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**An Analysis of the Green Building Industry:**  
Growth, Developer Segmentation, and Determining Asset Value

**Prepared for:**

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## Table of Contents

List of Figures .....	3
List of Tables .....	4
Executive Summary .....	5
I. Introduction .....	7
II. A Examination of the Green Building Market Growth and the Driving Factors. ....	9
Upward Trajectory of Green Construction.....	9
Driving Factors Behind Green Construction.....	12
III. Analysis of the Green Building Market, the Developers Involved and the Major Sectors Involved in Green Development. ....	14
Developer Segmentation Involved in Green Building and Green Building Owners .....	14
Industries with High Levels of Green Investment.....	16
Regional Development Analysis .....	19
Sectors Least Involved in Green Development.....	21
Reasons Developers Are Not Involved in Green Development .....	22
What Distinguishes LEED Projects from Peers .....	23
IV. Green Building Development Processes and how it Adds Value. ....	24
Value Engineering .....	24
Integrated Design Process Value Proposition.....	25
V. Determining the Asset Value Based on Long-Term Benefits, Life-Cycle Costing, and Ensuring Maximum Valuation. ....	27
Green Building Asset Value and Long Term Benefits .....	28
Life-Cycle Cost Analysis.....	31
Appraisals and Maximum Valuation .....	34
Government-Based Energy Efficient Financing Offering .....	35
Interpreting Value Captured by Development Participants.....	36
Inefficiencies of Green Buildings that Lead to Decreased Value.....	37
VI. Conclusion .....	38
Primary Target Audience.....	38
Trends in Product Offering .....	39
Future Steps.....	40
VII. References .....	41

# List of Figures

*Figure 1 Green Building Growth in Nonresidential Market..... 11*  
*Figure 2: LEED Building Owner Types ..... 16*  
*Figure 3: Percentages of Green School Projects within the Last 3 Years..... 18*  
*Figure 4 Early Intervention Adds Value..... 26*  
*Figure 5: Perception Gap on Cost Effectiveness of Green Design..... 28*  
*Figure 6: Average Rental Price - Class A Office Per Square Foot..... 28*  
*Figure 7: Average Sales Price - Class A Office Per Square Foot 2010 ..... 29*

# List of Tables

*Table 1 Nonresidential Green Construction Growth Over Time*..... 10  
*Table 2 Bradshaw Survey Findings*..... 15  
*Table 3 Top 10 States for LEED*..... 20  
*Table 4 States with Least Green Office Building* ..... 20  
*Table 5 Sectors with lowest planned green building activity* ..... 21  
*Table 6 Premiums of Green Commercial Buildings* ..... 29  
*Table 7 Window Options LCCA* ..... 32  
*Table 8 Capital Needs Assessment* ..... 33

## Executive Summary

The value of green building grew approximately 680% between 2005 and 2011 - valued at \$10 billion and \$78 billion respectively. While Costar expects the 2016 green construction to be worth between \$115-132 billion, McGraw-Hill is estimating that green construction will be worth \$248 billion by 2016.

The driving factors behind green building include economic, environmental, and social factors, as well as state and federal public policies.

The USGBC lists education, health care, and office buildings as having the largest percentage of green building stock. Additionally, the United States government and the retail and hospitality sectors are increasing their number of green buildings.

The United States has 2.5 times more firms producing at a high level of green development in 2012 as compared to 2009. McGraw-Hill conducted a global survey, which estimated that 74% of contractors, 71% of engineers, 69% of consultants, 57% of architects, and 56% of building owners had planned green developments in the next year.

USGBC rates the top ten states for LEED development (based on a per capita basis): Illinois, Maryland, Virginia, Massachusetts, New York, California (tie), Oregon, North Carolina, Colorado, Hawaii, Minnesota; and the bottom ten states: Oklahoma, West Virginia, Mississippi, Alabama, Indiana, Louisiana, South Dakota, North Dakota, Kentucky, and Nebraska. These geographically-oriented green developments are influenced by three main factors: 1) energy price per kilowatt-hour, 2) influential lobbyists, and 3) state and federal policies and incentives.

Executives are less likely to develop a LEED-certified building due to high costs and the amount of time required to complete the certification process. Fifty-three percent of executives would rather develop green buildings based on company standards or choose an alternative green certification process, such as Energy Star or Green Globes.

The Value Engineering Process is used: 1) to optimize cost without decreasing quality or hindering the performance of a building, and 2) to maximize the value to the owner through evaluating costs, function, and aesthetics of building components. The Value Engineering Process yields the greatest benefit if implemented when the design phase is 35% completed.

The Integrated Design Process (IDP) is a project delivery approach that is highly collaborative. It integrates people and systems to optimize project results, increase value, and maximize efficiency throughout the development process. Construction costs can be reduced by 30% when resilience and life cycle are discussed at the beginning of the development process.

Green buildings have a *perceived* 17% increase in construction costs; however, the *actual* mean cost increase is only 2%. Clients need to have these misconceptions demystified by well-informed consultants, developers, architects and project managers. The initial higher construction costs are offset by the benefits green buildings produce through premium rental, sales, and occupancy premiums compared to non-green buildings.

Life-cycle cost analysis (LCCA) is an economic analysis of a building, or of industrial components, used to assess the total cost of ownership. For example, insulated windows can have a higher initial cost; yet, the energy savings over the life of the product produces a larger net present value. Net present values calculate the time-value of money and measure real wealth.

Owners of green buildings need to ensure that value created is captured in the appraisal. The income-producing method is the most effective means to creating a higher appraisal value.

#### Recommendations for Atelier Ten:

- Continue to pursue clients who are currently involved in sustainable design and development: green building for the federal government, educational institutions, and the healthcare industry. Green building will continue on its rapid rise in all of these sectors. Developers in these fields are already interested and experienced in green building, and they can readily attest to the statistics of added value from peer projects.
- Customize green certification options to meet individual client goals – even the option of no formal certification. Some clients will wish to pursue LEED-certification, while other clients will want no part of the LEED process. In these cases, Atelier Ten can recommend alternative green certification processes, or the firm can work with the client to devise a customized green standardization process all its own.
- Now that green is mainstream, companies will be looking for better design and operations of buildings to distinguish their company in the market. Many owners and developers are raising the green bar by developing net-zero buildings. Atelier Ten needs to be prepared to consult on these techniques as well. As part of net-zero buildings, solar panels are a major requirement and financial incentives from them and other energy efficient components will grow, making capital more readily available.
- Green Building Performance Disclosure is another trend gaining more exposure and importance. In 2013, more than 30 cities including Boston, Seattle, and Washington DC, enacted laws that require commercial building owners to report building performance, including annual energy and water usage. The reporting system is to encourage owners to increase energy efficiency and reduce carbon emissions.
- Atelier Ten, in order to gain and maintain competitive advantage, should research how to incorporate cloud-based automation systems into its consulting services.

## I. Introduction

This research paper is prepared for John Dalton of Atelier Ten, a firm comprised of environmental design consultants and building services engineers, who is seeking information to identify developers involved in the green building industry, how to tailor their services directly to those developers, and how to maximize the value of green buildings.

The real estate industry is evolving rapidly, conforming to customer and market demands for more efficient building practices. These customer demands are driven by environmental impacts, cost of energy sources, the impact on occupants' health, and performance from the built environment. Activist groups and government bodies are encouraging innovative real estate development and construction processes that produce more efficient and higher quality buildings.

The rise of green development became a prominent topic when the United States Green Building Council (USGBC), a private membership-based non-profit organization, established Leadership in Energy and Environmental Design (LEED), a rating system for the design, construction, operation, and maintenance of green buildings. LEED, established in 2000, is a third-party rating system that certifies green buildings based on the following five categories: sustainable sites, water efficiency, energy and atmosphere, materials and resources, and indoor air quality. Today, several other environmentally-friendly and energy-efficient frameworks exist to create high-performance buildings.

Section II analyzes the green building market demand and industry growth. McGraw-Hill Construction (MHC), a construction industry analyst group, reports tremendous growth in nonresidential green development. MHC defines green building as “a construction project that is either certified under any recognized global green rating system or built to qualify for

certification”.<sup>1</sup> In 2005 green development accounted for 2% of the industry, while in 2012 green development increased to 44% of the industry. More current figures show green share of the market is 48% with the non-green market share at 52%. The increase in green development is attributed to client and market demands.<sup>2</sup> Factors including reduced operating costs, branding and imaging, and notions of “the right thing to do” are drives that increased the number of green buildings.<sup>3</sup>

Section III is an analysis of the green building market, focusing on types of developers and project owners involved in green building. This section also includes a breakdown of the various industries using green building techniques and the geographical regions where green building developments are the most prominent. Additionally, this section discusses the reasons developers choose not to implement green building practices in their projects and what distinguishes LEED projects from other green projects developed by peers.

Section IV evaluates how value engineering is applied to green buildings to optimize costs without decreasing quality or hindering the performance of a building, and to maximize the value to the owner. Additionally, this section assesses the most effective delivery process for sustainable buildings and methods used to add value by saving money through early intervention in the development process. The traditional development process has been design-bid-build; however, evidence indicates a shift towards processes to accommodate innovation. In 2010, the American Institute of Architects reported Integrated Project Delivery (IPD) methods are an “emerging process”<sup>4</sup>, which requires more detailed communication and collaboration between the owner/developer, the architect and the general contractor, and which fosters the ability to do

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<sup>1</sup> Harvey M. Bernstein, Enver Fitch, and Bonna Laquidara-Carr, eds., *World Green Building Trends: Business Benefits Driving New and Retrofit Market Opportunities in Over 60 Countries*, report (Bedford: McGraw-Hill Construction, 2013), pg. 64, accessed April/May 2014, [http://www.worldgbc.org/files/8613/6295/6420/World\\_Green\\_Building\\_Trends\\_SmartMarket\\_Report\\_2013.pdf](http://www.worldgbc.org/files/8613/6295/6420/World_Green_Building_Trends_SmartMarket_Report_2013.pdf).

