

Why Energy-Efficient *Commercial* Real Estate Matters

Avis Devine

Commercial real estate, and the built world generally, impacts personal health, economical health, and environmental health. How the various actors interact with commercial real estate and the resulting benefits of those interactions are determined by planning and thoughtful design of commercial real estate. Through the pursuit of the benefits associated with thinking about the “triple bottom line” (Fig. 2.1), owners, occupants, and users of commercial real estate can help protect the environment and future generations while also capturing social and financial benefits.

2.1 CERTIFICATION

Having identified the benefits associated with energy efficient and sustainable commercial real estate, the next question is how to pursue the goal? Many certification programs exist, providing third-party verification of the greening of real estate. However, these programs can be costly, in terms of both money and time. Given this, many owners, operators, and space users ask: why can't I just “green” my building without certifying

A. Devine (✉)

Schulich School, York University, Toronto, ON, Canada

e-mail: devinea@uoguelph.ca

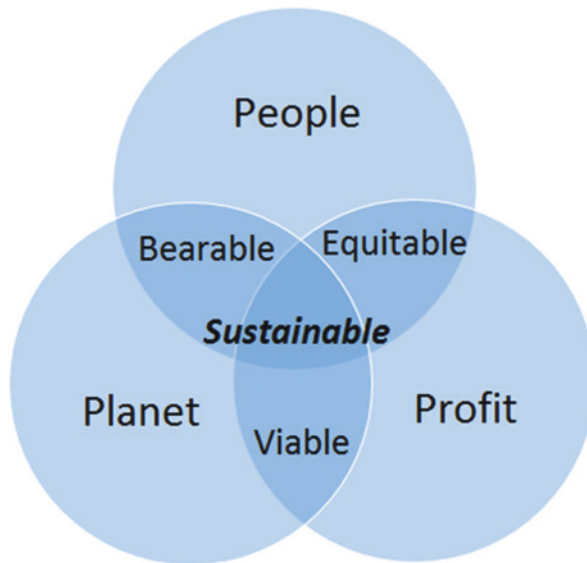


Fig. 2.1 The Venn diagram of the triple bottom line

it? That is, why can't I incorporate the sustainable and energy-efficient building design features and operational practices without seeking costly third-party certification? By skipping the certification process, the product may be brought to market faster and for a decreased expense. This decreased cost and time frame could allow for an increased return. Or, the funds earmarked for certification could instead be utilized to yet further increase the building's efficiency.

The answer is that third-party certification is how an entity communicates a property's energy efficiency to their target audience. It is a signal, allowing for transparent communication of a concept. All forms of certification serve as signals—diplomas, driver's licenses, etc. These are shorthand, widely accepted methods of identifying that someone or something has completed a task or obtained a goal. A driver's license proves to others that the possessor has the capacity to carefully and successfully operate a vehicle. A rental car agency could require that each customer proves their capacity by taking a driving test with an agency employee. However, this would be extremely costly to the agency and the customer. Instead, the agency relies on the signal provided by the

customer's possession of a driver's license as proof that they are capable of operating a vehicle. Possessing an energy-efficiency certification on the commercial real estate in question provides the owner, operator, or space user with that signal, or credible evidence, of the property's energy efficiency. This evidence can then be used to inform a target audience, whether it is the government, a prospective tenant or investor, or a company's customers.

However, not all signals are equal. A firm can attempt to signal a property's energy efficiency to the target audience without third-party certification. One approach is benchmarking a subject property's energy use against market data (if available). Another is for a large firm to create an internal certification system. This self-applied seal of approval is awarded to a subset of the firm's properties based on energy efficiency, often as compared to the firm's total portfolio. This method is subject to sample bias, as all of the properties in the sample are owned by the firm. For example, a firm may identify the top 20% of their properties based on energy efficiency. What is missing is data showing the energy efficiency of a firm's properties compared to the energy efficiency of the remaining properties in the market. What if this firm is definitively lagging the market in the basic energy efficiency? In that scenario, the firm's most energy-efficient properties may be average energy users (not efficient) compared to the other similar properties in the market. Additionally, such internal certification systems are subject to puffery (the act of using positive terms to obtain higher prices) or greenwashing/whitewashing. All of these methods are signals of a property's energy efficiency. However, "self-certification" provides weak signals to the target audience. They are inexpensive (in terms of both time and money) to obtain, but more costly signals [e.g., the Leadership in Energy and Environmental Design (LEED) system] are stronger signals. This is why a graduate degree is viewed as a stronger signal of expertise in a field than a bachelor's degree—the added cost of obtaining the graduate degree (and time involved) strengthens the signal.

2.1.1 Evidence: LEED-Certified Apartments

In a study of the relationship between LEED certification and multi-family apartment rental rates in the USA, Bond and Devine (2015) are able to uniquely identify the difference in rental rate premiums between the strong third-party certification signal and the weaker self-applied

signals. The authors use unit-level data on market rate, privately constructed multifamily rental properties to examine relative rental rates in 2012. After controlling for a variety of unit and building characteristics, local economic conditions, and an area's propensity to support "green" initiatives, results indicate higher rental rates associated with energy efficient and sustainable properties. Findings show that LEED-certified units earn between 7 and 9% higher rents than comparable non-certified properties.

