

ASSESSING THE VALUE OF GREEN BUILDINGS

In the real estate sector, energy performance may be a new asset valuation tool. This is being aided by mandatory certification and disclosure policies in several large cities in the United States, in Australia, and in Europe, along with voluntary programs like ENERGY STAR and LEED, Australia's Green Star and NABERS ratings, and Energy Performance Certificates (EPC) in Europe. The 2012 GRESB survey from the Global Real Estate Sustainability Benchmark offers early evidence that performance certification is an emerging trend in evaluating a real estate portfolio.

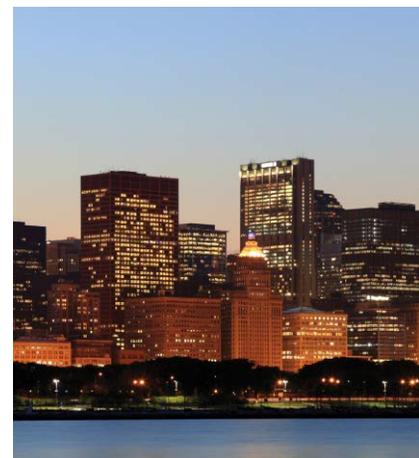
For a number of years, advocates of green buildings have stated that efficient, green buildings not only have lower energy bills, but their design and features improve the occupants' experience and worker productivity. And by extension, these green attributes should increase the value of a building in the real estate market. Recent empirical studies are demonstrating just that – energy efficient commercial buildings and commercial buildings with green attributes have:

- Increased resale value (2-17%)
- Increased rental rates (5.8-35%)
- Higher occupancy rates (0.9-18%)
- Lower operating expenses (30%)
- Higher net operating income (5.9%)
- Lower capitalization rates (50-55 basis points)
- Productivity gains (4.8%)¹

Interest in green buildings continues to grow. In the 2012 global Energy Efficiency indicator (EEI) survey conducted by the Johnson Controls Institute for Building Efficiency, 44 percent of building executives (versus 35 percent in 2011) said their organizations planned to pursue voluntary green building certifications for existing buildings in the next year. Sixty percent of respondents said they had at least one certified green building.²

¹ See the following charts for more detail on these green building valuation research findings and their citations.

² This survey did not specify one uniform green building standard.



The 2012 GRESB survey from the Global Real Estate Sustainability Benchmark offers early evidence that performance certification is an emerging trend in evaluating a real estate portfolio.

A strong example for the value of green buildings can be found in Australia's real estate market. There, some buildings are experiencing "brown discounts" for poor energy efficiency ratings. Buildings with NABERS ratings of less than 3 stars reported significant discounts in value – 10% in Sydney and 13% in Canberra. (Newel 2011) These findings may have global implications and may be indicative of the future of the real estate market where the value of buildings will be discounted for low energy performance rating.

The following sections of this research update review studies in global markets, including the U.S., Australia, and the European Union on the value of building energy performance.

UNITED STATES

With 1.5 billion square feet of LEED-certified space and 2.5 billion square feet of ENERGY STAR-certified commercial space in the market today, there is an ever more robust set of data for analysis to demonstrate statistically significant financial benefits of energy efficient buildings. A large data set is needed because an energy efficient green building can only be compared to its peer conventional building – a building of similar age, height, size, and sub-market location.

Green building certifications:

The **ENERGY STAR** program is jointly sponsored by the U.S. EPA and U.S. DOE. Nonresidential buildings can receive ENERGY STAR certification if their source energy use achieves a specified benchmark level. The label is awarded to the top quarter of all comparable buildings, ranked in terms of source energy efficiency.

The U.S. Green Building Council's **LEED** (Leadership in Energy and Environmental Design) certification program measures buildings on six distinct components of sustainability, one of which is energy performance.

Australia's **Green Star** ratings assess the environmental potential of office buildings, establishing how they will perform under ideal circumstances based on design information and management processes.