<sup>2</sup> Bernstein, Fitch, and Laquidara-Carr, *World Green Building Trends*, 17.

<sup>3</sup> Ibid.

<sup>4</sup> William B. Bradshaw and Lynn M. Fisher, *Green Building and the Organization of Development*, working paper (2010), pg. 6.



more innovative work. Studies indicate IPD decreases construction and operational costs through extensive planning from the beginning stages of development.<sup>5</sup>

Section V discusses how to determine the asset value of green buildings by identifying the long-term benefits. This section examines how implementing life-cycle cost analysis is used to assess the total cost of ownership. In conjunction with understating the total cost of ownership, an owner needs to ensure that a green building receives an appraised value that encompasses all of the green features. Green buildings have different standards for appraisal, which need to account for the higher rental, sales, and occupancy rates that lead to larger loan amounts compared to non-green buildings. To encourage developers to incorporate energy efficient building techniques, the United States government offers financing options for green retrofits, a policy exemplifying the government's support for energy-efficient buildings. Lastly, this section looks at the inefficiencies of green buildings and how their value can be decreased.

Finally, Section VI of the paper concludes with a defined segment of developers as a potential customer base and a description of the customized product offerings.

## **II. A Examination of the Green Building Market Growth and the Driving Factors.**

### **Upward Trajectory of Green Construction**

In 2000, the United States Green Building Council (USGBC) created a specific green building rating system, Leadership in Energy and Environmental Design (LEED), to set guidelines for sustainable buildings. As of January 1, 2014, more than 2.8 billion square feet of building

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<sup>5</sup> *Integrated Project Delivery: A Guide*, report (American Institute of Architects, 2007), pg. 2, accessed April/May 2014, <http://www.aia.org/aiaucmp/groups/aia/documents/document/aiab085539.pdf>.

space has been LEED-certified.<sup>6</sup> In 2000, twelve LEED-certified projects existed; however, that number has grown on a global scale to 4,605 as of 2012.<sup>7</sup>

The increased participation in green buildings happened in the latter part of the decade. McGraw-Hill Construction (MHC) has analyzed its construction project data for the green share of the nonresidential market, and reports the U.S. green building market has grown from 2% in 2005 to 44% in 2012.<sup>8</sup> The U.S. firms represented in the study report 48% of their projects are green and that percentage is expected to increase in the future.<sup>9</sup> The USGBC breaks down the growth in the nonresidential green buildings market over time as indicated in Table 1:<sup>10</sup>

**Table 1 Nonresidential Green Construction Growth Over Time**

2% of construction in 2005
15% of construction in 2008
28-35% of construction in 2010
41% of construction in 2012 <sup>11</sup>

McGraw-Hill Construction explains that the lower percentages between 2005-2008 are attributed to businesses “doing the right thing”; however, the increased green construction from 2008 to 2010 is directly correlated with business opportunities related to financial benefits, and social and environmental reasons.<sup>12</sup> As of 2013, the green share of the market is 48%, while the non-green market share is 52%.<sup>13</sup>

CoStar Group released research verifying the green building market growth and the upward trajectory. In 2013, CoStar Group updated a study on trends in green real estate and found that the nonresidential green build environment increased in market share over the last

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<sup>6</sup> Ashley Katz, "Green Building Facts," U.S. Green Building Council, January 1, 2014, Market Impact, accessed April/May 2014, <http://www.usgbc.org/articles/green-building-facts>.

<sup>7</sup> Nadine M. Post, "LEED Green Building Rating System Shows Strong Growth," Green Source, December 5, 2013, accessed April/May 2014, <http://greensource.construction.com/news/2013/12/131205-leed-green-building-rating-system-shows-strong-growth.asp>.

<sup>8</sup> Bernstein, Fitch, and Laquidara-Carr, *World Green Building Trends*, 40.

<sup>9</sup> Ibid.

<sup>10</sup> Katz, "Green Building Facts".

<sup>11</sup> Ibid.

<sup>12</sup> Bernstein, Fitch, and Laquidara-Carr, *World Green Building Trends*, 8.

<sup>13</sup> Ibid., 40.

few years, and it is steadily rising.<sup>14</sup> Figure 1 illustrates the expected growth of the green market share, as compared to the total non-residential construction market over time.

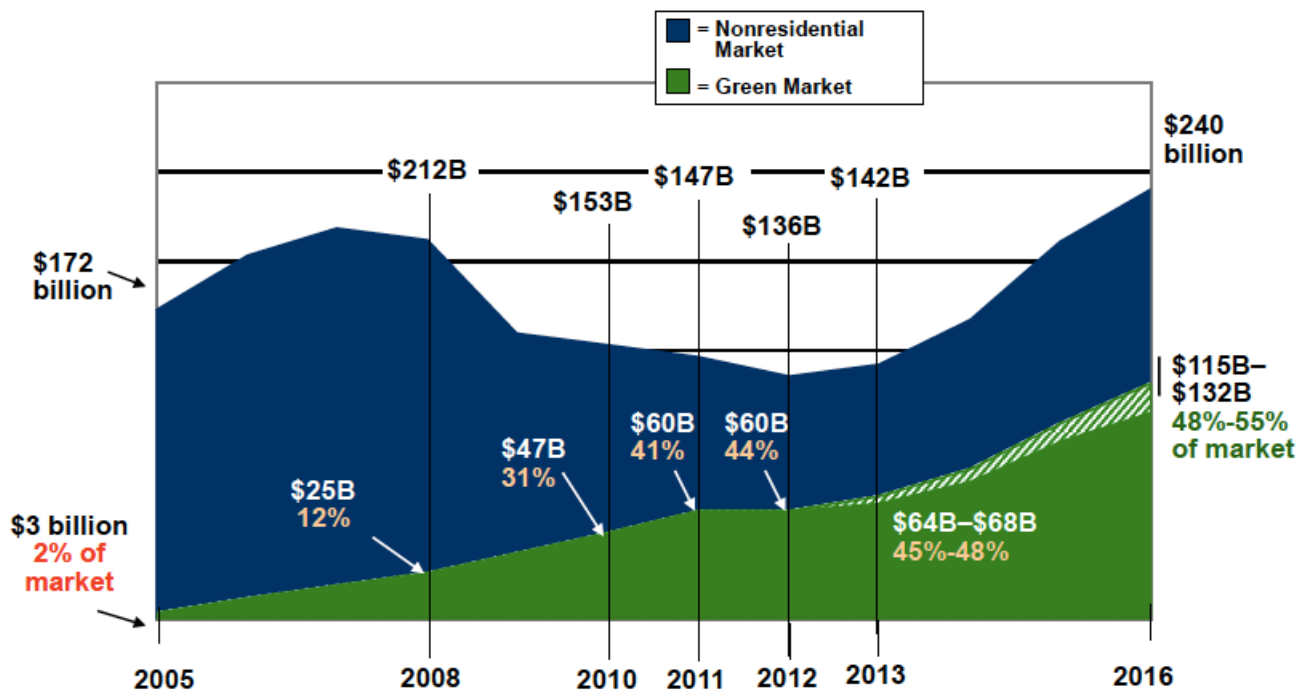


Figure 1 Green Building Growth in Nonresidential Market<sup>15</sup>

The value of green building grew approximately 680% between 2005 and 2011 with values reported at \$10 billion and \$78 billion respectively.<sup>16</sup> While Costar expects 2016 green construction to be worth between \$115-132 billion, McGraw-Hill is estimating that green construction will be worth \$248 billion by 2016.<sup>17</sup> The next section examines the benefits of green construction and the driving factors that contribute to the increase in square footage and value of the green buildings.

<sup>14</sup> Anthony Guma and Greg Kats, "CoStar Presents: Current Trends In Green Real Estate, Summer 2013 Update" (Webinar, New York City, New York), accessed April/May 2014, <http://www.costar.com/webimages/webinars/CoStar-Webinar-CurrentTrendsInGreen20130627.pdf>.

<sup>15</sup> Ibid.

<sup>16</sup> McGraw Hill Construction, "Green Building Outlook Strong for Both Non-Residential & Residential Sectors," news release, November 15, 2012, accessed April/May 2014, <http://construction.com/about-us/press/green-building-outlook-strong-for-both-non-residential-and-residential.asp>.

<sup>17</sup> Jacob Kriss, "Three Billion Square Feet of Green Building Space LEED-certified," U.S. Green Building Council, April 8, 2014, accessed April/May 2014, <http://www.usgbc.org/articles/three-billion-square-feet-green-building-space-leed%25C2%25AE-certified>.

## Driving Factors Behind Green Construction

The driving forces behind green construction include market demands and decreased operational costs, as well as social and environmental benefits. McGraw-Hill Construction (MHC) indicates that business decisions are important driving factors affecting the bottom line of green building investments. Green buildings increase the net operating income by decreasing operating costs, positively affect branding and public relations, and create energy efficiency resulting in energy cost savings. However, MHC names client demand as the strongest driving factor (41%).<sup>18</sup> As more owners and clients understand the benefits of green construction and demand green projects, the green construction market continues to grow. Internal corporate commitments are the second strongest driving factor (32%), market demand (30%) and lowering operating costs (30%) tied for third strongest driving factor.<sup>19</sup>

While business incentives are important drivers, the developers and owners are noticing that social factors are just as important. Building green protects tenants' health and well-being. MHC's survey reports 56% of respondents list health and well-being as a top reason to build green.<sup>20</sup> Managers are noticing tenants are more productive, have fewer sick days and lower healthcare costs.<sup>21</sup> Green buildings contribute to higher worker productivity rates, which have tripled since 2008.<sup>22</sup>

Finally, MHC's survey respondents agree that environmental reasons are more important now compared to 2008.<sup>23</sup> Ninety percent of respondents cite energy-use reduction is essential to reducing environmental impacts. Surveyors listed the three most important environmental

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<sup>18</sup> Bernstein, Fitch, and Laquidara-Carr, *World Green Building Trends*, 41.

