

# Does Green Pay Off?

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**Executive Summary.** *This study provides some comparison data on Energy Star and Leadership in Energy and Environmental Design (LEED)-certified buildings versus non-Energy Star or non-LEED-certified office property in the United States using the CoStar database. These results are promising for the benefits of investment in sustainable real estate, energy savings, and for the green movement now sweeping our society. The payoff from wise green investment is easy to justify even if it is based on purely profit motivations.*

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This systematic study addresses questions on the benefits of investments in energy savings and environmental design. It compares all U.S.-based Energy Star office buildings as one measure of “green” building along with Leadership in Energy and Environmental Design (LEED)-certified office buildings as another measure of “green” with a large sample of non-Energy Star and non-LEED-rated buildings. Essentially, Energy Star buildings are those within the 25% most efficient buildings for energy conservation. LEED-certified buildings are based on the standards provided by the U.S. Green Building Council (USGBC). A parallel effort undertaken by Fuerst and McAllister (2008) finds similar results to those presented here and using the same data source, while Eichholtz, Kok, and Quigley (2008) also find modest yet positive results for controlled rent differentials.

There is not enough data to break down LEED certification into various levels (certified, silver, gold, platinum) or even to provide extensive descriptive statistics, but there is sufficient data to try and provide a preliminary indication as to the value added by the general LEED rating. While other ratings exist both in the United States and globally, and better measures of building efficiency, productivity, and operation adaptability are needed, such discussions are left to future research.<sup>1</sup> Definitions of the terms used here are found in Appendix 1.

To date, most studies on the benefits of green investment are case studies (see, for example, RICS, 2005; Kohlhepp, 2007; and Scheer and Woods, 2007). From such case studies, strong opinions can

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be formed about the costs and benefits of green investment, yet a single case is seldom the prototypical mean and there exists much local variation that adds to or reduces the marginal costs of going green. The current study goes well beyond case studies by starting with a database of over 2.4 million properties and paring it down to a comparable set for the office market.

With respect to the all-important question of added costs, most available surveys on the costs are from the USGBC and, as such, some developers are skeptical of potential downward bias. Developers point out the direct cost of certification and the high indirect costs of dealing with inflexible, uninformed, and uncooperative local building code regulators or the lack of local experts and resources. Clearly the costs of going green vary by local market, the number of vendors and experience in the local market, developer/owner experience, and project or portfolio scale.<sup>2</sup> The indirect costs of green efforts, manifested in frustration and mental wear and tear, are more difficult to estimate; yet such costs are clearly coming down, and will likely continue to decline. This work uses available resources and data to outline what is known.

Note that many of the benefits of green and high-performance buildings may not yet be reflected in higher base rents in some local markets.<sup>3</sup> The reason is simple. Most of the benefits accrue to tenants and tenants require proof before they are willing to share in the cost of investments that theoretically will help them be more productive or save money. Only in very recent years have tenants started to fully appreciate the benefits of cleaner air, more natural lighting, and easier to modify spaces. A survey of 500 corporations completed by Grant Thornton in the summer of 2007 indicated that 75% of executives said that their companies would be spending more on environmental programs in the future. Of those surveyed, 68% expected environmental responsibility reporting to become mandatory within three to five years.<sup>4</sup>

Supporting investments in environmentally responsible facilities, a study by Greg Kats of Capital E Analytics in early 2007 provided the following

summary of benefits from going green, as shown in Exhibit A-1 of Appendix 2. Productivity benefits are estimated to be as much as 10 times the energy savings from green efforts. These benefits come in the form of lower absenteeism, fewer headaches at work, greater retail sales, and easier re-configuration of space resulting in less downtime and lower costs. Kats' cost estimates based on a sample of 33 office and school buildings suggested only 0.6% greater costs for LEED certification, 1.9% for silver, 2.2% for gold, and 6.8% for platinum certification. These estimates are obviously direct costs but they are quite close to those provided by the USGBC. Earlier, a book published by the Aardex Corporation (2004) suggested that effective buildings could increase tenant productivity by at least 30%. Aardex considered lighting, air quality, layout, and much more in its building systems with many criteria that are not part of the LEED scoring system. More studies on productivity are needed to be sure that such claims of higher productivity are not just short term or the placebo effect of new environments.

If tenants are not willing to pay higher base rents for greener buildings, is it still worth going green?<sup>5</sup> The answer is likely positive if: (1) you accept claims of faster absorption; and/or (2) you expect to hold the building for several years and you believe the value impact results that derive from not only rents, but also lower operating expenses and lower cap rates.

This study focuses only on the direct real estate benefits using a sample that includes most of the for-rent office data available for the entire United States.

### **Existing "Preliminary" Studies**

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While all similar studies are still preliminary and in working paper form, this study provides a comparison of the results from Fuerst and McAllister (2008) and Eichholtz, Kok, and Quigley (2008) to those in this study. Note that the general rent and occupancy figures in the current study are three quarters later than the data used by the other two studies.

Exhibit 1 shows that all three studies have generally higher rents and occupancy rates. The results of the current study's general value results are quite high and in line with Fuerst and McAllister but the regression controlled results are lower yet still quite positive.

### Data Used in this Study

CoStar is the leading collector of property data. A few years ago, CoStar started to note whether buildings were Energy Star-rated or LEED-certified. As of early 2008, there were over 1,200 Energy Star-rated buildings in the database and more than 900 office buildings, over 220 retail, 25 industrial, 53 hospitality, and 12 others. Five hundred and eighty buildings in the database were LEED-certified but the sample available for comparing occupancy, rents, and values was much smaller than for Energy Star buildings. The Energy Star-rated buildings included 322 million square feet. The typical Energy Star office building is Class A with 353,000 square feet, 15 floors, built in 1985 or later, multi-tenanted, and 91.7% leased. The following filters were used to develop the comparison sample studied here: (1) only Class A office buildings; (2) 200,000 square feet or more; (3) five stories or more; (4) built since 1970; and (5) multi-

tenanted. Seventy-two percent of the Energy Star buildings met all these criteria, which resulted in a sample of 643 buildings. The non-Energy Star buildings meeting these criteria numbered over 2,000 with nearly a billion square feet.

