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## **Green Hotels: An Overview**

By Minu Agarwal Prashant Das

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*By Minu Agarwal and Prashant Das*

*In this article, we adopt a real estate perspective and explore the sustainability implications of hotels. First, we provide a background on sustainability, describe how it relates to the hotel sector and synthesize literature on the economic implications of sustainability. Further, we provide and explain trends on sustainability certifications, LEED in particular, in the US context.*

### ***What is Sustainability, Why is it Important?***

The latest report by the inter-governmental panel on climate change (IPCC) has estimated that human activity has resulted in 1°C of global warming above pre-industrial levels<sup>[1]</sup>. The report calls for reaching and sustaining net zero CO<sub>2</sub> emissions to prevent further rise in global temperatures beyond current projections. Buildings contribute nearly a third of the greenhouse gas emissions and US buildings, in particular, contribute 38% of the total national greenhouse emissions<sup>[2]</sup>. Governments, organizations and individuals are thus increasingly aware that buildings are critical part of addressing an increasingly urgent challenge -climate change. Growing knowledge of the impact of buildings on the environment and their occupants has led to wide scale reconsideration of how buildings are built and operated.

At the same time humans spend increasingly more time inside buildings<sup>[3]</sup> and thus buildings have a large impact on our health, productivity, and wellness. Several sustainability metrics have thus been developed to address these and other issues.



### *How is Sustainability Incorporated in Real Estate?*

A real estate asset could be perceived in terms of its building mass as well as the behavior of the people occupying it. Sustainability could be achieved from both standpoints. For example, using environment friendly materials and design will enhance the sustainability from the building standpoint. Similarly, improving business processes (such as sourcing local material and employees for hotel operations) may enhance sustainability from the human behavior perspective. While the definition of sustainability interventions may differ from one context to another, organizations such as the United States Green Building Council (USGBC) have devised building project certifications for various types of buildings, climates and geographical locations. USGBC was constituted in 1993 as a membership based non-profit organization. The Leadership in Energy and Environmental Design (LEED) certification, administered by the USGBC is continually re-examined by a large body of volunteer committees comprising of building professionals, developers and building systems manufactures. A wide range of parties are involved with the intent of keeping the rating system current and market relevant. Earlier in 1990, the Building Research establishment (BRE) developed the Building Research Establishment Environmental Assessment Method (BREEAM) rating system in the UK.

Since their inception, sustainability labels such as LEED and BREEAM -among several others- have grown in their acceptance rates and are increasingly popular design and performance assessment tools for building projects. While BREEAM is the oldest whole building sustainability rating system, LEED can be regarded as the most widely adopted system on several counts[4]. It has been used in over 165 countries and in many parts of the world it is being adopted at a wider scale[5]. For example, the City of Vancouver and City of New York have recently passed laws[6] that require LEED certification at a pre-specified level to be achieved by all new-construction projects that meet specific byelaw criteria.

LEED regulates and certifies a building's design or operations validating the buildings as less harmful to the environment compared to a standard building. LEED rates a project's performance based on a pre-defined multi-criteria-credit system. The most important credit category relates to energy use and atmospheric emissions, the Energy and Atmosphere category (EA). The next big category of credits is related to human health which ensure minimum thresholds of daylight, thermal comfort, air quality and visual connection to the outdoors, the Indoor Environmental category (IEQ). Water-use is the third big category promoting efficiency in use and recycling, the Water Efficiency category (WE). LEED also examines the environmental impact of building projects within and beyond the site boundary and includes the environmental cost of daily transportation and site development, the Sustainable Sites category (SS). Projects with access to public transportation and pre-existing infrastructure receive additional credit.

These rating systems have a profound impact on the design and construction of a building and the ratings achieved are not simply a by-product of the design process. One study[7], for example, examined two residential projects in Italy and found them to score much higher on ITACA, a local rating system, but much less on the LEED system. Thus, designers must be much more efficient to earn the LEED label. LEED rating system has also duly recognized this and USGBC has released several different tracks that have been tailored to different building types and geographical locations.



## *How do Sustainability Labels Enhance Real Estate Performance?*

Initial motivations for incorporating sustainability in real estate were primarily driven by the notion of corporate social responsibility (CSR). As such, sustainable real estate was considered an investment in the society and thus, a cost center. However, over the years, academic studies reported several economic benefits of sustainability in real estate.