<sup>19</sup> Ibid.

<sup>20</sup> Ibid.

<sup>21</sup> Ibid.

<sup>22</sup> Ibid., 17.

<sup>23</sup> Ibid., 18.

reasons to contract green buildings: reduction in energy consumption (72%), lower greenhouse gases emissions (27%), and protection of natural resources (27%).<sup>24</sup>

Public policy on the federal and state level is also a large driving factor for the increase in green development. President Barack Obama signed Executive Order No. 13514 in October 2009, requiring federal buildings to increase energy efficiency, reduce greenhouse gas emissions, eliminate waste, conserve water resources, plan for storm water management, and recycle.<sup>25</sup> Further the policy aims to have all federal buildings, entering the design phase in 2020 and beyond, be designed to attain zero-net-energy by 2030.<sup>26</sup> Any construction, major renovations or repairs, and alterations to federal buildings must align with high-performance and sustainable building codes.<sup>27</sup> The aforementioned federal policies solidify the government's commitment to energy-efficient buildings. These requirements are now making green building practices the basic building codes for government. Because government proceedings shape social policy, developers need to adopt green building techniques into everyday practice.

Similarly, states are incorporating sustainable building techniques into building codes. Florida adapted their building codes to include the International Energy Conservation Code (IECC).<sup>28</sup> In January 2011, California adopted CalGreen, a mandatory green building code that requires all new buildings to conserve water, use interior materials that do not emit pollutants, and recycle construction waste.<sup>29</sup> Philadelphia passed Greenworks, two laws requiring that new construction and significant renovation of large city government buildings meet LEED Silver

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<sup>24</sup> Ibid.

<sup>25</sup> Executive Order 13514 of October 5, 2009, Federal Leadership in Environmental, Energy, and Economic Performance. *Federal Register*, title 3 (2009): pg. 1. Accessed April/May 2014. <http://www.gpo.gov/fdsys/pkg/FR-2009-10-08/pdf/E9-24518.pdf>.

<sup>26</sup> Ibid., 3.

<sup>27</sup> Ibid.

<sup>28</sup> *2012 Green Building Market Barometer*, report (Turner Construction Company, 2012), pg. 8, accessed April/May 2014, <http://www.turnerconstruction.com/about-us/sustainability/green-market-barometer>.

<sup>29</sup> Ibid.

certification, and that all new construction in the city requires cool roofs.<sup>30</sup> As more states adopt green building techniques into building codes, these green techniques will become the standard.

### **III. Analysis of the Green Building Market, the Developers Involved and the Major Sectors Involved in Green Development.**

#### **Developer Segmentation Involved in Green Building and Green Building Owners**

The United States has 2.5 times more firms with a high level of green development in 2012 compared to 2009; with 33% of respondents expecting to be highly involved in green development by 2015.<sup>31</sup> McGraw-Hill Construction reports that of the architects, engineers, contractors, consultants, and owners surveyed globally, 94% claim to be engaged in some level of green building. Of the above firm types, owners and consultants are more dedicated to green buildings, with 41% of owners and 35% of consultants doing more than 60% of their business in green building in 2012.<sup>32</sup>

Nonresidential green development projects are planned across all firm types. MGH reports that contractors (74%), engineers (71%), and consultants (69%) have planned green developments in the next year, in addition to architects (57%) and owners (56%).<sup>33</sup> The lower percentages for architects and owners are attributed to the smaller size of building portfolios compared with professional firms.

William Bradshaw, co-founder and president of Green Coast Enterprises, conducted a survey to document the size and mix of development firms in the United States in the context of green development. For the survey, conducted in February 2010, he contacted 955 potential respondents. The list of respondents was compiled using the United States Green Building

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<sup>30</sup> "Green Buildings," Mayor's Office of Sustainability: City of Philadelphia, section goes here, accessed April/May 2014, <http://www.phila.gov/green/greenBuilding.html>.

<sup>31</sup> Bernstein, Fitch, and Laquidara-Carr, *World Green Building Trends*, 11.

<sup>32</sup> Ibid.

<sup>33</sup> Ibid., 12.

Council (USCGB) membership list, participants in the U.S. Department of Energy (DOE) database Builder’s Challenge program, and real estate development organizations known personally to Bradshaw.

Of the 102 unique responses received, the median respondent firm was small, privately-held, male-led firms, and located in the South, involved in single-family, office, multi-family and mixed-use developments. The majority (83%) of the participants revealed themselves to be privately-held small firms, with five or fewer people having control or decision-making abilities. Non-profits (10%) are the second largest group of respondents. The respondents unanimously believed the green sector of their businesses would grow to become a large percentage of operations in the coming years. However, respondents self-labeled the individual projects as green and no baseline as to what defines green was established.

The results of the survey indicated that not only were large corporations developing green businesses, but small companies were as well. The key findings are listed in Table 2:<sup>34</sup>

**Table 2 Bradshaw Survey Findings**

94% planned to have a green project in construction in the next two years
90% had a green project in progress
70% had just completed a green project
6% had no experience in green construction and had no plans to do so

Additionally, respondent firms expected the green construction market to grow and that their involvement in green projects would increase over the next five years. The median firm expected 75% of its business to be in green projects.<sup>35</sup>

The USGBC categorized LEED membership by sector, naming the top three participant professional firms as the largest group, followed by contractors and builders, and product

<sup>34</sup> Bradshaw and Fisher, *Green Building and the Organization of Development*, 6.

<sup>35</sup> *Ibid.*, 7.

manufactures.<sup>36</sup> Among LEED professional firms, the top three are architecture, construction management, and mechanical engineering firms.<sup>37</sup> California, New York and Texas are the top three states with the most LEED Professionals credentials held in the U.S.<sup>38</sup>

The Green Building Information Gateway, a USGBC product, published the top five LEED owner types, which are displayed in Figure 2. The research identified five groups of corporate companies who own the most LEED-certified buildings.

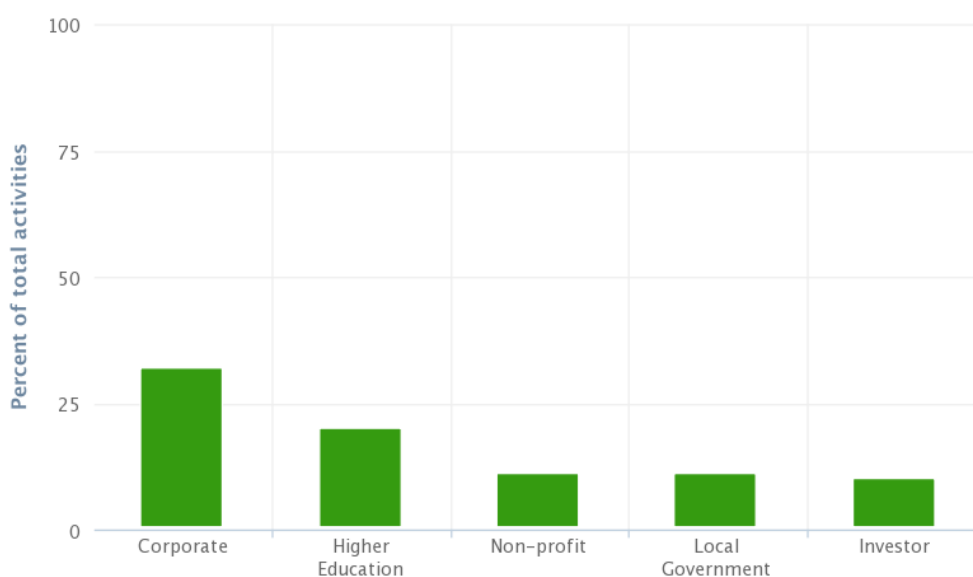


Figure 2: LEED Building Owner Types<sup>39</sup>

### Industries with High Levels of Green Investment

Sectors within the nonresidential green real estate industry are increasing investments in green more so than others. The USGBC lists education, health care, and offices as having the largest percentage of green building stock compared to other industries.<sup>40</sup> Office green

<sup>36</sup> *LEED In Motion: People and Progress*, report, June 1, 2013, Distribution of Member Companies by Professional Sector, accessed April/May 2014, [http://usgbc-centraltexas.org/wp-content/uploads/2013/09/LEEDReport\\_PeopleProgress.pdf](http://usgbc-centraltexas.org/wp-content/uploads/2013/09/LEEDReport_PeopleProgress.pdf).

<sup>37</sup> *Ibid.*, 8.

<sup>38</sup> *Ibid.*

<sup>39</sup> Chris Pyke and Adam Rohloff, "Report: Geographic & Temporal Patterns in Green Building Practice," The Green Building Information Gateway, April 1, 2012, Collection Breakdown, accessed April/May 2014, <http://www.gbig.org/collections/1838>.

<sup>40</sup> Katz, "Green Building Facts".



construction was valued at \$7-8 billion in 2010.<sup>41</sup> In 2012, green office space accounted for 54% of the office space market, which was the second largest sector after the education sector during the same time period.<sup>42</sup> Health care green construction was valued at \$8-9 billion in 2010 with a projected 40% growth in green construction.<sup>43</sup>

The education sector is highly involved in green buildings, valued at \$13-16 billion in 2010;<sup>44</sup> with 45% green construction starts in 2012.<sup>45</sup> The education sector includes K-12 and higher education institutions. McGraw-Hill Construction reports 66% of K-12 and 84% of higher education institution respondents attained third-party green certification on some type of project. Figure 3 depicts the percentages of new projects compared to retrofit projects in the education sector.<sup>46</sup>

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<sup>41</sup> McGraw Hill Construction, "Green Building Market Grows 50% in Two Years Despite Recession," news release, November 12, 2010, Green Building Market Grows 50% in Two Years Despite Recession, accessed April/May 2014, <https://construction.com/AboutUs/2010/1112pr.asp>.

