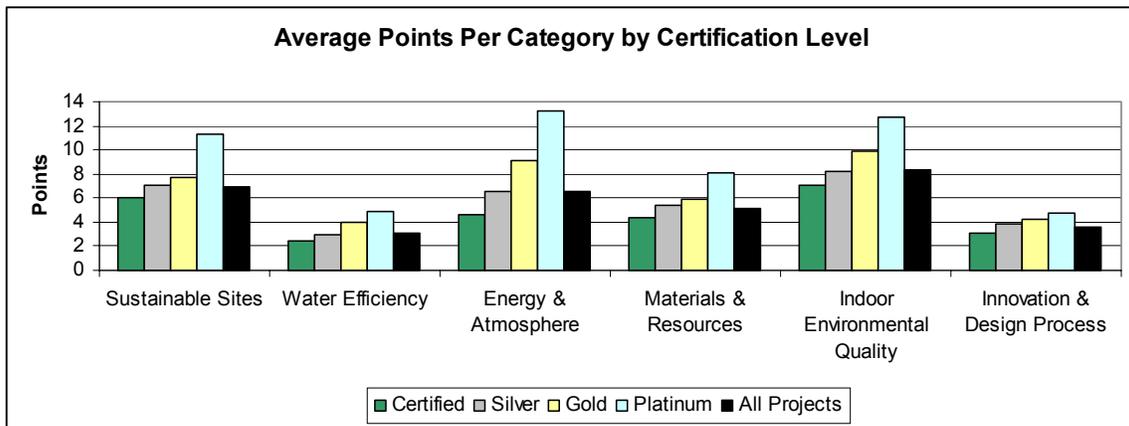
A complex host of factors including building type (office, medical, educational, residential, etc) building location (i.e., urban vs. suburban, arid vs. coastal, etc), and project goals (trophy project vs. budget control) often combine to make each project unique. Nevertheless, by first segmenting and then aggregating all 235 LEED-NC projects by level of certification, it is possible to develop a typical project profile for each level of the LEED-NC certification.

As illustrated below, it is easy to see where the average project typically earns certification points i) on an absolute basis, ii) in relation to other categories within its certification, and iii) relative to other levels of

certification. As expected, when certification levels increase, the typical project (across all certifications) subsequently earns additional points across every category.

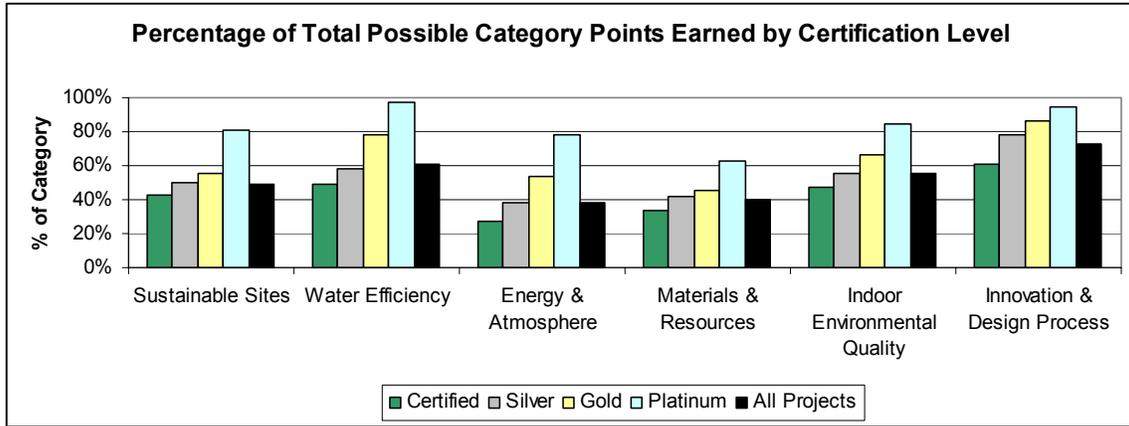
Less noticeable, yet perhaps more telling is the varying degree of steepness of the step-function within each category when moving from one certification level to the next. For example, when an average project moves from Gold to Platinum, on average it earns an additional 4.2 points within the Energy & Atmosphere category, yet only earns an additional 2.2 points within in the Materials & Resources category.

Unfortunately, this analysis is not particularly meaningful without the proper context. Because the total number of achievable points in each category is not uniform across all categories, when moving from one certification level to the next, it does not logically follow that each category will move in lock-step and earn an identical number of points. As with the example mentioned above, this same pattern is, indeed, what is evident in the graph below.



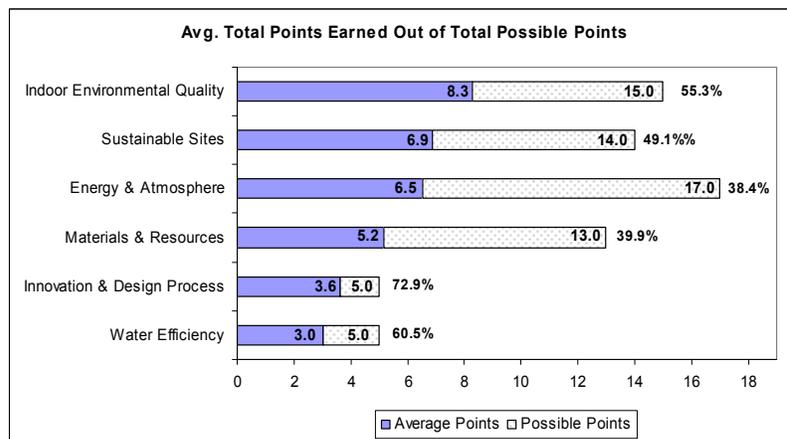
In continuing to develop the profile of a typical project, it is interesting to examine the relative degree of category usage across categories and across certification levels. As depicted below, there is considerable difference in the proportion of points earned for each category relative to its total achievable points. These differences are evident both i) across categories, but within the same certification and ii) within the same category, but across certifications.

Quite noticeable is the lack of points earned relative to those achievable in both the Energy & Atmosphere category and the Materials & Resources category. Across the Certified and Silver levels, the Energy & Atmosphere category, with a total of 17 possible elements, ranks the lowest in terms of usage with just 27.0% and 38.6% of the category elements being adopted, respectively. At the Gold and Platinum levels, however, the Materials & Resources category, with a total of 13 possible elements, ranks the lowest in terms of usage with just 45.3% and 62.6% of the category elements being adopted, respectively.



On the other end of the spectrum, with the exception of Platinum, the Innovation & Design Process category, with a total of 5 possible points, ranks the highest in terms of usage with 60.6%, 78.0%, 86.0%, and 94.3% of Certified, Silver, Gold, and Platinum projects electing to adopt various elements within this category. This finding, however, was not particularly surprising as the Innovation & Design Process category is the most flexible category, with no hard set criteria for earning points. By its very nature, it is designed to be a catchall for novel and innovative green elements that do not fit the other categories. As a result, many projects take advantage of these loose guidelines earning multiple points in this category.

By combining the two previous graphics, the profile of a typical LEED-NC project emerges. Presented below, the relative and absolute relationships among categories can easily be discerned. With the largest number of achievable points, yet third in absolute points earned and last in points earned relative to total points achievable, the Energy & Atmosphere category is clearly the anomaly. As there is no required minimum number of points per category (other than prerequisites, which while mandatory, earn no points), projects are therefore making deliberate choices to under-adopt elements within the Energy & Atmosphere category relative to its total weighting.



## LEED-NC Element Analysis

To further develop the profile of the average LEED-NC project, it is necessary to look beyond categories and actually drill down to the individual elements which comprise the categories. When examining the ten most popular elements, or the top LEED point-getters, a common theme emerges. Of all ten of the

elements listed below, most can easily and with little argument be categorized as “low-hanging fruit.” This is because, by and large, these particular elements either add no or negligible cost, are prescribed by regulation, or are already used in common practice and require little or no modification in either behavior or knowledge. Even the tenth most popular element can be found in 185, or 78.7%, of the 235 LEED-NC projects.

#### Top LEED Point-Getters

N.	Element	Category	# of Projects	% of Projects
1	Local/Regional Materials, 20% Manufactured Locally	M&R 5.1	221	94.0%
2	Low-Emitting Materials, Carpet	IEQ 4.3	218	92.8%
3	Optimize Energy Performance, 20% New, 10% Existing	E&A 1.1	208	88.5%
4	Alternative Transportation, Bicycle Storage & Changing Rooms	SS 4.2	201	85.5%
5	Water Efficient Landscaping, Reduce by 50%	WE 1.1	200	85.1%
6	Recycled Content, Specify 25%	M&R 4.1	199	84.7%
7	Site Selection	SS 1.0	198	84.3%
8	Low-Emitting Materials, Adhesives & Sealants	IEQ 4.1	192	81.7%
9	Low-Emitting Materials, Paints	IEQ 4.2	191	81.3%
10	Construction Waste Management, Divert 50%	M&R 2.1	185	78.7%

On the other hand, however, the profile of the ten least popular, or bottom LEED point-getters, is quite different. These elements are rarely seen in LEED-NC projects. In fact, even the tenth least popular element is only seen in 31, or 13.2%, of LEED-NC projects. By contrast, the least popular element is seen in only 4, or 1.7%, of LEED-NC projects. The common theme among these ten elements is a lack of applicability and high first costs associated with their implementation.

Of the three building reuse elements listed in the chart below, all three, by in large, only pertain to significant redevelopments and renovations with little applicability for new construction projects which constitute the majority of LEED-NC projects. Similarly, the brownfield redevelopment element is only applicable to a small subset of projects as well.

#### Bottom LEED Point-Getters

N.	Element	Category	# of Projects	% of Projects
1	Building Reuse, Maintain 100% of Existing Shell & 50% of Non-Shell	M&R 1.3	4	1.7%
2	Resource Reuse, Specify 10%	M&R 3.2	11	4.7%
3	Building Reuse, Maintain 100% of Existing Shell	M&R 1.2	13	5.5%
4	Rapidly Renewable Materials	M&R 6.0	16	6.8%
5	Renewable Energy, 20%	E&A 2.3	20	8.5%
6	Renewable Energy, 10%	E&A 2.2	22	9.4%
7	Optimize Energy Performance, 60% New, 50% Existing	E&A 1.5	24	10.2%
8	Resource Reuse, Specify 5%	M&R 3.1	25	10.6%
9	Building Reuse, Maintain 75% of Existing Shell	M&R 1.1	28	11.9%
10	Brownfield Redevelopment	SS 3.0	31	13.2%

Taking the above analysis a step further, in the table below, all 59 elements are analyzed across all certification levels. Each element has been color-coded in one of four colors based on the number of projects that have achieved points toward certification due to its adoption.