Studies have shown significant association between green labels and commercial real estate performance metrics. Green-labeled properties show superior performance in terms of topline<sup>[8]</sup> (revenue, rental rate), bottom line<sup>[9]</sup> (net operating income), occupancy rate<sup>[10]</sup>, operating expenses<sup>[11]</sup>, and asset valuation (transaction price<sup>[12]</sup>, capitalization rate<sup>[13]</sup>). Some studies also report indirect financial benefits of green-labeled properties such as reduced absenteeism<sup>[14]</sup> among the occupants, superior marketability<sup>[15]</sup>, better perceived indoor air quality<sup>[16]</sup>, and higher occupant productivity<sup>[17]</sup>. Besides, green-labeled buildings are less volatile in terms of pricing and rental rates, providing a potential hedge against the property market cycles<sup>[18]</sup>. Although opting for green labels may add up the investment costs by up to three percent<sup>[19]</sup>, the multiple benefits from the topline, bottom line and valuation may facilitate a payback within a few years.

### *Sustainability Trend in Hotels: What to Expect and Why*

Although tourism and hospitality industries were among the earliest to recognize the importance of sustainability in business, much less is documented about the financial benefit of green labels in hotels. A Beijing (China)-based study reported nearly 7% increased room rate and 20% less complaints about indoor air quality in green hotels<sup>[20]</sup>. A US based study<sup>[21]</sup> reported that although green labeled hotels enjoy significantly higher rental rates (ADR: average daily rate) the corresponding occupancy rate are significantly lower such that the revenues are not different from non-green-labeled hotels. The study argues that the revenue managers potentially become too optimistic with room pricing but should be able to benefit from increased revenue by keeping the same (or only marginally higher) room rate in green-labeled hotels. The bottom-line benefits (through reduced operating expenses) and pricing benefits (through reduced capitalization rates) may lead to further financial benefits. However, these benefits have not been scientifically documented yet. A recent study<sup>[22]</sup> reports a somewhat positive (yet statistically insignificant) pricing effect of LEED label in US hotels, but argues that with a larger number of green hotels being transacted, the price premium in LEED-labeled hotels may become significant.

While other commercial real estate assets have longer-term occupants (owner-occupiers or tenants), hotels are occupied for very short tenancies (usually a day or a few more). Therefore, the motivation for green hotels needs to be analyzed differently. Due to their short tenancy, the enthusiasm for green hotels among hotel customers may be dominated by an expectation of superior comfort or experiential benefits. However, green hotels may not necessarily provide these amenities. In specific types of hotel (airport, conference, etc.) dominated by large, similarly-minded corporate clients, the CSR motivation may still exist, but will be relatively muted due to the presence of retail customers. On the owners' side, the attractiveness of green labels will be correlated to tangible financial benefits, such as higher revenue, lower expenses and higher valuation. However, beside higher ADR, there is scant scientific evidence on other financial benefits of green hotels. Therefore, we should expect relatively modest popularity of green label in hotels which will gradually grow as more scientific evidence emerges supporting the financial benefits of going green.



***What are the Trends for LEED labels in US hotels?***

In December 2018, the USGBC database recorded over 112 thousand US-based projects of which nearly 1,600 included hotels. Anecdotal evidence (from reviewing the Real Capital Analytics reports) suggest that nearly 10% of commercial transactions are related to hotels, but less than two percent representation of hotels in the USGBC database is remarkable.

First, the projects are “registered” with the USGBC for a LEED label consideration. Exhibit 1 summarizes the US-based properties on which the certification decision has been taken by USGBC. We also extract statics on hotel-specific projects. Nearly 30% (34,743) of the 112,000 projects have been certified with less than 0.04% (39) projects which were “rejected” certification for some reason.