Of particular interest is the rental rate premium experienced by buildings which self-identify as "green." As multifamily properties are directly marketed to the public, the authors are able to collect data on each unit regarding if it is positioned as being "green" despite not having a third-party certification (LEED or otherwise). A direct comparison is made between LEED-certified units (strong signal), self-identified "green" units (weak signal), and traditional, non-green units (no signal). The findings indicate that while both the strong and weak signals are associated with higher rental rates than the non-green (signal-less) units, the units with the strong signal experience double the rental rate premium of the units with the weak signal. That is, the average rental rate premium of LEED-certified (strong signal) units is 9.1%, while the premium for the weak signal is 4.7%. These findings, which are all highly statistically and practically significant, support the concept that a costly signal is a stronger signal and that energy efficient and sustainable real estate certification programs can be an effective signal for commercial real estate owners, operators, and space users to consider.

2.2 CERTIFICATION PROGRAMS

If a property owner, operator, or space user wishes to effectively communicate the energy efficiency of the property to a target audience, they should invest in a strong signal, such as third-party certification. Once this decision has been made, the next step is selecting a certification program. There are hundreds of energy efficiency and sustainability certification programs for real estate around the world. While many can be eliminated based on geographic limitations and real estate focus (residential versus commercial, etc.), there are still several options from which to choose. Following is a summary of the two largest and best-known certification programs in the world. Information is also provided on a few other well-known energy-efficiency-specific and asset/class-specific

programs. For more information on energy-efficient certification programs, see Chap. 4: Energy Efficiency and Green Building Assessment.

2.3 LEED¹

The LEED is the most widely used energy efficiency and sustainability certification program in the world, certifying over 1.85 million square feet of space every day. The program was piloted by the US Green Building Council (USGBC) in 1998 as a single standard, applicable to any type of real estate. Now, in its fourth complete version, the program offers five rating systems with specialized guidelines for 14 different asset classes and/or real estate phases (planning, design and construction, and operations). Using a points system, properties are certifiable at four levels: Certified (40–49 points); Silver (50–59 points); Gold (60–79 points); and Platinum (80+ points). Certification relies on documentation (not testing) and, with the exception of LEED:O+M, certification is perpetual. LEED:O+M certification is valid for 5 years at a time.

2.4 BREEAM²

In 1990, the Building Research Establishment (BRE) established the environmental assessment method (EAM), making BREEAM the world's longest-established building sustainability assessment, rating, and certification program. BREEAM has great market penetration in Europe, capturing in excess of 80% of the market share of green building certification, making the BREEAM brand the well-known leader for that continent. The method is applicable to any format of the built environment, and the certification process involves independent, licensed assessors evaluating procurement, design, construction, and operations against performance benchmarks. These aspects are evaluated using ten categories, with certification awarded on five levels (Pass, Good, Very Good, Excellent, and Outstanding). Approximately 75% of new construction commercial buildings in the UK would meet the BREEAM Pass requirements, while less than 1% of the same group would clear the outstanding certification hurdle.

There are four primary technical standards under which communities, infrastructure, and buildings may seek certification. However, for any building not fitting into one of those four categories, certification may be pursued under the BREEAM Bespoke method. This program

allows for buildings to be assessed according to property-specific and appropriate criteria. Of the four technical standards, three are design or construction related and the fourth, In-Use, assesses operations. In-Use certification has a slightly modified rating structure, including an additional category of Acceptable, and In-Use certification must be revalidated annually.

2.5 GREEN STAR³

The Green Building Council of Australia (GBCA) launched GreenStar in 2003. Since then, the program remains the dominant green building certification program for the country and Australia's only national, voluntary rating system for buildings and communities. Green Star offers four certification programs: Design and As Built; Interiors; Communities; and Performance. Ratings scale from one to six stars for performance and four to six stars for the other three programs. Buildings earn credit toward certification in the categories of management, indoor environment quality, energy, transport, water, materials, land use and ecology, emissions, and innovation, while communities earn credit in the categories of governance, design, livability, economic prosperity, environment, and innovation.

2.6 ENERGY STAR⁴

In 1992, the US Environmental Protection Agency (EPA) created Energy Star to provide a third-party certification program for energy efficiency in commercial and industrial buildings (in addition to a separate program geared toward homes). While not all property types are eligible for certification, more than 20 categories of properties are now included in the program. Through an online tool, the program rates the energy efficiency of a property on a scale of 1–100, and properties rating 75 or higher are eligible to apply for Energy Star certification, subject to third-party verification. Recertification must be sought annually. The Energy Star program is incorporated into several other green building certification programs, including LEED and Green Globes, and is an item of consideration in the ranking of green building lists by Travelocity, CoStar, Honest Buildings, AAA Tour Book, and several others.

2.7 GREENING IN THE BLACK (ENERGY EFFICIENCY MUST MAKE FINANCIAL SENSE)

While the benefits to society and the environment of energy-efficiency measures are clear, a company will be unable or unwilling to pursue them without it making sense to their firm. There are a variety of forces driving the growth of the green building market, and Fig. 2.2 highlights the seven most commonly cited reasons (McGraw-Hill Construction 2011). Many of these reasons translate to supply and demand features, including direct observation of the increased demand for green buildings, the observation of the increased prominence of green building projects, and the benefits to the health of those using the space. All of these categories reflect the push from the market for more green buildings. Additionally, there are several benefits to the owners and operators of green buildings, including increased cost savings and property values, and decreased vacancy rates. Lastly, the list notes the role of policy, as it incentivizes and requires green building. The former policy provides a financial benefit to the developer and/or owner.