### General Descriptive Results

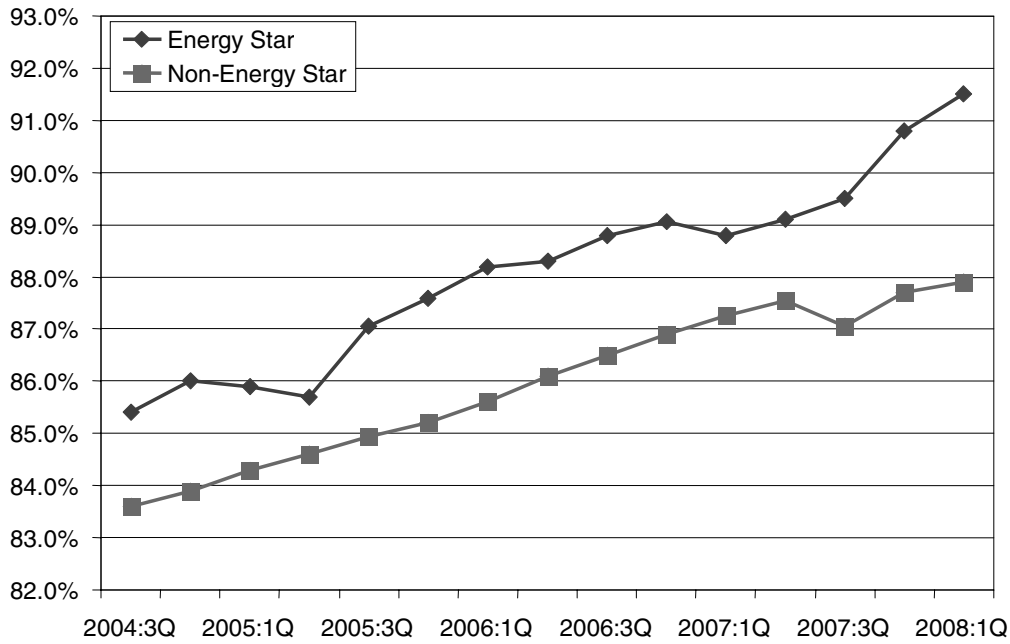
Data comparison results are provided in Exhibits 1–7. Data on absorption rates was not available but casual surveys suggest much faster absorption rates for LEED-certified buildings. Operating expenses based on energy costs also varied with Energy Star-rated buildings running \$1.27 per square foot per year for energy in 2006 compared to non-Energy Star-rated buildings running \$1.81 per square foot. These 50-cent or so differences continue to be reported in 2007.

The sample of properties where cap rates were known is modest but there is a differential in terms of lower cap rates by about 55 basis points, suggesting higher values by just under 10%. Together, the higher occupancy rates, higher rents, and lower operating expenses logically translate to higher values but not necessarily by the rent differential shown in Exhibits 3 and 7. One might suggest that the LEED and Energy Star-rated

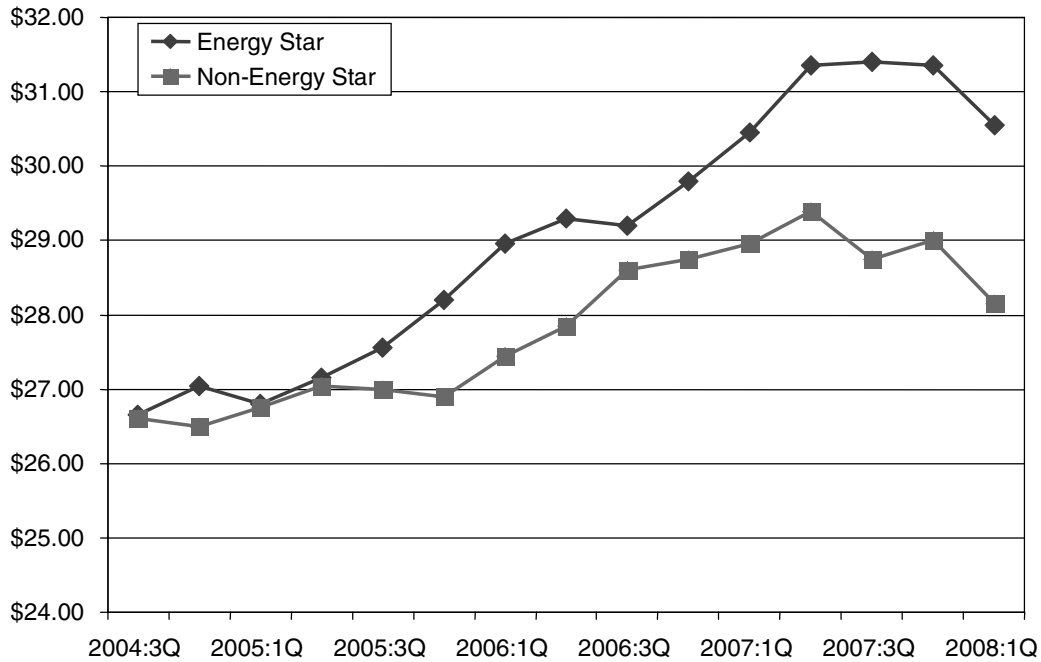
**Exhibit 1**  
**General Result Comparisons of Three Studies to Date on Rents, Occupancy, and Values**