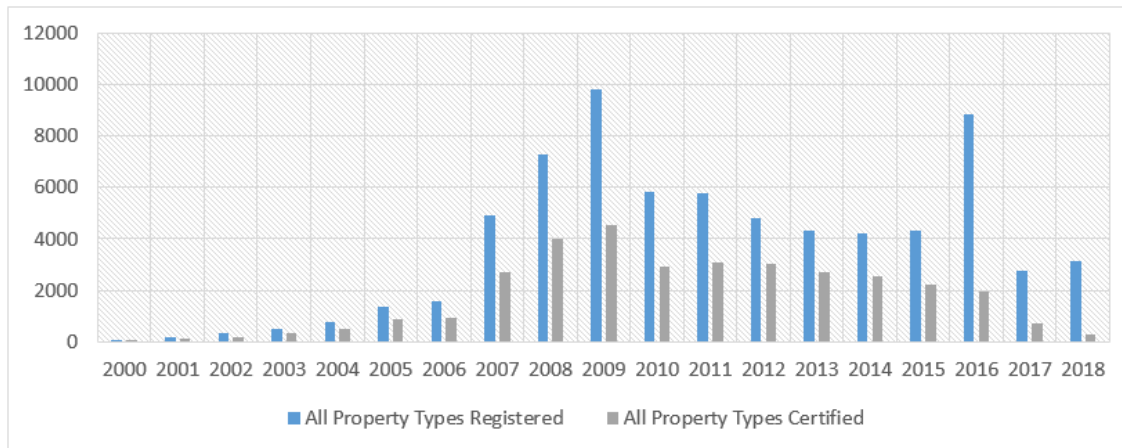
Exhibit 1: Summary of LEED Certification Decision on US-based properties

LEED Level	All Properties	%	Hotels	%
Denied	39		11	
Certified	7,929	23%	134	29%
Bronze	3	0.01%		0.00%
Silver	11,694	35%	178	39%
Gold	12,182	36%	126	28%
Platinum	1,894	6%	9	2%
<b>Grand Total</b>	<b>33743</b>	<b>100%</b>	<b>458</b>	<b>100%</b>

Data source: USGBC, based on data up to 1 December 2018.

The review process may take anywhere from a few months to over twelve years to complete after which a “certification” decision is taken. The average time for all properties is 2 years. Hotels, on average, need 3 years for certification processing. However, the processing time for hotel projects varies in a narrower range (up to 8 years). Exhibit 2 presents the trend of property registration and certification. The trends were reinforcing until the financial crisis. Academic research reports this as the “market acceptance” of LEED certification[23].

Exhibit 2: Number of Projects Registered and Certified for LEED in the US over time



Data source: USGBC, based on data up to 1 December 2018.

The number of projects registered waned in the aftermath of the crisis, but has witnessed increased enthusiasm in later years. 2017 and 2018 witnessed relatively smaller number of projects being registered or certified. The two peaks in number of registered projects seen in years 2009 and 2016 coincide with the years of change in versions of the LEED rating system. Registrations under version 3 (also known as LEED 2009) closed[24] on Oct 2016. Version 3 was launched[25] in 2009 marking the close of version 2. Release of new versions thus appears to be a driver for the timing of the registration depending on choice of the version of the rating system. Risk-averse parties may rush to register in the old version to avoid any unforeseeable changes in the new upcoming versions of the rating system. Some parties may wait to be registered in the new version to maintain the market-edge. Exhibit 3 presents the same analysis focusing on hotel projects.

Exhibit 3: Number of Hotel Projects Registered and Certified for LEED in the US over time



Data source: USGBC, based on data up to 1 December 2018.

USGBC awards different “levels” of LEED certification to projects based on the “points” achieved by them. It thus recognizes various degrees up to which a project may demonstrate achievement of the various sustainability goals. Currently there are four available levels of certification namely: Certified, Silver, Gold and Platinum requiring a minimum of 40, 50, 60, 80 points respectively. While the lower three levels of achievement appear equidistant in terms of additional points needed, the incremental design effort and cost may not be so. The energy related credits (EA category) are the strongest indicators of certification level achieved[26]. Additionally, projects needed a mean increase of 3.51, 5.46, and 11.59 in EA credits in order to graduate from certified to silver, silver to gold and gold to platinum. Similar trends were found on the site related (SS) category as well, the next strongest category of credits after EA to indicate level of certification.

A large number of LEED credits deal with indoor environmental quality. While in the current version of LEED, 35% points are directed towards climate change related concerns, 20% deal directly with health and comfort of the occupants. LEED and other similar rating systems thus have a strong synergy with hotel buildings. Hotels can potentially derive direct financial benefits by ensuring comfortable and positive experience of the hotel guests.

Exhibit 1 provides the detailed breakup across the levels of certifications. Hotel project certification rates are lower at Gold and Platinum levels compared to their peers. In terms of mean credits achieved per category, hotels are among top performers[27] only in the SS category credits which tend to be location driven. Energy-related expenses usually constitute a small part of hotel cash flows. The impact of location on hotel valuation is substantially higher. Thus, the importance of SS credits reflect an environment-friendly trend. On EA category, considered important for achieving higher certification levels, hotels were found to be the lowest achievers along with residential property types. This could explain the drop in Gold and Platinum level certification for hotels.