Percentage of Projects Attempting Each Element by Certification Level

N	Category	Element	Certified	Silver	Gold	Platinum	All
1	SS 1.0	Site Selection	81.0%	85.7%	86.2%	100.0%	84.3%
2	SS 2.0	Urban Redevelopment	12.0%	22.9%	17.2%	42.9%	17.4%
3	SS 3.0	Brownfield Redevelopment	12.0%	12.9%	13.8%	28.6%	13.2%
4	SS 4.1	Alternative Transportation, Public Transportation Access	70.0%	67.1%	56.9%	85.7%	66.4%
5	SS 4.2	Alternative Transportation, Bicycle Storage & Changing Rooms	80.0%	90.0%	87.9%	100.0%	85.5%
6	SS 4.3	Alternative Transportation, Alternative Fuel Refueling Stations	23.0%	32.9%	39.7%	71.4%	31.5%
7	SS 4.4	Alternative Transportation, Parking Capacity	57.0%	68.6%	81.0%	100.0%	67.7%
8	SS 5.1	Reduced Site Disturbance, Protect or Restore Open Space	24.0%	21.4%	50.0%	42.9%	30.2%
9	SS 5.2	Reduced Site Disturbance, Development Footprint	53.0%	61.4%	65.5%	71.4%	59.1%
10	SS 6.1	Stormwater Management, Rate & Quality	27.0%	34.3%	51.7%	100.0%	37.4%
11	SS 6.2	Stormwater Management, Treatment	31.0%	38.6%	51.7%	100.0%	40.4%
12	SS 7.1	Landscape & Exterior Design to Reduce Heat Islands, Non-Roof	50.0%	67.1%	65.5%	100.0%	60.4%
13	SS 7.2	Landscape & Exterior Design to Reduce Heat Islands, Roof	34.0%	55.7%	56.9%	100.0%	48.1%
14	SS 8.0	Light Pollution Reduction	43.0%	44.3%	50.0%	85.7%	46.4%
15	WE 1.1	Water Efficient Landscaping, Reduce by 50%	81.0%	82.9%	93.1%	100.0%	85.1%
16	WE 1.2	Water Efficient Landscaping, No Potable Use or No Irrigation	56.0%	54.3%	81.0%	100.0%	63.0%
17	WE 2.0	Innovative Wastewater Technologies	12.0%	17.1%	43.1%	85.7%	23.4%
18	WE 3.1	Water Use Reduction, 20% Reduction	60.0%	75.7%	93.1%	100.0%	74.0%
19	WE 3.2	Water Use Reduction, 30% Reduction	37.0%	60.0%	82.8%	100.0%	57.0%
20	E&A 1.1	Optimize Energy Performance, 20% New, 10% Existing	77.0%	95.7%	98.3%	100.0%	88.5%
21	E&A 1.2	Optimize Energy Performance, 30% New, 20% Existing	57.0%	85.7%	91.4%	100.0%	75.3%
22	E&A 1.3	Optimize Energy Performance, 40% New, 30% Existing	21.0%	45.7%	75.9%	100.0%	44.3%
23	E&A 1.4	Optimize Energy Performance, 50% New, 40% Existing	7.0%	21.4%	44.8%	85.7%	23.0%
24	E&A 1.5	Optimize Energy Performance, 60% New, 50% Existing	2.0%	4.3%	25.9%	57.1%	10.2%
25	E&A 2.1	Renewable Energy, 5%	2.0%	10.0%	32.8%	57.1%	13.6%
26	E&A 2.2	Renewable Energy, 10%	1.0%	2.9%	25.9%	57.1%	9.4%
27	E&A 2.3	Renewable Energy, 20%	1.0%	2.9%	24.1%	42.9%	8.5%
28	E&A 3.0	Additional Commissioning	43.0%	57.1%	48.3%	100.0%	50.2%
29	E&A 4.0	Ozone Depletion	51.0%	47.1%	53.4%	100.0%	51.9%
30	E&A 5.0	Measurement & Verification	26.0%	28.6%	34.5%	71.4%	30.2%
31	E&A 6.0	Green Power	35.0%	48.6%	51.7%	28.6%	43.0%
32	M&R 1.1	Building Reuse, Maintain 75% of Existing Shell	10.0%	14.3%	13.8%	0.0%	11.9%
33	M&R 1.2	Building Reuse, Maintain 100% of Existing Shell	5.0%	2.9%	10.3%	0.0%	5.5%
34	M&R 1.3	Building Reuse, Maintain 100% of Existing Shell & 50% of Non-Shell	1.0%	2.9%	1.7%	0.0%	1.7%
35	M&R 2.1	Construction Waste Management, Divert 50%	72.0%	81.4%	84.5%	100.0%	78.7%
36	M&R 2.2	Construction Waste Management, Divert 75%	43.0%	68.6%	67.2%	100.0%	58.3%
37	M&R 3.1	Resource Reuse, Specify 5%	3.0%	5.7%	24.1%	57.1%	10.6%
38	M&R 3.2	Resource Reuse, Specify 10%	1.0%	1.4%	12.1%	28.6%	4.7%
39	M&R 4.1	Recycled Content, Specify 25%	71.0%	97.1%	91.4%	100.0%	84.7%
40	M&R 4.2	Recycled Content, Specify 50%	53.0%	74.3%	75.9%	100.0%	66.4%
41	M&R 5.1	Local/Regional Materials, 20% Manufactured Locally	90.0%	98.6%	94.8%	100.0%	94.0%
42	M&R 5.2	Local/Regional Materials, of 20% Above, 50% Harvested Locally	60.0%	77.1%	70.7%	85.7%	68.5%
43	M&R 6.0	Rapidly Renewable Materials	2.0%	4.3%	12.1%	57.1%	6.8%
44	M&R 7.0	Certified Wood	26.0%	17.1%	31.0%	85.7%	26.4%
45	IEQ 1.0	Carbon Dioxide (CO2) Monitoring	45.0%	52.9%	75.9%	100.0%	56.6%
46	IEQ 2.0	Increase Ventilation Effectiveness	12.0%	32.9%	36.2%	42.9%	25.1%
47	IEQ 3.1	Construction IAQ Management Plan, During Construction	53.0%	47.1%	63.8%	100.0%	55.3%
48	IEQ 3.2	Construction IAQ Management Plan, Before Occupancy	52.0%	55.7%	48.3%	100.0%	53.6%
49	IEQ 4.1	Low-Emitting Materials, Adhesives & Sealants	79.0%	82.9%	82.8%	100.0%	81.7%
50	IEQ 4.2	Low-Emitting Materials, Paints	74.0%	80.0%	93.1%	100.0%	81.3%
51	IEQ 4.3	Low-Emitting Materials, Carpet	90.0%	92.9%	96.6%	100.0%	92.8%
52	IEQ 4.4	Low-Emitting Materials, Composite Wood	34.0%	44.3%	53.4%	85.7%	43.4%
53	IEQ 5.0	Indoor Chemical & Pollutant Source Control	54.0%	70.0%	72.4%	100.0%	64.7%
54	IEQ 6.1	Controllability of Systems, Perimeter	22.0%	28.6%	39.7%	85.7%	30.2%
55	IEQ 6.2	Controllability of Systems, Non-Perimeter	14.0%	14.3%	31.0%	28.6%	18.7%
56	IEQ 7.1	Thermal Comfort, Comply with ASHRAE 55-1992	44.0%	68.6%	87.9%	100.0%	63.8%
57	IEQ 7.2	Thermal Comfort, Permanent Monitoring System	36.0%	44.3%	70.7%	71.4%	48.1%
58	IEQ 8.1	Daylight & Views, Daylight 75% of Spaces	36.0%	42.9%	55.2%	71.4%	43.8%
59	IEQ 8.2	Daylight & Views, Views for 90% of Spaces	65.0%	68.6%	82.8%	85.7%	71.1%

KEY	
	0.0% to 25.0%
	25.1% to 50.0%
	50.1% to 75.0%
	75.1% to 100.0%

The final step was to examine whether certain elements tended to be adopted jointly. To investigate this, correlation matrices were set up for all 59 elements and across all levels of certification. The analysis was then further confined to only those correlations within a specific category (i.e., Sustainable Sites, Water Efficiency, etc) to keep the analysis manageable. This resulted in the correlation table which is presented below. The table includes all correlations greater than 0.4 and all correlations less than (0.4). While efforts were made to interpret the correlations, the initiative was ultimately abandoned as it was determined that much more green building expertise is needed to draw any conclusions with any degree of confidence. Nevertheless, it serves as a good starting point for future research initiatives. As such, the complete 60 X 60 correlation matrices for each certification level have been included in the Appendix B.

Correlations Table All Correlations: -0.4<0.4															
	Platinum			Gold			Silver			Certified			All Projects		
	E 1	E 2	Corr	E 1	E 2	Corr	E 1	E 2	Corr	E 1	E 2	Corr	E 1	E 2	Corr
SS 1 - 14	2	8	(0.75)	2	9	(0.44)									
	2	9	(0.73)	4	9	(0.41)									
	4	8	(0.47)	8	11	0.41									
	8	9	0.55												
	8	14	(0.47)												
WE 15 - 19				15	16	0.56	15	16	0.42	15	16	0.55	15	16	0.52
				18	19	0.60	18	19	0.69	17	19	0.42	17	19	0.42
E&A 20 - 31	23	24	0.44	21	20	0.62	20	21	0.62	21	20	0.63	20	21	0.66
	23	25	0.47	22	21	0.76	21	22	0.52	22	21	0.55	21	22	0.64
	23	26	0.47	23	22	0.57	22	23	0.71	23	22	0.63	22	23	0.70
	23	31	(0.65)	24	23	0.75	23	24	0.48	24	23	0.59	22	24	0.44
	24	25	0.94	25	23	0.75	26	23	0.41	25	23	0.43	22	25	0.43
	24	26	0.94	25	24	0.70	26	25	0.51	25	24	0.49	22	26	0.43
	24	27	0.94	26	23	0.69	27	23	0.41	26	23	0.42	22	27	0.41
	24	30	(0.68)	26	24	0.74	27	25	0.51	26	24	0.70	23	24	0.69
	25	26	1.00	26	25	0.85				26	25	0.70	23	25	0.64
	25	27	0.75	27	23	0.65				27	23	0.42	23	26	0.64
	25	30	(0.55)	27	24	0.69				27	24	0.70	23	27	0.60
	26	27	0.75	27	25	0.81				27	25	0.70	24	25	0.63
	26	30	(0.55)	27	26	0.96							24	26	0.72
	27	30	(0.73)										24	27	0.68
	M&R 32 - 44	37	38	0.55	35	36	0.61	32	33	0.42	32	33	0.54	32	33
37		42	0.47	37	38	0.66	32	34	0.42	33	34	0.44	33	34	0.54
37		44	0.47	39	40	0.54	32	37	0.60	35	36	0.54	35	36	0.61
38		43	0.55				32	39	(0.42)	37	38	0.57	37	38	0.64
42		43	0.47				35	36	0.71	39	40	0.68	39	40	0.60
43	44	0.47				37	38	0.49	41	42	0.41				
IEQ 45 - 59	46	52	(0.47)				41	43	(0.57)						
	46	57	0.55				45	58	(0.45)	47	48	0.42	45	57	0.41
	52	55	(0.65)				47	48	0.55	54	55	0.41	47	48	0.47
	52	58	0.65				56	57	0.42	56	57	0.55	56	57	0.51
	54	57	0.65												
	55	57	0.40												
57	59	0.65													

Key: E 1 = First Element in Pair  
E 2 = Second Element in Pair  
Corr = Correlation

Finally, in continuing our primary research, we also hosted a real estate workshop to evaluate our findings and to test our hypotheses with experienced real estate professionals from a diverse set of functional backgrounds. The findings from the workshop follow in the next section.

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## GREEN BUILDING WORKSHOP

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### Overview

We hosted a workshop for real estate professionals on Friday, March 10, 2006, to better understand the role of green building in the larger real estate industry. Our goal was to help bridge the gap between the early-adopters of green building and LEED certification and the broader real estate community. Workshop attendees included real estate executives with a wide range of green project experience ranging from no experience to over 30 green projects, and a wide range of disciplines, including consultants, contractors, engineers, architects, lenders, investors, and owners. Representatives from the USGBC, the public sector, and the real estate development business were in attendance, including representatives from CBRE, City of Santa Monica, CTG Energetics, Douglas Emmett, Gensler, JP Morgan, KB Homes, Swinerton, The Olson Company, Toyota, Turner Construction, and Wells Fargo. The questions posed to the attendees focused on the costs, benefits, opportunities, and threats for green building and LEED adoption.

The workshop opened with a brief presentation from Greg Reitz, Green Building Program Advisor for the City of Santa Monica and Board Member of the USGBC – LA. Mr. Reitz discussed the benefits of green building and introduced the role of the USGBC in creating and administering the LEED certification standard. Following Mr. Reitz’s presentation, our group briefly presented its findings and conclusions from the existing body of green building literature and the statistical analysis of LEED-NC adoption. After this presentation, a panel of experienced real estate executives discussed the benefits and costs of green building. The workshop closed by dividing the attendees into two small groups to discuss the opportunities for and barriers to increased green building adoption.

The workshop provided a valuable opportunity to compare our findings from the existing body of literature and statistical analysis of LEED-NC to the specific experiences of real estate executives. In most cases, we found that our analysis echoed the sentiments of the workshop attendees; however, we found that there is still a significant amount of skepticism among real estate executives regarding the business case for adopting green building standards.