	Miller, Spivey, & Florance	Fuerst and McAllister	Eichholtz, Kok, & Quigley
Rent			
Green Buildings			\$29.80
Energy Star	\$30.50	\$29.34	
LEED	\$42.15	\$27.07	
Control Sample	\$28.00	\$24.68 (all sample)	\$28.16
Occupancy Rate			
Green Buildings			88.99%
Energy Star	91.5%	88.40% (median)	
LEED	92.0%	88.40% (median)	
Control Sample	87.8%	86.06% (all median)	81.35%
Regression model controlled Log of Effective Rent Per Sq Ft			
LEED Rent Differential %		9.2%	4.4%
Energy Star Rent Differential %		11.6%	8.9%
Value Per Sq Ft (regression result)			
LEED	9.9%	31.4%	
Energy Star	5.3%	10.3%	

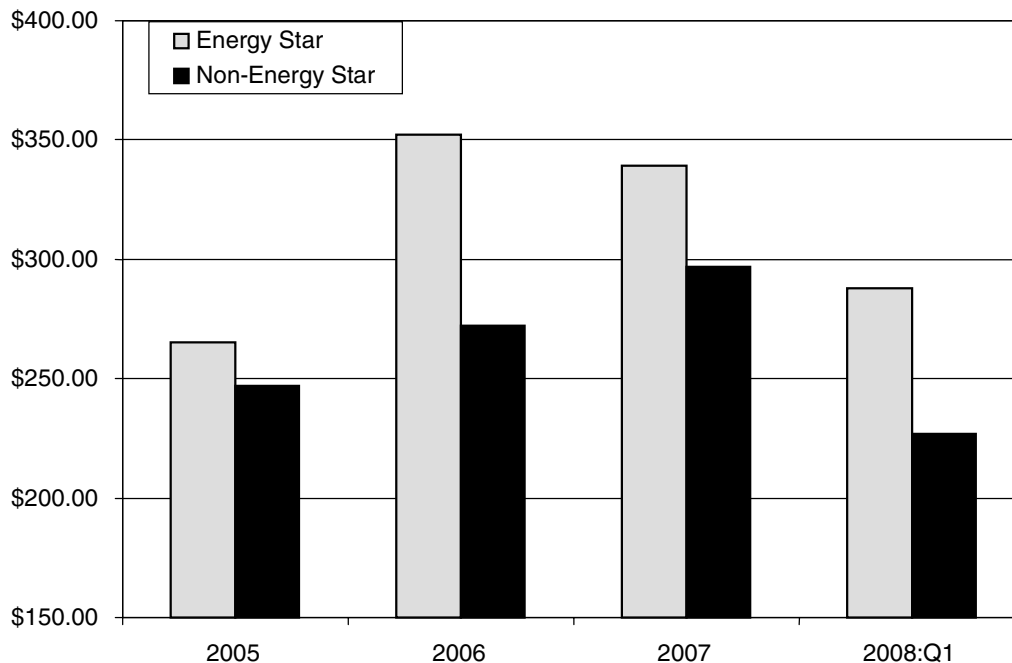
**Exhibit 2**  
**Occupancy Rates By Quarter Through 2008:Q1**



**Exhibit 3**  
**Direct Rental Rates Through 2008:Q1**

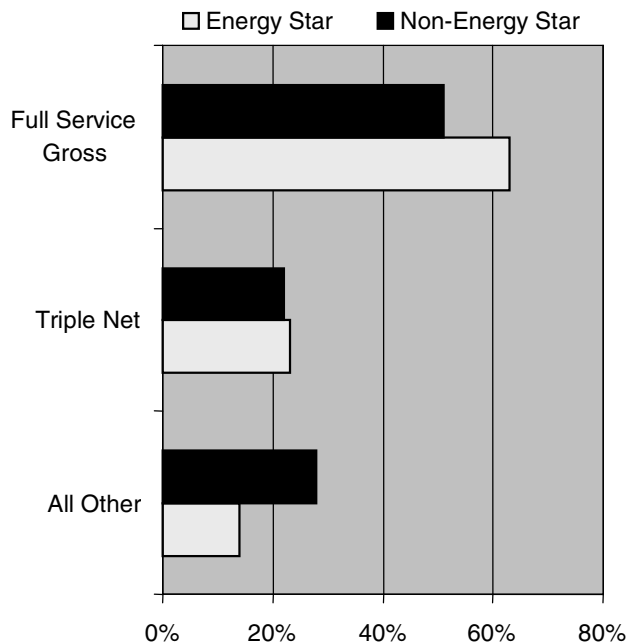


**Exhibit 4**  
Sales Prices Per Sq Ft



buildings are newer or more recently retrofitted and thus the general statistical results would not hold for a more controlled comparison. Below is a more controlled comparison using standard regression analysis.

**Exhibit 5**  
Lease Structures



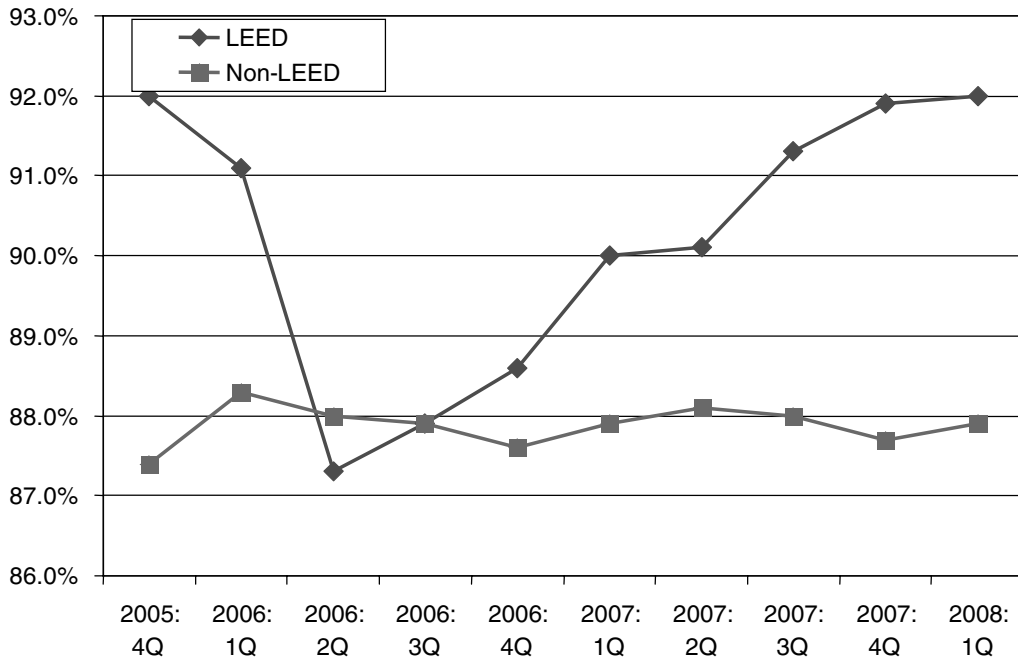
**Price Impact with Age, Location, and Time of Sale Controlled**

