THE BUSINESS CASE FOR GREEN BUILDING

WORLD GREEN BUILDING COUNCIL

A Review of the Costs and Benefits for Developers, Investors and Occupants

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FOREWORD

The World Green Building Council and its coalition of green building councils from 94 countries share the same goal: to create a built environment that will give people better, brighter, healthier spaces to live, work and play. But those of us who work in the industry are keenly aware that good intentions like these are not enough. Green buildings must perform, and they must do so across a host of metrics, including, and especially, financial ones. This latest report, "The Business Case for Green Building: A Review of the Costs and Benefits for Developers, Investors and Occupants," confirms yet again that when environmental strategies—along with program management—are integrated into the development process from the beginning of a building's life cycle, green buildings save energy, save water, save precious resources and most importantly, save money. And the cost to build more sustainably continues to fall.

Over the past 20 years, the building industry has systematically reduced design and construction costs as building codes around the globe become stricter, supply chains for green materials and technologies reach maturation and the design profession becomes more dexterous at delivering cost-effective green building design. Green building has inspired countless material, product and process innovations that have speeded up the adoption of green design, construction, and operations across the globe. Today, green building is a half-trillion dollar industry in the United States, and more than a trillion dollar industry worldwide.

The WorldGBC is a part of a global movement of people from widely different backgrounds, circumstances, cultures, countries and industries. We all continue to unite around a singular commitment – not just to building green, clean, sustainable buildings, but also to building sustainable cities and communities and a sustainable world.

As this report and others continue to underscore, green building plays a fundamental and cost-efficient role in tackling some of the immediate challenges of our times. The WorldGBC is proud to continue to play a leadership role in the explosive growth of global green building.

Rick Fedrizzi
Chairman
World GBC

SKANSKA

Some regard environmental concerns as costly and non-profitable restraints. Some even neglect the need for sustainable use of natural resources. Unfortunately, taking this stand means losing opportunities to make a difference. Every day, we gain new information about the state of the planet. But only rarely do we get any advice on how to act profitably going forward. That is why this long-awaited report is needed so much. We are very proud to be associated with the WGBC and this authoritative work. It presents strong evidence that going green is good business – sometimes even for unexpected reasons. For example, green buildings with more daylight and better air-quality enhance the well-being of the users and offer them the best possible conditions to outperform.

This work presents the facts and figures – now it is a matter of mind-set. Everyone who is engaged in the development of our societies need to realize that it takes a new approach to really succeed. Green is not a bolt-on gadget – key to success is to make green an integrated and natural part of the process from the first day of planning and through the entire life of a building.

As a major international construction and development company and early adopter of the green agenda we are actively seeking the best solutions in the long run. What we – owners, authorities, developers, builders, tenants and even users – decide to do today will have a lasting impact. After a decade of lessons learned we now know green buildings are high-performing in every aspect – environmentally and socially as well as economically. I hope this report will inspire us all to make the right choices and take the next step. In the end it is about creating and future-proofing value. Sharing the responsibility will grant us all a share of the gain.

Johan Karlström
President and CEO
Skanska

GROSVENOR

The population of our global cities is projected to double by 2050. With this challenge before us, the property industry must be brave and innovative if we are to create and manage buildings, communities and cities which are not only efficient in environmental terms, but also promote a high quality of life for all who pass through them.

The publication of The Business Case for Green Building demonstrates beyond doubt that green building is now a global movement, and that sustainability delivers benefits well beyond the environmental.

Grosvenor is passionate about cities, urban design and development. We try to take a long-term view, seeing ourselves as stewards with an eye to the future, and we aim to continually improve our understanding of cities for the benefit of occupiers, investors and all our other stakeholders. As such, we are proud to sponsor The Business Case for Green Building.

Increasingly, Grosvenor's business strategies, and investment and development practices, reflect our long-term ambition to help create and manage vibrant, sustainable cities which operate within the world's annually renewable resources – and, as a result, our vision of the future is beginning to affect our day-to-day decision-making too.

We know that our vision is ambitious, and that Grosvenor is only one player in the market. However, we also know that the property industry has a key role to play in creating more sustainable places in which future generations will want to live, work and play.

We see this report as the next step in understanding and communicating why green building adds social and economic, as well as environmental, value, and we hope that the report inspires others in the global property industry to consider their vision for sustainability.

Kate Brown
Group Director – Sustainability
Grosvenor Group

FOREWORD

With the strain on our environment becoming more evident as buildings and cities continue to grow in parallel with global populations, each country should have their own agenda on sustainable development. On a global scale, everyone needs to be involved and consciously contributing to the cause.

Economics is as much an important driver for sustainability along with the environment, society and culture. Providing case studies of how selected countries and building studies respond to the challenge enables everyone to gauge the effect of their everyday interaction with energy, water and waste within a building up through the scales.

In Abu Dhabi's case, we are shaping our sustainable future through the mandated Estidama programme. Our unique situation is being addressed through compulsory design and construction of buildings, soon to be expanded to include operational lifetimes. Global sustainable development is about telling others what each of us are doing to improve, working together to share experience and practices.

Falah Mohamed Al Ahbabi
General Manager
Abu Dhabi Urban Planning Council

EXECUTIVE SUMMARY

In recent years, a wide range of studies and reports have outlined elements of the 'business case' for green buildings, but this report is the first attempt to synthesize all credible evidence from around the world into one definitive resource, complete with global examples and thought pieces from leading experts.

Research clearly shows that there are a large number of compelling benefits from building green, which are received by different stakeholders throughout the building life cycle. Yet, one issue that has remained controversial is whether it is possible to attach a financial value to the benefits of green buildings – crucial information for real estate lenders and the investment community. Do green buildings attract a financial premium in terms of rental and sales value? Are they more attractive to tenants and occupiers? Are employees occupying greener buildings more productive?

This report investigates the business costs and benefits of green building in five vital categories and finishes with an exploration into the both the impacts that a greener built environment can have at a macro scale and how this can be achieved.

EXECUTIVE SUMMARY

Key Findings

Using peer-reviewed evidence as the standard for the analysis and guided by a steering committee of experts from around the world, the findings presented in this study represent a critical summation of the most recent and relevant research.

The body of the report provides insight into how these findings were reached, including the context of the studies – essential reading for understanding the relevance of the findings to what is found in local markets.

Design and Construction Costs
Research shows that building green does not necessarily need to cost more, particularly when cost strategies, program management and environmental strategies are integrated into the development process right from the start.

While there can be an additional costs associated with building green as compared to a conventional building, the cost premium is typically not as high as is perceived by the development industry.

Asset Value
As investors and occupants become more knowledgeable about and concerned with the environmental and social impacts of the built environment, buildings with better sustainability credentials enjoy increased marketability.

Studies around the world show a pattern of green buildings being able to more easily attract tenants and to command higher rents and sale prices.

In markets where green has become more mainstream, there are indications of emerging 'brown discounts', where buildings that are not green may rent or sell for less.

Operating Costs
Green buildings have been shown to save money through reduced energy and water use and lower long-term operations and maintenance costs.

Energy savings in green buildings typically exceed any design and construction cost premiums within a reasonable payback period.

In order to achieve their predicted performance, high-performing green buildings need to be backed up by robust commissioning, effective management, and collaboration between owners and occupiers.

Workplace Productivity and Health
Research shows that the green design attributes of buildings and indoor environments can improve worker productivity and occupant health and well-being, resulting in bottom line benefits for businesses.

Despite evidence of its impact, improved indoor environmental quality has not been a priority in building design and construction, and resistance remains to incorporating it into financial decision-making.

While more research is needed, investing in better indoor environments can lead to better returns on one of every company's greatest assets - its employees.

Risk Mitigation
Sustainability risk factors can significantly affect the rental income and the future value of real estate assets, in turn affecting their return on investment.

Regulatory risks have become increasingly apparent in countries and cities around the world, including mandatory disclosure, building codes and laws banning inefficient buildings.

Extreme weather events and systematic changes in weather patterns affect the insurability of real estate and lead to questions about the resilience of assets.

Changing tenant preferences and investor risk screening may translate into risk of obsolescence for inefficient buildings.

Scaling Up from Green Buildings
By greening our built environment at the neighborhood and city scale, we can deliver on large-scale economic priorities such as climate change mitigation, energy security, resource conservation and job creation, long-term resilience and quality of life.

What These Findings Mean for Business

The report points to an increasingly compelling business case for green buildings. The evidence presented highlights that sustainable buildings make clear business sense – it's not just about saving the planet. These benefits range from risk mitigation across a building portfolio and city-wide economic benefits, to the improved health and well-being of individual building occupants. Moreover, green buildings can now be delivered at a prices comparable to those for conventional buildings and these costs can be recouped through operational costs savings and, with the right design features, through more a more productive workplace. Design decisions made at the start of a project will impact the long-term value of the building and its return on investment, meaning a whole-life cost/value approach is needed, from design through building operation. While there is a growing evidence base for all of these findings, the information being gathered is concentrated in certain regions and climates. In order to effectively transform the global marketplace, there is a need for more data and for more case studies from around the world.

