Sustainability of office buildings
Lessons learned from academic and professional research

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Abstract
Sustainability has been pursued by owners of office buildings with varying frequency since the 1990s, as owners and managers seek improvements in capital and operational costs, return on investment (ROI), retrofit length, and tenant attractiveness/comfort, among a variety of building specific benefits. The millennial generation of workers seems to be more socially and sustainability conscious than generation X and the baby boomers, therefore further solidifying the adoption of sustainable practices in the workplace. A building’s sustainability performance can be benchmarked based on recent building codes in certain communities or assessed and certified on a more holistic basis by private rating systems certifying buildings worldwide. Prominent holistic building sustainability assessment systems with worldwide outreach include: Leadership in Energy and Environmental Design (LEED) by the US Green Building Council (USGBC) – based in and dominating the USA market; Building Research Establishment Environmental Assessment Method (BREEAM) – based in and dominating the UK; and Green Globes – based in Canada and the USA.

The adoption of sustainable attributes and certifications among office buildings may be viewed through the lens of quantitative and qualitative outcomes of worldwide research, with a special focus on the construction budget impact. Since 2010, academic and professional research has tried to shed light on the adoption of sustainable practices among key office building performance indicators. The top drivers of green building are client demand, financial returns, environmental regulations, and occupant wellbeing. A five- to eight-year payback period is expected for green property investment with sale premiums ranging from 0% to 30% and rents 0% to 17.3%. Construction cost premiums can vary significantly with a range from −0.4% to 12.5% with the location and rating level pursued influencing the cost. In addition to the rationale for the adoption of sustainable certifications and the evidence of the success of the modifications, there is also a list of issues that the developer should explore before proceeding.

Introduction
The United Nations projects an increase of the current worldwide population from 7.3 billion
to 8.5 billion by 2030 and 9.7 billion by 2050. These trends suggest the need for additional construction and continuous repurposing of existing buildings, to accommodate the growing pressures, especially in urban areas. Even though this chapter focuses on office buildings the projected population growth requires development across all uses (e.g. residential, retail, industrial, etc.). Determining the global building stock is a daunting task, however, Navigant Research estimates its size at 151.8 billion square meters in 2014 with a projected increase of 13% (171.6 sq. m.) in 2024. Although the size of the building stock can be indicative of economic activity, there is also an environmental footprint, which cannot be ignored. The US Environmental Protection Agency (EPA) estimated in a 2009 report that buildings consume 13% of the total water and 39% of total energy in the USA, while generating 38% of the carbon dioxide emissions. Exploring these consumptions by major real estate use, residential buildings consumed larger amounts of water (74%), energy (54%), and produced more CO₂ (21%) compared to the commercial buildings (which experienced 26%, 46%, and 18% respectively). Furthermore, in 2014 alone the commercial real estate sector consumed 20% of US energy consumption, with an increase being predicted to 27% between 2012 and 2040 (CBRE, 2015). These trends underscore the need to address the environmental impact between both uses even though this chapter is focusing on office buildings.

In order to protect and sustain the environment for future generations there is a need to balance the profit of companies with their social (people) and environmental (planet) responsibility. These are the three Ps of sustainability that John Elkington highlighted in his famous quoted phrase of “the triple bottom line” in 1994. Sustainability can be achieved in existing and new structures through a combination of various actions and efficient equipment. The US National Institute of Building Services – Whole Building Design Guide (WBDG) highlights six critical elements in any sustainable design, consisting of the optimization of: (1) the site potential, (2) energy use, (3) water use, (4) building space and material use, (5) operational and maintenance practices, and (6) enhancement of the indoor environmental quality. These elements are also guiding principles for the sustainable US federal buildings, with the exception of the site potential. Beyond the aforementioned elements, a developer and/or owner can view a building before its construction as a four-stage process (life cycle), which includes: materials selection/manufacturing, construction, use/maintenance, and end of life. Bayer et al. (2010) suggest that applying a Life Cycle Assessment (LCA) before construction improves the sustainability of a building and the payback period, because of the improved decision-making process during all four stages of a building. Most recently, LCA was adopted by Leadership in Energy and Environmental Design (LEED) v4, which is one of the prominent sustainability certifications.