These observations of increasing demand and supply of green buildings are accurate. In 2005, only 2% of non-residential building starts were green buildings—a number that increased to 44% by 2012 and is expected to surpass 50% of the market in new non-residential structures

Strong Market Demand

High cost savings for business and tax payers

Public health gains from green buildings

Steady gains in the percentage of large, non-residential commercial or institutional projects that are green

Federal, state, and municipal mandates and policies

Increased property values

Lower rental vacancy rates for LEED-certified buildings

Fig. 2.2 The list of the seven most commonly cited reasons for green building market growth (McGraw-Hill Construction 2011)

in 2016 (McCook 2013). Total green non-residential construction is estimated to exceed total in excess of \$120 billion, representing a notable economic opportunity to firms that elect to pursue green building (McGraw-Hill Construction 2011).

In addition to new construction, opportunities exist to enhance the efficiency of existing buildings. The market for green retrofits is estimated to be near \$1 trillion between 2015 and 2023 (Clancy 2014). Firms that have completed such retrofits report decreased operating expenses (down 9% in 1 year and down 13% over 5 years) and increased expected asset values (McGraw-Hill Construction 2011).

2.8 CORPORATE IMAGE BENEFITS

Direct financial benefits from efficiency are not the only economic benefit of sustainable and energy-efficient commercial real estate. There is also the importance of the firm's association with energy efficiency and sustainable investment. Decisions to invest in green commercial real estate may be done to please a variety of stakeholders, including the tenants, customers, management, and investors.

Through association with third-party-certified green real estate, companies can communicate their commitment to energy efficiency to their stakeholders. Research reveals government organizations and mining and construction companies are more likely to rent green office space (Eichholtz et al. 2016). The government users are unsurprising—governments utilize a variety of techniques to encourage environmentally sensitive real estate use. This can be accomplished through government policies that impact private construction, offering incentives for green building, or requiring that properties meet certain energy-efficiency thresholds in order to pass inspection.

However, governments can also encourage environmentally sensitive real estate through their own investment activities. By mandating government entities may operate only in buildings that are environmentally certified, government can encourage the adoption of energy-efficient buildings. The mining and construction industry result is interesting and dovetails with another finding: the industry with the fourth highest percent of green space utilization is crude petroleum and gas. That is, the firms that profit from fossil fuels and their higher use are heavy users of real estate that specifically uses *fewer* fossil fuels. The fact that mining and petroleum firms heavily utilize energy-efficient space highlights the

use of green space as a signal of corporate environmental responsibility to their stakeholders, because it is otherwise in direct contrast to these firms' income sources.

2.8.1 *Evidence: Fortune 200 Firms Utilize LEED*

A 2015 USGBC survey of one-quarter of the Fortune 200 companies indicates that leading companies value the importance of green building certification, both for its associated financial benefits and for its role in stakeholder relations (Long 2015). Of the firms surveyed, 93% use LEED programs and 82% intend to use the program in the next three year's construction and retrofit projects. Of those that use the LEED program, 70% do so to save money through energy efficiency and 60% believe it positively impacts their return on investment. With respect to corporate image and green buildings, four out of five of these firms believe that using this certification program is an important and effective way of communicating their sustainability efforts to their stakeholders.

2.9 APPEASING CUSTOMERS

Also of particular interest to firms is communicating their commitment to environmental sustainability with their customers. Much research in the marketing and consumer behavior fields has been dedicated to understanding the environmentally motivated consumer, and how economic, demographic, and personal value measures impact their purchase decisions (Schlegelmilch et al. 1996; Shrum et al. 1995; Mazar and Zhong 2010). There is evidence of a relationship between product demand growth and environmentally products (Chen 2001; Crane 2001). Consumers consider not only prices and quality but also their personal values and beliefs (Caruana 2007; Irwin and Baron 2001), and they express this through consumption of environmentally sensitive products (Anderson and Cunningham 1972; Kinnear et al. 1974).

The literature has substantiated the relationship between environmental certification and consumer decisions, and between environmentally certified commercial real estate and its operation (see Sect. 2.11 for more information). However, this raises the question of a tenant's willingness or ability to pay higher rents in a building simply because it is environmentally certified. While decreased energy costs may be passed along to the tenant (or may be retained by the owner), there is no evidence that

the energy savings completely offset the rental rate premiums. Therefore, the tenants truly are paying a rent premium for situation in a green building. How is that premium being justified in the tenant's business plan? Is there evidence that consumers' incorporation of environmental certifications into their purchasing decisions results in a business benefit to the space user of the green building? Figure 2.3 describes this set of relationships.

Devine and Chang (Working Paper 2016) examine the benefits of sustainable and energy-efficient-certified buildings to the retail businesses that operate within them. By utilizing data on retail bank branch deposits, the authors find that LEED-certified bank branches have a higher probability of above average deposit growth than non-certified branches, and experience above average deposit growth. In an event study analysis, these findings persist both during 1 year prior to certification (based on the announcement of the LEED certification being pursued) and for 1 or 2 years after the event. Energy star-certified branches are also associated with above-average deposit growth, but the magnitude of the results is nominal, and the results are not as statistically strong.