<sup>42</sup> McGraw Hill Construction, "Green Building Outlook Strong for Both Non-Residential & Residential Sectors," news release, November 15, 2012, accessed April/May 2014, <http://construction.com/about-us/press/green-building-outlook-strong-for-both-non-residential-and-residential.asp>.

<sup>43</sup> "Green Building Market Grows 50% in Two Years Despite Recession".

<sup>44</sup> Ibid.

<sup>45</sup> "Green Building Outlook Strong for Both Non-Residential & Residential Sectors".

<sup>46</sup> Harvey M. Bernstein, Donna Laquidara-Carr, and Enver Fitch, eds., *New and Retrofit Green Schools: The Cost Benefits and Influence of a Green School on Its Occupants*, report (McGraw-Hill Construction, 2013), pg. 4, accessed April/May 2014, <http://w3.usa.siemens.com/buildingtechnologies/us/en/higher-education/Documents/smart-market-report-new-and-retrofit-green-schools-mcgraw-hill-2013.pdf>.

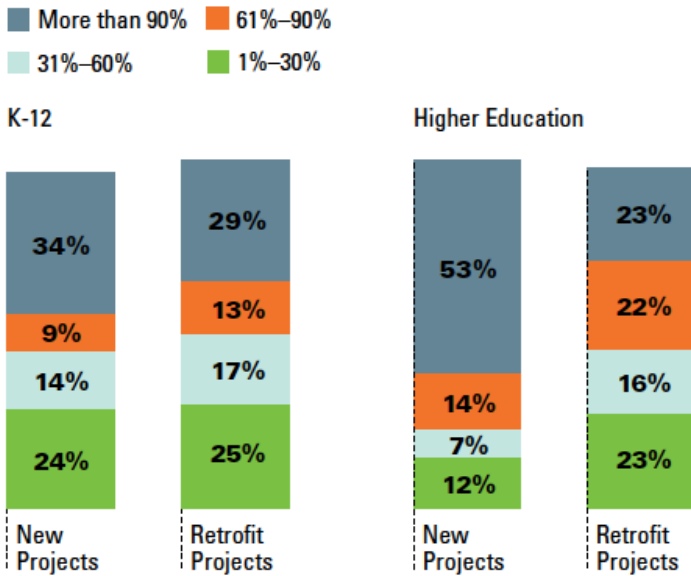


Figure 3: Percentages of Green School Projects within the Last 3 Years<sup>47</sup>

Additionally, the United States government’s building portfolio is increasing the number of green buildings. In 2012 the United States government owned 306,166 buildings and leased another 55,152.<sup>48</sup> The U.S. General Services Administration reports this portfolio contains 3.3 billion square feet, accounting for approximately \$24.6 billion in annual operating costs.<sup>49</sup> In 2011, the U.S. government’s total energy consumption was 1,116.6 trillion BTUs,<sup>50</sup> making the federal government one of the largest energy users in the United States. As of 2012, the government had 6% gross square feet (GSF) considered sustainable under the *Guiding Principles for Federal Leadership in High Performance and Sustainable Buildings* criteria established by the U.S. Government for use by federal agencies, with 17% GSF not sustainable, 74% GSF not yet evaluated, and 3% GSF not applicable.<sup>51</sup>

<sup>47</sup> Ibid.

<sup>48</sup> United States of America, U.S. General Services Administration, Real Property Management Policy, *FY 2012 Federal Real Property Chart*, February 11, 2014, Key Stats, accessed April/May 2014, <http://www.gsa.gov/portal/content/102880>.

<sup>49</sup> Ibid.

<sup>50</sup> United States of America, U.S. Energy Information Administration, Office of Survey Development and Statistical Integration, *Annual Energy Review*, September 27, 2012, accessed April/May 2014, <http://www.eia.gov/totalenergy/data/annual/showtext.cfm?t=ptb0113>.

<sup>51</sup> *FY 2012 Federal Real Property Chart*.

The U.S. Government does not have a single, unified federal policy on green building in place to monitor the goals outlined in Executive Order No. 13514; therefore, several agencies rely on third parties to aid them such as USGBC's LEED rating system.<sup>52</sup> Additionally, the greening of existing building inventory needs standards, leading federal agencies to use the LEED Existing Buildings and Commercial Interiors program.<sup>53</sup> While some agencies have concerns about a government-wide endorsement of LEED due to increased costs for the certification and registration processes, other agencies find it to be a useful tool and an opportunity to address some issues for future LEED requirements.<sup>54</sup>

Finally, the retail and hospitality sectors have notable green building plans for the next two years. McGraw-Hill Construction reports 38% of retail respondents chose green options in 2013 and are expected to increase to 52% by 2015.<sup>55</sup> Hotel owners are following the same trend with 48% of respondents choosing green options for projects in 2013, and such choices are projected to increase to 64% by 2015.<sup>56</sup> Both retail and hotel owners report their key reasons for increased green investments: an average 8% reduction in annual operation costs, an average 15% energy use reduction, asset value increases of 7% for retail and 11% for hotel owners, and an increase in return on investment with an average of 8% for retail and 14% for hotel owners.<sup>57</sup>

## Regional Development Analysis

The USGBC highlights the states with the greatest proportion of sustainable buildings under the LEED rating system. The list is based on 2010 Census per capita data and an inventory

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<sup>52</sup> United States of America, The Office of Federal Environmental Executive, *The Federal Commitment to Green Building: Experiences and Expectations*, Lack of Clear Federal Policy, accessed April/May 2014, [http://www1.eere.energy.gov/femp/pdfs/fedcomm\\_greenbuild.pdf](http://www1.eere.energy.gov/femp/pdfs/fedcomm_greenbuild.pdf).

<sup>53</sup> Ibid.

<sup>54</sup> Ibid.

<sup>55</sup> McGraw-Hill Construction, "Green Building Is Growing Rapidly in the Retail and Hospitality Sectors," news release, June 25, 2013, accessed April/May 2014, <http://construction.com/about-us/press/green-building-is-growing-rapidly-in-the-retail-and-hospitality-sectors.asp>.

<sup>56</sup> Ibid.

<sup>57</sup> Ibid.

of 2013 certified green commercial and institutional buildings. Table 3 lists the USGBC's top ten states for LEED buildings, calculated using per-capita figures.

**Table 3 Top 10 States for LEED<sup>58</sup>**

1. Illinois	6. Oregon
2. Maryland	7. North Carolina
3. Virginia	8. Colorado
4. Massachusetts	9. Hawaii
5. New York/California (tie)	10. Minnesota

The cost of electricity could be driving these states to build more green buildings. The northeast and western states have some of the most expensive electricity costs in the U.S. that range from \$0.116-\$0.34 per kilowatt-hour.<sup>59</sup>

As previously noted, individual state and city public policies are driving green development. The top ten LEED states have more green development because of proactive laws that encourage and/or require development to meet green requirements.

In addition to certain sectors with low involvement in green building technology, certain states have low green involvement. Table 4 lists the states with the least proportion of green office buildings relative to the total stock of buildings in the market:<sup>60</sup>

**Table 4 States with Least Green Office Building**

Oklahoma	Louisiana
West Virginia	South Dakota
Mississippi	North Dakota
Alabama	Kentucky
Indiana	Nebraska

<sup>58</sup> Jacob Kriss, "USGBC Releases the Top 10 States in Nation for LEED Green Building," U.S. Green Building Council, February 18, 2014, accessed April/May 2014, <http://www.usgbc.org/articles/usgbc-releases-top-10-states-nation-leed-green-building>.

<sup>59</sup> "Electricity Monthly Update," U.S. Energy Information Administration - EIA - Independent Statistics and Analysis, March 21, 2014, accessed March/April 2014, [http://www.eia.gov/electricity/monthly/update/end\\_use.cfm#tabs\\_temps-1](http://www.eia.gov/electricity/monthly/update/end_use.cfm#tabs_temps-1).

<sup>60</sup> Norm Miller, *Does Green Still Pay Off?*, technical paper (Costar Group), pg. 8, accessed March/April 2014, <http://www.costar.com/josre/pdfs/DoesGreenStillPayOff.pdf>.

The cost of electricity can be attributed to the lack of green investment as the ten states listed above have some of the lowest energy costs in the nation. As of January 2014, the electric industry average revenue was between \$0.725-\$0.925 per kilowatt-hour.<sup>61</sup> In fact, Louisiana and West Virginia reported lower average revenue per kilowatt figures in January 2013.

Additionally, some southern states are disgruntled with USGBC’s LEED-certification system claiming the approach has limited participation from stakeholders in various industries that could otherwise contribute to sustainable construction.<sup>62</sup> Timber, plastic, and chemical industry lobbyists are upset with the exclusionary nature of LEED. Mississippi, Alabama, and Georgia have made efforts to ban LEED. Louisiana is also joining in the anti-LEED fray. Backed by national lobbyists of the chemical industry, Louisiana House Representative Eddie Lambert has introduced efforts via House Bill 1067 to ban LEED from use on public projects.<sup>63</sup>

### Sectors Least Involved in Green Development

MHC segmented sectors with planned green building activity over the next three years.

The three sectors with the lowest planned green building activity are listed in Table 5.<sup>64</sup>

Table 5 Sectors with lowest planned green building activity

New high-rise residential – 4 floors or more	29%
Commercial interiors	25%
New low-rise residential (1-3 floors)	20%

<sup>61</sup> “Electricity Monthly Update”.

<sup>62</sup> Jose Luis Gabriel Cruz, "Southern States Outlaw LEED Building Standards," ArchDaily, August 30, 2013, section goes here, accessed April/May 2014, <http://www.archdaily.com/422885/southern-states-outlaw-leed-building-standards/>.

<sup>63</sup> Stage, Shannon. “An anti-LEED bill has been filed in the Louisiana House of Representatives.” U.S. Green Building Council: Louisiana Chapter. Accessed April/May 2014.

<http://usgbclouisiana.org/?page=ADVOCACYALERT&hhSearchTerms=%22anti+and+leed+and+bill%22>.