### Panel Discussion

The panel discussion consisted of a variety of participants from multiple disciplines including Steve Holt, Senior Project Manager for Turner Construction, Scott Lewis, Founder and Principal of Brightworks, Doug Robertson, CEO of House & Robertson Architects, and Sanford Smith, Corporate Real Estate and Facilities Manager for Toyota. The questions posed to the panel members may be found in Appendix D. A summary of findings from the panel discussion follow:

Benefits	Drawbacks
<p data-bbox="237 1644 326 1675"><i>Publicity</i></p> <ul data-bbox="237 1680 792 1896" style="list-style-type: none"><li data-bbox="237 1680 792 1801">▪ Private developers, particularly corporations wishing to promote an image of “corporate responsibility” benefit from public relations and branding associated with green building.</li><li data-bbox="237 1806 792 1896">▪ Other owners seek to build green because it is consistent with their corporate philosophy or reflects their true values.</li></ul>	<p data-bbox="824 1644 1029 1675"><i>Increased First Costs</i></p> <ul data-bbox="824 1680 1372 1896" style="list-style-type: none"><li data-bbox="824 1680 1372 1801">▪ Design and floor plans matter in first costs more than green features. For example, a wide-open floor plan may cost less per square foot than a dense, closed floor plan.</li><li data-bbox="824 1806 1372 1896">▪ Many factors impact the construction cost premium for a green building including location, how integrated the planning</li></ul>

<ul style="list-style-type: none"> <li>▪ Some owners consider green building as a marketing ploy or branding effort. This may often be the case in firms in heavy industrial sectors historically known for their harmful impact on the environment.</li> </ul>	<p>process is, and how many green projects the developer or owner has worked on. This impacts the validity of studies evaluating the “average” cost premium for building green, as there really is no “average” green building.</p> <ul style="list-style-type: none"> <li>▪ Most participants argued that cost premiums for building green are not significant.</li> </ul>
<p><i>Operating Cost Savings</i></p> <ul style="list-style-type: none"> <li>▪ The energy and water savings from building green may create long-term competitive advantages for companies with significant operating costs.</li> <li>▪ Green building optimizes efficiency and reduces construction waste.</li> </ul>	<p><i>Risk of Obsolescence</i></p> <ul style="list-style-type: none"> <li>▪ Many developers and owners have taken a cautious stance towards LEED certification and other standards, as they believe the standards or requirements may change over time, given the infancy of the industry.</li> </ul>
<p><i>Better Buildings</i></p> <ul style="list-style-type: none"> <li>▪ Green building is really about building a better building. The end result should be high performance buildings with superior design.</li> </ul>	<p><i>Planning Time</i></p> <ul style="list-style-type: none"> <li>▪ Timing and administration for building green will be higher. It is critical to integrate the planning for green building at the earliest planning stages.</li> <li>▪ Participants can then value each green option for the design and make systematic trade-offs.</li> <li>▪ Owners should take a significant role in this planning, as they will live with the results long-term. Poor owner participation may lead to confusion and competing parties among architects, developers, and consultants.</li> </ul>
<p><i>Third Party Verification</i></p> <ul style="list-style-type: none"> <li>▪ The LEED standard decreases green washing by providing third party verification of the steps taken to design and construct a sustainable building.</li> <li>▪ LEED also provides a common standard with which to compare the performance of buildings across regions, industries, etc.</li> </ul>	<p><i>Greenwashing</i></p> <ul style="list-style-type: none"> <li>▪ There may be too much fixation on chasing points versus focus on functionality and design of the building itself.</li> <li>▪ The focus should be on designing an attractive, high-performance building rather than on short-term costs.</li> </ul>
<p><i>Lower Liability</i></p> <ul style="list-style-type: none"> <li>▪ Green building may lower liability for health-related issues for employees. Architects could be held liable for poor construction that negatively impacts employee health.</li> </ul>	
<p><i>First Costs</i></p> <ul style="list-style-type: none"> <li>▪ LEED certification may be achieved with little to no cost premium; however these</li> </ul>	

<p>costs are difficult to compare across projects and across regions.</p> <ul style="list-style-type: none"> <li>▪ The LEED certification process may be quicker and have a more certain outcome relative to California Title 24 in certain cases.</li> </ul>	
<p><i>Employee Health/Productivity</i></p> <ul style="list-style-type: none"> <li>▪ Owners may not see marked improvements in productivity or absenteeism, if employees were already working in high performance buildings.</li> <li>▪ Health, happiness and productivity benefits are extremely difficult to measure and quantify.</li> <li>▪ It is also very difficult to measure incremental benefits of certain standards (e.g., day lighting and window size). For example, old studies compared student test scores in classrooms with little or no day lighting to well lit classrooms. New studies should be done comparing different levels of day lighting, since no one builds classrooms without day lighting anymore.</li> </ul>	
<p><i>Financial Benefits</i></p> <ul style="list-style-type: none"> <li>▪ It is very difficult to measure the effect of LEED certification on lease-up and sales process versus traditional buildings. For example, lease-up time may simply be a function of the current market, the location, or many other market factors having nothing to do with sustainability. A down market, however, may make comparisons easier.</li> </ul>	

The panel discussion involved lively debate on the benefits and costs associated with green building. While there was some debate over the relative value of the LEED certification, the panel participants agreed that high performance buildings are preferable to low performance buildings. Moreover, there are many benefits associated with higher performance buildings and little evidence to support a significant cost premium associated with green building.

## Group Discussion

After the presentations and panel discussion, the audience and panel members split into two pre-assigned and professionally diverse groups to discuss the barriers to and opportunities for broader adoption of green building. After being given a brief moment to review selected quotes from periodicals and other research sources, each group discussed their own experiences and perceptions as they related to barriers and opportunities and the table below highlights common themes:

Barriers	Opportunities
<p><i>Competing Standards:</i></p> <ul style="list-style-type: none"> <li>▪ Green Globes, ENERGY STAR, and others standards are being compared to LEED when they are very different (“apples and oranges”).</li> <li>▪ Need high quality standard. LEED comes closest to whole-building, sustainable approach, but there is room for improvement.</li> <li>▪ LEED is not the only standard with a third party “stamp of approval.”</li> </ul>	<p><i>Government incentives:</i></p> <ul style="list-style-type: none"> <li>▪ If more green building standards become required through government mandate, they must be accompanied by more incentives.</li> <li>▪ Incentives should include expedited permitting, tax credits, and government-sponsored LEED consultants.</li> <li>▪ Flexible point adoption must be kept intact difficult legal issue with reduced flexibility (USGBC supposedly voluntary)</li> </ul>
<p><i>USGBC Growth</i></p> <ul style="list-style-type: none"> <li>▪ USGBC was not prepared for the huge success of LEED and is having difficulties adapting with its current infrastructure and resources.</li> <li>▪ USGBC must become more active in driving the standard and improving the execution of the certification process.</li> </ul>	<p><i>Improve Green Building Process</i></p> <ul style="list-style-type: none"> <li>▪ Integration of green building design, materials, and technologies must be included early in the design phase and monitored.</li> <li>▪ Leading firms beginning to incorporate this process into their best practices internally -- led by architecture and engineering firms.</li> <li>▪ Owners must be involved in project process from beginning or risk giving consultants too much power.</li> </ul>
<p><i>LEED Standards</i></p> <ul style="list-style-type: none"> <li>▪ Some LEED categories and individual elements don’t work or include choices that don’t make sense (e.g. storm water drainage that filters to foundation).</li> <li>▪ Point allocation system needs work to account for costs vs. convenience (e.g. bike rack point = photovoltaic technology point).</li> </ul>	<p><i>Market Green Features and Value</i></p> <ul style="list-style-type: none"> <li>▪ Leverage 3<sup>rd</sup> party certification (e.g. LEED certification) but market higher-quality and/or more attractive building.</li> <li>▪ Explain how green features make buildings better. This is more important than a standard or sustainability to occupants/owners.</li> </ul>
<p><i>Lack of Education/Information and Misperceptions</i></p> <ul style="list-style-type: none"> <li>▪ Lack of education/awareness within the real estate community.</li> <li>▪ More institutional-quality data and market research needed for valuing green building features and underwriting green projects.</li> <li>▪ Need for more 3<sup>rd</sup> party data on green building construction and operating costs.</li> </ul>	<p><i>Competitive Differentiation</i></p> <ul style="list-style-type: none"> <li>▪ Transportation is a critical element; largest impact on environment and sustainability of community</li> <li>▪ Residential case study with post-occupancy survey of condo buyers. Only 9% said that green features were their primary reason for buying, but 40% thought it was important.</li> </ul>

<p><i>Case Studies:</i></p> <ul style="list-style-type: none"> <li>▪ The lack of case studies from private developers makes selling the business case for green building difficult.</li> <li>▪ Most early adopters have been corporate, long-term owners with little or no incentives to broadcast their learnings to private developers.</li> </ul>	<p><i>Education and Awareness</i></p> <ul style="list-style-type: none"> <li>▪ USGBC and LEED are still young. There have been improvements to the process and there is still a lot of room for the USGBC to grow and improve its standards.</li> <li>▪ More information needed for appraisal and underwriting standards -- third party market research firm may assume this role.</li> <li>▪ Education and partnership with real estate industry associations -- the source of information is important.</li> </ul>
<p><i>Attitudes:</i></p> <ul style="list-style-type: none"> <li>▪ Many developers take the attitude of, “We don’t have to adopt green building.” Some feel that it is still too early to care about the green building initiative.</li> <li>▪ Over-promotion or over-selling of a standard may divert developers’ focus from building quality and design.</li> </ul>	<p><i>Government Approach:</i></p> <ul style="list-style-type: none"> <li>▪ Incorporate sustainability into RFP process from cities in the bidding process.</li> </ul> <p><i>Owner Approach:</i></p> <ul style="list-style-type: none"> <li>▪ Incorporate sustainability into operating costs or leasing agreements.</li> </ul>
<p><i>Residential:</i></p> <ul style="list-style-type: none"> <li>▪ Not much room for additional premiums in many markets with sustained increase in market values.</li> <li>▪ NAHB is a widely-recognized name in residential real estate and now provides an independent and competing standard with LEED.</li> <li>▪ Conflicting pre-requisites in internal policies and government code, especially for larger homebuilders.</li> </ul>	<p><i>Residential:</i></p> <ul style="list-style-type: none"> <li>▪ A market downturn may lead to a requirement for more competitive differentiation among home builders and sellers.</li> <li>▪ There is a market for sustainable/green residential product at all price points and customer segments, including high-end customers.</li> </ul>
<p><i>Government Approach:</i></p> <ul style="list-style-type: none"> <li>▪ Government strong-arm tactics without trade-offs or compensation will not work to encourage private developers, and they may leave areas with strict green building requirements.</li> </ul>	
<p><i>Knowledgeable Contractors:</i></p> <ul style="list-style-type: none"> <li>▪ There is a need to hire an experienced contractor on large-scale green building projects to avoid costly mistakes.</li> </ul>	
<p><i>Risk of Tenant Dissatisfaction:</i></p> <ul style="list-style-type: none"> <li>▪ Tenants may regret design or construction decisions post-occupancy.</li> </ul>	

When assessing the comments from the group discussions, it becomes clear that the broad adoption of green building standards is far from guaranteed. However, by facilitating a group discussion and providing third party quotes and statistics, we gathered opinions from different disciplines and identified the *most significant* barriers to and opportunities for broader green building adoption. More importantly, the group discussion supplemented our own primary and secondary research by providing perspectives from multiple disciplines and personal viewpoints.

After our Green Building Workshop concluded, it was clear that the real estate community was not yet universally supportive of green building and its benefits. In fact, much of the existing published research and our own research were viewed with skepticism due to the lack of education and institutional-quality market information on the subject. Some additional and surprising insights also came out of the workshop discussions, including:

- **Benefits:** LEED certification may be achieved with little to no cost premium; however, these costs are difficult to compare across projects and across regions. Therefore, attendees expressed skepticism regarding empirical studies on the “average” cost premium of green building.
- **Costs:** There may be too much fixation on chasing LEED points versus focusing on building functionality and design. This can result in lower-quality buildings and/or buildings with poor sustainability.
- **Barriers:** Most early adopters have been corporate, long-term owners with little or no incentives to broadcast their buildings’ success or failure to private developers. This makes the lack of education and market information even more important of a barrier.
- **Opportunities:** The integration of green building design, materials, and technologies must be included early in the design phase and monitored throughout the development process. Leading firms are beginning to incorporate this process into their best practices internally -- led by architecture and engineering firms.

Of the three components of our project: existing research, our research, and the Green Building Workshop, we believe that the workshop was the most insightful in terms of gathering information regarding the benefits and costs of green building. By bringing together a diverse group for the panel and group discussions, we also brought together different viewpoints on green building and its value and growth prospects. It provided us with useful feedback on the criticisms of green building, and the USGBC and LEED specifically, which was a perspective that is more difficult to obtain through existing research and the analysis of LEED project statistics.