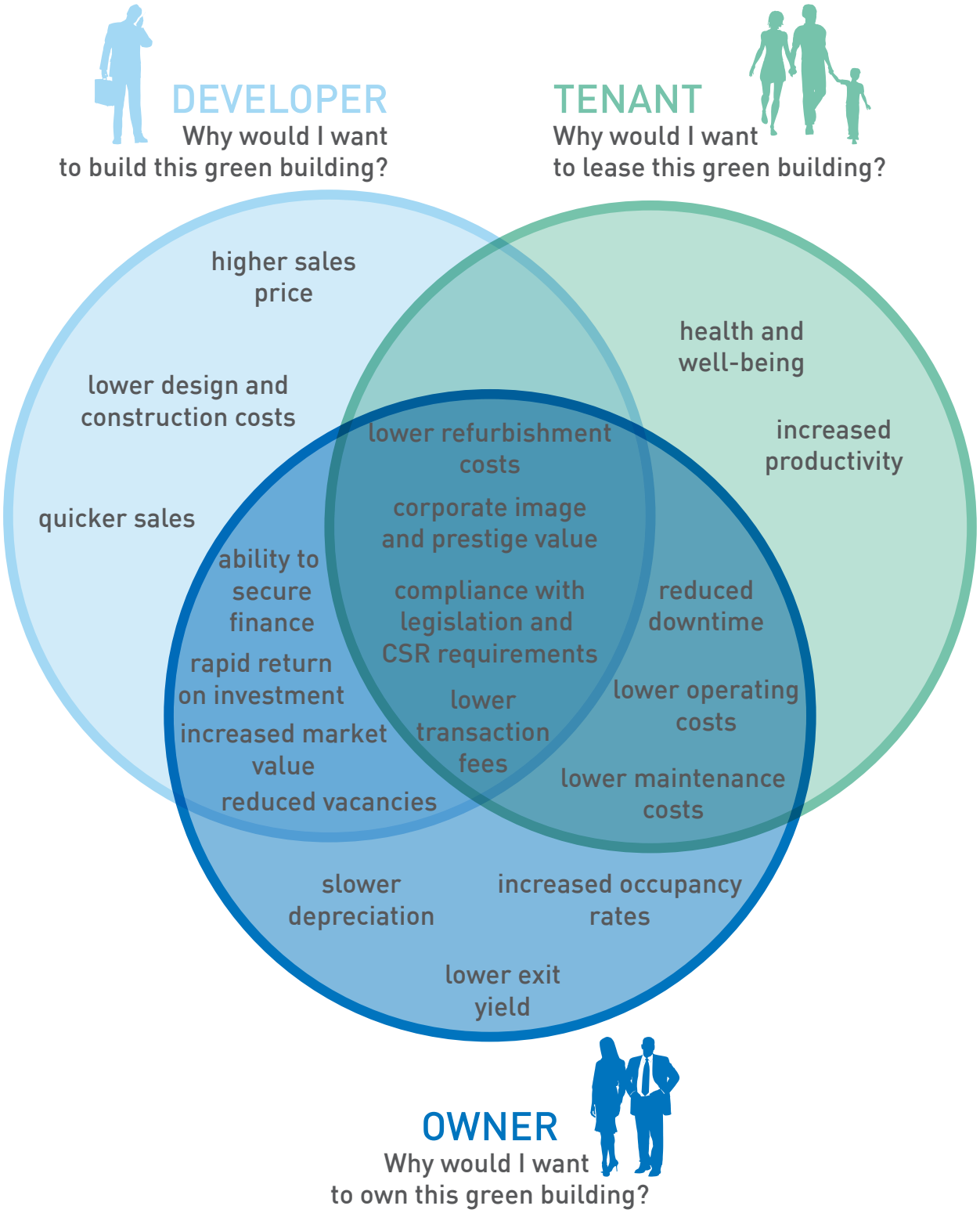
This presents an excellent opportunity for businesses to partner with each other, and with academia and government, to better understand the financial implications of a more sustainable built environment. We need the right data to spur better financial decision-making.

A key illustration of this point is where due to a lack of financial metrics, many businesses have ignored the potential to improve indoor environments and are now missing a major opportunity to use buildings to leverage broader organizational success. Studies can tell us what has happened in given markets over a specific period of time. Practitioners have to look at local market conditions and at what defines and drives green building in a given location, not just a snapshot of data, to get the complete picture and effectively decide whether investments will ultimately translate into enhanced financial returns.

What is clear is that there is mounting evidence that in many markets across the world, part of being a better quality building means being a green building. In premium markets in particular, green is increasingly expected by tenants and owners – it is just part of what good 'quality' means.

With so many drivers for green buildings at play, and many parts of the world still at the nascent phase of green building, there can be no doubt that the business case for green building will continue to evolve as markets mature. Green building is something that tenants, investors and policy makers will come to demand and expect over time – indeed we have already seen this momentum grow globally where in more and more places, green is now becoming the status quo.

This report lays out the best business case evidence we have available today and provides insights into what these findings mean for industry as well as next steps we can take from here. It also shows how governments can leverage green building policies to support local economies and meet their long-term goals. With this foundation, we call on the private and public sectors to use their collective knowledge and strength to move the green building agenda forward, knowing that it benefits people and the environment - and their bottom lines.


DEVELOPER
Why would I want to build this green building?
TENANT
Why would I want to lease this green building?
higher sales price
lower design and construction costs
quicker sales
health and well-being
increased productivity
lower refurbishment costs
corporate image and prestige value
compliance with legislation and CSR requirements
ability to secure finance
rapid return on investment
increased market value
reduced vacancies
reduced downtime
lower operating costs
lower transaction fees
lower maintenance costs
slower depreciation
increased occupancy rates
lower exit yield
OWNER
Why would I want to own this green building?

INTRODUCTION

Is There a Business Case For Green Buildings?

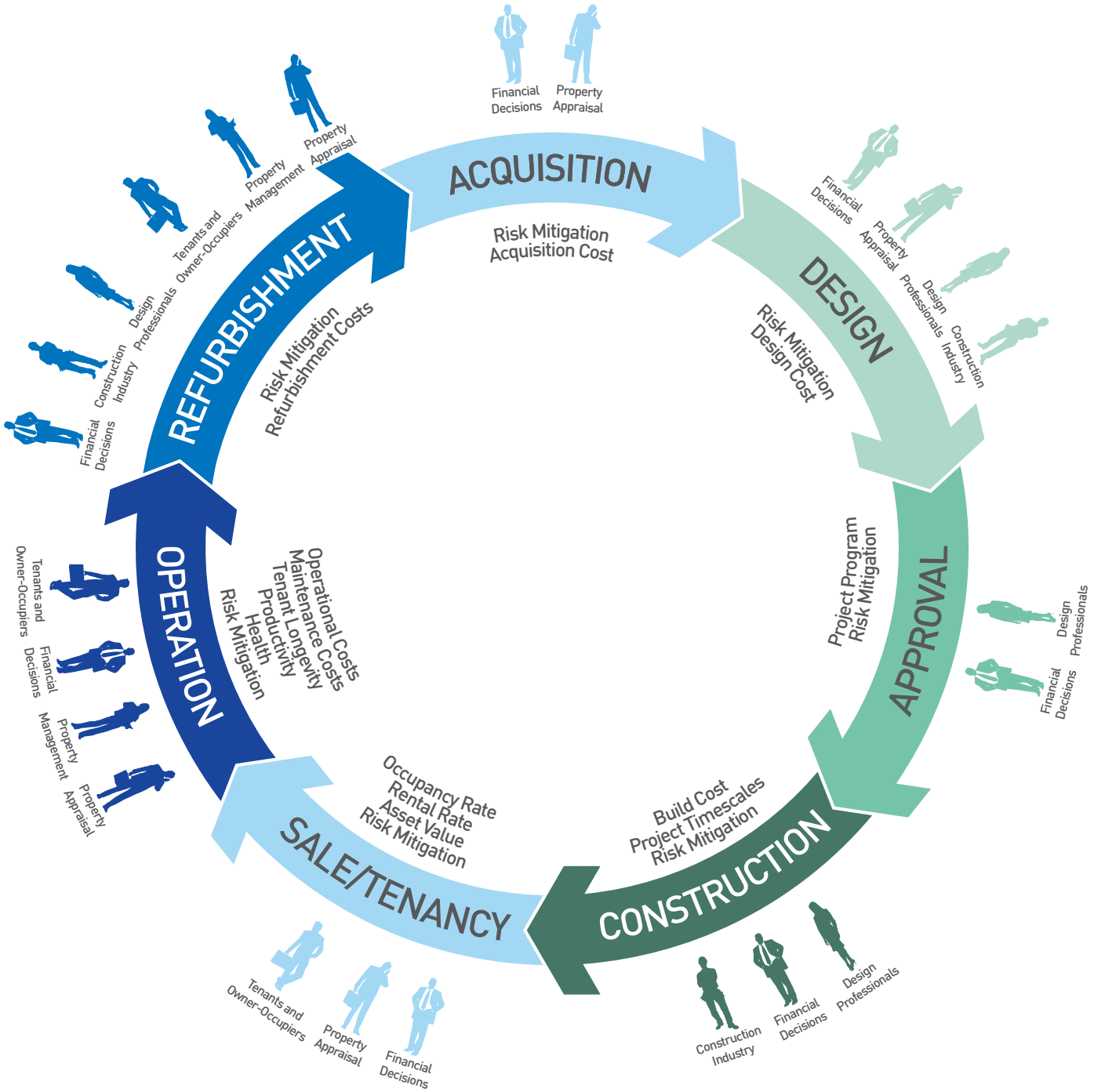
A range of reports from both industry and academia have documented individual elements of the green building business case, but this report is the first attempt to synthesize all credible evidence into one definitive reference guide.

While the environmental benefits of green buildings have been firmly established, green buildings also deliver a range of compelling financial and social benefits, which can be found in this report in the chronological order in which they are extracted. Starting with the benefits that may be obtained during the design and construction phase, the discussion then shifts to the asset value and returns received by investors and developers. This is followed by the operational benefits such as cost savings, workplace health and productivity, and finally the issue of risk mitigation, which plays a role in every stage of a building's economic life.

Much of the evidence presented in this report comes from relatively new buildings, as this has been the focus of research to date. However, the report features a 'life cycle wheel' throughout to illustrate each stage, with the stakeholder icons further indicating which part of the property and construction sector is playing a leading role at a given point. The intention is to make it readily apparent which sections are most relevant to your particular role in the industry.

At the same time, this report sets out to do what most other green building resources do not - it targets building developers, owners and investors who are the ultimate decision-makers when it comes to financing green building projects, as well as the tenants who drive market demand. The Business Case for Green Building speaks to, not about, these players.

To provide a robust and reliable report, we made it a point to use only peer-reviewed research as the basis of our findings. In the few cases where we refer to other types of documents, this is clearly noted in either the text itself or in the footnotes.


ACQUISITION
Financial Decisions
Property Appraisal
Risk Mitigation
Acquisition Cost
DESIGN
Financial Decisions
Property Appraisal
Design Professionals
Construction Industry
Risk Mitigation
Design Cost
APPROVAL
Design Professionals
Financial Decisions
Project Program
Risk Mitigation
CONSTRUCTION
Construction Industry
Financial Decisions
Design Professionals
Build Cost
Project Timescales
Risk Mitigation
SALE/TENANCY
Tenants and Owner-Occupiers
Property Appraisal
Financial Decisions
Occupancy Rate
Rental Rate
Asset Value
Risk Mitigation
OPERATION
Tenants and Owner-Occupiers
Financial Decisions
Property Management
Property Appraisal
Operational Costs
Maintenance Costs
Tenant Longevity
Productivity
Health
Risk Mitigation
REFURBISHMENT
Property Appraisal
Property Management
Tenants and Owner-Occupiers
Design Professionals
Construction Industry
Financial Decisions
Risk Mitigation
Refurbishment Costs

What We Mean By 'Green Building'

The first wave of high-performing, green building arose as a response to demand for energy and resource efficiency. Times have changed, and strengthened by the advent of green building rating tools, the industry now recognizes that green buildings deliver much more than energy efficiency alone. It also understands that green buildings must be viewed holistically - that energy efficiency cannot come with a price of reduced fresh air and poor indoor environmental quality, or high water consumption. Buildings must be examined in the context of their impact on the local, natural and built environments - and their neighbors.