**Prominent sustainable certifications**

Worldwide there are many certifications acknowledging a building’s sustainability performance based on a comprehensive assessment of multiple building and area characteristics. The most widely used globally are: Building Research Establishment Environmental Assessment Method (BREEAM), based in the UK; Leadership in Energy and Environmental Design (LEED), based in the USA; and Green Globes, based initially in Canada, which is receiving increasing interest. BREEAM presence is significant with more than 535,967 certificates issued and 2.2 million buildings registered for assessment in 72 countries. BREEAM is the most prominent sustainability certification in Europe, accounting for more than 80% of the sustainable commercial buildings (office, retail, logistics, hotels, etc.) (RICS, 2013). The US Green Building Council,
which developed LEED, reports that more than 13.8 billion square feet are LEED certified in the USA, and more than 72,500 certified buildings exist worldwide in more than 150 countries as of August 2015. CBRE’s National Green Building Adoption Index trends also show the increasing support for LEED certification among office buildings in the USA, with the adoption of a sustainable certification (Energy Star label or LEED) being more prominent among buildings of more than 250,000 square feet for the ten largest markets versus all other buildings. Finally, Green Globes has nearly 4,000 buildings certified across Canada and the USA.

Although buildings typically obtain one certification, there are cases where buildings pursue multiple. For example, the Crystal in London has attained the highest certification level under LEED (Platinum) and BREEAM (Outstanding). The building is 6,300 square meters and among the innovations adopted is the use of renewable energy (geothermal, photovoltaic, and wind) rather than fossil resources (e.g. oil or gas). It also has a natural ventilation system and triple-glazed windows. Rainwater, graywater, and even black water are purified in the building.

**Building Research Establishment Environmental Assessment Method (BREEAM)**

BREEAM (Building Research Establishment Environmental Assessment Method) is a building’s sustainability assessment tool offered by the Building Research Establishment (BRE), with four assessment schemes, of which three are relevant to office buildings. BREEAM was launched in 1988 with the intention to: mitigate the life cycle impacts of buildings on the environment; enable buildings to be recognized according to their environmental benefits; provide a credible, environmental label for buildings; and stimulate demand for sustainable buildings (Arup, 2014). A survey of construction and other industry professionals (Parker, 2012) has shown that the main driver of BREEAM in the UK has been local planning authority requirements followed by the policies of organizations that might adopt certain requirements in their procurement strategies. The key benefits highlighted in the survey included the social aspect (building recognition), reduction in construction waste and material use as well as improved occupant satisfaction and operation cost savings.

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

LEED (Leadership in Energy and Environmental Design) was developed by the US Green Building Council (USGBC) in 1993, based on BREEAM. There are currently five ratings, of which three are the most relevant to office buildings. Each of these ratings has a set of prerequisites the project is required to meet to be considered for LEED certification. Both the private and public sectors have recognized LEED as a sustainability standard for buildings, including the US federal government. USGBC argues that LEED properties can differentiate themselves in the marketplace because of the healthier/happier occupants, reduced utility costs and improved occupancies, even though the rents are higher than in non-LEED buildings. Another key driver of LEED is the increasing adoption of various sustainable practices by municipal building codes, including the requirement of an increasing number of communities requiring all the new public buildings to be LEED certified (e.g. San Francisco, Atlanta).

**Green Globes**

Green Globes was developed in Canada (2000), based on BREEAM as a sustainability assessment tool for buildings. BOMACanada has the Canadian license for Existing Buildings
and Green Building Initiative (GBI) for both new and existing buildings in the USA, with GBI being the first organization accredited by the American National Standards Institute (ANSI). Green Globes is increasing its popularity because of the streamlined certification process and the much lower cost than LEED. In 2013, the US federal government determined that either Green Globes or LEED can be used for the certification of government buildings.

Differences between sustainable certifications
A number of differences exist between BREEAM, LEED, and Green Globes with the most notable shown in Table 19.1. Additional differences include:

1. BREEAM's focus on the type of building (use) versus LEED which focuses on status – new or existing (CBRE and EMEA, 2009);
2. BREEAM's passing score for buildings complying with area regulations, even though regulations differ among the various countries. In contrast LEED does not provide such an accommodation;
3. BREEAM's minimum standards, in contrast to LEED, which require buildings to meet certain prerequisites before the certification process begins;
4. BREEAM's location sensitivity, which affects the assessment of a building's environmental and economic conditions more than LEED;
5. LEED's requirement for recyclable materials in contrast to BREEAM which does not make it compulsory;
6. BREEAM's requirement for an assessor to be trained by BRE, in contrast to LEED which adds a credit if a LEED AP is used on a project;
7. BREEAM's ability to compare different buildings in contrast to LEED.¹⁹