<sup>64</sup> Bernstein, Fitch, and Laquidara-Carr, *World Green Building Trends*, 12.

Most notable is that commercial interiors and new low-rise residential developments have decreased planned green building activity since 2008. In 2008 their participation levels were 32% and 28% respectively.

The USGBC categorized LEED membership by sector, naming the bottom four participants: insurance companies as the smallest group, followed by financial institutions, the federal government, and utilities and energy services.<sup>65</sup>

### **Reasons Developers Are Not Involved in Green Development**

Developers face significant hurdles in obtaining green certifications, and several of these hurdles deter developers from pursuing green techniques. The McGraw-Hill Construction (MHC) survey reports the main reasons developers choose not to use a green rating system are the cost and length of time to complete the process. The other two main reasons for the lack of participation in green rating systems include the program not tailoring to regional climate, unforeseen cultural implications, and the difficulty in understanding the requirements and documentation processes.<sup>66</sup> A more streamlined certification process would increase participation levels in green rating systems.

MCH also cites that developers who are not involved in green building do not truly understand the business value and they lack the understanding of overall green benefits.<sup>67</sup> Developers unaware of the impact on energy-consumed need to be informed about the lowered annual operation and maintenance costs.

During an interview with Patrick Malik, Operations Manager in the Property Management Division at Stirling Properties, Mr. Malik contributed insightful testimony as to why some developers chose not to incorporate sustainable design in specific projects. Stirling Properties is

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<sup>65</sup> *LEED In Motion: People and Progress*, 12.

<sup>66</sup> Bernstein, Fitch, and Laquidara-Carr, *World Green Building Trends*, 23.

<sup>67</sup> *Ibid.*, 17.

a full-service commercial real estate development firm with emphasized involvement in the retail sector. Malik explained that, as the developer of retail shopping centers, his company focuses on the project's exterior and that the concern of tenant utilities costs is minimal to the developer. The tenant carries the burden of water and electricity use, thus the tenants have more interest than the developer in sustainable technologies. Because Stirling Properties, as a developer, has a small invested interest when it comes to the cost of utilities, it is difficult to justify the cost of sustainable features, because the payoff is not substantial.<sup>68</sup> Once again, if potential tenants were more aware of how green building practices benefit their financial bottom line, as well as their overall quality of life, the demand for green buildings would continue to increase.

### What Distinguishes LEED Projects from Peers

Turner Construction Company surveyed over 700 executives in 2012, and it reports that companies are committed to sustainable buildings; however, fewer are seeking LEED certification.<sup>69</sup> In 2008, executives were 61% likely to invest in LEED, 54% in 2010, and 48% in 2012.<sup>70</sup> Reasons executives are not pursuing LEED include the costly certification process (82%), staff time required (79%), time required for the process (75%) and overall difficulty (74%).<sup>71</sup>

Instead, executives and developers gain the knowledge and understanding of LEED design and construction to develop their own building standards. While 52% of executives would not participate in the LEED certification process, they would prefer to use their own company's green building standards.<sup>72</sup> This means companies are more knowledgeable about LEED's means and methods and are choosing to forgo the formal certification process and are choosing to build to

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<sup>68</sup> Patrick Malik, telephone interview by author, March 29, 2014.

<sup>69</sup> *2012 Green Building Market Barometer*, 6.

<sup>70</sup> *Ibid.*

<sup>71</sup> *Ibid.*, 2.

<sup>72</sup> *Ibid.*

“LEED standards.”<sup>73</sup> Companies who forego LEED and seek another type of certification choose Energy Star (63%), Green Globes (25%), Living Building Challenge (21%), and the Building Research Establishment Environmental Assessment Method (19%).<sup>74</sup>

## IV. Green Building Development Processes and how it Adds Value.

### Value Engineering

Value engineering is an “evaluation of alternative construction materials and systems to save money without effect on program, maintenance, or appearance, chosen on a priority basis.”<sup>75</sup> The goal is to optimize cost without decreasing quality or hindering the performance of a building, and to maximize the value to the owner. Cost, function, and aesthetics are the three contributing factors to value. To capitalize on cost, choose the item that costs less when comparing identical products. Functional items are tied to the use. High cost items that have little function to a project do not add value and should be eliminated during the design phase. Lastly, aesthetics add great value to a project and are usually chosen by the client. During the value engineering process, the cost, function and aesthetics decisions must be balanced to maximize the overall value. Unnecessary costs with no function or enhanced aesthetics need to be excluded.<sup>76</sup> The value engineering process, implemented when the design phase is 35% completed, will yield the greatest benefit, because costing estimates are available for materials and systems, thus cost savings are readily identifiable.<sup>77</sup>

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<sup>73</sup> Ibid., 6.

<sup>74</sup> Ibid., 7.

<sup>75</sup> Alaa El Dean El-Alfy, "Design of Sustainable Buildings Through Value Engineering," *Journal of Building Appraisal* 6, no. 1 (May 1, 2010): pg. 4, accessed April 2014, <http://www.palgrave-journals.com/jba/journal/v6/n1/pdf/jba201014a.pdf>.

<sup>76</sup> Ibid., 4.

<sup>77</sup> Alaa El Dean El-Alfy, 6.



Value engineering applied in the design phase improves building sustainability by fulfilling the sustainable requirements of durability, ecology, health, and sociocultural factors.<sup>78</sup> Value engineering increases the sustainability of buildings and aids in achieving LEED certifications.<sup>79</sup>

### Integrated Design Process Value Proposition

The Integrated Design Process (IDP) is a project delivery approach that is highly collaborative and integrates people and systems to optimize project results, increase value, and maximize efficiency throughout the development process.<sup>80</sup> IDP differs from the conventional approach in that all members of the development process collaborate from the beginning “to meet high-performance and sustainable design objectives that are environmentally, socially, and financially responsible.”<sup>81</sup> Early collaboration allows for ideas to be tested and altered before construction so as to limit change orders and budget increases. The Integrated Design Process is designed to develop cost-effective green buildings. Figure 4 demonstrates how IDP adds value by saving money through early intervention.<sup>82</sup> In one example an owner decided to save money by changing glass types during construction. However, the cheaper glass was a low performance thermal barrier creating the need to redesign and upgrade the mechanical system at a premium price.<sup>83</sup> The IDP would have indicated the lowest cost system and understood the implications of design change during construction.

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<sup>78</sup> Ibid., 11.

<sup>79</sup> Ibid., 8.

<sup>80</sup> *Integrated Project Delivery: A Guide*, 2.

<sup>81</sup> Tasha Halevi, "AEC - Architectural Energy Corporation," AEC, accessed March 19, 2014, <http://www.archenergy.com/news/integrated-design-better-buildings-through-collaboration>.

<sup>82</sup> Jerry Yudelson, "Green Building and Value Engineering" (lecture, Presentation to Global Society for Value Engineering Annual Conference, Portland, OR, 2011), accessed April/May 2014, <http://www.slideshare.net/yudelson/yudelson-save-presentation-final>.

<sup>83</sup> Alex Zimmerman, *Integrated Design Process Guide*, report, How Is IDP Different?, accessed April/May 2014, [http://www.cmhc-schl.gc.ca/en/inpr/bude/himu/coedar/upload/Integrated\\_Design\\_GuideENG.pdf](http://www.cmhc-schl.gc.ca/en/inpr/bude/himu/coedar/upload/Integrated_Design_GuideENG.pdf).

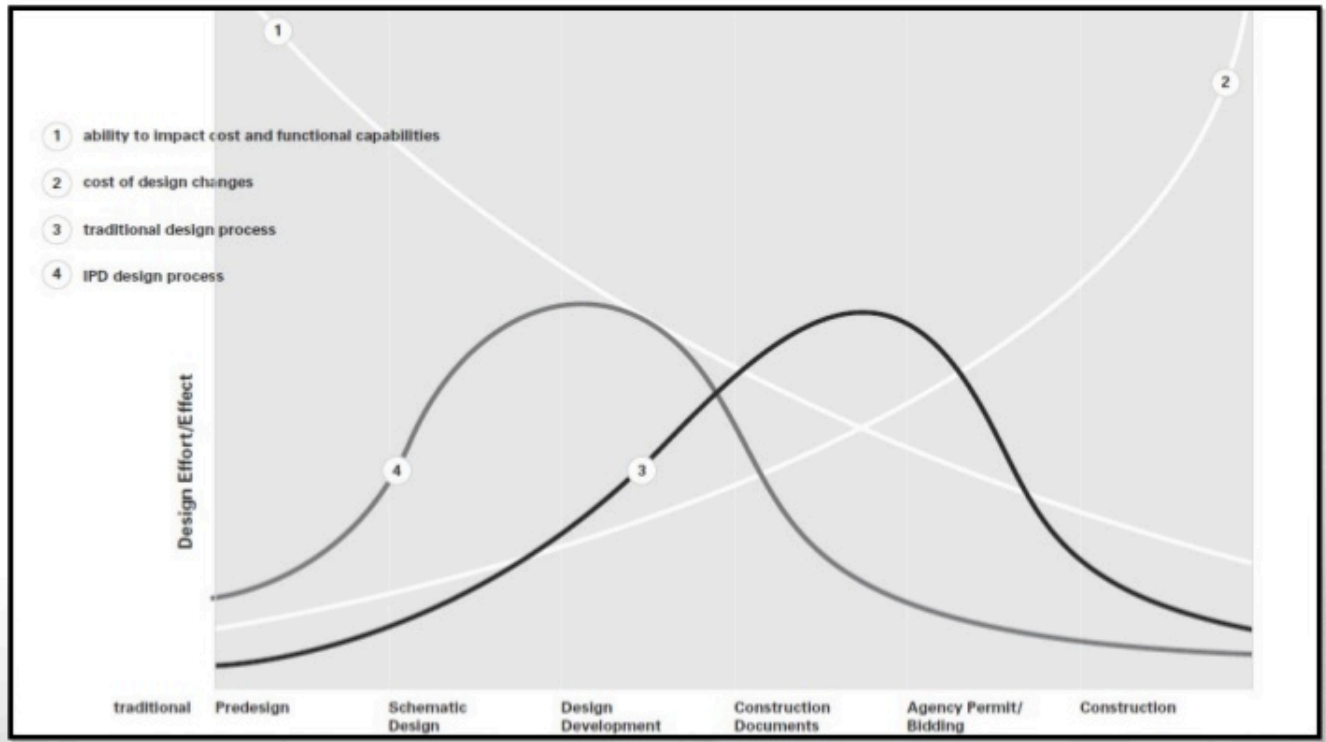


Figure 4 Early Intervention Adds Value<sup>84</sup>

IDP is a more effective approach to ensure that a sustainably-designed project is efficiently coordinated and that costs are minimized. Owners, designers and contractors reap benefits from the integrated design process. Owners are able to clearly articulate their desired outcomes and discuss options to achieve those outcomes in the most financially feasible way. Designers can produce accurate budget estimations and solve any design-related issues. The IDP differs from the conventional process in that it allows every team member to be more actively engaged and the total effects result in a cohesive goal to build a sustainable building. Contractors use their expertise to help develop strong construction plans and anticipate design/construction issues. The collaboration effort between all players increases the predictability of the outcome and allows for better control costs and budgeting.<sup>85</sup>

<sup>84</sup> Yudelso, "Green Building and Value Engineering".