Several hedonic models were tested to try and understand if the differentials observed above are valid or spurious and correlated with newer buildings in more expensive cities. With sales price per square foot as the dependent variable, the following model was tested:

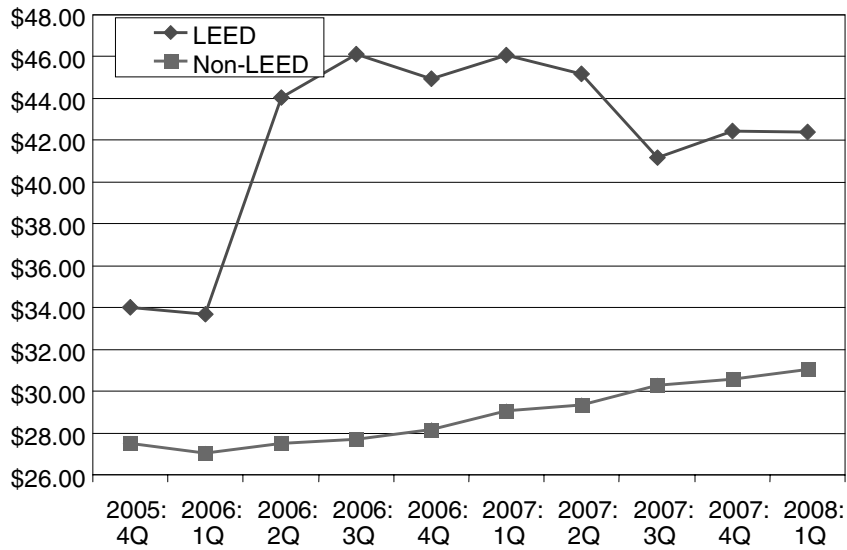
$$\begin{aligned}
 \text{Sales Price/Sq Ft} = & \alpha + \beta_1(\text{Age}) + \beta_2(\text{ES}) \\
 & + \beta_3(\text{LEED}) + \beta_4(\text{Size}) \\
 & + \beta_5(\text{CBD}) + \beta_6(\text{Yr dummy}) \\
 & + \beta_7(\text{City Dummy}) + \varepsilon. \quad (1)
 \end{aligned}$$

Where  $\alpha$  is the constant,  $\beta$  is the regression coefficient for each variable and  $\varepsilon$  is the error or residual term. Several forms of this model were used to

**Exhibit 6**  
**Occupancy Rates Through 2008:Q1**



**Exhibit 7**  
**Direct Rental Rates Through 2008:Q1**



examine the effects with only Energy Star or only LEED certification in the model, as well as with several different location controls. The general results are as follows:

Variable	Coeff.	t-Stat
Intercept	201.39	11.03***
Age	-4.66	-11.88***
ES	13.99	1.68*
LEED	24.14	1.79*
Size	0	0.835
CBD	64.05	8.52***
2003	-6.92	18.59***
2004	20.97	17.87***
2005	51.73	17.52***
2006	75.82	17.10***
2007	103.04	17.98***
Boston	161.26	18.17***
LA	95.17	13.31***
NYC	259.14	21.70***
Wash DC	160.39	11.22***
San Fran	121.51	19.19***

Notes:  $R^2 = .478$ ; Adj.  $R^2 = .468$ ; Std. Error = 105.42; Number of Observations = 927.

\* Significant at the 85% level.

\*\*\* Significant at the 95% level or above.

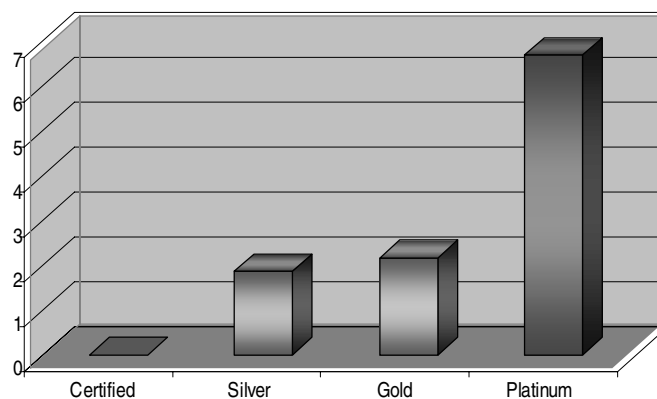
The mean price per square foot is \$242.75; therefore, the average LEED impact on sales price per square foot is a positive 9.94% or roughly 10%. The Energy Star impact on selling price is 5.76% on the positive side. Interestingly and very surprisingly, the correlation between LEED and Energy Star in this database is  $-0.064$ , so these effects likely do not contain any multicollinearity. When the variables were tested independently, the coefficients barely moved. Thus, it appears in this data set and based on 2003–2007 data that the benefits from LEED certification and Energy Star investment are cumulative, despite the fact that there should be a correlation between the two variables.