While green buildings have well-documented environmental benefits, we have made a conscious decision to focus this report on the economic and social benefits of green building. The green building movement has matured over time, and a deeper understanding of the 'triple bottom line' value of green buildings has emerged, shifting the emphasis from 'planet' to 'people' and 'profit'. Consequently, the conversation is now geared around how green buildings deliver on economic priorities such as return on investment and risk mitigation and on social priorities such as employee productivity and health.

The Big Picture

While we have divided this report into sections based on the distinct benefits of building green, it is clear that, as the individual pieces fit together to reveal a larger, more complete picture, so too the micro benefits of green buildings can be scaled up to generate macro benefits across the entire economy.

These 'big picture' benefits - such as climate change mitigation, energy security and resource conservation, job creation, improved occupant health, productivity and economic activity, long-term resilience and quality of life - are the priority issues for governments around the world, and are increasingly drivers for both public and private green building programs. The strategies for leveraging green building as a way to meet these priorities are explored in the last section of this report.

The global building industry is multi-faceted and complex, with many disconnected silos across the supply chain required to deliver the end product – a building. Green Building Councils have been established in more than 90 nations around the world to work with each section of the industry - from planners and policy makers, designers and developers, to building owners, managers and tenants - to drive market transformation and bring people together

Just as the conductor brings the orchestra together, Green Building Councils are uniting their national property and construction industries to establish common definitions of green building, develop rating systems which measure sustainability, educate the entire supply chain, and raise the profile of green building as local and national priorities. Having a compelling business case for green buildings is an essential element of their success.

We know that buildings are responsible for one-third of the world's greenhouse gas emissions and represent the largest and most cost-effective way to mitigate those emissions. At the same time, we recognize that making the financial case for green buildings to the right decision-makers will only serve to help us fulfill the potential of the building sector.

With so many drivers for green buildings at play, and many parts of the world still at the nascent phase of green building, there can be no doubt that the business case will continue to evolve. Work is still required in some areas, with more data and case studies needed. Our own analysis of what the evidence does - or does not - tell us aims to provide some guidance on next steps, whether that is more research or action required to remedy some of the clear roadblocks.

It is true that each region has different drivers and priorities. However, the global industry is moving away from a building-by-building approach to sustainability and towards greening entire neighborhoods, cities and countries. To succeed, partnership between industry and government is essential. It is only through partnership that we will realize the full potential of the built environment to deliver an economically, environmentally and socially sustainable future.

THE BUSINESS BENEFITS

DESIGN AND CONSTRUCTION

ASSET VALUE

OPERATING COSTS

WORKPLACE PRODUCTIVITY AND HEALTH

RISK MITIGATION

DESIGN AND CONSTRUCTION COST

- Research shows that building green does not necessarily need to cost more, particularly when cost strategies, program management and environmental strategies are integrated into the development process right from the start.

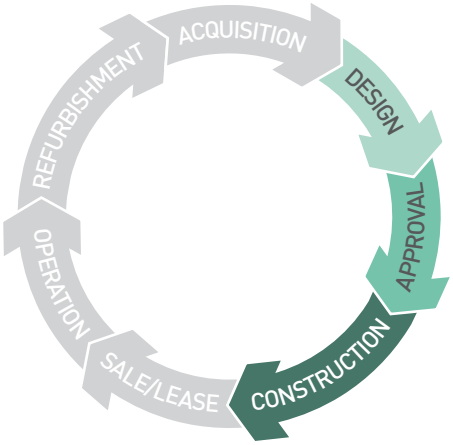
- While there can be an additional cost associated with building green as compared to conventional building, the cost premium is typically not as high as is perceived by the development industry.

- Higher upfront capital costs for green buildings have been found to be proportional to the increased level of environmental certification. However, increasingly, projects are able to achieve higher levels of certification at lower cost compared to less ambitious projects.

- There has been an overall trend towards the reduction in design and construction costs associated with green building as building codes around the world become stricter, supply chains for green materials and technologies mature and the industry becomes more skilled at delivering green buildings.

- Upfront cost increases in green buildings are often offset by a decrease in long-term life cycle costs, particularly in the case of green buildings that feature high-performance façades and energy-efficient building systems.

DESIGN AND CONSTRUCTION COST



This chapter focuses on the costs that occur at the very beginning of a building's life cycle, related to design and construction activities.

'Soft costs' relate to items or services that do not form part of the finished building, but that are necessary components of the development process. These include costs associated with architectural and design fees, inspection fees and permits, legal and valuation fees, environmental certification fees, loan-generated interest, accounting fees, insurance, taxes, marketing and project management costs. 'Hard costs' relate to tangible items that need to be procured to complete the building, including the cost of acquiring the site, the building structure, finishes, materials and landscaping.

Most of the costs discussed in this chapter refer to either design costs, comprising mainly architectural, design and consultant's fees, or construction costs, which refer to the building structure itself and not site acquisition.

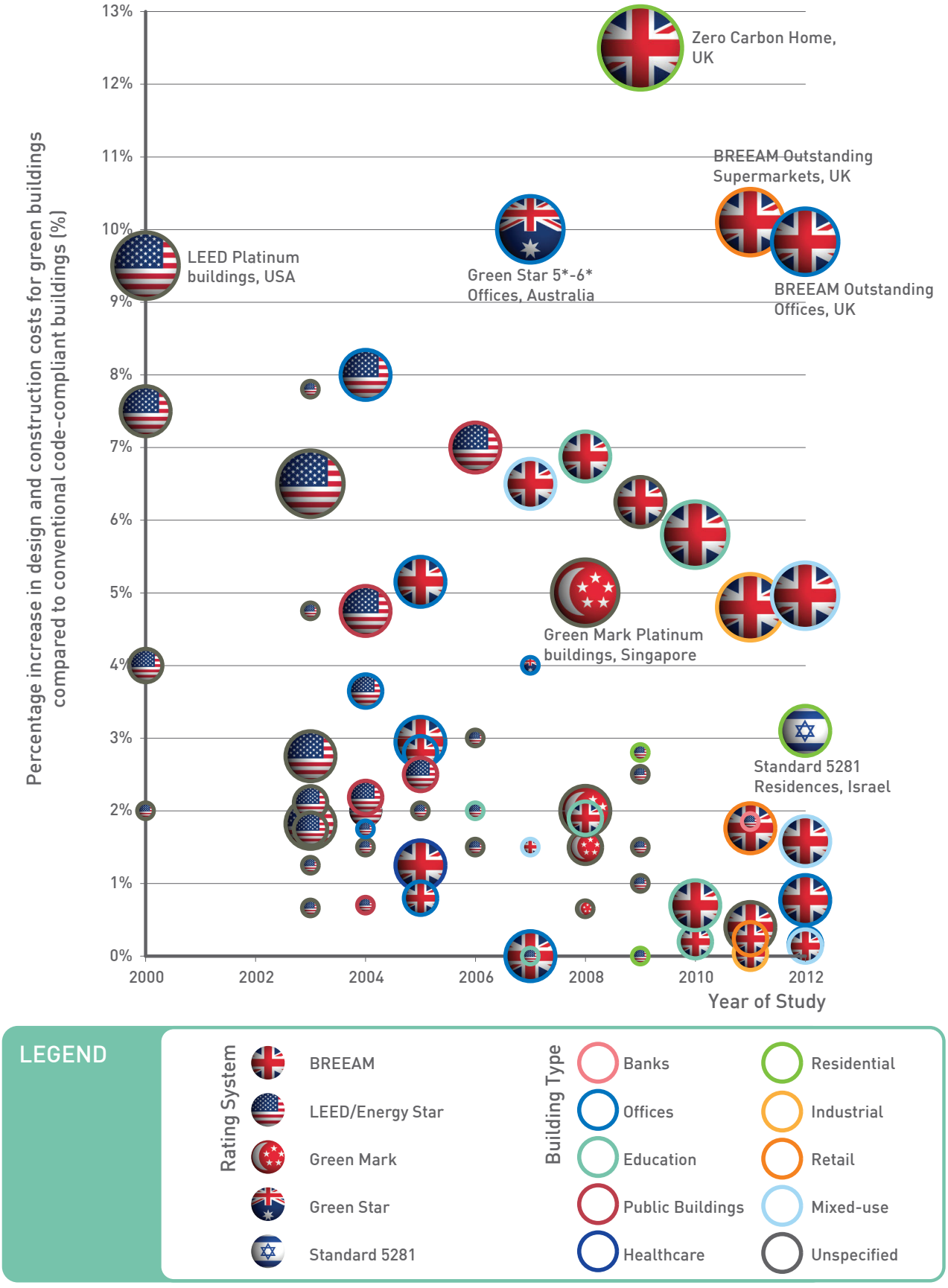


Figure 1

Actual cost premiums, various sources,[1] showing that the actual reported cost premiums for green buildings fall within the 0% - 12.5% range (where the sources have reported ranges of values, the mean value has been used). Actual cost premiums have been taken from a wide variety of building types, including offices, homes, schools, warehouses, banks, supermarkets, health centres, community facilities, academic buildings, and public buildings.

The Cost of Green Building

Based on research findings from various sources, actual design and construction costs have been documented to be in the range of -0.4[2] to 12.5%,[3] with the latter value corresponding to a zero carbon building project. The results from these studies, published between 2000 and 2012, are based on a wide variety of building types and present data from the United States, United Kingdom, Australia, Singapore and Israel. Most of the earlier data is based on studies of datasets comprising LEED-certified buildings in the United States[4] while most of the recent studies are from case study examples of BREEAM-certified buildings in the UK.[5]

These figures use code-compliant buildings as a baseline and this baseline is highly dependent on the progressiveness of the national or local building regulations for that particular location. The countries with reported case study examples all have environmental certification systems in place and strong Green Building Councils that drive the national green building agendas, which may have an influence on improved baselines for code-compliant buildings, consequently narrowing the gap between the cost of a code-compliant building and a green building. Countries with less emphasis on the green agenda embedded into their building regulations might find that the cost premiums are higher than those presented here. Nevertheless, the ranges and trends are reasonably consistent across these five very different locations.