<sup>85</sup> *Integrated Project Delivery*, 3.

One study estimates construction costs can be reduced by 30%<sup>86</sup> through the use of integrated project delivery systems, by discussing resilience and life cycle in the beginning of the development process.<sup>87</sup> Operational costs are reduced through integrated design systems by detailing goals to reduce energy and water-consumption levels before construction. Capital costs are reduced when the contractor is involved early in the design process. Beginning with thorough construction plans reduces the number of change orders, thereby saving the customer money.<sup>88</sup>

## V. Determining the Asset Value Based on Long-Term Benefits, Life-Cycle Costing, and Ensuring Maximum Valuation.

Green buildings share a common pricing misconception. Greg Kats, president of Capital E, a national clean energy advisory firm, conducted research that estimates that the median cost increase of building green is 2%, while the majority of respondents surveyed perceive a 17% increase in additional costs, as depicted in Figure 5.<sup>89</sup> However, research suggests the slight increase in soft costs (costs not associated with acquisition or construction) is offset by decreased costs achieved with features such as high-performance facades and energy efficient building systems - features that additionally increase the building's overall value.<sup>90</sup>

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<sup>86</sup> Ibid., 3.

<sup>87</sup> Michelle M. Frey, ed., *The Business Case For Green Building: A Review of the Costs and Benefits for Developers, Investors, and Occupants*, report (World Green Building Council, 2013), pg. 22, accessed April/May 2014, [http://www.worldgbc.org/files/1513/6608/0674/Business\\_Case\\_For\\_Green\\_Building\\_Report\\_WEB\\_2013-04-11.pdf](http://www.worldgbc.org/files/1513/6608/0674/Business_Case_For_Green_Building_Report_WEB_2013-04-11.pdf).

<sup>88</sup> Halevi, Tasha.

<sup>89</sup> Greg Kats, *Greening Buildings and Communities: Costs and Benefits*, report (CA: Good Energies), accessed April/May 2014, <http://www.goodenergies.com/news/-pdfs/Web%20site%20Presentation.pdf>.

<sup>90</sup> Frey, *The Business Case For Green Building*, 22.

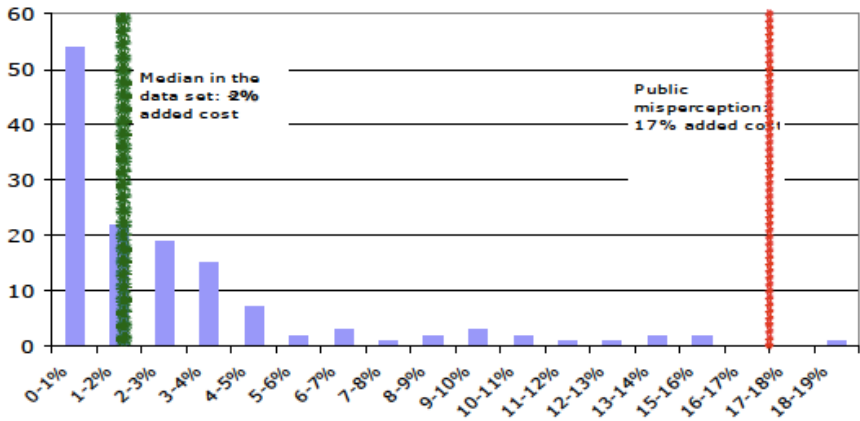


Figure 5: Perception Gap on Cost Effectiveness of Green Design<sup>91</sup>

### Green Building Asset Value and Long Term Benefits

Green building asset value is determined by the appraised value and, in the market, by buyer and sellers. The asset value is dependent upon building cost, the income producing streams, and operating costs. CoStar Group published a report in 2010 with evidence that indicates green buildings generate premium rental and sales rates. Figure 6 indicates LEED-certified Class A offices receive higher rental rates compared to Energy Star certified and non-green buildings.<sup>92</sup> Likewise, sales prices for LEED-certified Class A offices are higher than Energy Star-certified and non-green buildings, as specified in Figure 7.<sup>93</sup>

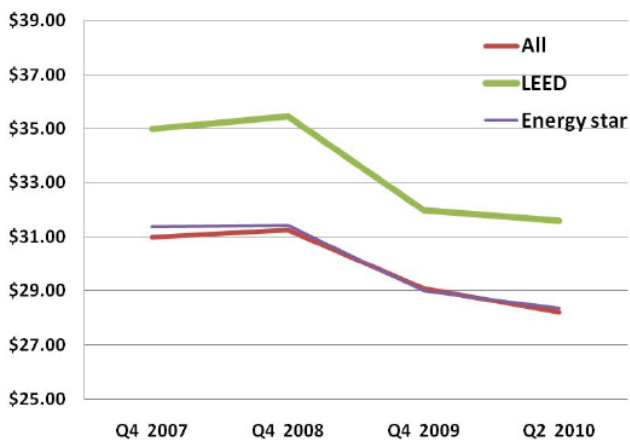


Figure 6: Average Rental Price - Class A Office Per Square Foot

<sup>91</sup> Kats, Greg.

<sup>92</sup> Norm Miller, *Does Green Still Pay Off?*, technical paper (Costar Group), pg. 3, accessed March/April 2014, <http://www.costar.com/josre/pdfs/DoesGreenStillPayOff.pdf>.

<sup>93</sup> *Ibid.*, 6.

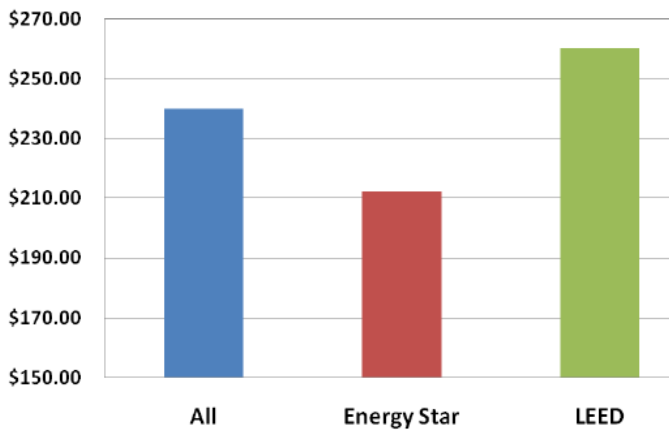


Figure 7: Average Sales Price - Class A Office Per Square Foot 2010

In 2011, the Institute for Market Transportation (IMT) published the results of four studies, which indicate that LEED and Energy Star commercial buildings have premium rental prices, sales prices, and occupancy rates. Table 6 specifies the premiums in each category.

Table 6 Premiums of Green Commercial Buildings<sup>94</sup>

Rental Premiums of Green Commercial Buildings	2.5% - 27%
Sales Premiums of Green Commercial Buildings	2.5% - 25%
Occupancy Premiums of Green Commercial Buildings in the US	3% - 17%

Additionally, overall operational cost savings through reduced water consumption, lower emissions, less energy consumption, and lower maintenance and operations costs offset the increase in upfront costs. One study suggests an additional 2% on top of construction cost yields a total 20-year net present value of \$11-13 per square foot.<sup>95</sup>

Potential tenants are interested in the attributes of green buildings such as improved indoor air quality that leads to improved employee performance. Owners have reported that green buildings that contribute to improved employee performance lead to higher occupancy

<sup>94</sup> David Leipziger, "Institute for Market Transformation," Institute for Market Transformation, 2011, accessed April/May 2014, <http://www.imt.org/search/596fb04a6bd60289148261907e857d70/>.

<sup>95</sup> Frey, *The Business Case For Green Building*, 56.

rates.<sup>96</sup> Better ventilation systems decrease the chance of spreading sickness throughout a building, thereby creating a healthier workplace. A study released in 2000 estimates healthier workplaces have potential annual savings and productivity gains ranging from \$1-14 billion by decreasing respiratory disease circulation and eliminating materials that cause allergies and asthma.<sup>97</sup> Higher occupancy rates decrease tenant turnover and the costs associated with vacancy, maintenance and repair, advertising, and utility costs. Costs associated with tenant turnover reduce the net operating income for the building owner, so a lower turnover rate means greater operating income.

Energy savings directly correlates with green buildings. A building's energy use accounts for 41% of total energy consumed, which is more than the industrial and transportation sectors.<sup>98</sup> LEED-certified buildings use 25%-30% less energy compared to non-green buildings.<sup>99</sup> In 2010, Greg Kats estimated LEED-certified buildings decrease water consumption by 39% through water reuse methods and using water-efficient plumbing fixtures.<sup>100</sup> These energy savings decrease operational costs and increase net operating income. These savings are significant compared to Kats' reported median 2% increase in upfront green building costs.