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## THEMES & RECOMMENDATIONS

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### Overview

Our primary and secondary research into the subject of green building led us to several important conclusions/themes. The following summarizes the themes uncovered in our paper:

Themes	Problems/Obstacles
<ul style="list-style-type: none"> <li>The majority of real estate and green building professionals expect rapid growth in the green building industry</li> </ul>	<ul style="list-style-type: none"> <li>The industry and the USGBC must be prepared for rapid growth and improve the standard</li> <li>Developers must begin to integrate green building standards earlier in the design and construction process</li> </ul>
<ul style="list-style-type: none"> <li>LEED is the dominant third-party certification in the commercial real estate market but standards can improve</li> </ul>	<ul style="list-style-type: none"> <li>Developers and owners may be “gaming the point system” and/or chasing points at the expense of building sustainability or quality</li> <li>Multiple standards are not comparable, create market confusion and may lead to slower adoption of LEED</li> </ul>
<ul style="list-style-type: none"> <li>Misperception of construction costs -- premiums may be smaller than expected</li> </ul>	<ul style="list-style-type: none"> <li>Developers focused on first costs because they don’t realize the long-term savings and have difficulty valuing them</li> <li>Real estate professionals unaware and/or skeptical of existing research on cost premiums</li> </ul>
<ul style="list-style-type: none"> <li>Benefits of green building include lifecycle cost savings, productivity savings, and financial benefits</li> </ul>	<ul style="list-style-type: none"> <li>Difficult cost comparisons across project type, location, and weather/climate</li> <li>Difficult to quantify productivity, health, and financial benefits attributable to green building standards and practices</li> </ul>
<ul style="list-style-type: none"> <li>Government/public and education sectors have been the leading adopters of LEED standards</li> </ul>	<ul style="list-style-type: none"> <li>Early success must be leveraged and marketed to private developers</li> </ul>
<ul style="list-style-type: none"> <li>Lack of awareness, education, institutional-quality research, and 3<sup>rd</sup> party market validation</li> </ul>	<ul style="list-style-type: none"> <li>More education and institutional-quality market information is needed to quantify benefits and costs (especially for real estate lenders/investors)</li> <li>Need system to value benefits of green building standards and practices</li> </ul>

From these themes, we identified the following opportunities to broaden green building adoption:

- Increase awareness of LEED standard;
- Leverage government participation/incentives;
- Market successes in public and education sectors;
- Launch residential LEED efforts and push green building into homes and neighborhoods; and
- Improve education efforts and develop institutional-quality market research.

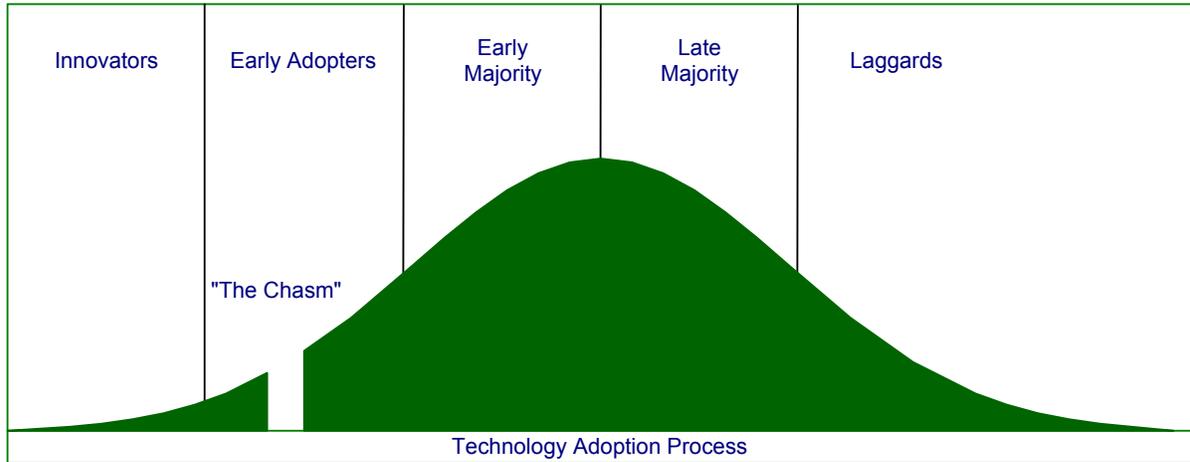
## Recommendations

Within the context of our themes and our assessment of the opportunities for broader adoption of green building practices and standards, we have identified recommendations for the major stakeholders in the green building industry:

Organization	Next Steps/Action Items
Federal and State/City Government	<ul style="list-style-type: none"> <li>▪ Eliminate or “phase-out” standards competing with LEED certification</li> <li>▪ Provide additional funding to USGBC and its education efforts</li> <li>▪ Standardize incentives (e.g. tax credits) for real estate developers, lenders, and investors based on LEED adoption and certification</li> <li>▪ Local government to change outdated zoning/codes to prevent the exclusion of new green materials and practices</li> </ul>
Real Estate Industry Associations	<ul style="list-style-type: none"> <li>▪ Develop standards to value green building certification and the individual adoption of technologies, materials, and design for the use in appraisals</li> <li>▪ Incorporate operating cost efficiency into leasing documents to encourage the adoption of green technologies</li> <li>▪ Integrate green building certification and the adoption of materials and technologies earlier in the design and development/construction process</li> </ul>
USGBC	<ul style="list-style-type: none"> <li>▪ Broaden education efforts to real estate and financial community</li> <li>▪ Increase outreach to broaden membership base to include real estate lenders and investors</li> <li>▪ Build and manage relationships with leading educational institutions like UCLA Anderson and other business schools</li> <li>▪ Commission research from third party focused on the benefits of green building to occupiers, tenants, agents/brokers, and appraisers</li> </ul>
UCLA Anderson	<ul style="list-style-type: none"> <li>▪ Continue relationship with local USGBC chapter through AMR project sponsorship and industry involvement</li> <li>▪ Organize additional green building events and workshops involving students, alumni, and other green building representatives</li> <li>▪ Provide impartial evidence of the value of green building through faculty support and research</li> </ul>
Ziman Center for Real Estate at UCLA	<ul style="list-style-type: none"> <li>▪ Continue relationship with Green Building Workshop participants and add green building industry professionals to outreach effort</li> <li>▪ Align with USGBC in their efforts to attract real estate professionals to its membership base</li> <li>▪ Support faculty research into green building industry</li> </ul>

It is clear that one of the largest barriers to broader adoption is the lack of education and institutional-quality information for the real estate lending and investing industries. In short, the majority of real estate professionals are not yet convinced about the legitimacy and economic benefits of green building and LEED certification. We believe the steps above, if taken, would move the industry towards broader adoption. Furthermore, we believe the “adoption curve” for LEED standards will follow the adoption patterns of other leading-edge products or technologies. As author Geoffrey Moore states in his well-known book on the adoption of new technology “Crossing the Chasm: Marketing and Selling Disruptive

Products to Mainstream Customers”, the green building industry has reached “The Chasm” (see diagram below). In order to cross this chasm to broadly expand adoption, the USGBC and other government stakeholders must work with educational and trade institutions to improve communication and education, standardize green building certification further, market successes in the government and education sector, and kick-off new programs for the residential real estate market. We believe that if the green building industry is successful in these efforts, the adoption of green building practices and standards will see increasingly rapid growth and acceptance.



Source: Crossing the Chasm: Marketing and Selling Disruptive Products to Mainstream Customers, by Geoffrey Moore. Revised 2002.

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## APPENDIX A: Existing Data and Research Summaries

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This appendix contains a summary of each of the existing articles, studies and/or reports used for analysis in our project.

### Green Building SmartMarket Report

#### Bibliography

McGraw Hill Construction. 2005. "Green Building SmartMarket Report." *2006 Green Building Issue*. New McGraw Hill Construction.

#### Main Topic

The study reports the results of a recent research study jointly conducted by McGraw Hill Construction's Research and Analytics Group and the U.S. Green Building Council (USGBC). The study analyzes the results of 1) a survey of the behaviors and opinions of USGBC members and 2) a survey of a representative sample of the architect, engineer, and contractor (AEC) community. The purpose of the studies is to provide a current snapshot of opinions and behaviors as they relate to Green Building.

#### Parties Mentioned

The SmartMarket Report addresses green building practices of the public and private sector.

*Public Sector:* Office of the Federal Environmental Executive, U.S. Department of Energy, etc.

*Private Sector:* Robert Berkebile (BNIM Architects), Gary Saulson (Director of Corporate Real Estate, PNC Financial Services Group), Tom Paladino (Paladino & Company, LLC).

#### Executive Summary

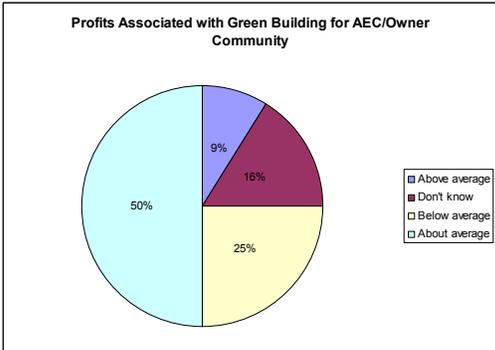
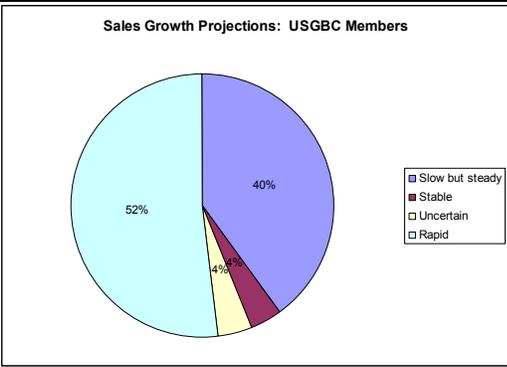
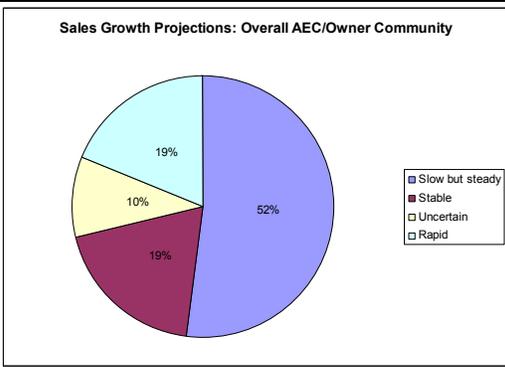
The SmartMarket Report confirms the green building trend is growing in importance to the AEC community, owners, and government agencies at all levels. The report finds that participation in green building is equally influenced by a desire to reduce lifecycle costs (energy and productivity increases) as it is by environmental concerns. On average the AEC community believes that green building will lower operating costs, increase building value, and improve return on investment. Still, only 40% of those surveyed reported a "more than moderate" involvement in green building. For all groups interviewed, "the largest obstacle to green building is higher perceived first costs."

#### Methodology

McGraw Hill Construction surveyed 417 architects/engineers, owners, and contractors from the McGraw-Hill Construction Network database. The sample consisted of 1/3 owners, 1/3 architects/engineers, and 1/3 owners. This group is a representative sample of the 400,000+ AEC population. The survey was conducted using computer-aided telephone interviewing. The survey is conducted at a 95% confidence interval and a margin of error of +/- 5%.

#### Key Statistics

- McGraw-Hill Construction estimates that by 2010, 5% to 10% of new non-residential construction starts will be green. Assuming a 5% - 10% growth in the overall industry, McGraw-Hill projects that the Green Building industry could grow from \$3 billion in 2004 to between \$10 billion and \$21 billion.
- 41% of the AEC/Owner community see profits associated with Green Building as either below average or "don't know." 50% perceive profits as "about average." Only 9% perceive profits as "above average."
- 36% of those surveyed believe the primary step for building green is when the client requests it. 17% see green building driven by design team recommendations. 16% said the green building decision is made during program development, and 16% stated that green building starts during conceptual design.
- There is no leading information source on Green Building. The AEC and owner communities ranked several industry journals and institutes above the USGBC. Not surprisingly, the USGBC member community sees the USGBC as the leading information source (by a large margin).



**Links to AMR Workshop**

- Most current snapshot of the attitudes of the building community towards green building.

**White Paper on Sustainability**

**Bibliography**

Building Design & Construction. 2003. "White Paper on Sustainability." Illinois: Reed Business Information. Available on the USGBC website. <<https://www.usgbc.org/Docs/Resources/BDCWhitePaperR2.pdf>>, accessed October 2005.

**Main Topic**

This white paper gives a brief history of green building, outlines the findings of a BD&C survey, analyzes industry trends and issues, and concludes with recommendations

**Parties Mentioned**

- United States Green Building Council

**Executive Summary**

The survey revealed that while only a small percentage of respondents had embraced green building wholeheartedly (9%), 33% were starting to do so, and 39% were inexperienced but interested in green building. 66% of respondents had some experience with sustainability with half of these respondents working for firms that had tried to develop at least one green project and roughly 34% working for firms that had actually completed green projects. The study shows that first-costs and the justification of the premium to clients are significant obstacles to green building. Respondents stated that in order to effectively promote sustainable design, there should be unbiased, independent review of costs and benefits of building green, more case studies available, and more training/education. In conclusion, the sense is that sustainable building is growing, firms are encouraging their employees to gain experience in sustainable building, but real estate professionals and clients are uncertain that the benefits warrant the costs.

The action plan includes 9 recommendations: 1) Conduct peer-reviewed studies of the benefits of green building on human health, performance, and well-being; 2) Enlist the business community to “champion a rigorous, peer-reviewed study of the economic and ‘business-case’ aspects of sustainable design;” 3) Establish a Federal Green Building Council; 4) Institute an Institute for Sustainable Development Research; 5) Set guidelines for states, counties, and municipalities to set up green building policy and incentives; 6) Launch a pilot study on 10 schools to determine the impact of green building on student performance; 7) Building product manufacturers should create green product tools and databases using life cycle assessment; 8) The USGBC should consider admitting trade associations; 9) Continue to update LEED.