Some major differences between LEED and Green Globes (GG) include:

1. GG's use of an ANSI process in assessing a building versus LEED which does not;
2. GG’s use of an interactive program delivery versus a template submission in LEED;
3. GG’s lack of prerequisites in contrast to LEED;
4. GG’s use of the Life Cycle Assessment (LCA) process, which has just begun in LEED v4;
5. GG’s allowance of multiple forest certification versus LEED;
6. GG’s certification cost which is significantly less than LEED.²⁰

Business case for sustainable buildings
Maximizing the returns from the construction of a building is critical in the success and longevity of any development venture. Therefore, addressing consumption levels (energy and water) and features that can improve the performance of a building are important in raising the value of the delivered asset. Even though residential buildings have a larger environmental footprint compared to commercial, embracing sustainability can significantly improve a building's performance regardless of use. Focusing on office buildings, which represent the majority of commercial buildings, a number of scholars, professionals, and agencies have compared green versus non-green building performance, shedding light on the differences.
<table>
<thead>
<tr>
<th></th>
<th>LEED</th>
<th>BREEAM</th>
<th>Green Globes</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Country based</strong></td>
<td>USA</td>
<td>United Kingdom</td>
<td>Canada (initially)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>USA (since 2004)</td>
</tr>
<tr>
<td><strong>Year</strong></td>
<td>1993</td>
<td>1988</td>
<td>2004</td>
</tr>
<tr>
<td><strong>Current versions</strong></td>
<td>LEED 2009 and v4</td>
<td>BREEAM International 2013</td>
<td></td>
</tr>
<tr>
<td><strong>Certifications</strong></td>
<td>Building design and construction</td>
<td>New construction,</td>
<td>New construction/significant renovations</td>
</tr>
<tr>
<td>(relevant for office buildings)</td>
<td>Building operations and maintenance</td>
<td>Refurbishment and fit-out,</td>
<td>Commercial interiors</td>
</tr>
<tr>
<td></td>
<td>Interior design and construction</td>
<td>In-use international</td>
<td>Existing buildings</td>
</tr>
<tr>
<td><strong>Levels</strong></td>
<td>Certified (40–49 points)</td>
<td>Unclassified</td>
<td>1 Globe</td>
</tr>
<tr>
<td></td>
<td>Silver (50–59)</td>
<td>Pass (30–44%)</td>
<td>2 Globe</td>
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<tr>
<td></td>
<td>Gold (60–79)</td>
<td>Good (45–54%)</td>
<td>3 Globe</td>
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<td></td>
<td>Platinum (80–110)</td>
<td>Very good (55–69%)</td>
<td>4 Globe</td>
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<td></td>
<td></td>
<td>Excellent (70–84%)</td>
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<tr>
<td></td>
<td></td>
<td>Outstanding (&gt;84%)</td>
<td></td>
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<tr>
<td><strong>Categories</strong></td>
<td>Energy and atmosphere</td>
<td>Energy</td>
<td>Energy</td>
</tr>
<tr>
<td></td>
<td>Indoor environmental quality</td>
<td>Health and wellbeing</td>
<td>Indoor environment</td>
</tr>
<tr>
<td></td>
<td>Water efficiency</td>
<td>Water</td>
<td>Water</td>
</tr>
<tr>
<td></td>
<td>Materials &amp; resources</td>
<td>Materials</td>
<td>Materials &amp; resources</td>
</tr>
<tr>
<td></td>
<td>Sustainable sites</td>
<td>Land use and ecology</td>
<td>Site</td>
</tr>
<tr>
<td></td>
<td>Regional priority</td>
<td>Pollution</td>
<td>Emissions</td>
</tr>
<tr>
<td></td>
<td>Integrative process</td>
<td>Management</td>
<td></td>
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<td></td>
<td>Location and transportation</td>
<td>Transport</td>
<td>Project management</td>
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<tr>
<td></td>
<td></td>
<td>Waste</td>
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<tr>
<td></td>
<td></td>
<td>Total</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Innovation and design process</td>
<td>Innovation credits&lt;sup&gt;a&lt;/sup&gt;</td>
<td></td>
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</tbody>
</table>