Several of the studies carried out have shown that green buildings do not necessarily have to cost more, and that the challenge of delivering green buildings within the budget of a conventional code-compliant building is certainly achievable.[6] In fact, some studies present case studies that cost less than certified buildings.[7]

A number of authors have suggested ways to effectively reduce the construction cost of green buildings, including:

- Adopting green strategies and including them in the budget from an early stage, to avoid more expensive bolt-on strategies;[8]
- Hiring experienced design and construction teams;[9] and
- Using an Integrated Design Process (IDP), from pre-design phase through to post-occupancy, where clients take on a more active role and all consultants are engaged from the very beginning.[10]

The use of IDP in development projects is a crucial element, not just in terms of delivering tangible sustainability benefits on a development project, but also in the cost-effective delivery of these projects. Buildings designed and delivered through this process would also provide long-term benefits via the consideration of issues like future-proofing, resilience, and life cycle thinking right from the start.

A study by Davis Langdon, published in 2007,[11] finds that "… there is no significant difference in average cost for green buildings as compared to non-green buildings", and demonstrates that building green does not necessarily equate to additional costs. An increasing number of project teams were shown to have delivered LEED-certified buildings within a budget comparable to that of non-LEED-certified buildings. One of the biggest challenges to the cost-effective delivery of green buildings is the development of an understanding that green design is not a bolt-on to conventional buildings, but is instead an integrated discipline for design that requires a different way of thinking.

Figure 1 also shows that increases in upfront cost have been found to be proportional to the increased level of environmental certification, with more aspirational projects, such as those that aim for 'zero carbon' performance, showing a 12.5% increase in design and construction cost compared to a conventional building. But for the majority of certified green buildings, the cost typically ranges from less than 0% to 4%, based on studies published within the last ten years. Higher levels of certification (such as BREEAM Very Good, LEED Silver/Gold, and Green Mark Gold/Gold Plus) have been shown to range from 0% to 10%, while the highest levels (such as BREEAM Excellent, LEED Platinum, Green Mark Platinum and 'zero carbon' in the range of 2% to 12.5% higher costs.

It is critical to bear in mind that these upfront costs are often offset by a decrease in long-term life cycle costs, particularly in the case of green buildings that feature high-performance façades and energy-efficient building systems. The delivery of cost-effective buildings, more so for green building, is about taking the long-term view and translating that into short-term actions.
The implications of the long-term benefits of green building are discussed in the 'Operational Costs' chapter of this report.

There is also the long-term value to the project in terms of improved health and quality of life, and increased worker productivity in commercial and office environments. These benefits are discussed in detail in the 'Workplace Productivity and Health' chapter of this report.

Green Retrofits

In a 2012 study on retrofits on commercial buildings in the UK, the cost of a retrofit with "enhanced energy efficiency improvements" was compared to a "market standard" refurbishment.[12] In this case, the definition of the market standard was the standard to which a building could be refurbished in order to meet regulatory requirements. The case studies included four offices, one retail building and one industrial building.

The study reported that the cost premium for refurbishments was in the range of 0.3% to 40.0% more than the market standard counterpart, with the highest premium associated with an Energy Performance Certificate (EPC) rating improvement from an E to a B, where the market refurbishment baseline did not show an improvement in the EPC rating.

The 'quick wins' comprised of a combination of improved controls, efficient boilers, airtightness improvements, variable speed pumps and external shading – combinations of these measures led to refurbishment cost premiums within the range of 0.3% to 12.8%. The higher premiums were associated with higher EPC ratings that required the retrofit of LED lighting, heat recovery systems, air source heat pumps, photovoltaics and passive chilled beams.

It should be noted that this study looked at only four buildings; it is not possible to draw any reliable conclusions from such a small sample. However, it would appear that these figures mirror the findings for new-build in terms of higher levels of certification requiring higher levels of investment.

CASE STUDY

Santiago Rising

Chilean project delivers high performance at a business-as-usual price

When owner and master developer, Inmobiliaria Almahue, decided to build the 16-story Costanera Lyon I office building in Santiago, Chile, in late 2008, the company was seeking possible silver lining to the global financial crisis.

The building was designed during 2009 as the crisis was unfolding. Despite the reluctance of many developers to launch projects in this time of limited cash flow and risk aversion, Inmobiliaria Almahue believed that having one of the few large buildings constructed over this time could be an advantage. The development team decided to proceed in spite of the state of the market, which was further complicated by a recent 8.8 magnitude earthquake in the region.

The owner sought to pursue LEED certification and to showcase the benefits of sustainable building practices as a key factor to add value to the business proposal. As a result, Inmobiliaria Almahue not only managed to design and build a LEED Silver building at zero additional cost (as compared to a very similar office tower built recently in the same area), but also to sell all of its 54 office units before the building was completed. While most of the prospective buyers were not initially aware of the LEED certification process, the expected benefits of having low operating costs and the low environmental impact of the project became the owner's most important sales pitch.

Costanera Lyon I was designed by architects Eugenio Simonetti and Renato Stewart as part of a two-building development. The 225,100 square foot building was conceived through an Integrated Design Process (IDP), which brings together all project team members from the outset to define and roadmap sustainability goals for the project, set performance targets, and define key design and construction features. This process enabled the building to take advantage of its location and weather conditions, maximizing occupant indoor comfort conditions while reducing overall energy consumption and environmental impact. The IDP approach also helped to deliver the building at a reduced cost, as the entire team was working together from the beginning.

The building features a sophisticated envelope consisting of a high-quality curtain wall in combination with high thermal mass concrete walls. There is optimal daylight level in all office spaces, and a heating, ventilation and air conditioning (HVAC) system based on a high-efficiency variable refrigerant flow (VRF) with heat recovery and natural ventilation to all offices and underground levels. The project also features considerable reduction of potable water consumption through the use of low-flow water fixtures and a grey water reutilization system for irrigation.

The building was completed on schedule in March 2012, and has since become one of the leading examples of green building practices in Chile. Its success was such that Inmobiliaria Almahue decided to immediately begin the design and construction of the development's second building: Costanera Lyon II, originally scheduled to be designed and built in 2013. The second project will pursue LEED certification and incorporates many of the green design features and lessons learned in the construction of Lyon I. This is now the new model, which is in high demand – even before reaching ground level construction, the owner has already sold 50% of the office spaces.

The Perception Gap

Sustainability is not the major cost driver on most projects; the challenge for design teams is often to deliver green buildings within conventional budgets. However, meeting this challenge is made more difficult because there are many industry professionals who operate under the general assumption that building green increases design and construction cost by approximately 10-20% (with estimates as high as 29%) compared to the cost of conventional code-compliant buildings.[14]

Figure 2 shows the distribution of actual design and construction costs in various countries (shown in the small graph on the left side of the diagram, under different certification schemes, compared with the estimated costs of green building from various surveys from 2000 to 2012 (shown in the graph on the right side of the diagram). There is clearly a perception gap here that needs to be addressed.

One interesting study[15] compares the perception of cost increases by professionals with experience in constructing green buildings with the perception of professionals with little or no experience in green buildings. Those with experience believe the cost uplift to be up to 13%, whereas those without experience believe the cost uplift to be up to 18%. This indicates that, while the lack of experience does increase the perceived cost of green buildings, even professionals with actual experience tend to estimate the costs as rather significant.

Where do the misconceptions on green building costs come from? We have shown here that a number of studies have reported that the cost premium for green buildings is nowhere near as high as these figures, and that a green building could even cost the same, or less than, a conventional code-compliant building.

This may be due to an inability to forget historical data, or a lack of awareness that costs are coming down. However, another factor could be that showpiece or demonstration buildings for sustainability may have additional costly 'finish' upgrades which are not directly related to green cost, and these are the buildings that are often featured in industry publications. They often also feature highly visible green technologies, such as photovoltaics and large building-integrated wind turbines, that are used to reinforce a green image but that may not be financially viable, especially if these are not coupled with a robust overall environmental strategy.

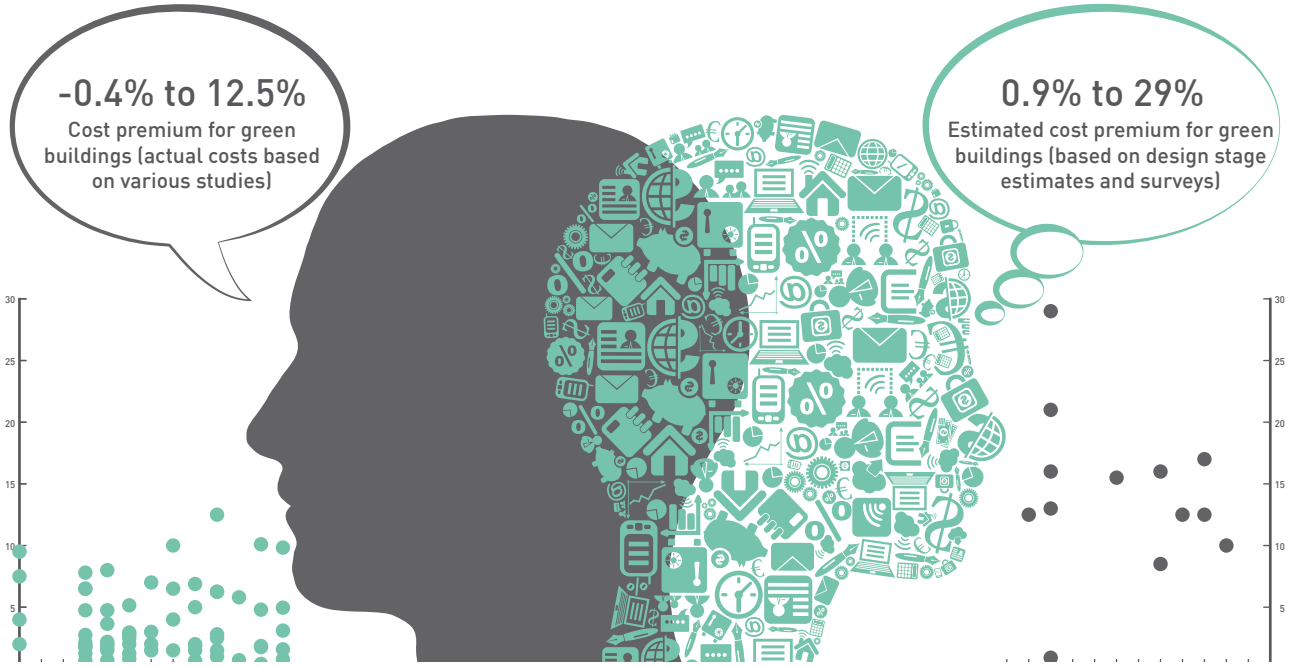


Figure 2
The Perception Gap - estimated vs. actual cost premiums for green buildings, various sources,[13] showing that the actual cost premiums for building green are lower than the industry estimates. Actual cost premiums have been taken from a wide variety of building types, including offices, homes, schools, warehouses, banks, supermarkets, health centres, community facilities, academic buildings, and public buildings.