### Methodology

A scientific sample of 10,000 recipients of Building Design & Construction was asked to complete an on-line survey. 498 respondents completed the survey. 23% of the respondents were from an architectural firm. 12% were from architecture/engineering firms, and 11% were from architecture firms. The rest were a diverse array of government agencies, designers, contractors, owners, etc.

### Key Statistics

#### Perceived barriers to sustainable design

"Adds significantly to first costs"	44%
"Market not interested or not willing to pay a premium"	42%
"Hard to justify, even on the basis of long-term savings"	35%
"Not comfortable with new ideas or technologies"	19%
"Too complicated/Too much paperwork"	16%
"Not applicable/Don't Know"	24%
"Sustainable design not seen as a barrier"	5%

## Costing Green: A Comprehensive Cost Database and Budgeting Methodology

### Bibliography

Matthiessen, Lisa Fay, and Peter Morris. 2004. "Costing Green: A Comprehensive Cost Database and Budgeting Methodology." <<http://www.davislangdon.com/pdf/USA/2004CostingGreen.pdf>>, accessed November 27, 2005.

### Main Topic

The study reports the results of a research study by Davis Langdon, a leading provider of cost planning and consulting services to architects and owners. The study analyzes (1) the costs and feasibility of each LEED element (2) the factors that are most likely to influence costs and feasibility and (3) construction costs among similar LEED and non-LEED buildings. The study also (1) criticizes the common practice of comparing the initial budget to the final construction costs as a means to benchmark the cost of green and (2) provides suggestions for successful green budgeting and team practices.

### Parties Mentioned

No specific parties were mentioned in any part of the study. For parts (1) and (2) of the study, the results were presented in aggregate and were drawn from a data set which included cost data on: universities and colleges (academic buildings), classrooms (higher education and K-12), laboratories (academic and commercial), offices, hospitals, libraries, multilevel parking structures (underground and above ground), theaters, gymnasiums, auditoriums, sports facilities, museums and art galleries, animal care facilities (such as shelters and vivariums), courthouses, visitor and community centers, police and fire stations, emergency operation centers, hotels, convention centers, retail stores, restaurants, apartments and student housing, and many other program types. For part (3) of the study, the results were also presented in aggregate and were primarily drawn from a data set which included cost data on libraries, laboratories, and academic classroom buildings.

### Executive Summary

The Costing Green Study concludes that many projects can achieve sustainable design within their initial budgets or with minimal additional funding. It cautions that each project's unique nature should be carefully considered when addressing the cost and feasibility of LEED. A one-size-fits-all is not a viable solution. As such, benchmarking, while valuable and informative,

is not predictive across projects. While cost differences between buildings are primarily due to program type, even within the same building program category, there is a very large variation in costs of buildings. There are low cost and high cost green buildings as well as low cost and high cost non-green buildings.

According to the study, the major factors that influence feasibility and cost are as follows: (i) demographic location (i.e., rural, suburban, urban), (ii) bidding climate and culture, (iii) local and regional design standards, including codes and initiatives, (iv) intent and values of the project, (v) climate, (vi) timing of implementation, (vii) size of building, and (viii) point synergies. Of these eight cost and feasibility drivers, the study concludes that the single most significant driver is the bidding climate and culture or the response of the bidders to the green requirements in the contract.

### **Methodology**

The study uses data from proprietary Davis Langdon database which contains information on nearly 600 distinct projects (both LEED and non-LEED) in nineteen different states. The projects encompass a wide variety of building types, locations, and sizes. Detailed construction costs (including individual component costs), program data, and design parameters and narratives are tracked for each project. Additionally, where applicable, the database also contains point-by-point information for LEED credits including credit identity, cost for the point, level of point attainment, and any notes that may be necessary to provide explanation for the point attempted or attained. Comparison reports were run on various parameters and were then extracted for statistical analysis which formed the underpinnings of much of the study.

### **Key Statistics**

- In a comparison between 93 non-LEED and 45 LEED-seeking buildings (which included libraries, laboratories, and academic classroom buildings) there was no statistically significant cost difference (measured in dollars per square foot) between the LEED population and the non-LEED population.
- In a comparison between 37 non-LEED and 15 LEED-seeking academic classroom buildings there was no statistically significant cost difference (measured in dollars per square foot) between the LEED population and the non-LEED population.
- In a comparison between 34 non-LEED and 15 LEED-seeking laboratories there was no statistically significant cost difference (measured in dollars per square foot) between the LEED population and the non-LEED population.
- In a comparison between 22 non-LEED and 15 LEED-seeking libraries there was no statistically significant cost difference (measured in dollars per square foot) between the LEED population and the non-LEED population. However, when examining a subset of this population, specifically those libraries with less than 40,000 total square feet (11 non-LEED and 11 LEED-seeking), there was a statistically significant cost difference with LEED seeking libraries actually being less expensive than non-LEED libraries. This finding should be interpreted cautiously as a majority of these LEED-seeking libraries were developed by a single owner with a commitment to achieve LEED and with tight controls over budgets and costs.
- The majority of non-LEED projects in the study achieved between 15 and 25 points within their established designs.
- Analysis of both the non-LEED and LEED projects suggests that there are usually 12 points that can be earned without any changes to design strictly due to the building's location, program, and/or owner and local code requirements. Further analysis also suggests that up to 18 additional points are then achievable with minimal effort and at little or no additional cost.

### **Key Graphs**

#### ***Cost Impact Due to Demographic Location***

	rural	urban
Site Selection		✓
Urban Redevelopment		✓
Alternative Transportation, Public Transportation Access		✓
Reduced Site Disturbance, Protect or Restore Open Space	✓	
Reduced Site Disturbance, Development Footprint	✓	
Stormwater Management, Rate and Quantity	✓	\$\$\$
Stormwater Management, Treatment	✓	\$\$\$
Water Efficient Landscaping, Reduce by 50%	✓	
Water Efficient Landscaping, No Potable Use or No Irrigation		✓
Construction Waste Management, Divert 50%		✓
Construction Waste Management, Divert 75%		✓
	5	6 to 8

**Cost Impact Due to Climate\***

	Platinum*	Gold*	Silver*
UCSB	7.8 %	2.7 %	1.0 %
San Francisco	7.8 %	2.7 %	1.0 %
Merced	10.3 %	5.3 %	3.7 %
Denver	7.6 %	2.8 %	1.2 %
Boston	8.8 %	4.2 %	2.6 %
Houston	9.1 %	6.3 %	1.7 %

\*The climates selected were the following:

- Mild Coastal – Santa Barbara and San Francisco
- California Central Valley – Merced
- Gulf Coast – Houston
- Northeast Coast – Boston
- Rocky Mountains – Denver

**Links to AMR Workshop**

Current and thorough survey of the construction costs and cost-drivers associated with achieving LEED accreditation based strictly on an examination of LEED vs. non-LEED projects.

**Building Momentum: National Trends and Prospects for High-Performance Green Buildings**

**Bibliography**

U.S. Green Building Council. 2003. “Building Momentum: National Trends and Prospects for High-Performance Green Buildings.” U.S. Green Building Council.

**Main Topic**

Based on the 2002 Green Building Roundtable, this article focuses on trends in the industry and recommendations to improve adoption of green building.

**Parties Mentioned**

- United States Green Building Council
- Government
- Public/Private Sector

**Executive Summary**

Examines current (2002) trends in green building and identifies opportunities to increase the proliferation of green building. Also address the role and importance of the government's involvement in industry growth. Significant barriers exist despite more than 600 buildings equaling more than 86 million square feet being registered for third-party certification. As the nation's largest landowner, the federal government will be a large factor in emphasizing the benefits of green building to the mainstream.

#### **Key Statistics**

- Initial costs can increase 2% - 7% due to the integration of high-performance features (green building/sustainable features)
- European Union spends 6x that of the U.S. concerning research devoted to the "built environment"
- Energy-star labeled buildings cost \$0.86/sq ft to operate, 40% less than average buildings (according to a 2002 EPA report)
- Has page devoted to "Federal Policies and Programs that Support Green Building"

#### **Links to AMR Workshop**

- Trends and barriers to adoption
- Importance of government involvement
- Education

### **Majority of Public Owners are Turning to Energy Efficiency Designs**

#### **Bibliography**

PinnacleOne. 2005. "Majority of Public Owners Are Turning to Energy Efficiency Designs." (Phoenix, AZ: Walsh Communications). Press release. Available from Pinnacle One website.  
<[http://www.pinnacleone.com/press\\_releases\\_pdf/2005%20Pulse%20-%20Energy%20Efficiency%20FINAL.pdf](http://www.pinnacleone.com/press_releases_pdf/2005%20Pulse%20-%20Energy%20Efficiency%20FINAL.pdf)>, accessed January 2006.

#### **Main Topic**

Results of survey conducted by PinnacleOne to determine attitudes towards green building and adoption of energy efficient practices, particularly LEED standards.

#### **Parties Mentioned**

- LEED, United States Green Building Council
- PinnacleOne

#### **Executive Summary**

Results of the survey indicate that while a majority of public owners have implemented projects with energy efficient designs, many have not or do not plan to use LEED certifications. The education sector, especially in the Western region has been leading the way in the adoption of green building.

#### **Methodology**

A national telephone survey conducted by Market Measurement, Inc., an independent market research consulting firm, that examined the attitudes of public owners on construction issues related to project management, energy/environment and claim resolution.

#### **Key Statistics**

- 60% of public owners have implemented energy efficient projects in the last year
- Only 29% currently use or plan to use LEED standards in the coming year
- 49% of respondents were unfamiliar with LEED standards
- Education sector leads the way; 73% of the sector have implemented energy efficient designs
- Of the 51% of owners familiar with LEED, 44% had no plans to use the standard
- 26% of owners didn't believe LEED standards were worth the increased costs

#### Links to AMR Workshop

- Adoption of LEED standards
- Industry perceptions of LEED

### Executive Survey Identifies Industry Concerns

#### Bibliography

Northwest Construction. 2004. "Executive Survey Identifies Industry Concerns; Materials Prices, LEED Standards Top The List."

#### Main Topic

Results of survey conducted by PinnacleOne which examined the opinions of construction industry executives (owners, architects, engineers, contractors and developers) on issues related to project management, energy/environment and claim resolution.

#### Parties Mentioned

- LEED, United States Green Building Council
- PinnacleOne
- Government

#### Executive Summary

Although much of this survey focuses on industry-wide trends and issues, the results clearly indicate that additional education is necessary in the area of green building. Air quality and energy efficiency is a concern for most of the respondents, but they do not have a good grasp on the benefits of green building as it relates to these areas.

#### Methodology

Conducted in October 2004, the results are based on the opinions of 136 executives involved in construction projects.

#### Key Statistics

- 77% of participants initiated energy efficient plans in new projects and 93% expect increased demand for energy solutions
- 39% failed to use LEED standards
- 44% of respondents were unaware of incentives offered by the government or local utilities
- 20% were unwilling to dedicate any budget to green building standards

#### Links to AMR Workshop

- Perceptions
- Education

### Green Building Market Barometer

#### Bibliography

Turner Construction Company. 2005. "Green Building Market Barometer." Available from Turner Construction website. <<http://www.turnerconstruction.com/greenbuildings/content.asp?d=2199>>, accessed March 2006.

#### Main Topic

The survey conducted a broad assessment of the views of senior executives involved with real estate projects, both green and traditional, with a special focus on green building issues in educational facilities. The purpose of the study is to provide insight into executives' current perceptions about green building from those who have participated in green projects and those who have not.

### **Parties Mentioned**

The Market Barometer references other studies and mentions the USGBC and its LEED standards. Turner Construction is a leader in commercial real estate development and has extensive green building and construction experience, including:

- With construction volume of \$7 billion in 2004, Turner ranks first or second in major segments of the construction industry. Turner maintains a nationwide network of offices and a staff of more than 5,000 employees, performing work on over 1,500 projects each year.
- Completed or under contract for more than 130 projects with Green building elements, valued at well over \$10 billion and totaling more than 40 million square feet (as of 9/05)
- Completed 15 LEED certified projects, with more than 54 additional LEED registered projects completed or in progress (as of 9/05)

### **Methodology**

The Turner Construction Company 2005 Green Building Market Barometer surveyed 665 senior executives on Green building issues through an online questionnaire. The survey was conducted from August 16–26, 2005. The survey was conducted by Bayer Consulting. The executives surveyed represented a broad spectrum of different types of organizations involved with facilities including architectural/ engineering firms (27%), owners and developers of rental buildings (15%), colleges and universities (11%), K–12 school districts (8%), consultants (8%), construction firms (7%), and nonprofit and government owner-occupants outside of education (7%). (Please see Exhibit 19.) The survey respondents worked with a wide variety of facilities including office (44%), healthcare (38%), higher education (38%), residential (35%), and K–12 (31%). (Please see Exhibit 20.)