Finally, the asset value of a green building is increased through its positive effect on public relations and branding. McGraw-Hill Construction reports that 25% of respondents say a key driver of building green is the positive public relations and branding associated with green buildings.<sup>101</sup>

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<sup>96</sup> Ibid., 36.

<sup>97</sup> Ibid., 72.

<sup>98</sup> Katz, "Green Building Facts".

<sup>99</sup> Ibid., 51.

<sup>100</sup> Ibid.

<sup>101</sup> Bernstein, Fitch, and Laquidara-Carr, *World Green Building Trends*, 41.

## Life-Cycle Cost Analysis

Life-cycle cost analysis (LCCA) is an economic evaluation of a building or industrial components used to assess the total cost of ownership, which includes the sum of the present values of all costs associated with acquiring, owning, and disposing of a building or an industrial component. Sustainable projects often use LCCA in conjunction with value engineering. Value engineering is used to identify identical products and design feature alternatives for materials, lighting, and water and energy usage techniques, and the initial costs associated with each product. The LCCA is an economic methodology used to identify the best value alternative by estimating the initial cost, and also includes the full life-cycle cost of each alternative.<sup>102</sup> Using LCCA addresses issues of design effectiveness, construction costs, and future costs of owning and operating a building or industrial components. Most importantly, it identifies the building value over time and aids in understanding the total costs and savings.<sup>103</sup>

LCCA focuses on building-related costs: initial costs, fuel, operations and maintenance, equipment replacement costs along with residual values, finance charges, and non-monetary benefits or costs, which encompass productivity gained from better indoor air quality or access to natural light. Non-monetary benefits may be difficult to translate into a dollar value because of the subjective nature and lack of precision. In these situations, accurate qualitative statements are used to account for positive benefits to the analysis.<sup>104</sup> All costs associated with the building throughout the entire life of the project are discounted with a risk-appropriate rate back to present day value, which estimates the total life-cycle cost for each alternative.

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<sup>102</sup> Stanley Hall and Terrel Emmons, *Sustainable Federal Facilities: A Guide to Integrating Value Engineering, Life-Cycle Costing, and Sustainable Design*, report (Washington, DC: National Academy Press, 2001), pg. 21-22, accessed April/May 2014, <http://www.wbdg.org/ccb/SUSFFC/fedsus.pdf>.

<sup>103</sup> "King County LCCA Guide," King County Green Buildings, What is LCCA?, accessed April/May 2014, [http://your.kingcounty.gov/solidwaste/greenbuilding/documents/KC\\_LCCA\\_calculator-guide.pdf](http://your.kingcounty.gov/solidwaste/greenbuilding/documents/KC_LCCA_calculator-guide.pdf).

<sup>104</sup> WBDG Cost-Effective Committee, "Consider Non-Monetary Benefits Such as Aesthetics, Historic Preservation, Security, and Safety," World Building Design Guide of the National Institute of Building Science, August 13, 2009, Non-Quantifiable Benefits, accessed April/May 2014, [http://www.wbdg.org/design/consider\\_benefits.php](http://www.wbdg.org/design/consider_benefits.php).

A valuable example of an LCCA is from King County, Washington. The county published a life-cycle cost assessments user guide to evaluate green building design options. King County demonstrates how LCCA works by comparing alternatives for improved glazing. Table 7 examines double tinted glass to double low-e glass by comparing the initial cost, cash flows, and savings amount, which are used to calculate the net present value (NPV) using a 5% discount rate and a 40-year life-cycle period. The initial cost for the double low-e glass is 70% higher, but has an additional \$600 annual energy savings over the 40-year life-cycle. The initial study compared both of these windows to a traditional double clear window, that had a lower initial cost and that produced zero annual energy savings. According to the LCCA double low-e glass should be chosen because it is the most cost-effective item with the highest NPV. Even though the double tinted glass has a higher return on investment, the net present value is used to make the decision because it is taking the time value of money into account and adding real wealth to the portfolio.

Table 7 Window Options LCCA<sup>105</sup>

Product Description	Initial Cost	Type of Cost	Cash Flow	Present Value	Net Present Value	Sum of Gains	Sum of Costs
Double Tinted Glass	\$ (10,000)	One Time	\$ -	\$ -	\$ (10,000)	\$ -	\$ (10,000)
Energy Savings	\$ -	Annual	\$ 3,000	\$ 51,477	\$ 51,477	\$ 51,477	\$ -
Period of Analysis(years)	40						
<b>Total Net Present Value</b>					<b>\$ 41,477</b>	<b>\$ 51,477</b>	<b>\$ (10,000)</b>
<b>ROI</b>	<b>415%</b>						
Double Low-e Glass	\$ (17,000)	One Time	\$ -	\$ -	\$ (17,000)	\$ -	\$ (17,000)
Energy Savings	\$ -	Annual	\$ 3,600	\$ 61,773	\$ 61,773	\$ 61,773	\$ -
Period of Analysis(years)	40						
<b>Total Net Present Value</b>					<b>\$ 44,773</b>	<b>\$ 61,773</b>	<b>\$ (17,000)</b>
<b>ROI</b>	<b>263%</b>						

Alternatively, the U.S. Department of Housing and Urban Development conducted a capital needs audit on 216 units in a multi-family apartment complex to examine all components in the complex. Each component was compared to traditional and green alternatives through an LCCA to determine the replacement date and which type of component to use. Table 8 compares the traditional and green alternatives, and gives a recommendation on the replacement type and

<sup>105</sup> "King County LCCA Guide", 7.



timeframe based on the payback periods and the energy savings. These examples suggest green alternatives should be chosen only when energy savings are generated. For example, the green-alternative roofs did not provide enough savings to justify the increased costs, therefore it was more economical to choose the traditional options. The analysis also demonstrated that the faucets should be changed immediately due to the fast payback period. Conducting a life-cycle cost analysis aids in making sound decisions on what types of products to purchase, and provides the costs and savings necessary to calculate the total cost of ownership.

Table 8 Capital Needs Assessment<sup>106</sup>

	Existing Component	Traditional Alt	Green Alt
Components	Asphalt Shingle Roof	20 Yr. Three Tab Asphalt Shingle Roof	30 Yr Architectural Shingle Roof
Costs		\$19,500	\$32,500
Est. Useful Life (Years)		20	30
Payback		\$0.00	\$0.00
Replace With	Traditional		
When	End of Cycle		

**Recommendation:** Replace with traditional alternative at the end of cycle because green option has significantly higher cost without any energy savings.

	Existing Component	Traditional Alt	Green Alt
Components	Existing Bath and Kitchen Faucets	Bath-2.0 GPM Aerators, Kitchen-2.2 GPM Aerators	Bath-1.0 GPM Aerators, Kitchen-1.5 GPM Aerators
Costs		\$2.00	\$2.25
Est. Useful Life (Years)		10	10
Usage/Yr		6,894	3,988
Payback			50% IRR vs. T
Replace With	Green		
When	Now		

**Recommendation:** Replace all bath and kitchen faucets with the green option due to fast payback potential.

	Existing Component	Traditional Alt	Green Alt
Components	Carpet - Residential	Traditional Low Pile Commercial	CRI Certified Commercial
Costs		\$5,106	\$7,121
Est. Useful Life (Years)		7	7
Replace With	Green		
When	End of Cycle		

**Recommendation:** Replace with green option for improved indoor air quality and recycled content of green product.

<sup>106</sup> U.S. Department of Housing and Urban Development. 2012. Multifamily Green Physical Conditions Assessment Example: HUD Green Academy Training.

## Appraisals and Maximum Valuation

The green building benefits discussed above should clearly translate into values, as energy usage effects property values. Appraisers use construction costs, income earnings, and comparable sales to establish the maximum valuation of a building. For a green building to receive the maximum valuation, the appraiser should expand the scope of work to include the intricacies of high-performance buildings.<sup>107</sup>

The comparable approach may be the least reliable method if there are a limited number of green buildings representing the same building type in the area. The cost approach requires evidence that the long-run premiums will offset the higher upfront costs through a cost-benefit analysis.<sup>108</sup> The cost approach may not account for the building's features and performance that increase the asset value.<sup>109</sup>

The best approach for green appraisals is the income-earning approach, which reflects the future benefits.<sup>110</sup> Green buildings can generate higher rents, lower vacancy turnover rates, and lower operating expenses, thereby creating a larger net operating income compared to non-green buildings. Therefore, green buildings should receive a higher appraisal value. A California medium-sized motel that upgraded windows, heating and cooling systems, and the system controls to energy efficient models reduced annual energy costs by 45%. The decreased operating cost increased the value by 8.5%, assuming no change in the capitalization rate.<sup>111</sup>

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<sup>107</sup> John Miller, *Green Building And Property Value: A Primer For Building Owners and Developers*, report (Institute for Market Transformation and Appraisal Institute, 2013), pg. 8, accessed April/May 2014, <https://www.appraisalinstitute.org/assets/1/7/Green-Building-and-Property-Value.pdf>.

<sup>108</sup> Ibid., 11.

<sup>109</sup> Ross Davies, ed., *Green Value: Green Buildings, Growing Assets*, report (London: Royal Institution of Chartered Surveyors, 2005), pg. 23, accessed April/May 2014, [http://c.ymcdn.com/sites/www.realpac.ca/resource/resmgr/industry\\_sustainability\\_-\\_research\\_reports/rgreenvaluereport.pdf](http://c.ymcdn.com/sites/www.realpac.ca/resource/resmgr/industry_sustainability_-_research_reports/rgreenvaluereport.pdf).

<sup>110</sup> John Miller, 11.