### What Does it Cost to Go Green?

A large sample of cost data on achieving Energy Star ratings is not available nor is there neutrally supplied data on LEED certification, say from contractor samples, but data as supplied by the

USGBC (Exhibits 8 and 9) and anecdotal surveys are available. According to surveys of those meeting the minimum LEED certification, the average costs are reported to be about 3% extra versus the zero figure provided by the USGBC.<sup>6</sup> With silver at 2.5% extra, plus the 3% as reported by developer surveys, it is still only at 5.5%. The reason for a developer premium is that there are still certification costs to go green. This includes fees to the USGBC and third parties, who certify the building at various levels, as well as the time necessary to await certification. Many local building codes are not flexible nor in tune with LEED standards so this education process adds to the costs. In some cities like Portland, Oregon, the adoption of integrated building codes has taken place. In Portland this is called PDX LEED, which puts the city on

**Exhibit 8**  
Extra Costs to Become LEED Certified as of 2007 Excluding Certification Fees  
Extra Costs in Percentage to Build Green



Source: USGBC

**Exhibit 9**  
Extra Costs to Go Green Vary by Region

Market	Platinum	Gold	Silver
USGBC Ave.	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%

board with sustainable objectives and makes the process easier.<sup>7</sup>

### Mandates and Incentives Affecting Costs to Go Green

Mandates and incentives provided by local governments, utilities, and other non-profits, trusts and foundations affect the cost to go green (Exhibit 8). If a city such as San Francisco requires gold certification as of 2012 on office projects larger than 50,000 square feet, the marginal costs of achieving LEED certification up through the gold level becomes zero since there will be no alternative (Exhibit 9). This is the case for many cities with regulations slated to become effective over the next several years.<sup>8</sup>

Over time, more cities will be adopting mandates to require LEED certification. Some cities will likely provide incentives; Cincinnati, for example, offers a property tax rebate on LEED-certified buildings for up to \$500,000 over 15 years for new buildings and 10 years for existing buildings.<sup>9</sup> Others will provide mandates whereby there is no choice but to become LEED-certified.

The increasing number of mandates creates concerns among developers and owners about dependency on third-party inspectors and reviewers from the USGBC. Never before in the history of the real estate industry have so many local governments been so dependent on a third party for certification of a building requirement, with the exception of third-party appraisers who may render opinions on value that government boards and review committees accept, reject, or revise. While USGBC seems up to the task of handling third-party certification, it has unprecedented authority to delegate to a third party.

According to a survey by the American Institute of Architects (AIA), the incentives that are most effective at stimulating green building include:<sup>10</sup> (1) tax incentives, credits or rebates; (2) density bonuses; and (3) faster building permits.

Only minor efforts are required to hit LEED certification at the minimum level once the developer

or owner become familiar with the process. In fact, using the system in place in 2007 and 2008, many points are achievable with very modest cost.

### Green Point Strategies

Talk to several developers successful at securing LEED certification and they will tell you that with a little planning it is neither that hard nor costly to hit the minimum point total for certification, which is 26 out of 69 possible points.<sup>11</sup> Many points are easy, such as designating minimal parking for low emission vehicles and facilitating bike racks. Others, such as teaching construction workers to toss waste into three different bins, are harder but feasible. Some points are relatively low cost or costless with a little planning and education, as can be seen below.

	Points Possible	Easy Points
Sustainable Sites	14	6-7
Water Efficiency	5	4-5
Energy and Atmosphere	17	0-1
Materials and Resources	13	6-8
Indoor Environmental Quality	15	5-7
Innovation and Design	5	1-2
Total	69	22-30

Sources: Trevor Jensen, USD Master of Science in Real Estate Student. Working Paper on LEED Strategies, 2008, Burnham-Moores Center for Real Estate.

The proposed 100-point system for 2009 is an improvement in that local differences are considered and innovation is treated as a bonus, with these two adding up to 10 more bonus points. Owners and developers will still be able to game the system in that some points are lower cost than others, but the minimum standards will continue to be raised and many local governments will impose LEED certification requirements on developers of new buildings.

### Leaders in Green Development, Ownership, and Occupancy

While it may look like Los Angeles is the leader among all cities in greening office property, the



**Exhibit 10**  
**Leading Metro Areas for Green as of Second Quarter 2007**

	Metro Area	# Bldgs	Square Feet	% of Total
1	Los Angeles	100	26,167,038	13.3%
2	Houston	46	21,101,378	10.8%
3	Washington DC	61	19,796,646	10.1%
4	New York City	11	12,328,784	6.3%
5	San Francisco	30	11,862,367	6.0%
6	Minneapolis/St Paul	20	11,381,738	5.8%
7	Denver	34	10,285,745	5.2%
8	Seattle/Puget Sound	16	7,616,710	3.9%
9	Chicago	13	6,326,489	3.2%
10	Dallas/Ft Worth	20	6,058,892	3.1%

**Exhibit 11**  
**Leading States for Green as of Second Quarter 2007**

	State	# Bldgs	Square Feet	% of Total
1	California	219	51,952,382	26.5%
2	Texas	91	27,942,442	14.2%
3	New York	13	12,580,084	6.4%
4	Minnesota	20	11,381,738	5.8%
5	Colorado	39	11,244,380	5.7%
6	Virginia	27	8,468,423	4.3%
7	Wash. DC	24	7,803,610	4.0%
8	Washington	17	7,649,214	3.9%
9	Florida	28	7,209,186	3.7%
10	Illinois	13	6,326,489	3.2%

**Exhibit 12**  
**Leading Owners for Green Office Buildings as of Second Quarter 2007**

	Owner	# Bldgs	Square Feet	% of Total
1	Hines	22	12,878,213	8.5%
2	TIAA-CREF	17	5,719,217	3.8%
3	Vornado/Charles E. Smith Comm. Realty	12	4,207,716	2.8%
4	Silverstein Properties Inc.	2	3,680,076	2.4%
5	Beacon Capital Partners Inc.	5	3,603,736	2.4%
6	The Blackstone Group	8	3,566,612	2.4%
7	Manulife Financial	7	3,509,420	2.3%
8	The Durst Organization	4	3,278,267	2.2%
9	GE Capital	15	3,093,947	2.0%
10	Maguire Properties	4	3,046,648	2.0%

proportion of green buildings is still less than 1% of the existing stock. Cities like Seattle and Portland are coming on strong as green leaders and even Chicago hosts over 100 buildings with green roofs as of 2008 (Exhibits 10 and 11). San Francisco is requiring all new office buildings that are 50,000 sq. ft. and larger to be Gold LEED-certified starting in 2012 and many other cities are likely to follow suit.