**Notes:**

<sup>a</sup>: LEED innovation credits are awarded under one of three options offered: [www.usgbc.org/node/2613903?return=/credits/new-construction/v4/innovation](http://www.usgbc.org/node/2613903?return=/credits/new-construction/v4/innovation)<br>

<sup>b</sup>: BREEAM innovation credits are awarded when: a) a building has exemplary performance within existing guidelines (all assessment areas have exemplary criteria); and b) an application is made by the project’s assessor for a technology applied, feature, design/construction method or process to be recognized as innovative.
Performance of green versus non-green buildings

Although scholars, certification organizations (USGBC, BREEAM, etc.), and government agencies (e.g. US Environmental Protection Agency, US General Services Administration (GSA), etc.) increasingly provide evidence of the benefits achieved from the embracing of sustainable practices in the built environment, delays in adoption of such practices exist. Three reasons for these delays stand out in several notable research studies.

First, cost and complexity of the process are cited by many managers and owners as their primary reason for not beginning the certification. Marker, Mason, and Morrow (2014) emphasize the top reasons for such delays, which include real and perceived costs, as well as process logistics and paperwork. Depending on the owner’s objectives in owning the building, the large investment in retrofits and the extended payback period may influence the decision. The paperwork and the documentation required for certification are hugely time-consuming and many buildings simply do not have the number of employees necessary to undertake the process, which often requires many months to complete.

Second, as is usually the case in the commercial building marketplace, the location of sustainable buildings within an area often has a significant impact on the decision to seek sustainability certification. For example, Braun and Bienert (2015) argue that commercial green buildings are more likely to be found in prime versus non-prime locations within a Metropolitan Statistical Area (MSA). Dermisi (2014) also found that LEED buildings tend to be located closer to each other by 21%, with differentiation existing between the ratings.

Third, easy and close access to mass transit stations encourages owners and managers to initiate the certification process. Transportation is a key attraction because of its importance in a building’s scoring. In addition to the desirability to tenants and residents of buildings near public transportation, sustainability and transportation are a marketing duo that decreases vacancies.

It is important to note as Fuerst et al. (2012) suggest, that sustainable class A office space is becoming less unique, since it accounted for almost half of the US transactions from 2007 through 2012. The increasing adoption of sustainable practices and certifications is highlighted in a recent survey of more than 1000 participants from 69 countries (Dodge Data, 2016). This survey suggested that commercial construction, which has been the premier adoption sector of green practices, is now closely followed by institutional construction.

The two top drivers of green building worldwide are client demand (increasing to 40% from 35% in 2012), environmental regulations (increasing to 35% from 23% in 2012), while market demand followed (although slightly decreasing to 30% from 33% in 2012). The top social reason for building green was the encouragement of sustainable business practices especially in the US (74%) and UK (72%). Another survey of US executives (Turner, 2015) suggested that the most important reasons for the adoption of green features are financial (energy efficiency, asking rents, ongoing operations and maintenance costs, and occupancy rates) as well as non-financial (occupant wellbeing, indoor air quality, employee productivity) with a five-year or more payback period being acceptable by the majority. The Dodge (2016) survey estimated a payback period for green investments of eight years with a 14% decrease in operating costs over five years and an 8% increase in building value over non-green projects.

Dermisi’s (2013) survey of class A office buildings achieving LEED certification showed an average retrofit cost of $0.21/sf and an average 1.8-year payback period. Aggregation of relevant research on sustainable versus non-sustainable buildings by the World Green Building Council (2013) suggested that the rewards of a sustainable building (asset value, operating efficiencies, workplace productivity, and health as well as risk mitigation) outperform the
assumed costs (including the cost of construction). Key academic studies comparing LEED and non-LEED office buildings identified significant sales and rental premiums, as well as lower operating expenses for LEED buildings. For example, Eichholtz et al. (2013) found a sale premium of 13% and Fuerst and McAllister (2011) 25% for LEED buildings. The World Green Building Council (2013) reports sale price premiums across the various sustainable designations ranging from 0% to 30%, and rent premiums ranging from 0% to 17.3%. Kok et al. (2012) found a rental premium of 7.1%, and Fuerst and McAllister (2011) a 5% premium. Wiley et al. (2010) found a much higher premium of 15–17% and Dermisi (2013) a 30% premium among certified class A buildings, with differentiations existing among certification levels (e.g., Gold 17% and Silver 16.7%). Similar to the results of Reichardt et al. (2012), Devine and Kok’s (2015) analysis of US leases suggested that sustainable buildings achieve 3–4% higher rents with LEED buildings achieving occupancy rates 4% higher compared to non-LEED. Their results also suggest that lease renewal is significantly higher among LEED buildings with rent concessions leading to a smaller reduction of average rent. A more focused study by Dermisi (2013) on class A buildings found that certified buildings achieve 18.8% lower vacancy.