The National Australian Built Environment Rating System (NABERS) measures the environmental performance of Australian commercial buildings, residential buildings, and single-family homes.

The European Union Energy Performance of Buildings Directive (EPBD) uses **Energy Performance Certificates (EPCs)** to evaluate the energy performance of commercial and residential buildings.

The certification standards above are analyzed in the studies highlighted in this research update. There are at least 12 other green building certifications globally, including BREEAM in the United Kingdom, Green Globes in Canada, and Green Mark in Singapore.

U.S. studies find:

Green Building Benefits	Increased Market Value Compared with Conventional Buildings	ENERGY STAR Buildings	LEED Certified Buildings
<i>Increased rental rates</i>	2-17%	<ul style="list-style-type: none"> • ENERGY STAR properties had a rental premium of 4.8%, or \$1.26 per square foot. (Pivo 2008) • ENERGY STAR offices had a rental premium of 3% per square foot between 2004 and 2007. (Eichholtz 2009) • An office building registered with LEED or ENERGY STAR had a rental premium of 2% between 2007 and 2009. (Eichholtz 2010)* • ENERGY STAR certified office space had a rental premium of 6%. (Fuerst 2009) • ENERGY STAR buildings had a rental premium of 7-9%. (Wiley 2010) 	<ul style="list-style-type: none"> • An office building registered with LEED or ENERGY STAR had a rental premium of 2% between 2007 and 2009. (Eichholtz 2010)* • LEED certified office space had a rental premium of 5%. (Fuerst 2009) • LEED buildings had a rental premium of 15-17%. (Wiley 2010)
<i>Improved resale value</i>	5.8-35%	<ul style="list-style-type: none"> • ENERGY STAR properties had a 13.5% higher market value per square foot relative to non-ENERGY STAR properties. (Pivo 2008) • Building sale price increased by 5.8% with ENERGY STAR certification (Miller 2008) • A sale price premium of 16% was found for ENERGY STAR offices between 2004 and 2007. (Eichholtz 2009) • A sale price premium of 13% was found for ENERGY STAR and LEED office buildings between 2007 and 2009. (Eichholtz 2010)* • A sale price premium of 31% was reported for ENERGY STAR offices. (Fuerst 2009) • A sale price premium of \$30 per square foot for ENERGY STAR was found in 25 metropolitan markets. (Wiley 2010) 	<ul style="list-style-type: none"> • Building sale price increased by 10% with LEED certification in an analysis of building sales from 2003-2007. (Miller 2008) • A sale price premium of 13% was found for LEED and ENERGY STAR office buildings between 2007 and 2009. (Eichholtz 2010)* • A sale price premium of 35% was reported for LEED-certified offices. (Fuerst 2009) • A sale price premium of \$130 per square foot LEED-certified buildings was found in 25 metropolitan markets. (Wiley 2010)

*The Eichholtz (2010) study did not differentiate between ENERGY STAR and LEED buildings.

(continued)