**Will Tenants Pay More?**

The Government Services Administration (GSA) has no choice but to embrace Energy Star and LEED-certified buildings and has required as much. By 2010, all GSA-procured space will be Energy Star-rated. Many other public and private companies have proclaimed intentions to go green but have found it difficult to do so. Among these are PNC, Cisco, Toyota, IBM, DHL, PepsiCo, and others. A green building is defined here as either Energy Star-rated or LEED-certified at any level. All of the tenants listed in Exhibit 12 have had sustainable business mission statements since mid-2005, yet not all have been able to secure green space or have been willing to pay for it. One vicious cycle is that developers (Exhibit 13) claim they cannot get rent premiums and tenants (Exhibit 14) don't demand green space while tenants claim it does not exist or they would demand it.<sup>12</sup>

When asked at a NAIOP 2008 Green Conference in Phoenix if they would pay more for a green

**Exhibit 13**  
**Leading Developers of Green Office Buildings as of Second Quarter 2007**

	Developer	# Bldgs	Square Feet	% of Total
1	Hines	39	26,374,642	17.7%
2	Vornado/Charles E. Smith Commercial Realty	14	4,750,018	3.2%
3	The Durst Organization	3	2,703,267	1.8%
4	Shorenstein Company LLC	3	2,444,010	1.6%
5	Opus Northwest Corporation LLC	4	2,346,632	1.6%
6	John Hancock Real Estate Finance Group	2	2,171,881	1.5%
7	The Durst Organization/Bank of America	1	2,118,441	1.4%
8	Trammell Crow Company	7	2,092,713	1.4%
9	Texas Eastern Corporation	2	2,086,307	1.4%
10	Maguire Properties	3	2,019,629	1.4%

**Exhibit 14**  
**Leading Types of Tenants by Industry in Energy Star Office Buildings as of Second Quarter 2007**

	Tenant Type	# Tenants	Square Feet	% of Total
1	Financial Institutions	968	20,228,058	18.0%
2	Law Firms	822	18,407,157	16.4%
3	Retailers/Wholesalers	694	12,275,254	10.9%
4	Manufacturing	240	9,704,599	8.6%
5	Personal Services	588	7,969,667	7.1%
6	Insurance	305	7,012,850	6.2%
7	Agri/Mining/Utilities	205	6,271,296	5.6%
8	Business Services	560	5,478,659	4.9%
9	Computers/Data Processing	245	5,218,630	4.6%
10	Government	127	5,161,872	4.6%
11	Accountants	196	4,003,835	3.6%
12	Engineers/Architects	148	3,876,718	3.4%
13	Real Estate	367	2,215,196	2.0%
14	Communications	98	1,603,219	1.4%
15	Medical	178	1,516,067	1.3%
16	Transportation	70	1,465,971	1.3%
	Grand Total	5,811	112,409,048	100.0%

building, the tenants uniformly said “No.” But, when asked if they would pay the same for a non-green building, all said they would pay less. While

this is obviously anecdotal, it does indicate how the framing of questions affects research conclusions (Exhibit 15).

**Exhibit 15**  
**Tenants with Sustainable Business Goals and the Percentage of Green Building Deals from**  
**March 2006 through March 2008**

Tenant	Green Leases	Green SF	Non-green Leases	Non-green SQ	% Green SF
CB Richard Ellis	13	123,188	42	421,528	23%
Wells Fargo & Co.	9	69,378	66	844,821	8%
BHP Billiton	7	454,381	0	0	100%
Wachovia Corp.	6	99,895	65	770,198	11%
U.S. General Ser. Adm.	6	345,469	50	2,691,310	11%
The Travelers Companies, Inc.	6	285,695	7	43,103	87%
Goodrich Petroleum Corp.	5	8,031	0	0	100%
Citigroup, Inc.	5	89,249	93	948,606	9%
Citizens Financial Group, Inc.	5	112,746	17	119,248	49%
StatOil	4	124,798	0	0	100%
Calif. Transplant Donor Network	4	21,512	0	0	100%
County of Los Angeles	4	78,978	6	106,888	42%
State of California	4	86,463	22	315,110	22%
Univ. of S. California	4	39,757	0	0	100%
Principal Life Ins. Co.	4	25,504	4	56,713	31%
TGS-NOPEC Geophysical Co., LP	4	35,211	0	0	100%
The Staubach Co.	4	39,903	7	149,119	21%
Pay By Touch	4	92,936	1	23,984	79%
Liberty Mutual Group, Inc.	4	57,705	31	333,488	15%
Career Education Corp.	4	126,608	4	87,130	59%
Jones Lang LaSalle Americas, Inc.	4	24,259	14	142,769	15%

Source: CoStar.

## Conclusion

Green does pay off. Tenant demand for green space is fairly new and not without its limits, but positive rent differentials do exist. Less skeptical tenants willing to believe claims of potential benefits are beginning to surface. Public and private companies are starting to initiate and support resource and energy conservation policies, and if they are serious, they should be willing to seek out more environmentally friendly buildings. In most local markets, green buildings remain a very small proportion of total space, so finding green buildings can be a challenge. Even without higher rents, in recalcitrant markets there are higher occupancy rates and faster absorption, all of which translates into higher values that almost certainly exceed the marginal costs to go green. The findings indicate that those buildings that do not reflect more efficient operating abilities as required by green buildings will become obsolete much faster.