Decreasing Costs for Green Building Over Time

In general, it is often the inclusion of these non-integrated bolt-on sustainable features and enhancements that cause projects to exceed original budgets.[16] A more integrated design approach that combines smart, passive design, thermally-efficient building skins and effective space planning to reduce energy demand as a first step, combined with highly-efficient systems, provides a cost-effective alternative to bolt-on systems installed on an otherwise under-performing building.

Figure 3 shows the percentage increases in actual build costs for LEED-certified projects, which illustrates gradual trend towards reduction in cost premiums over time. This is not surprising - the building industry has been steadily developing its capability for delivering green buildings, and supply chains worldwide are likewise heading towards more mature stages, bringing down costs and facilitating the efficient delivery of green buildings.

There is also increasing awareness, acceptance and education around green building certification and assessment tools, which means that more professionals are becoming well-equipped to design and certify green buildings.

Clients (i.e., investors, owners and developers) are increasingly aware of sustainability and energy issues and demand more expertise from the industry and the collaborative teams that are brought together to deliver their projects.

This increase in skills, tools and supply chain maturity have meant that the costs associated with achieving certification have decreased and will continue to decrease as green building becomes more mainstream.[18]

Minimum standards for building codes are progressively becoming stricter as well, which means that the baseline requirements and associated costs that represent 'business as usual' are progressively getting higher, narrowing the gap between the cost of code-compliant buildings and the cost of green buildings.

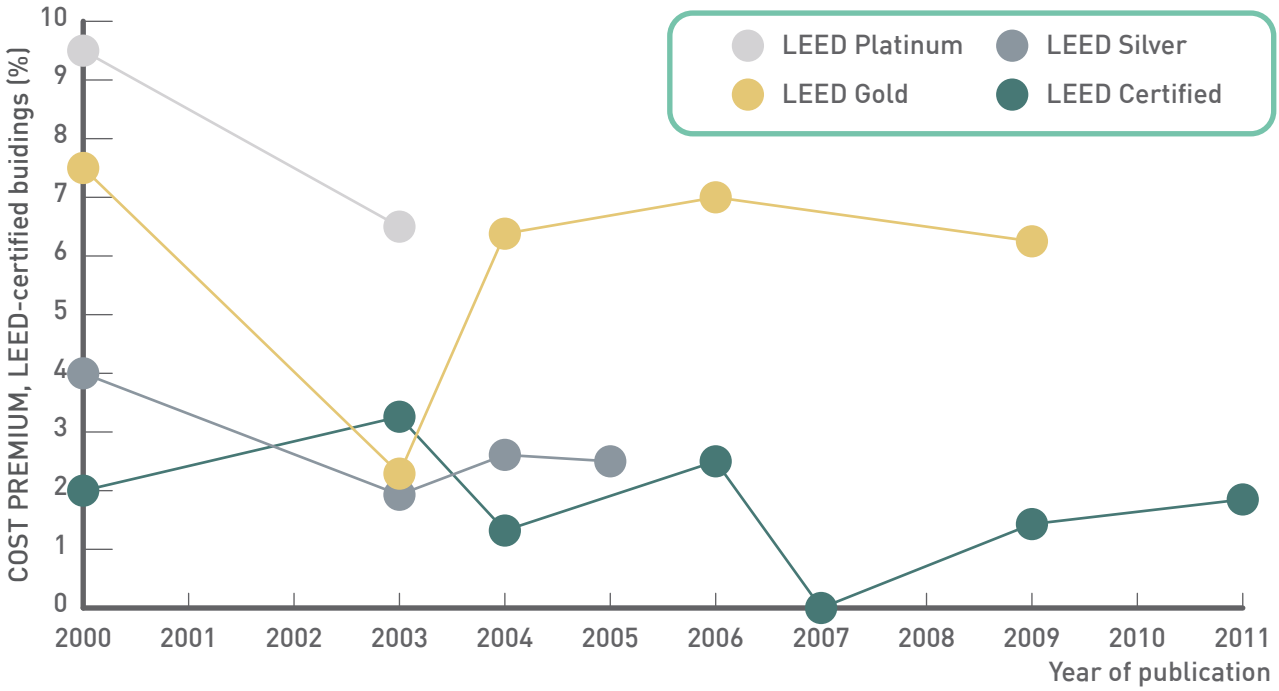


Figure 3
Reported cost premiums associated with LEED certification in the United States showing the gradual reduction of premiums over time, averaged values from various sources[17]

What Does This Mean for the Future?

Numerous studies have shown that green building construction costs are gradually coming down, but misunderstandings regarding the inevitability of the high cost for green buildings continue to present a challenge to the development industry.

As green building certification schemes, rating systems and green buildings in general become more mainstream around the world, the challenge is no longer about not having the expertise to deliver green buildings, but rather having the data and knowledge to be able to deliver them cost-effectively. Integrated design process will increasingly play a key role in keeping costs down without compromising the quality of green buildings being constructed. Transparency and collaboration between client and development teams are crucial in order to ensure that the investment in design and construction activities achieve the expected benefits after the building is complete.

THOUGHT PIECE

Life Cycle Cost Assessment

Proponents of sustainable design have long held great hopes for Life Cycle Cost Assessment (LCCA), where costs and savings associated with construction, and long-term operations and maintenance, are modeled. Results can be in the form of simple paybacks or more sophisticated models with escalation, predicted utility costs, and time value of money, with results presented as Net Present Value or Internal Rate of Return.

The hope has been that LCCA would allow project teams to see that expensive initial design measures can be worth it in the long run.

But LCCA does not seem to have made much headway in our expanding arsenal of sustainability tools. This may be due to several factors:

Inherent lack of certainty in LCCA, in an industry that desires certainty
Acknowledging the inherent risk of trying to predict the future, the best LCCA models include sensitivity analyses, allowing the user to test the gamut of possible outcomes given reasonable variables – most of which by definition cannot be accurately predicted.

LCCA models are therefore primarily used as a decision-making tool, where the goal is simply to compare proposed design approaches or technologies and to make informed choices based on predicted outcomes. This does not require that the predicted costs and savings be absolutely correct. Instead, we evaluate relationships; we assess whether one proposed system is more or less effective than another one.

Lack of understanding of the value and capability of LCCA
LCCA is not well understood by design professionals, as is a financial modeling tool. The financial sector is comfortable with uncertainty and the weaknesses of long-term estimates; it just needs a transparent and honest process. The financial industry is happy with pro-formas that assess rental income, vacancy rates, market competition and, in this context, LCCA is a breeze. However, most design teams want a hard and fast answer, and as a result, many teams hesitate to use LCCA, or try to make the results seem more concrete than they really are.

Humans are not rational
LCCA is fundamentally based on a fallacy: that the cost of money is linear, and that we are rational human beings. It isn't, and we aren't. Interest is a reasonable substitute for our time value of money, but many 'real life' experiments show we do not really treat time value logically or consistently. If we did, we would all exercise regularly, weigh the right amount, never binge drink, etc. We desire gratification now. Even financial professionals who are meant to be very rational in their decision-making still have to pay today's bills. So, while we may build a perfectly good LCCA model, we are often inclined not to abide by its results.

So how can we make LCCA a more useful and used tool? Currently, we lack a single accepted standard for LCCA modeling. Fortunately, progress has been made to this end; the European Union and the American National Standards Institute (ANSI) have both come up with approaches in an effort to coordinate within their markets.

From the industry side, we need to understand that like energy modeling, an LCCA model is only as good as the least accurate input (as we say in the US, "garbage in, garbage out"). We also need to accept that while LCCA is not the simple and persuasive answer that we might like it to be, that just like energy modeling, it can help us to make the right decisions.

Despite these challenges, the use of LCCA in the current BREEAM and DGNB tools and the next version of LEED demonstrates its relevance and acceptance across the industry and is proof that rationality can sometimes even overcome human nature.

by Lisa Matthiessen
Integral Group (with thanks to Peter Morris)

NEXT STEPS FOR INDUSTRY

- **Green should become standard:** There is already a large body of knowledge relating to the costs associated with building green – it is now time to take these lessons learnt to build green buildings as part of standard practice, and deliver high-quality buildings that are sustainable without being showy, within conservative budgets and demanding timescales.
- **Collect more data:** Continue gathering reliable and robust cost information on the hard and soft costs associated with designing and constructing green buildings.
- **Increase industry awareness:** Improve education on green design issues and integrated design processes, and reinforce the importance of an holistic approach to design and environmental strategies.
- **Conduct more research:** More researchinto the impact of external factors on the cost of green buildings is needed, particularly the impact of environmental, technological and economic change.

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11 Matthiesen et al, 2007

12 Quartermaine et al, 2012

13 BRE, 2007; BRE Trust, 2005; Target Zero, 2010, 2011 and 2012; Kats, 2003, 2006 and 2009; BCA Singapore, 2008; Davis Langdon, 2007; Syphers et al, 2003; American Chemistry Council, 2005; Building Design and Construction, 2003; Matthiessen et al, 2004 and 2007; GSA, 2004; CBRE, 2009; Lucuik, 2005; Jackson, 2009; Buiding Design and Construction, 2007; Galuppo et al, 2010; Turner Construction Company, 2005; World Business Council for Sustainable Development, 2007; Gomez, 2008; Berman, 2001; The David and Lucille Packard Foundation, 2002.

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18 Mapp, 2011; Davis Langdon, 2009; Matthiessen, 2007; CBRE, 2009; Lucuik, 2005; Kats, 2003

ASSET VALUE

- As investors and occupiers become more knowledgeable about and concerned with the environmental and social impacts of the built environment, buildings with better sustainability credentials will enjoy increased marketability.

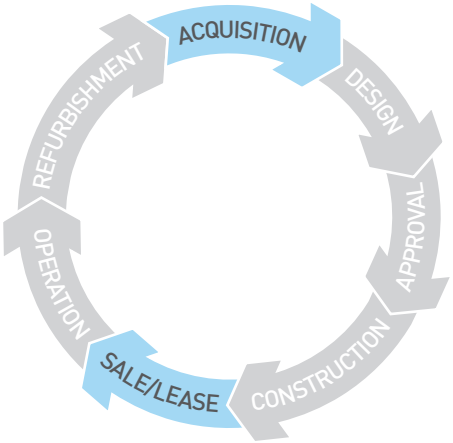
- Studies around the world show a pattern of green buildings being able to more easily attract tenants and to command higher rents and sale prices.