Green Building Benefits	Increased Market Value Compared with Conventional Buildings	ENERGY STAR Buildings	LEED Certified Buildings
<i>Higher occupancy rates</i>	0.9-18%	<ul style="list-style-type: none"> • ENERGY STAR properties had 0.9% higher occupancy rates. (Pivo 2008) • Occupancy rates were 2-4% higher for ENERGY STAR buildings compared with non-ENERGY STAR buildings. (Miller 2008) • Effective rent (rent adjusted for different vacancy rates in labeled offices) was about 10% higher in ENERGY STAR offices, compared to offices of the same age and building quality, within a 0.2-square-mile area around a certified building. (Eichholtz 2009) • Effective rent was 5% higher for ENERGY STAR and LEED office buildings between 2007 and 2009. (Eichholtz 2010)* • Occupancy rates were 10-11% higher for ENERGY STAR certified buildings. (Wiley 2010) • Occupancy rates were 3% higher in ENERGY STAR-labeled offices. (Fuerst 2009) 	<ul style="list-style-type: none"> • Effective rent (rent adjusted for different vacancy rates in labeled offices) was about 9% higher for LEED offices, compared to offices of the same age and building quality, within a 0.2-square-mile area around a certified building. (Eichholtz 2009) • Effective rent was 5% higher for LEED and ENERGY STAR office buildings between 2007 and 2009. (Eichholtz 2010)* • Occupancy rates were 16-18% higher for LEED certified buildings. (Wiley 2010) • Occupancy rates were 8% higher in LEED-labeled offices. (Fuerst 2009)
<i>Lower operating expenses</i>	30%	<ul style="list-style-type: none"> • Operating expenses were 30% lower for ENERGY STAR versus non-ENERGY STAR buildings. (Miller 2008) • ENERGY STAR buildings had 9.8% lower utility expenditures than non-ENERGY STAR buildings. (Pivo 2008) 	
<i>Higher net operating income (from higher rents, higher occupancy rates, or lower operating expenses)</i>	5.9%	For ENERGY STAR properties, net operating income per square foot was 25 cents (5.9%) higher than for non-ENERGY STAR properties. (Pivo 2008)	

*The Eichholtz (2010) study did not differentiate between ENERGY STAR and LEED buildings.

(continued)

Green Building Benefits	Increased Market Value Compared with Conventional Buildings	ENERGY STAR Buildings	LEED Certified Buildings
<i>Lower capitalization rate</i>	50-55 basis points	<ul style="list-style-type: none"> ENERGY STAR properties had capitalization rates 50 basis points lower than non-ENERGY STAR properties. (Pivo 2008) Capitalization rates in ENERGY STAR properties were lower by 55 basis points, suggesting a higher value of almost 10%. (Miller 2008) 	
Green Building Benefits	Increased Value Compared with Conventional Buildings	Energy Efficient Buildings with Green Attributes	
<i>Productivity gains</i>	4.88%	<ul style="list-style-type: none"> Productivity gains may increase due to: lighting (0.7-23%), quieter working conditions (1.8-19.8%), improved ventilation (0.6-7.4%), and workstation controls (0.2-3%). (Loftness 2003) For LEED-certified buildings, benefits of \$37 to \$55 U.S. dollars per square foot are reported as a result of productivity gains from less sick time and greater worker productivity, primarily from better ventilation, lighting and general environment. (Kats 2003) ENERGY STAR and LEED buildings had productivity gains of 4.88% for tenants who reported gains. (N. Miller 2009) 	

AUSTRALIA

There are two environmental building rating systems in Australia: GreenStar, managed by the Green Building Council of Australia (GBCA) and NABERS (the National Australian Built Environment Rating System).

Green Star ratings are designed to assess the environmental potential of office buildings, establishing how they will perform under ideal circumstances based on design information and management processes. NABERS measures the environmental performance of Australian commercial buildings, residential buildings, and single-family homes. Using 12 months of verifiable performance information, the system evaluates a building's energy efficiency, water usage, waste management and indoor environment quality. NABERS assigns buildings a star rating on a scale from one to six stars using benchmarks that are representative of the performance of other similar buildings in the same location. A 6-star rating demonstrates leading building performance, while a 1-star rating means the building is lagging in performance and has room for improvement.

Australian studies find:

Green Building Benefits	Increased Market Value Compared with Conventional Buildings	NABERS Buildings	Green Star Buildings
<i>Premium in value</i>	2-12%	Buildings with a 5-star NABERS rating delivered a 9% premium in value, and 3-4.5 star NABERS energy ratings delivered 2-3% premium in value. (Newel 2011)	Green star rated buildings had a 12% premium in value. (Newel 2011)
<i>Investment return</i>	0.6-4%	The investment return on buildings with a NABERS energy rating was 0.6% higher than a non-rated building. (IPD 2011)	The investment return was 4% higher with a Green star rating. (IPD 2011)

EUROPEAN UNION – THE NETHERLANDS

The EU Energy Performance of Buildings Directive (EPBD) has mandated energy certification of buildings enabling private and corporate occupiers to take energy efficiency into consideration when making decisions. It requires the disclosure of energy performance in buildings when they are constructed, sold, or rented. The Directive has led to the implementation of national Energy Performance Certificates (EPCs) for residential and commercial buildings across the European Union. As of December 2010, more than 7,560 buildings had been certified in the Netherlands market. Office buildings account for nearly 70 percent of the certified space.