<sup>111</sup> *Recognition of Energy Costs and Energy Performance in Real Property Valuation*, report (Institute for Market Transformation and Appraisal Institute, 2012), pg. 10, accessed April/May 2014, [http://www.imt.org/uploads/resources/files/Energy\\_Reporting\\_in\\_Appraisal.pdf](http://www.imt.org/uploads/resources/files/Energy_Reporting_in_Appraisal.pdf).

A green building with a higher appraised value results in a higher sales price.

Additionally, greater appraised value can justify larger loans by demonstrating higher resale value compared to non-green buildings. Therefore, the developer reaps the benefits immediately with initial higher appraisal values with larger loans, or over time through higher income earnings and sales price.

Ultimately, the burden of proof is the responsibility of the appraiser. Green building owners need to verify that the appraiser is qualified to appraise green buildings and that the appraiser is up to date on current trends.

### **Government-Based Energy Efficient Financing Offering**

While legislation requiring nonresidential buildings to incorporate green features does not exist, the U.S. Department of Housing and Urban Development (HUD) encourages green development through non-single family home mortgages offerings. HUD's Federal Housing Administration (FHA) and Fannie Mae developed Green Refinance Plus to encourage owners of affordable housing to refinance into new mortgages to receive funding for energy and water savings upgrades.<sup>112</sup> The cost assessment tools identify the cost effective opportunities for increasing energy savings. The program structure permits lower debt service coverage and higher loan-to-value ratios, producing additional loan proceeds for the energy efficient improvements. When interest rates begin to rise, this program will aid developers seeking to add green retrofits to multi-family rentals. Programs like this one entice developers to pursue green technologies and solidify the government's support for green buildings by making it easier for developers to incorporate energy-efficient systems.

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<sup>112</sup> Brian Sullivan, "FHA and Fannie Mae Announce Green Refinance Plus to Pay for Energy-Efficient Upgrades in Affordable Apartment Buildings," HUD.GOV, May 31, 2011, accessed April/May 2014, [http://portal.hud.gov/hudportal/HUD?src=/press/press\\_releases\\_media\\_advisories/2011/HUDNo.11-106](http://portal.hud.gov/hudportal/HUD?src=/press/press_releases_media_advisories/2011/HUDNo.11-106).

## Interpreting Value Captured by Development Participants

Each player in the development process captures value produced by green technology. One study suggests it is the occupants who capture the most value from green technology investments.<sup>113</sup> The cost to install energy-efficient systems will add value to the user by lowering energy bills. Occupants are also saving money on business operations through increased productivity and decreased employee sickness and absenteeism. Greg Kats studied 11,000 workers in 107 buildings and found a 1% increase in worker productivity.<sup>114</sup> The 1% productivity translated into \$600-700 in savings per year or \$3 per square foot. The present value of work productivity is estimated at \$35 a square foot for a LEED-certified building using a 5% discount rate over 20 years.<sup>115</sup>

Who captures value is also dependent on lease structures. Interviewee, Patrick Malik, believes the tenant captures the value in the retail sector since the individual tenants are responsible for energy usage. However, office leases are structured so that the owner/developer and tenants share the value. Stirling Properties structures office leases based on operational costs, with a baseline established at lease signing. If operational costs per tenant increase above the baseline, the tenant must pay the pro-rata share per square foot of the increase. This method incentivizes both parties to consume less energy and decrease operating costs.

Developers and owners can also capture value from sustainable design via lower insurance rates. Malik explained that Stirling Properties identifies cost savings by using white Thermoplastic Polyolefin (TPO) roofs. White TPO roofs are less expensive to install compared to asphalt roofs, and the method of attachment for a TPO roof is more secure than an asphalt roof. During Hurricane Katrina, none of the white TPO roofs were damaged and no insurance claims were filed; however, all of the asphalt roofs were damaged and required replacement. Malik also

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<sup>113</sup> Davies, 22.

<sup>114</sup> Ibid.

<sup>115</sup> Ibid.

explained that installing a lighting-control system will not lower insurance costs directly, yet it does ensure the parking lot lights will systematically turn on, thereby decreasing the possibility of accidents that would result in insurance claims. These secondary factors do not have specific dollar amounts, but increase the owner's value.

### **Inefficiencies of Green Buildings that Lead to Decreased Value**

Green buildings are designed to perform a specific way and to consume a predicted amount of energy. However, if the building is not constructed, commissioned, operated, and/or managed in the appropriate manner, the actual energy consumption will differ from the predicted savings calculated.<sup>116</sup> A performance gap is the difference between designed performance and built performance of a building. Performance gaps fail to decrease energy consumption as planned, resulting in a reduced asset value from a larger potential value based on energy savings. Building commissioning, a thorough quality assurance process used during the life-cycle of a building, is the most important factor in hedging against performance gaps by increasing opportunities for energy savings throughout the development process.<sup>117</sup> Building commissioners examine the quality of design, construction, occupancy, and operations to ensure the built performance matches the design. Green building management also decreases the chance for performance gaps by monitoring objectives set to reduce costs and emissions, and by facilitating transparent communications between tenants and owners.<sup>118</sup>

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<sup>116</sup> *The Business Case For Green Building*, 58.

<sup>117</sup> *Ibid.*

<sup>118</sup> *Ibid.*, 61.

## VI. Conclusion

The final recommendations for John Dalton of Atelier Ten, for identifying developers involved in the green building industry, for tailoring their services directly to those developers, and for maximizing the value of green buildings are as follows:

Sustainability is a core issue rather than a passing trend and is becoming the standard in building requirements. Combined with the government's increased involvement in green buildings, the government is setting the precedent for national practices. As the government creates social policy for the nation, green buildings will continue to increase in market share.

### Primary Target Audience

Within the limited time frame, research detailing a specific group of developers is inconclusive; yet, green development spans a wide variety of industries. The most efficient means to increase the customer base is to target sectors already involved in green building and aim to increase the sector's percentage of green building stock. Clients within sectors with current involvement have the ability so see the value added in peer projects.

Therefore, Atelier Ten needs to target office buildings, educational institutions, and healthcare, and the government sector as they continue to expand their green building portfolio. The government sector has the potential to be the most advantageous client base since only 6% of the gross square footage is certified sustainable. The executive order requires all government buildings to be sustainable and predictions estimate more than 500 existing federal buildings aim to undergo green certification in 2014.<sup>119</sup> Atelier Ten's consulting services can aid in sustainable design for renovations and new builds.

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<sup>119</sup> Jerry Yudelson. "What's the Future of Green Building in 2014? Industry Leader Offers Top 10 Megatrends." PR Newswire. December 17, 2013. Accessed April/May 2014. <http://www.prnewswire.com/news-releases/whats-the-future-of-green-building-in-2014-industry-leader-offers-top-10-megatrends-236190941.html>.

In addition, the McGraw-Hill report specifies a more detailed segment that is involved in green building, but has a lower percentage of green buildings planned for the next year. The following list is another target audience for Atelier Ten. Again, since this sector has some involvement in the green industry, recruiting clients in the same sector will be easier.

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New high-rise residential – 4 floors or more	29%
Commercial interiors	25%
New low-rise residential (1-3 floors)	20%

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When recruiting clients in sectors with involvement in green building, Atelier Ten can then use past statistics to show new clients the potential savings and added value green building produces.

### Trends in Product Offering

Product offerings should differ based on client type. For clients who wish to achieve LEED-certification, Atelier Ten can assist in the process by aiding in the environmental design. However, as commercial green real estate continues to expand, LEED will experience more competition from alternative green certification systems that are less costly and complex. Atelier Ten should be cognizant of these clients who do not want a LEED-certified building, and offer assistance in pursuing alternative green certification systems. Green Globes is gaining in popularity and Atelier Ten should be knowledgeable about these rating systems.

Atelier Ten can also provide clients with their environmental design expertise to guide executives to develop green buildings that are not LEED certified but are still energy efficient. The issue with not using a certified program is that there is no assurance that the built performance will match the designed performance.

Moreover, now that green is mainstream, companies will be looking for better design and operations of buildings to distinguish themselves in the market. Many owners and developers

are raising the green bar by developing net-zero buildings. Atelier Ten needs to be prepared to consult on these techniques as well.<sup>120</sup> As part of net-zero buildings, solar panels are a major requirement and financial incentives for them and other energy efficient components will grow, making capital more readily available.<sup>121</sup>

Green Building Performance Disclosure is another trend gaining more exposure and importance. In 2013, more than 30 cities including Boston, Seattle, and Washington DC enacted laws that require commercial buildings owners to report building performance including annual energy and water usage.<sup>122</sup> The reporting system is to encourage owners to increase energy efficiency and reduce carbon emissions.

## Future Steps

A final recommendation: Atelier Ten, in order to gain and maintain competitive advantage, should research how to incorporate cloud-based automation systems into its consulting services. Jerry Yudelson, a green building consultant, stresses the importance of a cloud-based automation system to effectively manage all systems in an intelligent building. Green buildings will rely more on innovative information technologies to design and manage all systems to work together for the greatest energy efficiency.<sup>123</sup> Hospitals are using building automation systems to improve efficiency and save money by using the cloud technologies for data storage, computing, and monitoring functionality for improved forecasting and estimating workload and energy conservation projects.<sup>124</sup> Incorporating cloud-based automation systems facilitates performance tracking for efficient building management.

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<sup>120</sup> Ibid.

<sup>121</sup> Ibid.

<sup>122</sup> Ibid.

<sup>123</sup> Ibid.

<sup>124</sup> Neal Lorenzi. "Taking Control: Reducing Operational Cost Through Smarter Energy Use." Health Facilities Management. November 1, 2013. Accessed April/May 2014. [http://www.hfmmagazine.com/display/HFM-news-article.dhtml?dcrPath=/templatedata/HF\\_Common/NewsArticle/data/HFM/Magazine/2013/Nov/1113HFM\\_FEA\\_marketplace](http://www.hfmmagazine.com/display/HFM-news-article.dhtml?dcrPath=/templatedata/HF_Common/NewsArticle/data/HFM/Magazine/2013/Nov/1113HFM_FEA_marketplace).



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