For those who have developed some experience in LEED certification and/or Energy Star ratings and planned with experts early in the process of new construction or existing building conversion, the costs to go green can be quite modest. As of 2008, there is still significant opportunity in terms of existing building conversions and those investors with portfolio strategies can take advantage of several economies of scale.

Contrary to popular opinion, the green movement is not purely public sector-driven, although a large number of cities are now mandating LEED certification for certain sized buildings, usually 50,000 square feet and up by the year 2012.<sup>13</sup> Tenants like the EPA and others within the federal government are important drivers but so is the typical public corporation today. The more typical tenants asking for Energy Star ratings, LEED certification or high-performance building features are private

market-based firms. They may not admit to a willingness to pay more for green but they will pay less for non-green.

Private developers are leading the way in accommodating this burgeoning demand. Some investors like CALPERS have recently announced efforts to increase their emphasis on green over the next several years. Several cities, like Boston, Los Angeles or San Francisco, have mandated LEED certification, while others, like Toronto, have provided incentives (i.e., rebates) for energy conservation methods. A great local incentive that costs cities very little but saves developers significant money is the promise of faster entitlement and permit reviews and/or reduced permit fees or bonus densities.<sup>14</sup>

More research is needed. Among the research most needed are new measures and tests of productivity changes as a function of the building type and amenities. New measures are also needed for building efficiency in terms of reconfiguration as internal space needs change. None of the current measures as used in Europe, the United States or Asia do a good job of capturing life cycle benefits or reconfiguring savings from more sustainable buildings.

The USGBC has become a new world leader and standard bearer. As such, it is hoped that LEED standards continue to evolve. The increasing reliance of cities on LEED certification systems and the USGBC will likely cause backlogs and it may take longer to become certified. The process of becoming certified will evolve and could become more difficult over time. Those who are risk averse should consider going through the process before the scoring system changes and becomes more difficult. It is not sufficient to be “certifiable.”

There remain real economic barriers to progress. When property managers are paid extra administrative fees on passed-through common area utility costs, they have fewer incentives to want to encourage energy savings. Also problematic are typical expense-pass-through net leases that do not balance out the increased rent necessary to support higher initial building and design costs with the gains that will supposedly accrue but cannot be guaranteed.

What is needed most is market transparency and better information along with measurement standards that can be agreed upon domestically, if not globally. LEED is a good start, but what is needed are more specific ratings on energy consumption, life cycle costing, and building productivity. As such rating systems evolve, the market’s ability to “price” green will improve.

## Appendix 1

### **Defining Green, Sustainable, Intelligent, and Secure Buildings**

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**BREEAM:** Started in the United Kingdom. BREEAM Buildings can be used to assess the environmental performance of any type of building (new and existing). Standard versions exist for common building types and less common building types can be assessed against tailored criteria under the Bespoke BREEAM version. Buildings outside the U.K. can also be assessed using BREEAM International. For example, there are BREEAM assessment methods for schools, industrial buildings, retail buildings, homes, offices, prisons, and much more. See <http://www.breeam.org/index.jsp>.

**CABA:** Continental Automated Buildings Association, based in Ottawa, Canada. CABA is a not-for-profit industry association that promotes advanced technologies for the automation of homes and buildings in North America. CABA encourages the development, promotion, pursuit, and understanding of integrated systems and automation in homes and buildings.

**CASBEE:** To be nationally authorized in Japan, a cooperative academic, industrial, and governmental project has been to establish a new system called the Comprehensive Assessment System for Building Environmental Efficiency (CASBEE). See <http://www.ibec.or.jp/CASBEE/english/index.htm>.

**Green:** A term applied to practically everything in which energy savings and resources are conserved or re-used. More specifically, it is related to the LEED rating provided by the U.S. Green Building Council (USGBC) or the “Energy Star” rating provided by the U.S. Environmental Protection Agency (EPA). Many other measurements of green

exist around the world, but none measure building productivity as of 2008.

**Green Globes:** The Green Globes system is a building environmental design and management tool. It delivers an online assessment protocol, rating system and guidance for green building design, operation and management. The genesis of the system was the Building Research Establishment's Environmental Assessment Method (BREEAM). The Green Globes system is used in Canada and the U.S. In the USA, Green Globes is owned and operated by the Green Building Initiative (GBI). In Canada, the version for existing buildings is owned and operated by BOMA Canada under the brand name 'Go Green' (Visez vert). The Green Globes system has also been used by the Continental Association for Building Automation (CABA) to power a building intelligence tool, called Building Intelligence Quotient (BiQ). In 2004, Green Globes for Existing Buildings was adopted by the Building Owners and Manufacturers Association of Canada (BOMA), where it operates under the name Go Green Plus. In addition, the Green Building Initiative (GBI) acquired the rights to distribute Green Globes in the U.S. In 2005, GBI became the first green building organization to be accredited as a standards developer by the American National Standards Institute (ANSI), and began the process of establishing Green Globes as an official ANSI standard. The GBI ANSI technical committee was formed in early 2006. See <http://www.greenglobes.com>.

**Green Star:** Started by the Green Building Council of Australia (GBCA) in 2002, it is a national, not-for-profit organization that is committed to developing a sustainable property industry for Australia by encouraging the adoption of green building practices. It is uniquely supported by both industry and governments across the country. Its key objectives are to drive the transition of the Australian property industry towards sustainability by promoting green building programs, technologies, design practices, and operations, as well as the integration of green building initiatives into mainstream design, construction, and operation of buildings. See <http://www.gbca.org.au/>

**Energy Star:** In 1992, the U.S. Environmental Protection Agency (EPA) introduced Energy Star

as a voluntary labeling program designed to identify and promote energy-efficient products to reduce greenhouse gas emissions. A few years ago, the EPA extended the label to cover new homes and commercial and industrial buildings. Those rated as among the most 25% energy efficient are given the Energy Star rating. Over time, this rating should become more difficult to achieve since it is a relative score as opposed to an absolute score like the LEED ratings.