There has also been work on one specific aspect of energy efficiency and its impact on retail sales: daylighting. By introducing skylights into

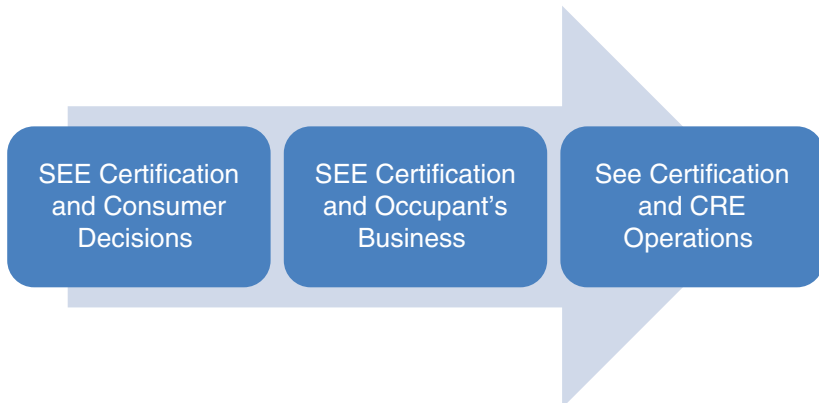


Fig. 2.3 A description of the relationship between consumers, businesses, and real estate owners as it relates to a willingness and ability to support rental rate premiums in environmentally-certified real estate (Chang and Devine 2016)

retail outlets that are traditionally lit through artificial means, the business garners a two-fold benefit: increased retail sales and decreased lighting-related utility costs. A study was completed on 73 retail chain store outlets in California in which 24 stores became daylight illuminated, while the others continued to operate under artificial light. There was a 40% increase in gross sales of the day lit store after the skylight installation, and the energy savings associated with the daylight ranged from \$0.24 to \$0.66 per square foot (Heschong Mahone Group 1999).

2.10 TALENT PRODUCTIVITY, ATTRACTION, AND RETENTION

For an average company, more than 90% of its operating costs are tied to human resources, with only 9 and 1% linked to rent and utility expenses, respectively (Terrapin Bright Green, LLC 2014). Because of this, changes in the built environment that increase worker productivity and happiness can lead to substantial financial implications for a firm. Research has found that LEED-certified buildings experience worker productivity increases associated with: daylight (18%); better lighting (23%); better ventilation (11%); and individual temperature control (3%) (World Green Building Council 2013).

As the millennial generation begins to advance in the workforce, attracting and retaining their skilled talent become more important. Studies find that this generation wants evidence that their employer is environmentally compliant. A survey of office workers aged 18–25 and 26–35 found that 96 and 98%, respectively, want to work in a greener office. Additionally, survey responses revealed desire for resource efficiency in many categories, as highlighted in Fig. 2.4 (Puybaraud 2010). While environmentally sensitive corporate values do not outrank the importance of job-specific details in most cases, situating in a green building and operating their space in an energy-efficient manner may provide a company with the marginal benefit needed to capture the attention of a prospective employee.

Finally, employee turnover can cost a company between 1- and 2-year salaries in total, so finding ways to retain good employees is critical (Fitz-enz 1997). The Colliers International 2012 Office Tenant Survey found that 95% of office tenants were interested in occupying a green building. This was up from 75% of respondents in 2010 (Green Building Council Australia 2013). Employees benefit from the improved efficiency

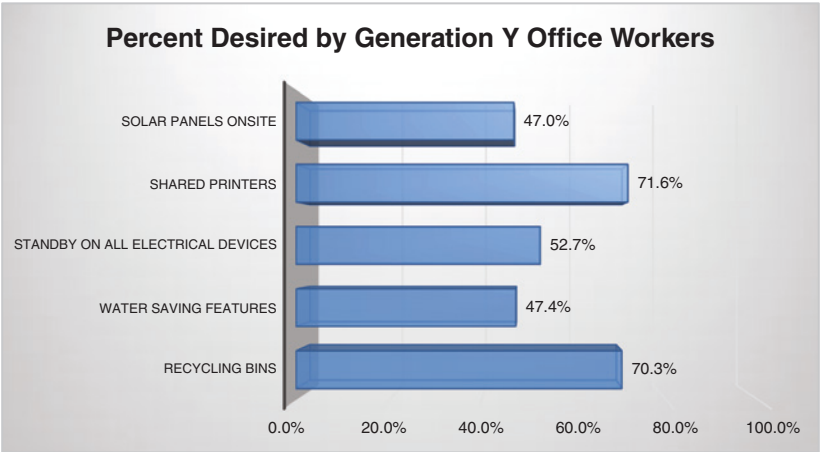


Fig. 2.4 The summary of the percent of Generation Y office workers that specified their desire for the indicated energy-efficiency features in their work environment (Puybaraud 2010)

and healthfulness of the green building, and they too benefit from the corporate image—they can say that they work in an environmentally sensitive space.

2.11 RESEARCH FINDINGS

While the benefits to society, the space users, and the environment are clear, a real estate owner or developer will be unlikely or unwilling to pursue them without it being financially viable. Much research has been completed addressing this point at various stages of the real estate process. The following section will examine research findings regarding the financial implications to commercial real estate investors across the different stages of the real estate lifecycle, from development and construction, through operation and disposition.

2.12 CONSTRUCTION

The financial concern regarding sustainable or energy-efficient commercial real estate construction is simple: If there is a marginal financial benefit to operating environmentally sensitive space, does that benefit exceed

any marginal cost to construct a building to those specifications? The answer to this question is yes, because now, it is possible to construct a sustainable and/or energy-efficient building with little to no additional cost. This answer comes as a surprise to many; based on a compilation of design-stage cost estimates and surveys, the perceived cost premium for green real estate construction (all construction types) is between 0.9 and 29%. However, based on factual cost analyses, the actual cost premiums for all construction types scale from 0.4% savings to a 12.5% green cost premium (World Green Building Council 2013).