### **Executive Summary**

There is a widespread recognition that Green buildings provide enduring benefits in the improved well-being and performance of students, teachers, and workers, as well by lowering total project costs over the long term. Yet, executives remain concerned about the higher construction costs of Green buildings, often due to inaccurate estimates of the costs required to incorporate Green features.

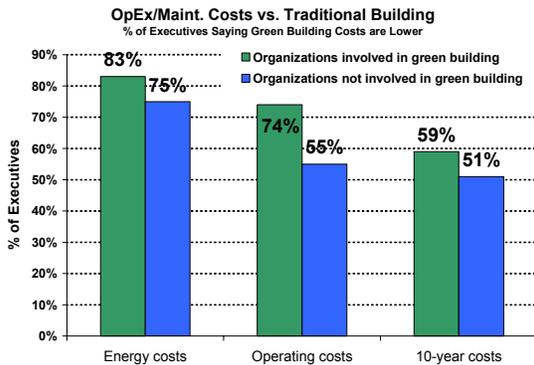
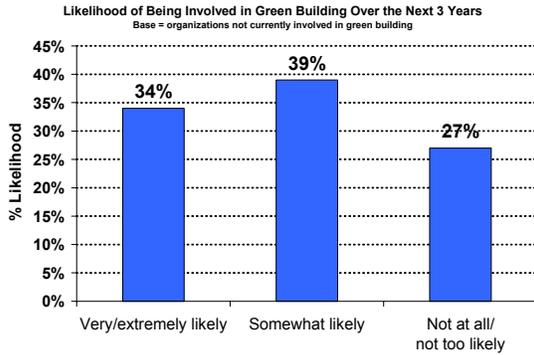
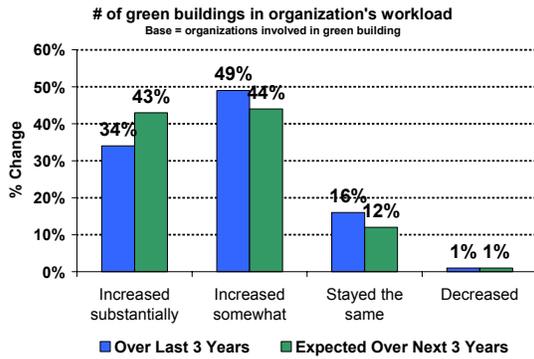
Providing accurate information to building owners and decision-makers is essential to encourage more building owners—both in the private sector and the public sector—to reap the substantial benefits that Green buildings provide in improved student performance, increased worker productivity, and lower ongoing operating costs. Turner Construction Company offers its 2005 Green Building Market Barometer as part of this effort.

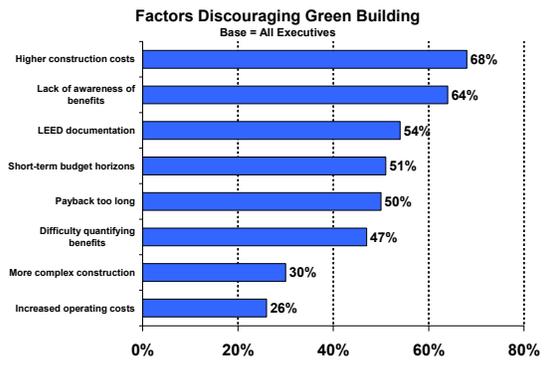
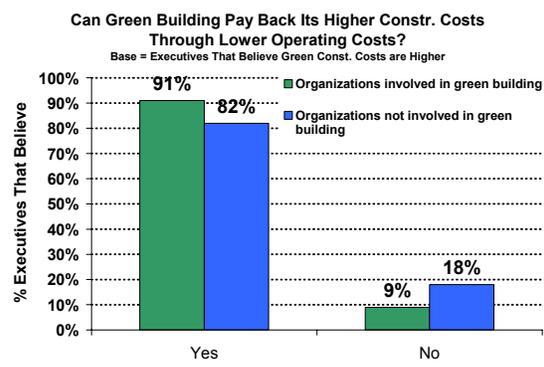
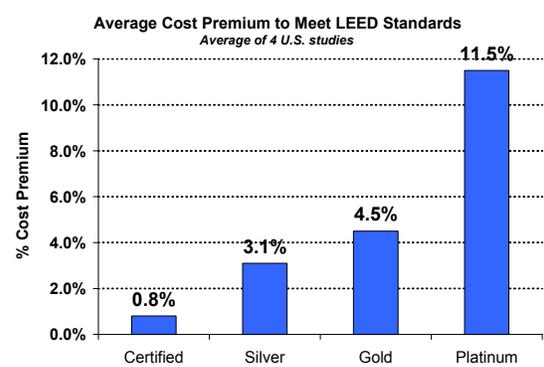
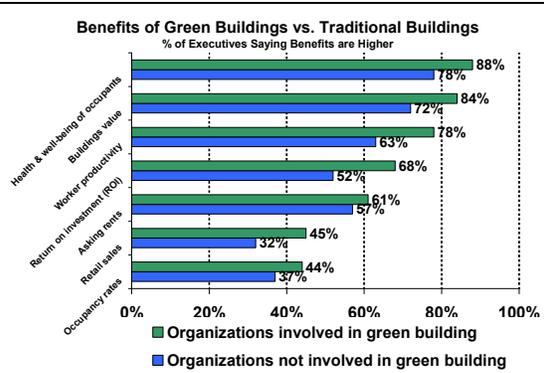
### **Key Statistics**

- Fifty-seven percent of the executives surveyed said that their organization was currently involved with Green facilities. Eighty-three percent of these executives said that the number of Green buildings in their organization's workload had increased over the last three years, with 34% saying there had been a substantial increase. Looking ahead, 87% of executives expected Green building activity to continue over the next three years, with 43% expecting a substantial increase. (exhibit 12)
- In addition, 34% of executives at organizations not currently involved with Green buildings said that they thought it was very or extremely likely that their organization would be working with Green buildings over the next three years, up from 30% in the 2004 survey. (exhibit 13)
- Among executives at organizations involved with Green buildings, 83% said that Green buildings enjoyed lower energy costs and 74% said that they had lower overall operating costs than traditional buildings. Even most executives at organizations not currently involved with Green buildings agreed that Green buildings were less expensive to operate—fully 75% of these executives said that energy costs were lower and 55% said that operating costs were lower. (exhibit 14)
- 88% of executives at organizations involved with Green buildings said that the health and well-being of the occupants was greater in Green buildings than in traditional buildings, and 78% said that workers in these buildings were more productive. Most executives in organizations not involved with Green buildings, agreed with these assessments—78% said that the health and well-being of occupants was greater in Green buildings and 63% believed that worker productivity was higher. (exhibit 15)
- Seventy-five percent of executives at organizations involved with Green buildings, and 86% of those not involved with them, said their construction costs were higher than for traditional buildings. The firm of Morrison Hershfield reviewed 4 U.S. studies of Green buildings that estimated the increase in construction cost required to

meet different levels of LEED certification. Based on this analysis, the estimated average increase required to meet the Platinum certification standards was 11.5%, not too far below the 13% estimate provided by executives at organizations with Green building experience. On the other hand, these studies found that to obtain a basic LEED certification required a minimal increase in construction cost—only 0.8%.<sup>22</sup> Even obtaining a LEED Silver certification only required an average increase of 3.1% and a Gold certification required a cost increase of 4.5%, both far below the 13% estimate by executives in the survey. (exhibit 16)

- Although executives believed that Green buildings cost more to construct, virtually all believed that their higher initial costs would be repaid over time through lower operating costs, such as energy savings, increased worker productivity, and other benefits. (exhibit 17)
- It came as no surprise that factors relating to cost were ranked as some of the most important obstacles to Green construction. Topping the list of concerns were higher construction costs, cited by 68% of executives as a very or extremely significant factor discouraging the construction of Green buildings. Roughly half the executives also rated two other cost-related factors as very or extremely significant obstacles to Green activity: short-term budget horizons of many organizations and a payback from Green construction that is felt to be too long. (exhibit 18)





**Links to AMR Workshop**

- Very relevant and recent study based on multiple-discipline survey of real estate professionals and green building representatives.
- Turner Construction a huge commercial real estate developer.
- Identifies perceptions of benefits, costs, and barriers to broader adoption.

## Turner Construction Company Survey

### Bibliography

Turner Construction Company. 2005. "Turner Green Building Survey Reveals That More Than 70% of Executives Believe That Green Buildings Enhance Student Performance and Ability to Retain Teachers." New York: Turner Construction Company. Available from Turner Construction website. <<http://www.turnerconstruction.com/corporate/content.asp?d=4919&p=4008>>, accessed March 2006.

### Main Topic

Green building costs are lower than perceived and continue to be a major barrier to adoption along with lack of awareness.

### Parties Mentioned

- LEED, United States Green Building Council
- Turner Construction

### Executive Summary

While past surveys took a snapshot of the market holistically, the 2005 survey focused on education. The survey found that most education institutions misperceive total costs or do not consider total lifecycle costs when evaluating a project. In reality, these educational facilities have lower long term costs from reduced energy expenses and other operating expenses.

### Methodology

Bayer Consulting conducted the survey over the Internet and surveyed 665 executives over a two-week period. Respondents were involved with green building either as owners, owner-occupants, developers, construction firms, architects, engineers, consultants and educational institutions.

### Key Statistics

- 73% of K-12 executives expect total costs over 20 years to be lower, while 80% of higher education facilities agreed
- 50% of K-12 projects are evaluated based on total costs
- Only 7% of K-12 executives say more emphasis is placed on total costs, with 51% indicating more emphasis is placed on initial costs
- Nearly 75% of higher education projects are evaluated based on total costs
- 5% of higher education projects emphasize total costs, whereas 57% emphasize initial costs

Exhibit 1

Benefits of Green Facilities--K-12

Base = Executives at Organizations Involved with Green K-12 Facilities

	Much Better	Somewhat Better	Total
Community Image	52%	35%	87%
Ability to Attract/Retain Teachers	20%	54%	74%
Reduced Student Absenteeism	17%	55%	72%
Student Performance	24%	47%	71%
Ability to Secure Government Approvals	11%	30%	41%

Exhibit 2

Benefits of Green Facilities--Higher Education

Base = Executives at Organizations Involved with Green  
College/University Facilities

	Much Better	Somewhat Better	Total
Community Image	35%	55%	90%
Ability to Attract/Retain Teachers	16%	55%	71%
Ability to Attract Students	16%	54%	70%
Student Performance	11%	48%	59%
Ability to Secure Research Funding	14%	40%	59%
Ability to Secure Government Approvals	18%	34%	52%
Reduced Student Absenteeism	7%	41%	48%

Exhibit 4

Emphasis on Initial Project Costs vs. Total Lifecycle Costs

Base = Executives from Organizations Involved with Each Type of Educational Facility Who Said Total Costs Were Typically Considered

	More Emphasis on Initial Costs	Equal Emphasis	More Emphasis on Total Lifecycle Costs
K-12 Districts	51%	42%	7%
Colleges/Universities	57%	38%	5%

Exhibit 7

Groups Influencing Decision to Build Green K-12 Facilities

Percent of Executives Rating Group as Very or Extremely Important

Base = Executives from Organizations Involved with K-12 Buildings

Superintendent	77%
Board of Education	76%
Private Arch/Eng/Cons	60%
District Business/Fin Staff	56%
District Facilities Staff	44%
State Government	31%
Parents/Residents	27%
Town/Country Government	19%
Teachers	16%
Nonprofit Organizations	10%

Exhibit 8

Groups Influencing Decision to Build Green Higher Educational Facilities

Percent Rating Group as Very or Extremely Important

Base = Executives from Organizations Involved with College/University Facilities

Board of Directors	75%
Administration	69%
Private Arch/Eng/Cons	51%
Facilities Staff	50%

State Government	38%
Faculty	22%
Local Government	19%
Current Students	19%
Prospective Students	15%
Nonprofit Organizations	15%
Alumni	14%

Exhibit 9

Existence of Policies Encouraging Green Construction

K-12 School Districts

Base = Executives Employed by K-12 School Districts

No	41%
Yes	59%

Colleges/Universities

Base = Executives Employed by Colleges and Universities

No	35%
Yes	66%

**Links to AMR Workshop**

- Trends and barriers to adoption
- Importance of government involvement
- Education

**Redefining How LEED Works**

**Bibliography**

Fedrizzi, S. Richard, October 2005. "Redefining How LEED Works." *GreenTech Urban Land Institute Magazine*. p. 16-21.

**Main Topic**

USGBC and LEED Standards.