EU studies find:

Green Building Benefits	Increased Market Value Compared with Conventional Buildings	EPC Buildings
<i>Rental premium</i>	6.5%	On average, buildings with a green energy label achieve a 6.5% higher rent than a less efficient, non-green building. (Kok and Jennen 2011)

CONCLUSION

Studies consistently show that markets are placing higher values on buildings with green features that translate into lower energy bills, better design and improved worker productivity. Evidence shows that these features of energy efficient green buildings are translating into greater value in the form of increased rental rates, higher sale prices, increased occupancy rates, lower operating expenses, higher net operating income, lower capitalization rates, and increased worker productivity.

METHODOLOGIES

US Studies:

The Pivo study analyzed the properties in the office property index produced by the National Council of Real Estate Investment Fiduciaries (NCREIF) from 1998 to 2008. In 2008, this database had 1,114 'control' properties, and 336 'responsible' properties. The study controls for age, height and square footage in comparing properties.

The Miller, Eichholtz, Fuerst and Wiley studies analyzed the CoStar Group database using hedonic regression analysis. The database includes approximately 300 LEED and 1,300 ENERGY STAR buildings, as well as approximately 10,000 buildings in the control group. Results differ between the studies because of variations in the definition of what a peer building is for each LEED and ENERGY STAR building, as well as variations in the years of data analyzed.

- Miller compares large Class A offices of similar age, location, size and time of sale.
- Eichholtz compares buildings of similar age and building quality within a 0.2 square mile area around the certified building.*
- Fuerst compares buildings of similar age and height within the same CoStar sub-market.
- Wiley looks at 46 metropolitan markets and controls for age, but not for microlocation effects.

* The Eichholtz (2010) study did not differentiate between ENERGY STAR and LEED buildings.

Productivity gains:

- The Loftness meta-study from the Center for Building Performance and Diagnostics at Carnegie Mellon analyzed many previous studies. It introduces eBIDS™, a cost-benefit decision support tool that presents the results of field case studies, laboratory studies, simulation, and other research.
- The Kats study used a sample of 33 green building projects in California.
- The N. Miller study results are based on a survey of more than 500 tenants who have moved into either a LEED or ENERGY STAR labeled building managed by CB Richard Ellis (CBRE).

AUSTRALIAN STUDIES:

- The Newel study – co-sponsored by Johnson Controls – compared 206 NABERS rated office buildings and 160 non-NABERS rated office buildings controlling for building size, building quality and location. This analysis also found premiums in rent, reduced vacancy, and higher tenant retention (reduced outgoings) in buildings with higher NABERS ratings.
- The Investment Property Databank (IPD) study released in early 2011 reviewed 1500 buildings, about half of which were rated buildings.

EUROPEAN STUDIES:

The Kok and Jennen study evaluated the financial implications of energy labels in the market for commercial real estate. It reviewed a sample of 1,100 rental transactions in the Netherlands.