## Conclusions

Although academics in tourism economics were among the earliest to study the importance of sustainability, scientific evidence on the economic benefits of sustainability in this sector is still emerging. Some recent studies within the hospitality sector hint towards positive effects of sustainability on business.

Survey-based studies are unequivocal about the positive impacts of going green in hotels: the customer satisfaction as well as the customers' willingness-to-pay increases. Besides, less customers complain about the indoor air quality when the subject hotel is green[28]. However, positive customer opinions about green hotels may not necessarily translate into their buying behavior. Unlike other commercial assets (e.g. offices), hotel occupants have much shorter tenancy and may assign relatively lower premium to pricing unless the advantages of green-ness to them are concrete. If going green compromises on the occupant comfort, the green attributes may have an adverse effect on revenues. Some studies[29] have shown positive impact of green attributes on hotel room rates. However, the room rate must interact with the corresponding occupancy rate to generate revenues. It appears that hotel operators overreact to the green labels in terms of increased room rates. Such a behavior results in lower occupancy rates and an insignificant impact on the revenues. Further, concerns have been raised about higher expenses associated with green hotels, in LEED buildings in particular, which lead to lower bottom line.

We find that the enthusiasm for sustainability label in hotels has been relatively low, but the trends have been upwards in recent years. The need for hotels going green cannot be emphasized enough. However, the green strategic plan must include considerations about occupant comfort and requires a more tactical revenue management so as to maintain higher level of occupancy.



Minu Agarwal is a PhD candidate and researcher at LIPID Lab for interdisciplinary research in building performance and architectural design process at EPFL (École polytechnique fédérale de Lausanne), Switzerland. She acquired her MS in Sustainable Design from Carnegie Mellon University (USA) and a Bachelor in Architecture from Indian Institute of Technology, Roorkee (India). Earlier, Minu worked as a sustainability Consultant with IES Ltd. (Atlanta) and Buro Happold (New York) among other companies. She has been an entrepreneur and served as an external reviewer for the Green Building Certification, Inc. (GBCI).

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Prashant Das, PhD is an Associate Professor of Real Estate Finance at Ecole hoteliere de Lausanne (Switzerland) where he also serves as a member of the Academic Board and the Acting Director of Hospitality Finance, Real Estate and Economics (H-FREE) Institute.

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### End Notes

- [1] “Global Warming of 1.5 °C” Accessed December 6, 2018. <https://www.ipcc.ch/sr15/>
- [2] Bond & Worzala (2014)
- [3] Klepeis et al. (2001)
- [4] Wilkinson (2011)
- [5] “LEED | USGBC.” Accessed December 6, 2018. <https://new.usgbc.org/leed>.
- [6] Vancouver, City of. “Passive Design Toolkit,” Accessed December 6, 2018. <https://vancouver.ca> Low energy intensity building requirements for certain capital projects LEED law, Pub. L. No. LL31/2016 (2016).
- [7] Asdrubali et al. (2015)
- [8] Miller, Spivey & Florence (2008) ; Eichholtz, Kok & Quigley (2010) ; Wiley, Benefield & Johnson (2010); Das, Tidwell & Ziobrowski (2011); Reichardt, Frantz, Rottke & Zietz (2012); Zhang, Liu, Wu, Zhang (2017)
- [9] Pivo & Fisher (2010)
- [10] Fuerst & McAllister (2009) ; Eichholtz, Kok & Quigley (2010) ; Reichardt, Frantz, Rottke & Zietz (2012)
- [11] Chapell & Corps (2009); Dorsey & Reid (2012)
- [12] Miller, Spivey & Florence (2008) ; Eichholtz, Kok & Quigley (2010); Das & Wiley (2014)
- [13] Pivo & Fisher (2010) ;
- [14] Miller, Spivey & Florence (2008)

- [15] Chapell & Corps (2009)
- [16] Zhang, Liu, Wu, Zhang (2017)
- [17] Dorsey & Reid (2012)
- [18] Das & Wiley (2014); Das, Tidwell & Ziobrowski (2011)
- [19] Dorsey & Reid (2010)
- [20] Zhang, Liu, Wu, Zhang (2017)
- [21] Robinson, Singh, Das (2016)
- [22] Das, Smith & Gallimore (2017)
- [23] Das & Wiley (2014).
- [24] "Is LEED 2009 the Most Current Version of LEED? What Is LEED V 3? | U.S. Green Building Council." Accessed February 4, 2019. <http://www.usgbc.org/help/leed-2009-most-current-version-leed-what-leed-v-3>.
- [25] "LEED Registration Close and Sunset Dates | U.S. Green Building Council." Accessed February 4, 2019. <https://www.usgbc.org/articles/registration-close-and-sunset-dates>.
- [26] Wu et al (2017)
- [27] Wu et al (2017)
- [28] Zhang et al (2017)
- [29] Zhang et al (2017), Robinson et al (2016)