- Where green buildings have generated higher sales prices, this increase in value is largely driven by higher rental rates, lower operating costs, higher occupancy rates and lower yields.

- In markets where green is more mainstream, there are indications of emerging 'brown discounts', where buildings that are not green may rent or sell for less.

- An understanding of what defines green buildings and drives demand in each context is essential as local market conditions have a significant impact on the valuation of these buildings.

ASSET VALUE



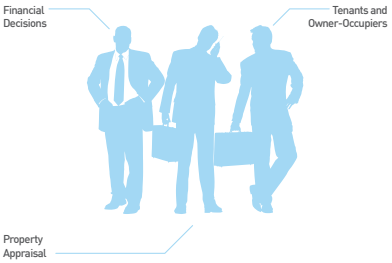
The concept of a building's 'asset value' has a different meaning for the various stakeholders in the property sector.

The most common definition of value is market value, which is the estimated price at which a building will transact in the market place between a willing buyer and a willing seller. In turn, for investment-grade buildings this is linked to the rental/capital figure that building occupiers (tenants or owner-occupiers) are willing to pay for owning or leasing a building. For example, for commercial buildings, the value of building is linked to a building's location, prestige, lease terms, operating expenses and resulting working environment.[1]

Other important factors include the availability of other green buildings in the area[2] and the viability of future refurbishment.

Developers and owners define value as the potential market value of their property, which is in turn influenced by the attractiveness of the property to potential occupiers. A property's market value is thus directly linked to the rental rate and occupancy rate. Figure 4 summarizes the determinants of value as they relate to the different stakeholders.

This chapter sets out findings from recent international studies that use transactional evidence to understand the influence of green building on sale prices, rental rates and occupancy rates, and the relationship between sale price premiums and construction cost premiums.



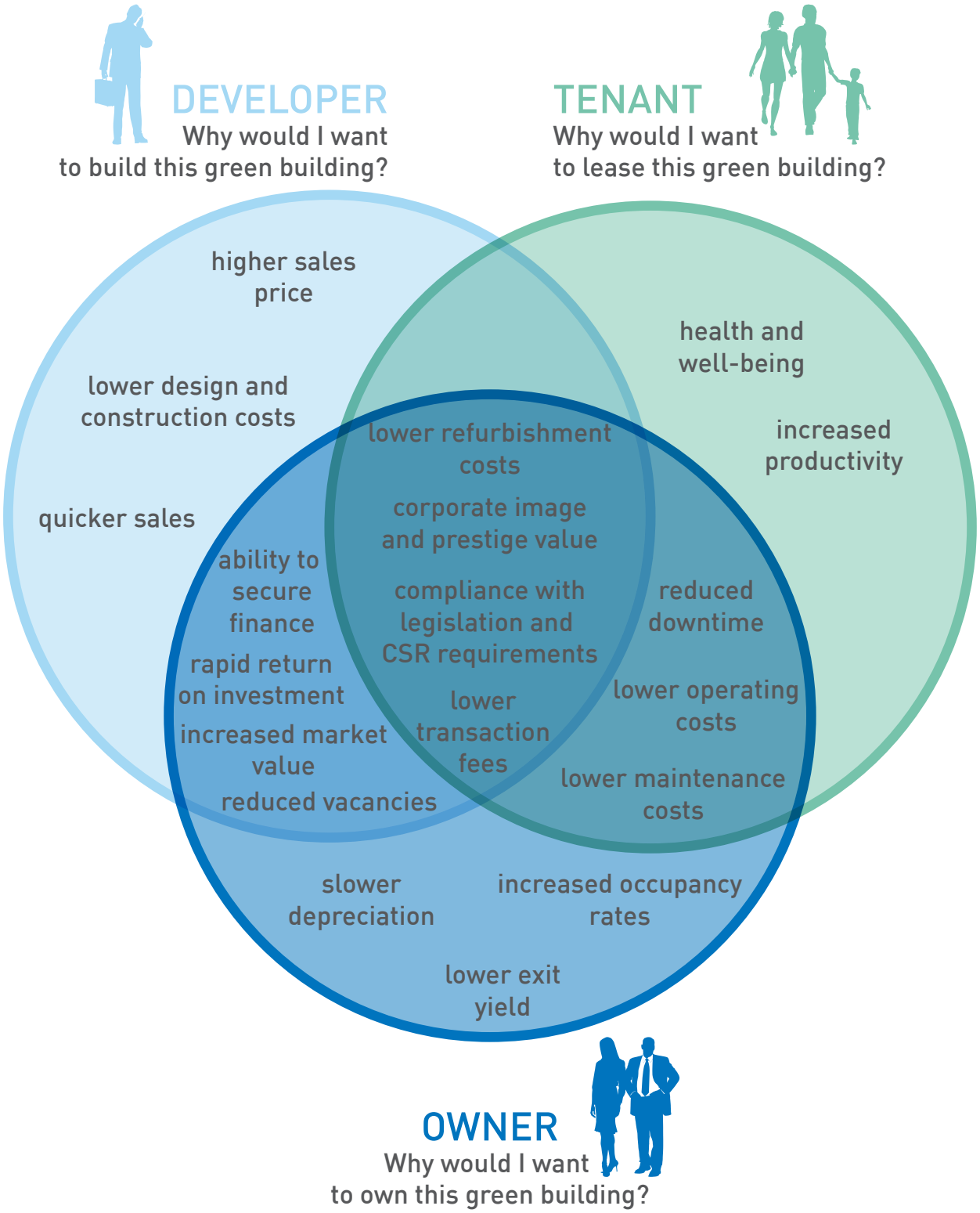


Figure 4
Stakeholder perceptions that affect the value of green buildings

How Do Green Buildings Influence Value?

Evidence from studies carried out over the past decade, primarily based on data gathered from LEED-certified office buildings in the United States, has shown that green buildings tend to have higher asset values than their conventional code-compliant counterparts.[3] This differential in asset value is evidenced by higher sale prices, which are in turn related to the following benefits:

- **Higher rental/lease rates:** Studies undertaken on certified green buildings have determined that a rental rate premium exists in many cases. This is attributed to the attractiveness of green buildings to prospective tenants in terms of their superior indoor environment, lower operating costs and enhanced marketability. In some markets where green buildings are more mainstream, a slightly different concept is emerging: where buildings that are not green result in lower rental and lease rates, or 'brown discounts'.
- **Lower operating expenses:** Certified green buildings tend to use less energy and water and are therefore often cheaper to own and operate, making them more attractive to prospective tenants and owner-occupiers where energy and water costs are a major consideration relative to overall costs, including rents.[4]
- **Higher occupancy rates:** Certified green buildings may be able to achieve higher occupancy rates, exhibiting an improved performance in the rental market compared to non-certified buildings,[5] providing owners and developers with the assurance of a lower volatility in the rate of return.
- **Lower yields:** Some studies have provided evidence of a lower yield at the time of sale. This lower yield (i.e., capitalization/discount rate) translates to a higher transaction price.[6]

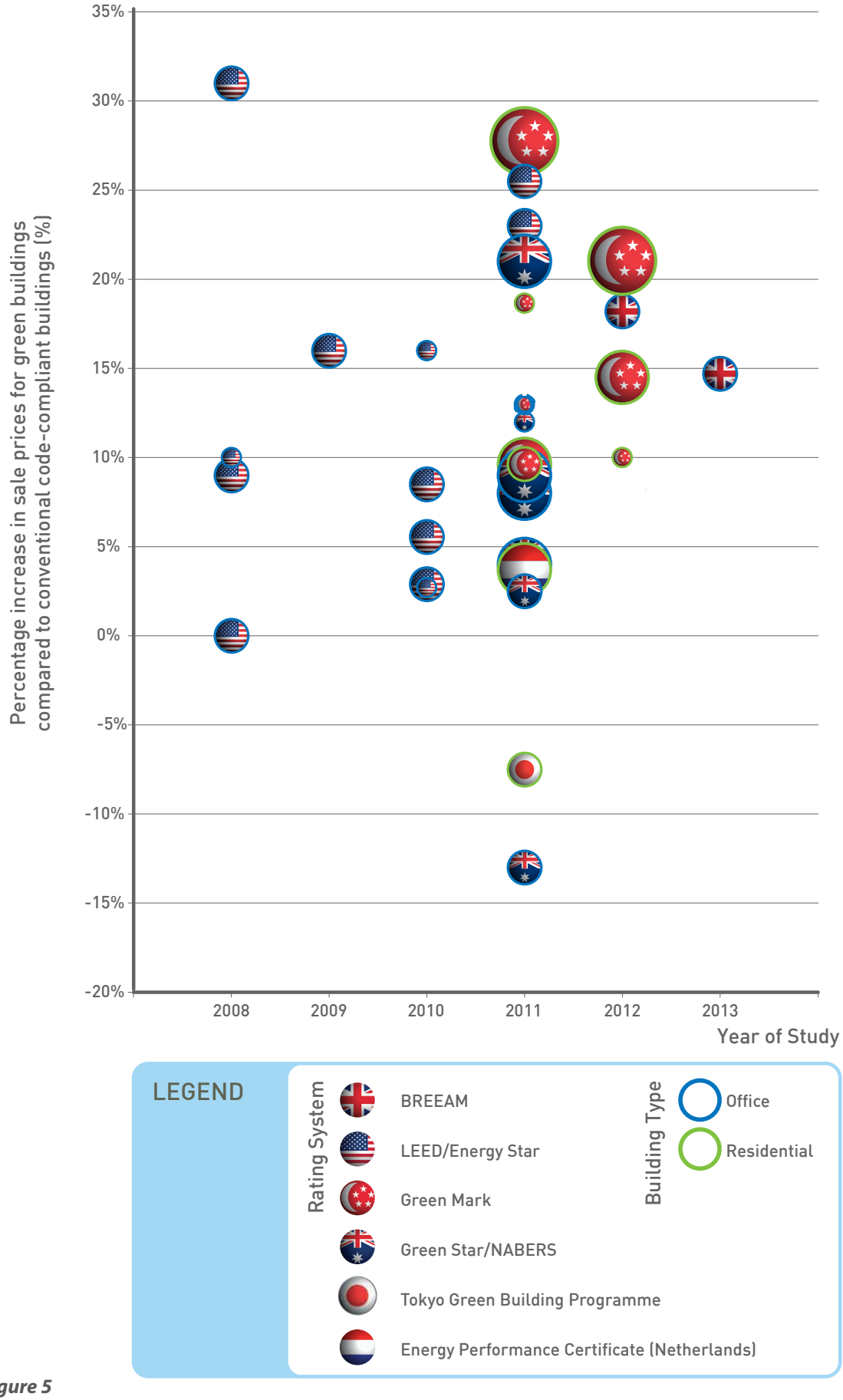


Figure 5
Reported asset value premiums of certified green buildings compared to conventional code-compliant buildings, various sources. [7,8]

Effects on Sale Prices

In a number of studies that compared certified green buildings to non-certified buildings in the same sub-market, price premiums were found to be in the range of 0 – 30%, including evidence showing that higher levels of certification also achieve higher sales premiums, including a number of examples for properties rated under the LEED[9] and Green Star[10] systems. The studies also demonstrate a trend towards higher levels of certification leading to the ability to command higher sale prices and rents. The range of reported values can be found in Figure 5. The data comprises of both residential and office properties rated under a number of environmental certification systems from the UK, the Netherlands, Australia, the United States, Singapore and Japan, although a majority of the studies found relate to LEED-certified office buildings in the United States.