Finally, looking at the differences in operating expenses between sustainable and non-sustainable buildings, Reichardt (2014) finds that LEED buildings command lower operating expenses in contrast to buildings with only the Energy Star label, which experience higher operating expenses. A survey of US General Services Administration (GSA) buildings found a 19% decrease in operating costs for LEED vs non-LEED buildings (GSA, 2011). Dermisi (2013) found that operating expenses decreased on average by 8.09%, while energy costs decreased by 7.02% among class A sustainable buildings. A survey of GSA buildings (GSA, 2011) found energy savings of 25% for LEED buildings, while the World Green Building Council (2013) reports that energy use among LEED buildings can decrease by 25–30%. Energy savings have a direct effect on a building’s budget allowing for the increase of the Net Operating Income (NOI) when significant savings are present. IMT et al. (2015) highlight the effect cost savings have on a building’s value (Table 19.2).

Beyond the direct monetary effects of sustainable buildings, the World Green Building Council (2013) acknowledges the productivity and health benefits to the occupiers, with shorter hospital stays (8.5%), improved mental function and memory (10% to 25%), increased sales (15% to 40%), and higher productivity (18%). Miller et al. (2009) provide some more in-depth evidence of the improved productivity, especially for those who moved to sustainable buildings (either LEED or Energy Star). A survey of focus groups in green office buildings of four major US cities identifies the importance of green attributes over the economic and environmental impact from these attributes (Simons et al., 2014). Additionally, a CBRE survey

Table 19.2 Effect of energy savings on building value per square foot

<table>
<thead>
<tr>
<th>Energy Saved</th>
<th>Savings per square foot</th>
<th>Value per Square foot</th>
</tr>
</thead>
<tbody>
<tr>
<td>Baseline</td>
<td>–</td>
<td>–</td>
</tr>
<tr>
<td>5%</td>
<td>$0.13</td>
<td>$2.38</td>
</tr>
<tr>
<td>10%</td>
<td>$0.25</td>
<td>$4.76</td>
</tr>
<tr>
<td>15%</td>
<td>$0.38</td>
<td>$7.14</td>
</tr>
<tr>
<td>25%</td>
<td>$0.63</td>
<td>$11.90</td>
</tr>
</tbody>
</table>

Notes: Assumptions: Income capitalization approach to value is used and the owner is responsible for utilities. The energy baseline is $3.50/sf/year and the cap rate 5.25%.
found higher employee satisfaction among tenant managers of sustainable buildings, with executives finding it easier to recruit in sustainable versus non-green buildings (CBRE, 2011).

**Sustainable construction costs of green vs non-green**

A critical component of any development is the project’s cost and a key question developers must ask is: Is there a construction premium for sustainable versus non-sustainable labeled buildings? There are a variety of responses to this question. For example, Morris and Matthiessen’s (2007) comparison of green vs non-green construction does not find any significant differences. Aggregated research from various worldwide sustainable designations from 2000-2012 finds cost premiums to be within the −0.4% to 12.5% range, with the highest values experienced for LEED Platinum, BREEAM Excellent or zero carbon projects (World Green Building Council (2013)). The Green Building Council (2013) estimates the cost differentiation between sustainable and non-sustainable construction to the lower end of the previous bracket, between 0–4%, with developers being able to mitigate it even further (e.g. early budget development, construction team with sustainability experience, use of Integrated Design Process (IDP) and economies of scale which have led to product cost decreases caused by both increase of sustainable buildings and embracing of sustainability by building codes). Another study of LEED and BREEAM buildings by CBRE and EMEA (2009) revealed a 2–3% construction premium for a basic certification and building certified at higher levels experiencing a 5–7.5% construction cost increase. A survey of construction and other industry professionals on BREEAM adoption premiums in the UK found that for less than half of the group surveyed the costs incurred were significant, however these costs were viewed by the majority as recoverable through more efficient operation of the building in the long term. The group experienced costs premiums from 1–20% with the median being 7.5% (Parker, 2012). In contrast, Yetunde et al. (2014) suggested that developers invest only a maximum of 2% to achieve a higher BREEAM rating, while lower ratings could be achieved with no or minimal additional cost. The same study finds that even though developers might need to spend more upfront for a higher rating their payback period is 2–5 years based on their energy and water costs.