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## References

- Asdrubali, F., G. Baldinelli, F. Bianchi, and S. Sambuco. "A Comparison between Environmental Sustainability Rating Systems LEED and ITACA for Residential Buildings." *Building and Environment* 86, no. Supplement C (April 1, 2015): 98–108. Bond, S., & Worzala, E. (2014). *Green Buildings. Private Real Estate Markets and Investments*, 234.
- Chappell, T. W., & Corps, C. (2009). High performance green building: what's it worth. *Investigating the Market Value of High Performance Green Buildings: Cascadia Foundation*.
- Das, P., & Wiley, J. A. (2014). Determinants of premia for energy-efficient design in the office market. *Journal of Property Research*, 31(1), 64-86.
- Das, P., Tidwell, A., & Ziobrowski, A. (2011). Dynamics of Green Rentals over Market Cycles: Evidence from Commercial Office Properties in San Francisco and Washington DC. *Journal of Sustainable Real Estate*, 1-22.
- Das, P., Smith, P., & Gallimore, P. (2017). Pricing Extreme Attributes in Commercial Real Estate: the Case of Hotel Transactions. *The Journal of Real Estate Finance and Economics*, 1-33.
- Dorsey, T. A., & Read, D. C. (2012). Best practices in high-performance office development: the Duke Energy Center in Charlotte, North Carolina. *Real Estate Issues*, 37(2-3), 26-31.

- Eichholtz, P., Kok, N., & Quigley, J. M. (2010). Doing Well by Doing Good? Green Office Buildings. *American Economic Review*, 2492-2509.
- Fuerst, F., & McAllister, P. (2011). Green Noise or Green Value? Measuring the Effects of Environmental Certification on Office Values. *Real Estate Economics*, 45-69.
- Klepeis, N. E., Nelson, W. C., Ott, W. R., Robinson, J. P., Tsang, A. M., Switzer, P., ... & Engelmann, W. H. (2001). The National Human Activity Pattern Survey (NHAPS): a resource for assessing exposure to environmental pollutants. *Journal of Exposure Science and Environmental Epidemiology*, 11(3), 231.
- McGrath, K. M. (2013). The effects of eco-certification on office properties: a cap rates-based analysis. *Journal of Property Research*, 30(4), 345-365.
- Miller, N., Spivey, J., & Florance, A. be formed about the costs and benefits of green investment, yet a single case is seldom the prototyp-ical mean and there exists rauch local variation that adds to or reduces the marginal costs of going green. The current study goes well beyond case.
- Reichardt, A., Fuerst, F., Rottke, N., & Zietz, J. (2012). Sustainable building certification and the rent premium: a panel data approach. *Journal of Real Estate Research*, 34(1), 99-126.
- Robinson, S., Singh, A. J., & Das, P. (2016). Financial impact of LEED and energy star certifications on hotel revenues. *The Journal of Hospitality Financial Management*, 24(2), 110-126.
- Robinson, S., Simons, R., & Lee, E. (2017). Which Green Office Building Features Do Tenants Pay For? A Study of Observed Rental Effects. *Journal of Real Estate Research*, 39(4), 467-492.
- Wiley, J., Benefield, J., & Johnson, K. H. (2010). Green Design and the Market for Commercial Office Space. *Journal of Real Estate Finance and Economics*, 228-243.
- Wilkinson, Sara, and Anita Bilos. "A Comparison of International Sustainable Building Tools – An Update," Vol. 17. Gold Coast, 2011.
- Wu, Peng, Yongze Song, Wenchi Shou, Hunglin Chi, Heap-Yih Chong, and Monty Sutrisna. 2017. "A Comprehensive Analysis of the Credits Obtained by LEED 2009 Certified Green Buildings." *Renewable and Sustainable Energy Reviews* 68 (February): 370–79. <https://doi.org/10.1016/j.rser.2016.10.007>
- Zhang, L., Wu, J., Liu, H., & Zhang, X. (2017). The value of going green in the hotel industry: evidence from Beijing. *Real Estate Economics*.