REFERENCES

- Eichholtz, P., N. Kok, and J. Quigley, "Doing Well By doing Good? Green office Buildings, Working paper," Fisher Center for Real Estate and Urban Economics, UC Berkeley, January, 2009. <http://www.ucei.berkeley.edu/PDF/seminar20090130.pdf>
- Eichholtz, P., N. Kok, and J. Quigley, "The Economics of Green Building." Maastricht University and University of California – Berkeley, August 2010. [http://cbey.research.yale.edu/uploads/Environmental%20Economics%20Seminar/EKQ%20082010%20JMQ%20\(2\).pdf](http://cbey.research.yale.edu/uploads/Environmental%20Economics%20Seminar/EKQ%20082010%20JMQ%20(2).pdf)
- Fuerst, F. and P. McAllister, "An Investigation of the Effect of Eco-Labeling on Office Occupancy Rates." Journal of Sustainable Real Estate, Vol. 1, No. 1, 2009. <http://www.costar.com/josre/JournalPdfs/03-Effect-Eco-Labeling.pdf>
- Fuerst, F. and P. McAllister, "New Evidence on the Green Building Rent and Price Premium." University of Reading, 2009. <http://www.henley.ac.uk/rep/fulltxt/0709.pdf>
- IPD Australia and New Zealand. "Green Cities 2011: Introducing the PCA/IPD Green Investment Index". February 2011. <http://www.ipd.com/LinkClick.aspx?fileticket=e48fKnS8DKQ%3D&tabid=427&mid=10392>
- Kats, G. "The Costs and Benefits of Green." A Report to California's Sustainable Building Task Force. Capital E Analytics, October 2003. <http://www.calrecycle.ca.gov/greenbuilding/design/costbenefit/report.pdf>
- Kok, N. and M. Jennen. "The Value of Energy Labels in the European Office Market." 2011. http://nilskok.typepad.com/KJ/KJ_NL_220511.pdf
- Loftness, et al. "Linking Energy to Health and Productivity in the Built Environment." Center for Building Performance and Diagnostics, Carnegie Mellon, 2003. http://www.usgbc.org/Docs/Archive/MediaArchive/207_Loftness_PA876.pdf
- McGraw Hill Construction. "Green Building Retrofit & Renovation." 2009. [http://mts.sustainableproducts.com/Capital_Markets_Partnership/BusinessCase/MHC%20Green%20Building%20Retrofit%20%26%20Renovation%20SMR%20\(2009\).pdf](http://mts.sustainableproducts.com/Capital_Markets_Partnership/BusinessCase/MHC%20Green%20Building%20Retrofit%20%26%20Renovation%20SMR%20(2009).pdf)
- Miller, N., D. Pogue, Q.D. Gough, and S.M. Davis, "Green Buildings and Productivity." The Journal of Sustainable Real Estate, Vol. 1, No. 1, 2009. http://catcher.sandiego.edu/items/business/Productivity_paper_with_CBRE_and_USD_Aug_2009-Miller_Pogue.pdf
- Miller, N., J. Spivey, A. Florance, "Does Green Pay off?" Journal of Real Estate Portfolio Management, Vol.14, No.4, Oct-Dec. 2008. <http://www.usgbc.org/ShowFile.aspx?DocumentID=5537>
- Pivo, G., and J. Fischer, "Investment Returns from Responsible Property Investments: Energy Efficient, Transit-oriented, and Urban regeneration office Properties in the US from 1998-2007." Indiana University, March 2009. <http://www.uic.edu/cba/mare/CureEvents/InvestmentReturns.pdf>
- Wiley, J., J. Benefield, and K. Johnson, "Green Design and the Market for Commercial Office Space." Journal of Real Estate Finance and Economics, Vol. 41, no. 2. 2010. <http://www.uic.edu/cba/mare/CureEvents/InvestmentReturns.pdf>

The Institute for Building Efficiency is an initiative of Johnson Controls providing information and analysis of technologies, policies, and practices for efficient, high performance buildings and smart energy systems around the world. The Institute leverages the company's 125 years of global experience providing energy efficient solutions for buildings to support and complement the efforts of nonprofit organizations and industry associations. The Institute focuses on practical solutions that are innovative, cost-effective and scalable.

If you are interested in contacting the authors, or engaging with the Institute for Building Efficiency, please email us at: InstituteforBE@jci.com.

institute
for **building**
efficiency
an initiative of Johnson Controls