**Justification of a developer’s pursuit of sustainability**

**Reasons a developer should adopt sustainable practices and/or certification**

The World Green Building Council (2013) provides a visual argument behind the reasons developers and owners pursue sustainable features and certifications for their buildings. Although each group has multiple reasons for such pursuits common reasons among all three are (WGBC, 2013): lower refurbishment costs, corporate image, compliance with legislation and CSR requirements and lower transaction fees. Combining the perspectives of WGBC (2014), Arup (2014), USGBC, the author’s experience, and the opinions of numerous managers and owners, a more comprehensive assessment can be offered on the reasons developers would be interested in adopting sustainability:

- **Legislative requirements**: an increasing number of communities/cities are adopting and mandating higher sustainability standards through their building codes, which creates an alignment with sustainable certifications options.
- **Investor, owner, tenant mission/vision alignment and corporate social responsibility**: In recent years, sustainability has been embraced by real estate and other
corporations as part of their mission statement with a number of them as well as
government agencies mandating sustainable practices. These actions create a prerequisite
for the space they occupy and owners/developers pursuing these tenants will need to
adopt sustainable practices in their buildings to maintain their appeal. Corporations are also
increasingly focusing on corporate social responsibility, with one of the many aspects being
their employee experience in the buildings they occupy in the form of occupant health
and wellbeing benefits. Corporate responsibility is also focusing efforts to decrease
pollution through a sustainable footprint and help in protecting the environment.

• **Building economics**: Adoption of sustainable systems improves the energy and water
consumption of a building, allowing improved performance through the commissioning
process. The use of efficient equipment and an environmentally friendly design allows for
an increase in the equipment life and the continuous building system monitoring coupled
with an expedited identification of failures, leaks, etc.

• **Market dynamics**: Real estate trends highlighted at length earlier suggest that green
properties attain improved vacancies, rents, and sales prices over their comparable non-
sustainable buildings.

• **Financial, permitting, tax and other incentives**: Certain lenders offer loans with more
favorable terms for sustainable construction and renovation due to permitting and other
efficiencies. Correspondingly, an increasing number of communities offer incentives in the
form of zoning exemptions, expedited city approval process for the adoption of sustainable
practices. Additional incentives and rebates are also offered by utility companies/US states
on energy and water efficient equipment or fixtures, in addition to tax benefits.

• **Risk management**: Sustainability ratings require building features that enhance commis-
sioning requirements, establish handover documentation requirements for proper
equipment use and monitoring, decrease reliance on conventional energy use, and
incorporate passive design elements.

• **Effect of millennials**: The millennial generation, which just surpassed the baby boomers
in number, puts a premium on sustainability in their workplace and beyond and is actively
seeking companies which share the same values. For a tenant to attract such a workforce
in a development, they need to be in a sustainable building, which offers open-
collaborative spaces, walkable and appealing internal and external surroundings, close
proximity to mass transit, and even wellness programs.

**Issues a developer should explore before deciding to build a sustainable structure**

Arup (2014) provides a framework for the identification of a primary and secondary sustain-
ability certification systems and ratings. A project may determine which ones to adopt by
answering five questions in advance:

1. Where is the project to be located?
2. What legislative requirements exist in this location?
3. What are the local market dynamics/expectations for new construction?
4. Who are the prospective tenants (names or types) and what requirements have they
   identified for sustainability certification?
5. Who is investing in this building?

Depending on the answers to the questions, the primary system can be then selected by
exploring further answers such as the level of legislative sustainability requirements (e.g. building
codes, etc.), the actual expectations of the owner, tenants and the tangible benefits by the adoption of sustainable practices at a higher versus a lower level of certification. If the assessment of a secondary certification system is required the expectations need to be determined similar to the primary system with an additional emphasis on the cost–benefit analysis of this system.