There has been a substantial amount of research into the added costs of constructing green buildings of all types, under a variety of certification programs, and obtaining certification at a variety of levels. The largest identified *commercial* real estate-related construction cost premiums are approximately 10% and all earned for properties garnering the highest level of certification under their specific program (LEED Platinum, BREEAM Outstanding, and Green Star five and six stars). The majority of research finds construction cost premiums ranging from 0 to 8%, with most commercial real estate findings in the 0–3% range (World Green Building Council 2013). Miller et al. (2008) find that the LEED construction cost premium is 3% for minimum certification and an additional 2.5% for Silver certification, and Kats (2010) examines 150 green-certified buildings across 11 countries and finds green buildings cost approximately 2% more to construct than their traditionally constructed counterparts.

Two recent works address the question of construction cost differences and BREEAM certification. Chegut et al. (2015, Working Paper) found the cost to construct a BREEAM-certified office building in the UK to be effectively the same as the cost associated with the traditional construction techniques, but did find design fees higher relative to the traditional construction. Other research into the added capital cost to certify an office building under the BREEAM program found no added costs for a Pass or Good rating and less than 1% added cost for Very Good and Excellent ratings (Abdul 2013). This nominal added cost is estimated to be paid back through utility cost savings within 2–5 years. Also of note in this study was the comparison of added costs over the progressing versions of the BREEAM program. For instance, to achieve an Excellent rating under the 2004 BREEAM rating scheme, added costs ranged from 0.1 to 5.7%. This range decreased to 0.8–1.71% by the 2011 iteration of the rating scheme. This provides evidence that as time passes, the construction cost premium decreases.

A similar gradual reduction in the construction cost premium associated with LEED certification over a 10-year period is described in the World Green Building Council's report (2013). This decrease in cost may be due to a few key factors. First, as building codes become more stringent and environmentally sensitive buildings become more popular, the technology required for such energy-efficient improvements becomes commercially available to the masses and decreases in price. Second, one way to prevent unnecessary added costs during building construction is to incorporate the green features from the beginning of the design process. This prevents costly modifications and value engineering mid-process.

2.13 EVIDENCE: LEED-CERTIFIED PNC BANK BRANCH CONSTRUCTION

PNC Bank has been constructing Energy Star and LEED-certified bank branches for over 5 years and has been very open about the associated benefits experienced through construction, operation, and employee satisfaction and productivity. Since launching this construction program and streamlining it, PNC has constructed over 250 green bank branches and is now focused on constructing net zero branches (buildings which create as much energy as they use on an annual basis). The firm estimates their LEED-certified branches cost \$100,000 less to construct and are built 1 month faster than comparable traditionally constructed branches. In addition to these construction-related benefits, these branches use one-third less energy and water, divert 80% of their waste from landfills, and experience 50% higher employee satisfaction (USGBC 2010).

2.14 RENTAL RATE, OCCUPANCY RATE, AND ASSET VALUE

This is the area in which the majority of related research has been completed. Numerous studies have examined the relationship between sustainable and energy-efficient building certification and rental rates, occupancy rates, and asset values, with most finding premiums for some certification schemes. The concept behind these premiums relates back to the corporate benefits experienced by tenants of green buildings. Tenants are willing to pay a premium rental rate for space in buildings which provide the green features they seek, and the impact of many tenants desiring such space leads to higher occupancy rates as well. These

two facts, assuming that operation costs are constant, will lead to greater net operating income and, therefore, higher asset value (assuming capitalization rates are held constant).

Early findings by Nelson (2007) and Miller et al. (2008) examine CoStar data on office buildings in the US and find higher occupancy and rental rates and evidence of sales' price premiums, respectively. This research was further developed in the coming years through several bodies of work. Eichholtz et al. (2010) use actual rent data (corrected for occupancy levels) and nearest neighbor matching to compare LEED and Energy Star-certified buildings to traditionally constructed buildings. Findings indicate that Energy Star-certified buildings rent for approximately 3% more per square foot. This translates into a 7% higher effective rent and, based on then-prevailing capitalization rates of 6%, an added \$5.5–\$5.7 million in value (a 19% premium) for the energy-efficient office buildings. The authors updated this research 3 years later, verifying that the premiums still exist, despite the volatility of the real estate market and the added supply of green buildings (Eichholtz et al. 2013). Similar findings are corroborated in Wiley et al. (2010) and Fuerst and McAllister (2011a, b).

A variety of additional dynamics have been added to this type of analysis as well. Fuerst and McAllister (2011a, b) show that dual-certified office buildings experience added rent and asset value premiums, and Holtermans and Kok (2016, Working Paper) indicate that while green rents may be associated with a premium, green rent growth is not. Two European analyses also add unique information to the field. First, the analysis of Dutch office space showed that poor-energy-efficiency buildings (rated D or lower) rent at 6.5% below the market rental rates experienced by more energy-efficient buildings (rated A, B, or C) (Kok and Jennen 2012). Second, Chegut et al.'s (2014) study of BREEAM-certified office buildings in London indicates that, while the certified buildings do experience the previously highlighted benefits, the marginal benefit decreases as the green building supply increases. Finally, Devine and Kok (2015) verify the rental and occupancy rate premium findings, but also find that environmentally labeled buildings pay out less in rent concessions. Average rent concessions for their Canadian subsample were 11% for traditionally constructed buildings and 7% for green-certified buildings, respectively. This indicates a greater rent capture rate for green buildings.

All of this taken together indicates that there is a rental rate, occupancy rate, and asset value premium associated with energy efficient

and sustainably certified buildings. Limitations to this analysis include the body of research's overwhelming focus on office buildings and on the US market. Multifamily rental rate premiums have also been found (Bond and Devine 2015) and are described in the Evidence: LEED-Certified Apartments section above. However, data limitations have made it difficult to examine evidence for similar findings in other commercial real estate asset classes. Additionally, many of these studies find that the premiums associated with Energy Star-certified properties are smaller than those associated with LEED-certified properties. Lastly, there is evidence that these premiums may shrink as more of the market becomes green certified. As this happens (i.e., as "green becomes the market standard), results may shift from premiums over market rates for green buildings.