These findings parallel those from the 'Design and Construction Costs' chapter; higher levels of certification are linked to both higher build costs and generally higher asset values. In fact, the build costs in the range of -0.4% – 12.5%, suggest a business case"for green buildings – the premiums in market value generally have been found to be higher than premiums in build costs.

It is worth noting that while these studies show a relationship between building green and the ability to command higher sale prices and rents, the green credentials of a property are not the only driving factor in the determination of value. Local conditions, the level of subsidy for energy and water, typical rents and property prices, the location of the building and prestige value of the property will all play a role in this, and as these factors are so closely linked it is not possible to definitively isolate the impact of building green on asset value. Based on the unique conditions of each market the magnitude of the financial benefits may vary depending on other influencing factors.

In the study of NABERS-rated buildings in Australia, it is important to note that while the higher levels of performance (NABERS 5*) tended to achieve a sales premium of up to 21%, the lower levels of performance (NABERS 2-2.5*) were also reporting discounts of as low as 13%. Similar findings in a recent study on LEED credits and green value show that just being 'LEED certified' does not add value - it starts at LEED Silver.[11] Could this possibly indicate a shift towards a preference of higher certification levels, and a growing perception that the lowest certification levels are simply not good enough?

In the case of the Green Mark certification scheme in Singapore, while the highest level of certification, Green Mark Platinum, presents a noticeable increase in sale price premiums when compared to Green Mark certified level (27.7% and 13% respectively), one study finds that Green Mark Gold/Gold plus properties do not follow the trend and actually show smaller sale price premiums than that of Green Mark certified buildings at 9.6%. The authors cite a lack of understanding in the Singaporean market regarding the difference between the various levels of certification. This implies that, for Singaporean development projects, the choice is between either the lowest or the highest level of certification, as the intermediate level may lead to increased build costs without a proportional return on investment - at least until market awareness increases.

Another example of a decrease instead of an increase in asset value can be found in a study conducted by Yoshida and Sugiura on the valuation of green condominiums in Tokyo, where the authors found that building green actually decreased the value of the buildings by 5 – 10%.[12] The prevalence of highly-efficient appliances and equipment in Japan was cited as one of the potential reasons why energy efficiency in building design was not seen as a driver for value. On the other hand, long-life design was perceived as increasing value due to slower depreciation. This is an interesting example of a contrasting market perception, where longevity and durability emerge as a higher priority than energy efficiency for green buildings.

Effects on Rental and Occupancy Rates

Evidence from the United States and Australia reveals that Energy Star, LEED and Green Star-rated buildings typically command rental premiums in the range of 0%[13] – 17.3%[14], with one study showing an instance of a rental discount of 9%.[15] This rental discount is found in a study from Australia, where lower NABERS ratings (an energy-only rating) have been linked with rental discounts as opposed to premiums.

Figure 6 illustrates the range of rental premiums for offices in the United States and Australia as reported in various studies over the past five years.

Similarly to sale prices, LEED-certified buildings have also shown a trend towards increased rental premiums associated with higher levels of certification.[16] The results from the study indicated an average 3% increase in rent for each increase in certification level.

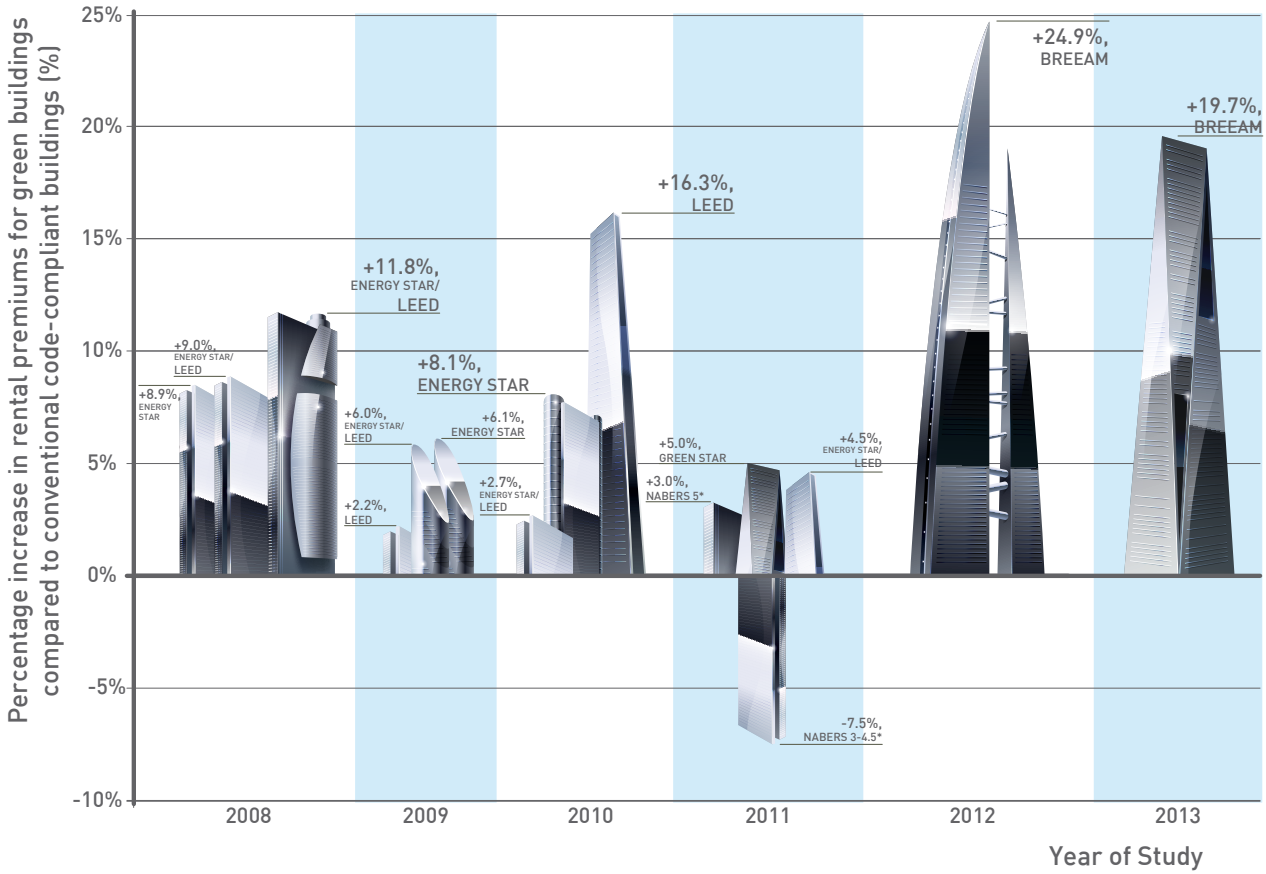


Figure 6a
Reported rental rate increases of certified green buildings as compared to conventional code-compliant unrated office buildings, various sources

There are a limited number of studies that report occupancy rates, although this is cited by many authors as being a significant determinant of value for green buildings. Figure 7 shows the reported occupancy rate increases from the available studies,[18] which range from 0 – 23.1%, and are based on figures for LEED and Energy Star-rated offices in the United States compared to their code-compliant counterparts.

No figures have been reported indicating that occupancy is negatively affected by green building.

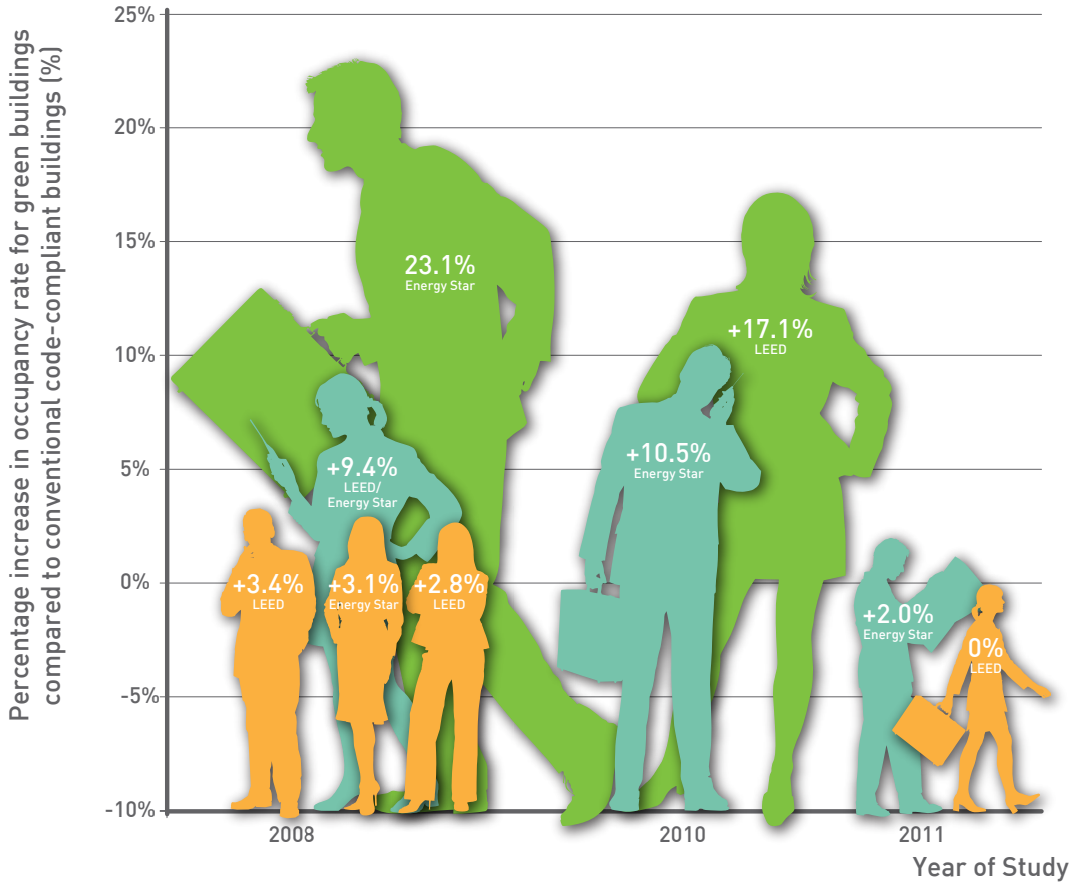


Figure 7
Reported occupancy rate increases of green certified office buildings as compared to conventional code-compliant office buildings, various sources