**Parties Mentioned**

- USGBC

**Executive Summary**

This article by Richard Fedrizzi outlines the purpose of the USGBC and discusses in detail the recent changes to the LEED Certification process.

**Key Statistics**

- "The core mission of the USGBC is to transform the way buildings are designed, built, and operated so that everyone can enjoy an environmentally and socially responsible, healthy, and prosperous built environment that improves the quality of life in communities."
- "With the launch of [new] LEED Green Building Rating Systems ... USGBC will offer a suite of tools that address the complex lifecycle of commercial and residential buildings in the United States."

### Key Graphs/Tables

- “The average LEED registered project takes two to three years to be completed and certified.”
- “Buildings account for more than 30% of primary energy consumption, 18 percent of potable water usage, and billions of tons of solid waste.”

### Links to AMR Workshop

- USGBC Mission
- Recent LEED Changes
- Average lifecycle of LEED project

## Promising Economics

### Bibliography

Pivo, Gary. October 2005. “Promising Economics.” *GreenTech Urban Land Institute Magazine*. p. 34-39.

### Main Topic

Benefits/costs to green building

### Parties Mentioned

- USGBC
- Paul, McNamara, Head of Research for London’s Prudential Property Investment Managers
- Studies: USC (2001); Emerging Trends in Real Estate 2005; Davis Langdon; Real Estate Economics; EPA; Berkeley National Laboratory; Innovest Strategic Value Advisors; Greg Kats

### Executive Summary

Addressing the top three barriers to the perception of sustainable design: higher costs, lack of market interest, and hard to justify investment.

### Methodology

Cites various published studies

### Key Statistics

#### Market Demand

- USC: at least 14.6M households are expected to want housing w/in ½ mile of transit by 2025 (2x today)

#### Costs

- Davis Langdon: no statistical difference in cost p.s.f.
- RE Economics: consumers w.t.p. 12% premium for new urbanism

#### Investment Opportunities

- EPA: energy costs reduced by 40% w/ payback of 2.5 years; if capitalized into building valuations and returned in 10 years – 41% IRR

### Key Graphs

- Investments in energy efficiency have high returns
- Comparative financial performance of above and below-average energy-efficient companies

### Links to AMR Workshop

- Existing research highlights
- Benefits and overcoming common challenges to green building

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<b>Technology Trends in High Performance Buildings</b>
<p><b>Bibliography</b></p> <p>Wilson, Alex. October 2005. "Technology Trends in High Performance Buildings." <i>GreenTech Urban Land Institute Magazine</i>. p. 46-51.</p>
<p><b>Main Topic</b></p> <p>New LEED technologies for real estate.</p>
<p><b>Parties Mentioned</b></p> <ul style="list-style-type: none"> <li>▪ Heschong Mahone Group</li> </ul>
<p><b>Executive Summary</b></p> <p>We are near a tipping point in the adoption of green building due to i) rising energy costs, ii) growing list of case studies, iii) increasing awareness of health and productivity benefits, and iv) technology and design advances in green development.</p>
<p><b>Key Statistics</b></p> <ul style="list-style-type: none"> <li>▪ Technology: ecological restoration of landscapes, daylighting, raised access floors, building-integrated photovoltaics, waterless urinals, and green roofs.</li> <li>▪ "Studies show that spaces illuminated solely by electricity and without views to the outdoors are less conducive to good health and office productivity than naturally lit spaces."</li> <li>▪ "Statistical analysis, such as those conducted by the Heschong Mahone Group, are making the case that natural daylighting and views to the outdoors are improving productivity in office buildings, improving learning in classrooms, boosting sales in retail stores, and speeding medical recovery in hospitals."</li> </ul>
<p><b>Links to AMR Workshop</b></p> <ul style="list-style-type: none"> <li>▪ New technology and the economic and health benefits of green building.</li> </ul>

<b>Outlook and Trends</b>
<p><b>Bibliography</b></p> <p>Cramer, Jennifer Seal and William D. Browning. October 2005. "Outlook and Trends." <i>GreenTech Urban Land Institute Magazine</i>. p. 58-65.</p>
<p><b>Main Topic</b></p> <p>Identify trends in green building and barriers and opportunities affecting further adoption of green building standards/practices.</p>
<p><b>Parties Mentioned</b></p> <ul style="list-style-type: none"> <li>▪ USGBC and Rocky Mountain Institute (RMI)</li> <li>▪ Firms: The Durst Organization and Liberty Property Trust</li> </ul>
<p><b>Executive Summary</b></p> <p>The green building initiative has grown to include several organizations and professionals across a broad range of industries. The choice is not whether the green building industry will grow, but when.</p>
<p><b>Key Statistics</b></p>

#### *Trends*

- Greater integration in green design is needed. “A successful green real estate development... results from whole-system, end-use thinking that is possible only when all team members work together from the outset to capture interconnections between the disciplines.”
- More green speculative and large-scale developments like One Bryant Park in New York (BofA and Durst)
- More advocates for green building
- The development community needs to participate. “Industry stalwarts such as Hines, Equity Office Properties, and Arden Realty have been aggressively pursuing the EPA’s Energy Star certification.”
- The public sector has been leading green building initiatives. “GSA, the government’s biggest landlord, requires that all new federal buildings meet the criteria for basic LEED certification.” Federal and state incentives are bringing more developers to the table. “Major incentives include accelerated depreciation, tax deductions, renewable energy credits, real estate tax incentives, and utility incentives.”
- *Barriers & Opportunities*
- “There are a number of barriers to green development, including market research, financing, the attitudes of intermediaries, and media coverage.”
- “Conversations with developers, REIT executives, real estate investors, and others in the industry reveal a variety of reasons to promote and sell green buildings: higher asset value; reduced energy cost, resulting in higher NOI; quicker lease-up and lower turnover; and more desirable properties.”

#### **Links to AMR Workshop**

- Trends, barriers and opportunities in the adoption of green development.

### **Selling Green Buildings With People Power**

#### **Bibliography**

LaMonica, Martin. October 28, 2005. “Selling Green Buildings With People Power.” *CNET News.com*.  
<[http://news.com.com/selling+green+buildings+with+people+power/2100-1008\\_3-5918004.html](http://news.com.com/selling+green+buildings+with+people+power/2100-1008_3-5918004.html)>, accessed February 2006.

#### **Main Topic**

Green building technologies, materials, and designs can lead to boosted productivity

#### **Parties Mentioned**

Toyota, Bank of America, USGBC, Liberty Property Trust, Carnegie Mellon University, Heschong Mahone Group, Wall Street Journal

#### **Executive Summary**

Builders and designers are betting on the beneficial effects on people, including worker productivity and student performance, to sell green or high-performance buildings.

#### **Key Statistics**

- “Sixty percent of U.S. property owners involved in construction used energy-efficient designs in the past year, according to construction consulting firm PinnacleOne.”
- “I believe the smoking gun of green buildings and the reason you’re going to see more of them... is productivity, said S. Richard Fedrizzi, President & CEO of the USGBC. He said office worker productivity on average increases 2-16 percent in green buildings.”
- “Liberty Property Trust is one company that has bought into the economic value of productive people. The company is marketing its green building projects by showing that an environment with good air and light increases worker productivity.”
- “Citing research commissioned by the USGBC, Fedrizzi said that children in green schools have 20 percent better test scores, and patients at hospitals using green technologies are discharged two-and-a-half days earlier than patients at traditional hospitals.”
- “Despite the benefits, there is still not a great deal of familiarity with the LEED certification system in the industry,

according to PinnacleOne, which found that less than a third of building owners plan to use the LEED certification system in the coming year.”

**Links to AMR Workshop**

- Summary statistics on worker productivity and “people benefits” of green building technologies, materials, and design.

**New Energy Efficiency Tax Credits Take Effect**

**Bibliography**

USGBC News. January 3, 2006. “New Energy Efficiency Tax Credits Take Effect.” *U.S. Department of Energy, Office of Public Affairs*. <<http://www.energy.gov/print/2852.htm>>, accessed March 2006.

**Main Topic**

Energy efficient tax credits signed into law in August 2005 go into effect

**Parties Mentioned**

- U.S. Department of Energy

**Executive Summary**

The energy efficient tax credits were signed into law as part of the first comprehensive legislation in over a decade. This energy bill contains provisions to provide businesses with tax credits to promote the use of green building technologies.

**Key Statistics**

Businesses may be eligible for credits such as:

- “30 percent tax credit for the installation of qualifying solar panel equipment on buildings.”
- “Business tax credits for companies that build highly energy efficient homes.”
- “Credits for companies that manufacture energy-efficient appliances such as dishwashers, clothes washers, and refrigerators.”

**Links to AMR Workshop**

- Government incentives for green building.

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## APPENDIX B: Correlation Tables

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## APPENDIX C: Survey

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### LEED Certification Process Questionnaire

The following is a copy of the survey we intended to distribute through the USGBC's database of approximately 20,000 Accredited Professionals.

Your responses to this survey will be kept confidential. However, if you would like to receive the report of the findings of this survey, please provide the following contact information:

Name: \_\_\_\_\_  
Organization: \_\_\_\_\_  
Email: \_\_\_\_\_

We will not share your information with anyone else.

**1) Please check the description that best fits your professional role**

- a. Architect
- b. Mechanical engineer
- c. Electrical engineer
- d. Plumbing engineer
- e. Civil engineer
- f. Structural engineer
- g. Landscape architect
- h. Commissioning agent
- i. Interior designer
- j. Project manager
- k. General contractor
- l. Developer
- m. Specifications writer
- n. Owner
- o. Realtor/broker
- p. Manufacturer
- q. Educator
- r. Consultant
- s. Other

**2) Have you worked on a LEED-certified project in the past, or are you currently?**

If yes, proceed to questions 3-14

If no, proceed to questions 15-20

[This Yes/No question will not include visible directions in the online/e-mail survey. Yes answers go to #3. No answers go to #15.](#)

**3) How many LEED-certified projects have you personally been actively involved in?**

- a. 0
- b. 1
- c. 2
- d. 3
- e. 4 or more

*For the following questions, please consider the most recent LEED project you were directly involved in. When applicable, please compare the project to other non-LEED projects.*

To avoid having to ask you for basic background information on the project for which you are answering these questions,

please provide as much of the following information as you can. (We will use this information only to match your responses to the information provided on this project's LEED certification sheet. If you are not comfortable providing this information, please do still complete the rest of the survey.)

Project name: \_\_\_\_\_  
 Owner: \_\_\_\_\_  
 City: \_\_\_\_\_  
 State: \_\_\_\_\_  
 Country (if not US): \_\_\_\_\_

**4) What type of project was this most recent LEED certified project you worked on?**

- a. New commercial construction and major renovation projects (LEED-NC)
- b. Existing building operations (LEED-EB)
- c. Commercial interiors projects (LEED-CI)
- d. Core and Shell projects (LEED-CS)
- e. Homes (LEED-H)
- f. Neighborhood Development (LEED-ND)

**5) What level of certification did you obtain?**

- a. Certified
- b. Platinum
- c. Gold
- d. Silver

**For this project, please rank how important each factor was in the decision to seek LEED certification?**

	Not at all important		Somewhat Important		Very Important
Customer requirement	<input type="radio"/>				
Government regulation	<input type="radio"/>				
Reduce environmental impact	<input type="radio"/>				
Your (firm's) image	<input type="radio"/>				

**6) How much benefit did you ACTUALLY receive from the LEED certification in each of the following benefit categories:**

	N/A	Much worse	Slightly worse	Similar	Slightly better	Much better
Project completion time	<input type="radio"/>					
Project cost	<input type="radio"/>					
Quality of building	<input type="radio"/>					
Image/recognition to building owner	<input type="radio"/>					
Ability to sell or lease the building	<input type="radio"/>					
Other: [fill in]	<input type="radio"/>					

**7) Overall, how much better or worse do you think the final product (building) is due to the LEED certification than it would have been without LEED?**

5-point scale: much worse, slightly worse, similar, slightly better, much better

**8) Overall, how much better or worse do you think the development and construction process was due to the LEED certification than it would have been without LEED?**

5-point scale: much worse, slightly worse, similar, slightly better, much better

**9) Overall, would you work on another LEED project based on your experience so far?**

5-point scale: certainly not, probably not, maybe, probably, certainly

These questions will only be seen by respondents who have not worked on LEED certified projects, so if the survey goes to the LEED auditors involved in the currently certified projects these questions will be excluded.