2.15 OPERATIONS

At the root of the green building concept lies the goal to decrease resource usage and greenhouse gas emissions. Because of this, the direct benefit of energy-efficient commercial real estate is a decreased level of energy use. Several studies have approached this key issue, beginning with a report on California LEED-certified commercial buildings (Kats 2003). This study found that the LEED-certified buildings were up to 35% more energy efficient than their traditionally constructed counterparts. The higher the certification level achieved (Certified, Silver, and Gold were examined), the greater the energy efficiency experienced.

In 2009, a set of analyses emerged using the same database, the Commercial Building Energy Consumption Survey. The first study (Newsham et al. 2009) compared 100 LEED-certified buildings to similar traditionally constructed buildings and found that the LEED buildings used between 18 and 39% less energy per square foot. However, they also found that approximately one-third of LEED buildings used more energy than their comparable buildings, likely due to the high-tech nature of the green buildings. The second study (Scofield 2009) questioned the former study's findings, as it did not account for both site and source energy.⁵ After incorporating that into the analysis, and measuring area-weighted energy use intensities (which captures the characteristic energy-use differences between large and small buildings), Scofield found no difference in the amount of energy consumed by LEED and traditionally constructed buildings. The author recently completed a similar

study of New York City LEED-certified office buildings examining the impact of different levels of LEED certification and found that while LEED Gold buildings used 20% less energy, LEED Silver and Certified buildings actually used more energy (Scofield 2013).

Focusing on retail space, Kahn and Kok (2014) examined all Wal-Mart stores in California and finds that newer stores (with more advanced energy-efficient technology) utilize significantly less electricity than comparable older stores. They also find no difference in energy usage associated with whether a retail space is rented or owned. This provides an interesting offset to Kahn et al.'s (2014) findings that higher quality, newer commercial buildings (studying office, flex, industrial, and retail buildings in California) use more energy. The authors indicate that these more advanced buildings allow for more discrete ambient comfort control (setting the temperature by area rather than for a full floor), but that meeting such demands requires more electricity to operate the associated advanced equipment.

Other studies further develop these findings. Kats (2010) extended his original study to 150 green buildings across 11 countries and found that these buildings experience a one-third reduction in energy use. Additionally, these buildings are associated with a nearly 40% decrease in water consumption. A study of New Zealand of environmentally labeled buildings found energy savings of one-third to one-half as compared to traditionally constructed buildings (Fullbrook et al. 2006). Finally, Devine and Kok's (2015) examination of US and Canadian office buildings found a positive relationship between BOMA BEST certification (a Canadian green certification program evaluating operations) and improved energy efficiency and that LEED core and shell-certified buildings in the USA use notably less power than both non-certified properties and those certified under other LEED programs and the Energy Star program.

2.16 INDIRECT OPERATIONAL BENEFITS

While power usage may be the first aspect of operations to come to mind when considering energy-efficient buildings, it is not the only way environmentally sensitive building operations can impact commercial real estate. Devine and Kok (2015) examined the broader operational benefits of environmentally labeled office buildings in the USA and Canada. Findings show that green buildings have more satisfied tenants and that

tenants in green buildings have a higher probability of re-leasing their space. These two results are related (as happy tenants would want to stay in their space) and point to a less-obvious operational benefit of green buildings: stickier tenants mean decreased “re-tenanting” costs. When a tenant vacates their space, the building must cover costs related to “resetting” the space with tenant improvements (TI) to make it rentable again, marketing the space, and leasing the space. This includes many expenses related to brokerage fees, legal fees, and likely below-market rents at the beginning of the new lease, in the form of rent concessions offered to entice the new tenant. In addition, it means no income associated with that space during its interim vacancy. All of this taken together can be a substantial cost, and one which is decreased in green buildings, because the tenants turnover less frequently and have relatively lower concessions.

2.17 EXISTING BUILDINGS

New construction represents only 2% of the US building stock, and 86% of building construction expenditures is associated with renovation of existing buildings. In 2008, the American Society of Heating, Refrigerating, and Air-conditioning Engineers (ASHRAE) estimated that 150 billion square feet of existing buildings—half the US building stock—will need to be renovated (Holness 2008). Taken together, it is clear that the place to make the greatest impact in energy-efficiency improvements is in the modification of the existing building stock.

Given the relative newness of environmental certification programs tailored to existing buildings, and the greater difficulty in measuring both the financial commitment to and financial output from making an existing building more energy efficient, there has been limited research on this topic. Holtermans and Kok (2016, Working Paper) evaluate the 30 largest markets in the USA and find that environmentally certified office space has increased from 5.7% in 2005 to nearly 40% in 2014. Regression results indicate that US office buildings certified under the LEED Existing Buildings Operations and Management (EB:OM) program do not experience statistically significant effective rental rate premiums, but do sell at higher prices.

In 2008, the Leonardo Academy completed survey analysis of 23 LEED EB:OM property owners and managers (Leonardo Academy Inc. 2009). Findings indicate implementation and certification cost

between \$0.02 and \$5.01 per square foot, with an average of \$1.58 per square foot. The cost was not correlated with the level of certification achieved (instead, it is believed that the level of certification achieved is more heavily impacted by the pre-renovation condition of the building). The survey results also indicated that of the 14 prerequisites for LEED Existing Buildings certification, all but four were consistently rated as low cost or no cost to implement. Finally, the authors compared the operating costs of LEED existing building-certified properties to industry standards and found that the total expenses per square foot were lower. While this provides a limited amount of evidence in support of the certification program, the evidence is compelling and the logic behind needed improvements to the existing built world is intuitive. This is an area that needs to be a priority for building owners and operators in the future.