Beyond the questions offered in the Arup study there are some additional issues a developer needs to explore in advance of making the decision to build a sustainable project:

1. Existence of financial incentives and grants:
   1.1 Tax incentives: tax inducements can take multiple forms such as income tax (e.g. Green Building Tax Credit, Sustainable Building Tax Credit), property tax (e.g. Alternative Energy Improvements), corporate tax (e.g. Energy-efficient commercial business deduction – U.S. Tax code 179D, Business energy investment tax credit – U.S. Tax code 48, Qualified reuse and recycling property – U.S. Tax code 168m, Renewable electricity production credit – U.S. Tax code 45), city tax exemptions.
   1.2 Lower permit fees: communities are increasingly offering incentives such as lower fees (e.g. City of Chicago, Charlotte – Mecklenburg County, North Carolina).
   1.3 Access to financing with better terms (Green community initiative – Seattle).
   1.4 Utility rate reduction: websites such as the Database of State Incentives for Renewables and Efficiency offer information on the various monetary initiatives developers can utilize for a sustainable project.
   1.5 Other monetary initiatives: such as certification fee reimbursement by city are already offered and will in all likelihood expand in the future.

2. Regulatory environment:
   2.1 Building codes: adoption of ASHRAE 90.1 and 189.1 have a significant effect on a project. Cities are increasingly requiring all new public or publicly funded constructions to be LEED certified based on specific square feet or investment size (e.g. Atlanta – ordinance #03-0-1693 and Chicago).
   2.2 Renewable energy permits: certain areas require such installations (e.g. the US Department of Interior – Bureau of Land Management offers a list of resources for Geothermal, Solar and Wind for multiple US states).
   2.3 Bonus density: some communities allow for an increase of the Floor to Area Ratio (FAR) if the building is sustainable (e.g. Chicago building code: 17-4-1015, Seattle).
   2.4 Expedited permitting: certain communities offer a more streamline and expedited issuing of permits if the project is sustainable (e.g. Dallas – Ordinance 27131).

3. True market value of a sustainable project in a specific market:
   3.1 Premium offered in a sustainable project: identification of the value (higher occupancy, rents, etc.) assigned by a market (tenants, buyers) for sustainable versus non-sustainable buildings and assessment of the potential construction cost versus the reward (premium).
   3.2 Green leases: explore if green leases are offered in the area and the ways area tenants participate in the building’s performance and savings (e.g. energy, water use) returns.
   3.3 Insurance costs: explore the difference in insurance costs between sustainable and non-sustainable buildings in the area.

4. Developer’s objective/plans for the property:
   4.1 Development’s objective: how green should the project be? How low should the energy costs, GHG emissions and water use be? Is the developer interested in a building’s life cycle analysis? Is the developer targeting specific users and should the project cater to their needs?
4.2 Holding period: the application of certain sustainable attributes to a building requires longer payback periods and if a developer is interested in a short holding period the costs might overshadow the short-term profit.

4.3 Site and scale: is the developer looking for a site promoting sustainability or the site is already selected and the building needs to be designed sustainably? What is the scale of the building (one or multiple-campus) and current status (new or existing).

Conclusions

Academic and professional research on the reasons behind the adoption of sustainable practices and certifications among office buildings show significant financial (increased rents, lower vacancies, etc.) and non-financial (occupant wellbeing, employee productivity, etc.) benefits for certificated buildings. Construction costs for sustainably certified buildings, however, may have a sizable premium, of up to 12.5%, requiring the developer to carefully assess if a sustainable building will be cost effective. If the answer is “yes” then a decision will need to be made on the type of certification and rating. Developers should be aware of the evidence that sustainability might not be valued (increased rent, occupancy, etc.) everywhere (downtown area versus suburban and other areas) in the same way.

Beyond presenting current information on the benefits of sustainable office buildings, this chapter highlights certain elements a developer needs to assess to determine if such a construction can be cost effective and profitable at a specific site. These elements include the existence of financial incentives, regulatory environment, true market value of a sustainable project in an area, and the developer’s objectives.

Notes

5 John Elkington, www.sustainability.com/history
6 The National Institute of Building Services: www.wbdg.org/design/sustainable.php
9 USGBC, Green Building facts: www.usgbc.org/articles/green-building-facts
11 Green Globes statistics: www.green globes.com/about.asp#history (Canada) and www.thegeb.org/green-globes-certification/ (US)
15 US Federal government sustainable requirements: www.gsa.gov/portal/category/25999
References


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