**10) What is your primary reason for not participating in a LEED-certified project?**

- a. Unaware of/unfamiliar with LEED elements and certification
- b. Certification takes up too much time/human capital resources
- c. Certification is too expensive
- d. Standard is not legitimate or is too environmentally-focused
- e. No opportunity to do so.
- f. Other (please explain) \_\_\_\_\_

**11) How can LEED improve the certification process?**

- a. Less paperwork/online interface
- b. Streamlined documentation and certification
- c. Improved integration with the design and construction phases of development
- d. Improved customer service and feedback mechanism
- e. More marketing to real estate community
- f. Other (please explain) \_\_\_\_\_

**12) Have you utilized other green building practices? If so, which practices/standards have you used?**

- a. Energy Conservation
- b. Water Conservation
- c. Construction Waste Conservation
- d. Title 24 (or other similar legislation)

**13) Will you consider a LEED project in the future? Why or why not?**

[Add space for comments]

**14) Additional comments?**

[Add space for comments]

From here on: these questions do go to all respondents, including those who have worked on LEED projects.

**15) Would you be open to further discussion of the LEED-certification process?**

YES / NO

**16) Would you be interested to receive a copy of the findings of this study, by email?**

YES / NO

If yes to either of the two previous questions, please provide your contact information.

Email: \_\_\_\_\_

Thank you for taking the time to complete the survey!

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## APPENDIX D: Workshop Materials

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### Green Building Workshop Agenda

*Presented by:  
The UCLA Anderson School of Management and  
The Ziman Center for Real Estate*

Friday, March 10  
9-11:00am PST

*Faculty Center Building (UCLA Campus in Westwood)  
480 Charles E. Young Drive  
Los Angeles, CA 90095*

#### Agenda Outline:

- I. Overview of USGBC & LEED Certification  
*Greg Reitz, Green Building Program Advisor – City of Santa Monica  
10-15 minutes*
- II. Presentation by MBA Student Team  
*10-15 minutes*
- III. Panel Discussion with Facilitator  
*30 minutes*
- IV. Group Discussions with Facilitated Breakout Sessions  
*30-45 minutes*
- V. Q&A with Conclusions from Group Discussions  
*10-15 minutes*

#### Panel Participants:

Steve Holt	Senior Project Manager	Turner Construction
Scott Lewis	Founder & Principal	Brightworks
Doug Robertson	Chief Executive Officer	House & Robertson
Sanford Smith	Corporate Real Estate and Facilities Manager	Toyota

#### MBA Class of 2006 Student Team:

Ben Cryer, Jeff Felder, Rebecca Matthews, Brian Okrent, Michael Pettigrew

## Topics for Discussion

### I. Overview of USGBC & LEED Certification

- A. Introduction by Greg Reitz, Green Building Program Advisor for the City of Santa Monica

### II. Presentation by MBA Student Team

- A. Summary of existing research and group findings
- B. Local and national adoption
- C. Conclusions

### III. Panel Discussion with Facilitator

- A. Introduction and Benefits of Green Building

- Please share your name, the company you work for, and how many green building projects have you worked on? If LEED, at what level of certification?
- What was the most important factor or reason you were involved in those green building projects?
- What specific benefits did you realize from using green building designs, materials, or practices? Please be as specific and quantify these benefits if possible.

- B. Costs of and Threats Against Green Building

- Did adopting green building practices or standards help create a better building, improve the development process, neither, or both?
- To the extent possible, please comment on the costs of the green building projects you've been involved with vs. traditional real estate projects, whether construction costs or operating costs?
- *Time Permitting:* What is the biggest obstacle for broader adoption of green building, excluding government legislation and corporate real estate owners?

### IV. Group Discussions with Facilitated Breakout Sessions (*see following pages*)

### V. Q&A with Conclusions from Group Discussions

## **Green Building Workshop Handout** *Selected Quotes and Statistics*

### **TOPIC: UNEXPECTED BENEFITS**

**What are the unexpected benefits of green building projects?**

**Source: *The Green Business Letter*, Dec. 2005. "Study Links Green Buildings to Higher Market Value."**

"... [Green buildings] can: earn higher rents and prices; attract tenants and buyers more quickly; cut tenant turnover; cost less to operate and maintain; and benefit occupants."

**Source: Terry J. Lasser, Feb. 2005. *Urban Land Institute*. "Marketing Green Multifamily Housing."**

Lydia Haran, leasing manager for New York City's Solaire - the first residential high-rise to earn LEED Gold - has an explanation for why 293 units were leased within five minutes. "We learned from the leasing process that the green features actually were primary and other factors secondary, that there was a pent-up demand for green luxury high-rises." According to Haran, "those units achieved a 10 percent premium in rents, which have risen some 15 percent since the building opened last year."

**Source: *McGraw Hill SmartMarket Report*.**

"[Our] employee turnover rate was down, absenteeism due to sickness was down, productivity was up – there are a lot of people in an operations field, and essentially it's like quantifying widgets, so it was easy to quantify. Workflow was up, and when we looked at energy consumption, we were using 20% less." -- Gary Saulson, Director of Corporate Real Estate at PNC Bank

### **TOPIC: UNEXPECTED COSTS**

**What are the unexpected costs of green building projects?**

**Source: *PinnacleOne Survey 2004***

"...a quarter of the respondents mistakenly felt they would need to dedicate more than five percent of their project budget to meet LEED standards and 20 percent were unwilling to dedicate any amount of their project budget to meeting green building standards."

**Gregory Kats, Oct. 2003. "The Costs and Financial Benefits of Building Green."**

"In the most comprehensive analysis of the financial costs and benefits of green building conducted to date, this report finds that an upfront investment of less than two percent of construction costs yields life cycle savings of over ten times the initial investment."

"The design and construction process for the first green building of a client or design/architectural firm is often characterized by significant learning curve costs, and design schedule problems such as late and costly change orders."

### **TOPIC: BARRIERS TO BROADER ADOPTION**

**What are the most significant barriers to broader adoption of LEED Certification?**

**Source: PinnacleOne Survey 2005**

“According to a new study by PinnacleOne, one of the nation's leading construction consulting firms, a majority (60 percent) of public owners in the United States have implemented construction projects with energy efficiency designs in the past year. Yet, less than a third (29 percent) of the owners currently use or plan to use LEED (Leadership in Energy and Environmental Design) green building standards in the coming year. *Surprisingly, almost half (49 percent) of the study participants were unfamiliar with the standards.*” [Emphasis added]

**Source: Turner Construction 2005 Market Barometer**

“...the perceived complexity and cost of LEED certification was rated as a very or extremely significant obstacle to Green construction by 54% of executives.”

**Source: Michael Corkery. Wall Street Journal, Oct. 19, 2005. “Green Option Often Overlooked.”**

“At issue is the Green Building Council’s checklist system that certifies projects as green. Some critics say the system gives too much weight to certain easy tasks, while giving the same weight to much more expensive ones. Builders get one point for installing a \$350 bike rack.... They score the same one point, however, for promising to obtain 5% of the building’s energy from renewable sources such as wind or solar power.”

**TOPIC: NEXT STEPS**

**What are next steps or actions you will take to adapt to this growing trend?**

**National Real Estate Investor Newsletter, Feb. 23, 2006. “Seeing Red Over Green Buildings in Washington”**

“Green-building ordinances are nothing new – at least 43 cities and 14 states have adopted measures to encourage energy efficiency and use of environmentally-friendly materials and construction methods, according to the U.S. Green Building Council. What is new about the District of Columbia’s Green Building Act--and worrisome to some developers-- is that the plan extends green building requirements to non-government projects.”

**Source: Michael Corkery. Wall Street Journal, Oct. 19, 2005. “Green Option Often Overlooked.”**

Darr Hashempour, Vice President of Energy Solutions at PinnacleOne, says “many owners shy away from the LEED standards because they are afraid of added costs, [but the] costs have gone down substantially... the problem is a lack of knowledge.”

## Workshop Speaker & Panel Participant Bios

### **Greg Reitz**

#### ***The City of Santa Monica, Green Building Program Advisor***

Greg Reitz is the Green Building Advisor for the City of Santa Monica. In his position, Mr. Reitz is responsible for promoting green building practices in the city. Since coming to the City, Mr. Reitz has started several new initiatives to promote green building practices including the Green Building Resource Center, LEED training for City staff, green building education for residents, grants to promote private sector green building, and a city-wide green building tour. Mr. Reitz is a LEED Accredited Professional and currently serves on the Board of Directors for the Los Angeles Chapter of the US Green Building Council. He is also the founding chairman of the Southern California Green Building Public Agency Council. Prior to working for the city, Mr. Reitz worked as a green building consultant for E2. Before entering the world of green building, his early professional experience was in management consulting for Andersen Consulting. Mr. Reitz has a BS in Cybernetics from UCLA.

### **Steve Holt**

#### ***Turner Construction, Senior Project Manager***

Steve is a registered architect with over 28 years of experience in project management, design, construction and cost control of technically demanding projects. As a Project Manager, Steve is the primary contact for the Owner, Architect and sub consultants. While overseeing the preconstruction and construction progress, Steve ensures that the Owner is treated fairly and equitably. Responsibilities include all construction-related issues, overall management of various project controls, scheduling/cost/budget studies and reviews, administrative reports, contract administration, and document control. Mr. Holt has a BS and Master's in Science from UC-Berkeley and an MBA from the UCLA Anderson School of Management.

### **Scott Lewis**

#### ***Brightworks, Founder and Principal***

Scott Lewis is the Founder and Principal of Brightworks, a leading provider of green building and sustainability consulting services. Brightworks presently supports over 40 projects and more than 10 million square feet of space in development in Oregon, Washington and California, including LEED™ green building programs for two U.S. courthouses and over a dozen highrise residential buildings, as well as university, institutional, commercial and industrial projects.

Scott leads advanced LEED workshops and sustainability trainings for large architecture and engineering firms, and is the author of the Succeed at LEED series in Environmental Design and Construction magazine. Brightworks also provides sustainability consulting services to large institutions such as Oregon Health and Sciences University, University of California Santa Barbara, and to large infrastructure projects such as the massive South Waterfront redevelopment in Portland, Oregon.

Scott provides sustainability coaching services through the Oregon Natural Step Network, helping organizations deepen their understanding of sustainability, and training them in methods of integrating principles of sustainability more deeply into their organizational mission and operations. Scott is a graduate of Stanford Law School and Colorado College.

**Douglas Robertson, AIA**

***House & Robertson, Chief Executive Officer***

Doug Robertson has a proven track record in the leadership of multifaceted teams in the technical execution of complex projects in collaboration with noted design architects. His overall technical expertise is complemented by his deep understanding of information technologies and their innovative applications within the design process. In addition, Doug also possesses a unique expertise and background in the resolution of intricate code and entitlement issues. Mr. Robertson has a BS in Art History from UC-Riverside and a Master's of Architecture from UCLA.

**Sanford Smith**

***Toyota Motor Sales, Inc., Corporate Real Estate and Facilities Manager***

In his role as Corporate Manager of Real Estate and Facilities, Sanford Smith heads a department of 40 associates involved in the planning, development and operations of all facilities projects for Toyota Motor Sales, USA. The portfolio consists of approximately 10 million square feet and includes a diverse range of facility types, including office space, ports, distribution centers and many others.

Sanford is a registered architect (California) and attended Cal Poly Pomona where he graduated with honors in 1979. He started his career in retail design and planning where he was responsible for the expansion of a regional department store chain. He then worked for The Irvine Company where he worked in both an architectural and development capacity. Sanford then spent four years at the University of California Irvine working on public/private real estate development before beginning his tenure at Toyota in 1990. At Toyota, his department's leading edge work on environmental issues has been recognized with CoreNet's 2003 Global Innovators Award as well as honors from US Green Building Council, American Institute of Architects, IFMA, IIDA and he recently accepted the Environmental Leadership Award from California's Governor, Arnold Schwarzenegger.

He is an active member of the Partner's Circle of the School of Environmental Design at Cal Poly Pomona, Cornell University's International Workplace Studies Program (IWSP) and Penn State's PACE program. In addition to his participation in CoreNet, Sanford belongs to the American Institute of Architects, serves on the marketing committee of the US Green Building Council and is a member of the Real Estate Executive Board.

Sanford received the prestigious Corporate Real Estate Leadership Award from the editors of Site Selection Magazine and was selected as the Corporate Real Estate Executive of the Year by the Los Angeles Chapter of CoreNet.

In his free time, Sandy enjoys travel with his family, bike riding, windsurfing, skiing and scuba diving.

## Firms Represented by Workshop Attendees

Allan D. Kotin & Associates  
Bond Companies  
Brightworks  
CBRE Investors  
City of Santa Monica  
CJA/Serrano Development  
CTG Energetics  
Douglas Emmett  
Environmental Planning Associates  
EPTDesign  
Financial Research Group  
Gensler  
Greenberg Glusker  
House & Robertson Architects  
JP Morgan Real Estate  
KB Homes  
LivingHomes  
Montage Development  
Morley Builders  
Swinerton  
The Olson Company  
Toyota  
Turner Construction  
Wells Fargo  
Yorkshire Development

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## Evaluating the Diffusion of Green Building Practices



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