2.18 REITs AND OTHER REAL ESTATE HOLDING COMPANIES

If energy efficiency in commercial real estate impacts the profitability of a property, then it may not only impact direct property owners, but also those that own property indirectly through (REITs) real estate investment trusts and other real estate holding companies. There is extensive research into the impact of corporate social responsibility (CSR) policies on firm performance. Margolis et al. (2009, Working Paper) provide a meta-analysis of the research completed on this topic between 1972 and 2007, finding a non-significant relationship between CSR and firm performance in the majority of cases (59%). There is a positive correlation between the two in approximately one-quarter of the analyses and very few findings that support a negative correction (2%). Given the recently changing attitudes of society regarding the environment, this analysis may not tell the full story. A more recent study finds that firms which voluntarily adopt sustainability policies achieve above average stock market returns and stronger accounting metrics (Eccles et al. 2014).

REIT managers have taken notice of the CSR benefits to firm performance and are identifying how to best incorporate CSR into a property-holding firm model. Pivo (2008) surveyed REIT managers and found that while most firms identified their sustainability efforts as exceeding compliance levels, they were primarily concerned with the impact of environmentally sensitive real estate decisions on the firm's financial

outcomes. This desire to pursue green real estate for risk and return-related reasons, more than social and moral ones, highlights the importance of energy-efficient commercial real estate providing a financial benefit in order to be widely adopted (see the Greening in the Black section of this chapter). A study by Eichholtz et al. (2014, Working Paper) examines the question of who (based on CEO characteristics) is investing in environmentally labeled commercial real estate. Findings indicate that Democrat-affiliated CEOs are more likely to invest in Energy Star-certified properties, while LEED certification is sought more frequently by Republican-leaning CEOs. The existing literature finds Democrat CEOs more socially minded (Hong and Kostovetsky 2012), while Republican CEOs are more concerned with mitigating risk (Hutton et al. 2014), which provides interesting parallels to the Eichholtz et al. (2014, Working Paper) findings. Additionally, the authors find that more experienced managers are more likely to invest in environmentally labeled real estate.

There are only a few papers that have evaluated the financial impact of sustainability and energy efficiency on REIT performance. The earliest findings were provided by Eichholtz et al. (2012) in a study of US REIT investments. By analyzing REITs based on their portfolio greenness (a measure of the percent of the portfolio that is certified under LEED or Energy Star), the authors determined that environmentally sensitive portfolios experienced superior operating performance and lower systemic risk. Green REITs had higher returns on assets, higher returns on equity, and superior ratios of funds from operations to total revenue. There was no evidence of abnormal return, indicating that this information is already priced into the stock prices, but these REITs had lower market betas. A similar study of Singaporean REITs yielded mixed results (Ho et al. 2013), and a third study found green initiatives in US REITs associated with higher firm value, greater return on assets, and superior stock performance (Sah et al. 2012). Most recently, Fuerst (2015, Working Paper) completed an analysis of the relationship between an REIT's Global Real Estate Sustainability Benchmark (GRESB) score and its operating performance. Results indicate that a higher GRESB score is associated with superior operational performance and decreased risk exposure and volatility. Perhaps, most importantly, this research identified tremendous room for financial improvement in the REITs of North America, Europe, and Asia, given greater efforts to comprehensively invest in sustainable and energy-efficient commercial real estate.

In addition to evidence regarding benefits of environmentally certified commercial real estate and firm performance, there are also two papers which examine debt benefits. The first examines US REITs and finds that those invested in green buildings receive lower spread on their commercial real estate mortgages (35–36 basis points lower than average), as well as lower spreads associated with their bond issuances and trades of their debt on the secondary market (Eichholtz et al. 2015, Working Paper). The second paper examines the default risk associated with CMBS mortgages and finds that mortgages on properties situated near fixed transit stations (a measure of walkability), those with higher Walk Scores, and those certified under the Energy Star program are all associated with below average default risk (An and Pivo 2015, Working Paper). The findings regarding superior operating performance, lower systemic risk, superior cost of capital, and decreased default risk all support findings similar to those described at the property level: sustainable and energy-efficient buildings are associated with decreased variance.

2.19 EVIDENCE: GRESB

A 2011 article outlined a global survey tool for real property portfolios which would measure the environmental performance of listed property companies and private property funds (Bauer et al. 2011). Once scored, these real estate firms may be compared and evaluated, both cross sectionally and over time, allowing transparency and consistent measurement of real estate firms' sustainability and energy efficiency. This survey is known as the Global Real Estate Sustainability Benchmark, or GRESB, and since its origination in 2009, has grown to include benchmarking on over 200 member firms.