**LEED:** LEED is a product of the U.S. Green Building Council. It stands for Leadership in Energy and Environmental Design and applies to the design, building materials used, and operation of the building. Points are awarded for sustainability, water efficiency, energy and atmosphere, materials and resources, indoor environmental quality, and design innovation. It is intended as a hurdle that only 25% of existing buildings will pass at the certified level with little additional cost. Higher point scores can result in Silver, Gold, and Platinum ratings. Over time, LEED point systems will be revised. Categories that can achieve ratings include new construction, existing buildings, commercial interiors, core and shell, homes or even neighborhood developments.

**Sustainable:** A system that on a "net" basis does not deplete resources. With respect to sustainable development, the focus includes all those elements common to green buildings, as well as sites that are sustainable with indigenous landscaping, capturing "gray" water that has been used and rainwater, and designed to minimize transport costs. Mixed-use developments where people can work, live, go to school, and play are a natural extension of sustainable development. Two good examples are Stapleton, Colorado (see <http://www.stapletondenver.com/>) and Birkdale Village, in north Charlotte, North Carolina (see <http://www.birkdalevillage.net/welcome.htm>).

**Intelligent:** The term for an adaptable building that is likely green and also easy to retrofit or remodel for changing internal configurations and uses (also known as a High Performance Building). Such buildings have longer economic lives and cost much less to occupy. Typical elements of an intelligent building are modular floor units, removable walls, under floor venting and wiring for phones

and data, motion sensor cameras and much more all on whips that are easy to re-configure. Back-up systems may include several sources of power and generators with battery back-ups and safe air/water storage systems. An example of an intelligent building would be ABN AMRO in Chicago See <http://www.hines.com/property/detail.aspx?id=156> or <http://www.buildings.com/articles/detail.aspx?contentID=2128>. See also <http://www.intelligentbuildingstoday.com/> and <http://www.caba.org/index.html>.

**Secure Buildings:** After September 11, 2001, a number of new security measures came to be in many buildings. Some of these features include access control for visitors and maintenance staff. Other features include surveillance, back-up power, air, water, and emergency plans. Secure buildings have several redundant systems. Secure buildings may be intelligent, but are not always green.

**USGBC:** The U.S. Green Building Council (USGBC) is a non-profit composed of leaders from every sector of the building industry working to promote buildings that are environmentally responsible, profitable, and healthy places to live and work. More than 11,000 member organizations and 75 regional chapters are united to advance the mission of transforming the building industry to sustainability. See <http://www.usgbc.org>.

## Appendix 2

### Exhibit A-1: The Financial Benefits of Going Green Are Mostly Related to Productivity

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

Category	20-year Net Present Value
Energy Savings	\$5.80
Emissions Savings	\$1.20
Water Savings	\$0.50
Operations and Maintenance Savings	\$8.50
Productivity and Health Value	\$36.90 to \$55.30
<b>Subtotal</b>	<b>\$52.90 to \$71.30</b>
Average Extra Cost of Building Green	(-3.00 to -\$5.00)
<b>Total 20-year Net Benefit</b>	<b>\$50 to \$65</b>

Source: Capital E Analysis

## Endnotes

1. See *The Costs and Benefits of High Performance Buildings: Lessons Learned*, published by Earth Day New York, 2007 which includes a compilation of excellent articles on performance measures. See also "User Effective Buildings" by Aardex Corporation, 2004.
2. Costs to upgrade existing buildings to various LEED certification levels allow for great economies of scale when a large number of similar buildings are being retrofitted. This is the low hanging fruit that astute investors have already been exploiting with extremely high payoffs.
3. Faster absorption is almost always mentioned by developers who have invested in LEED or Energy Star buildings even if they do not observe higher rents. We have no data to support the absorption claim at this time but have no reason to question its validity.
4. See "Top Executives Are Embracing Corporate Responsibility" by Anne Moore Odell from SocialFunds.com as reported in GreenBiz.com. See [http://www.greenbiz.com/news/reviews\\_third.cfm?NewsID=35955](http://www.greenbiz.com/news/reviews_third.cfm?NewsID=35955) Summer, 2007.
5. While anecdotal in nature, when several tenants including Cisco, PNC, IBM, Toyota, and PepsiCo where asked if they would pay more rent for a green building uniformly said "No," but added that they would pay less for a building that was not green, so part of the problem is one of framing and perspective.
6. These are surveys by the authors with a modest sample of only 26 respondents, so we do not suggest these are definitive.
7. See [www.portlandonline.com/osd/index.cfm?c=4167&a=114662](http://www.portlandonline.com/osd/index.cfm?c=4167&a=114662).
8. See [www.dsire.org](http://www.dsire.org) which lists incentives and many regulations by geographic area or state legislature sites like <http://www.leginfo.ca.gov/index.html> or AIA at [http://www.aia.org/susn\\_rc\\_default](http://www.aia.org/susn_rc_default)
9. See Jerry Yudelson, "Green Building Incentives That Work: A Closer Look at How Local Governments Are Incentivizing Green Development," for NAIOP Research Foundation, November 2007.
10. Survey by AIA and the Developers Roundtable at the end of 2007. Source: [www.Metrogreenbusiness.com/news](http://www.Metrogreenbusiness.com/news).
11. We note that the new system will likely be 100 points plus 10 points for regional factors and innovation.
12. Nico Rottke, Ph.D. European Business School, San Diego presentation, July 1, 2008.
13. For example, Los Angeles will require LEED certification by 2012 while San Francisco will require Gold LEED certification for office buildings of 50,000 square feet or more.
14. Costa Mesa, California and others have adopted such incentives. See DSIRE, the Database of State Incentives for Renewables and Efficiency at <http://www.dsireusa.org/library/includes/incentiveupdated.cfm?&CurrentPageID=3&EE=1&RE=1>.

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