The organization's goal is to provide real estate investors and owners with the insight into environmental, social, and governance issues needed to manage and monitor commercial real estate sustainability performance at a portfolio level. Participation in the GRESB survey has become a "best practices" tool for leading real estate firms worldwide, allowing firms to evaluate themselves both against their track record and against their competitors. One of the key benefits of GRESB is that the survey results allow for worldwide comparison of private equity funds, pension funds, and both public and private real estate companies. Encouraging this transparency and benchmarking not only encourages firms to improve their own performance, but also helps advance

developments in sustainable and energy-efficient real estate. As of 2015, the GRESB survey received responses from over 700 firms (170 listed, 537 private) across six continents, representing 61,000 total assets valued at \$2.3 trillion.⁶

2.20 CONCLUSION: MITIGATING RISK AND INCREASING RETURN

This chapter began by explaining why commercial real estate is key in the shaping of society and in the health of the planet. Through the pursuit of the triple bottom line (Fig. 2.1), owners, occupants, and users of commercial real estate can help protect the environment and future generations while also capturing financial benefits. Pursuit of environmentally sensitive commercial real estate can take many forms, including sustainable and/or energy-efficient design, construction, and operations. Certification programs, such as LEED, Energy Star, BREEAM, Green Star, and hundreds of others, provide third-party evidence of those actions, signaling the environmentally sensitive nature of a building's design or operations to outside observers.

Such certifications are associated with a variety of benefits. First, there are the corporate benefits. Firms associated with environmentally certified buildings may experience corporate image benefits. By affiliating with third-party-certified green real estate, companies communicate their commitment to the environment to their stakeholders. As customers of all types, both business-to-business and business-to-consumer, begin to demand greater environmental sensitivity from the companies they support, third-party verification of green initiatives becomes imperative. Additionally, corporate image benefits do not help relations with only external parties, but with internal parties as well. Employees are now valuing an environmentally sensitive employer and workplace in their job decisions. In addition to employee's desire to work in a green building, green buildings are associated with more productive workers and with greater employee retention. Given the large cost associated with employee turnover, retaining good talent is key in a firm's success, particularly after having attracted and maximized the productivity of a high-quality employee in conjunction with a green building investment.

Second, there are the real estate-related benefits. Despite the benefits to society and the environment, a commercial real estate owner or

investor is unlikely to pursue energy-efficiency strategies unless it also makes financial sense in the ownership and operation of the property. Given this, extensive research has been conducted to examine the relationship between energy efficiency and commercial real estate construction and operations.

The long-held question regarding energy-efficient real estate construction is how much more it costs to build as compared to a traditionally constructed building. Findings indicate that while the perceived added cost is substantial, the actual cost is nominal and shrinking. As energy-efficient technology becomes widely commercially available, its price begins to fall. Additionally, when plans to pursue energy efficiency are incorporated from the beginning of the design stage, there are no added construction costs, with the only remaining additional costs being related to design fees. Evidence from the industry supports this, and also suggests accelerated construction schedules.

Once construction is complete, buildings have other opportunities to capitalize on energy efficiency, both in the income and in the expense side of operations. Benefits associated with building income are captured in rental rates, occupancy rates, and their impact on asset value. The majority of research on environmentally certified buildings to date has been completed in this field, examining the impacts of energy efficiency on income. Given the aforementioned business benefits to a corporation occupying the environmentally certified space, it is reasonable to expect a tenant to pay a premium to situate within an environmentally certified building. Research findings support this hypothesis, with extensive work across many countries providing evidence of both rental rate and occupancy rate premiums for energy-efficient buildings, and decreased rent concessions paid to tenants of environmentally certified buildings. Related research finds that while green buildings have rental and occupancy rate premiums, those rates do not increase at an above-market pace, and that as the supply of green buildings grows the marginal benefit of certification decreases. Results also show that green buildings have higher asset values, a natural finding given higher rental and occupancy rates and little reason to expect higher operating expenses or greater risk.

In fact, the natural assumption is to expect decreased natural resources use in environmentally certified commercial real estate. This is often true, with research finding energy and water savings associated with energy-efficient buildings. However, many environmentally certified buildings are “smart” buildings, using advanced technology to operate the

building as efficiently as possible. This advancement is associated with lower operating variance and, therefore, risk. But this notable level of technology is also associated with higher levels of energy use. Other indirect operational benefits that lead to decreased operating variance include more satisfied tenants and a higher propensity of tenants to re-lease their space.

We also consider questions of energy efficiency in existing (not just newly constructed) buildings, and to how and if these benefits filter through from individual building operations to corporate owners, particularly in listed real estate companies. Evidence indicates the importance of understanding the unique aspects of both these categories as well, and that impacts for all types of operations and ownership scenarios are associated with cost savings, increased income levels, and decreased risk levels, all of which may translate to greater financial returns.

Throughout this chapter, we have discussed ways in which energy-efficient commercial real estate can improve returns to both property owners and the space users. We have also touched on ways green buildings decrease risk exposure, particularly through decreasing the variability to operating costs. While the majority of this commercial real estate research has been completed on office buildings due to the availability of data, a few studies branch out into multifamily, retail, industrial, and flex buildings as well. Taken together, this young literature tells a compelling story about the importance of energy-efficient buildings in shaping the health of future societies and the environment, truly supporting the goal of sustainability: to meet the needs of today without sacrificing the well-being of tomorrow.

NOTES

1. Information taken from www.usgbc.org/leed unless otherwise noted.
2. Information taken from <http://www.breeam.com> unless otherwise noted.
3. Information taken from <http://www.gbca.org.au> unless otherwise noted.
4. Information taken from <http://www.energystar.gov> unless otherwise noted.
5. Source energy is the energy used in creating and transmitting the power to the building.
6. Information taken from <https://www.gresb.com/results2015/introduction>.

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AUTHOR BIOGRAPHY

Dr Avis Devine Assistant Professor of Real Estate Finance, University of Guelph. Prior to her academic career, she was the Assistant Vice President in charge of commercial real estate underwriting and valuation for Dollar Bank, FSB in Pittsburgh, PA. Her research interests include Sustainable and Energy Efficient Real Estate, Commercial Real Estate, Multifamily Housing, and Institutions.

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