HOLLYWOOD HOUSE

CASE STUDY

Green Partnership: A Good News Story

UK retrofit investment promises a bright future for owner with long-term view

When real estate fund manager PRUPIM sought new tenants for empty space in Hollywood House, a multi-occupied office building located in Woking just outside of London, securing a strong tenant was going to be a challenge in a highly competitive market. This five-story building dated from the 1980s and, as with most buildings of that period, it was inefficient in terms of energy use and had high operating costs compared with current market standards.

Construction and project development company Skanska, an existing tenant in the building, was looking to rationalize its office space in the United Kingdom. Hollywood House met all Skanska's needs in this regard but one – the building did not live up to the company's green aspirations. Skanska approached PRUPIM with the requirement for an energy efficient building that worked for its employees and met its green commitment. PRUPIM recognised an opportunity to protect the value of its asset by retaining a major tenant on an extended lease and attracting further new tenants to a significantly upgraded, greener building. An extensive refurbishment with a significant commitment to achieving high green standards began.

PRUPIM's management teams worked closely in partnership with Skanska both as the proposed tenant and as the contractor. A number of green interventions were implemented including:

- Connection to district heating and power;
- Energy efficient lighting;
- Improved ventilation and energy management systems;
- A solar photovoltaic array to generate renewable energy on site;
- Water efficient plumbing fixtures and fittings;
- Rainwater harvesting;
- Energy monitoring and control systems, and;
- Cycle storage, showering facilities and electric car charging.

This extensive retrofit resulted in a desirable place to work that is also a building with optimized energy performance and reduced operational costs. Hollywood House is predicted to use 56% less energy than before the refurbishment, and 55% less water than standard. The cost of the green interventions is expected to be recovered in 13 years through energy savings alone. As well as these significant cost reductions, the tenant can now demonstrate a green commitment as well as offer a healthy and comfortable workplace for its employees.

PRUPIM has benefited significantly from the project. Not only has the upgrade extended the building's useful lifespan, but with Hollywood House achieving both BREEAM Very Good and LEED Platinum ratings, its leasing potential has increased. PRUPIM now has a desirable property with recognisable green credentials that appeal to prospective tenants.

The commitment to this green retrofit has allowed PRUPIM to secure a ten-year lease with its current tenant, immediately adding value to the asset. "Integrating sustainability into the refurbishment of Hollywood House enabled us to secure a pre-lease of 1,574 square meters - or nearly 17,000 square feet - to Skanska, an occupier with a strong covenant and a strong commitment to sustainability," confirms Nina Reid, PRUPIM's Director of Responsible Property Investment.

Having worked together on the retrofit project, the two groups will continue to maximize the green advantages of the new space. Skanska was among the first tenants to sign PRUPIM's standard agreement incorporating green lease clauses. The green lease, an agreement that aims to encourage green practices by both landlord and tenant, has seen the implementation of an environmental management plan setting performance targets for the building. Both owner and occupier aim to work together to meet these goals with the support of a Green Building Management Group established for the purpose – a green relationship that will reap benefits for both sides for many years to come.

A Growing Understanding

Although many studies have documented a rental, occupancy or price difference between 'green' and non-green buildings and dwellings, the underlying reasons for these differentials are not yet clear.

However, as more green buildings are built and more data is collected, our understanding of the issues should become more transparent. One recent study relates the exact energy bill of Energy Star buildings to the premiums paid for the buildings and documents that a one-dollar saving in energy costs per square foot (about a 50% reduction in costs), leads to an increase of US$0.95 in cash flows, and an increase of $13 in asset values.[19] These are quite precise capitalizations of energy savings.

This must be placed in the context of the type of leasing arrangements found in the U.S. and the land/building value ratio as these do not necessarily translate to other countries. There is also a risk that a lack of understanding of the mechanics for these price differentials may lead to predicted cost savings and occupier benefits not being realized.

This is particularly the case if buildings do not perform as expected. Sayce et al (2010) point out two case studies where either anticipated cost benefits are not always delivered,[20] or where worker comfort was not enhanced by being in an energy-efficient 'green' building.[21] It is important that failures as well as successes are addressed, in order to better understand the risks and mechanics of valuation.

It is also essential to understand that higher prices don't necessarily produce higher returns for investors, only for developers, so long as the price premium is not extinguished by higher construction costs. For investors to enjoy extra returns, the properties would need to appreciate faster or depreciate slower than other properties, and apart from the Yoshida and Suguira study,[22] evidence for this is currently very limited. Nonetheless, Pivo and Fisher (2010) have shown that green features do not dilute returns or harm investment portfolios.[23]

Another interesting development is that, as green buildings continue to gain momentum in the market and the supply of available green properties increases, and value arising from an element of 'scarcity' decreases, further increasingly demanding levels of mandatory compliance will narrow the specification gap between a green building and any other prime buildings. In a recent study by Chegut et al (2013), the authors estimate that for each additional green building in a particular area, the rental and sale premium for a certified building in the same area is decreasing by 1% and 4%, respectively. So, in time, prime and green may well simply converge.

Nevertheless, it is clear from the evidence that, despite differences in international certification schemes, there is a growing trend where the varied benefits of green building are reflected in market expectations of the prices that individuals and companies are willing to pay for them. Potential buyers and tenants in most markets are increasingly drawn to investing in green buildings, and at least in some countries, currently seem to be willing to differentiate through price of these spaces in terms of both sales and rental values.

THOUGHT PIECE

Reflecting the Past and Embracing the Future

The role of valuation professionals and valuation in facilitating change

A building's market value is critical to the construction and investment decision-making process and as such, accurate valuations underpin the operation of the real estate markets and form the basis for performance analysis, financing decisions, transactions, development advice, dispute resolution and taxation. Therefore, ensuring that valuation professionals' expertise extends to a deep appreciation and understanding of sustainability matters, many of which are still uncertain, is a prerequisite for more sustainable real estate markets.

Yet we live and work in an increasingly paradoxical, uncertain and ambiguous world in which the traditional trust in the advice of professionals seems to be rapidly disappearing, replaced by a climate of litigation in which the professional's opinion is scrutinized and challenged, driving the professional to advise only in relation to that which can be substantiated by hard data; advice merely based on opinion and experience is no longer sufficient.

Therefore, there is a temptation for valuers to base advice on analysis of recent past transactions and a notion of the future continuing to be 'business as usual'. After all, anything else involves some level of speculative interpretation of trends. Yet, this is misplaced; valuations are about advice in relation to the future – and that implies uncertainty.

So what is, or rather should be, the valuer's repose to the sustainability agenda? The fact that sustainability is on valuation professionals' agendas and that of their clients is a major step forward from only ten years ago. Professional bodies are writing consideration of it into standards and guidance, and rightly so. But in practice, how do we do the right thing and balance fact and opinion, science and perception? Whilst current valuation techniques have the capacity to reflect sustainability issues, it is one thing to have standards as to process; it is another to have evidence to change advice and thus potentially influence clients. Multiple regression analysis of past rental transactions can point to certified buildings achieving differential levels from those without.

But is this sufficient evidence of the business case for either constructing or investing in 'green' buildings and consequently for valuation professionals to advise clients accordingly?

This is surely too simplistic. In many ways, recently constructed and certified buildings are simply synonymous with prime stock, but many prime buildings do not remain so for long. What makes intrinsic value over time relates to location and the ability of a building to create a human response toward it, either as occupier or in terms of its fit to place. So what may fulfill the 'green agenda' on completion may not, in the long-term, be sustainable if it does not meet social needs.

Understanding and considering the interactions and interdependencies between these more complex and often less tangible value-influencing sustainability factors, and incorporating this knowledge into daily valuation theory and practice, ranks among the profession's biggest challenges. Our understanding of value should seek to recognize the real contribution that buildings make to their owners and wider society and planetary well-being. Needless to say this would mean widening, or indeed challenging, the traditional concepts of value by going beyond the perception that buildings constitute just another financial asset class.

For this much deeper and wider understanding is needed - including how some of the so-called sustainability features will perform over time. The heartening news is that there are now early signs that valuation professionals are beginning to systematically collect data relating to several sustainability considerations - but there is a long way to go before this is comprehensively analyzed and reflected in valuations. However, once valuation professionals have the data, they clearly are more vulnerable to litigation - if they do not use it. And a failure to acknowledge this will definitely not result in 'business as usual'.

by Ursula Hartenberger
RICS

and Sarah Sayce
Kingston University

NEXT STEPS FOR INDUSTRY

- **Increase transparency and consistency:** Appraisers, or valuation experts, need to be engaged with the process of accounting for sustainability measures in the development projects on which they advise– there is a need for greater transparency and consistency of approach in order to minimize any perceived risks of devaluation or a decrease in expected benefits from the inclusion of sustainability features on building projects.
- **Collect more data:** More data is needed with regards to the impact of certification or green measures on building value for different markets and at different levels of certification. In particular, data is needed on the impact not just of certification, but of individual measures or strategies, and how they are perceived by valuers. Existing studies for rental and occupancy rates in particular are based on small sample sets and need to be built up to increase their reliability and robustness.
- **Understand the implications:** The industry also needs to gain a better understanding of the implications of changes in the ratio of certified versus non-certified buildings, the trend in legal requirements to upgrade buildings, fiscal incentives to offset capital costs and other external factors related to political, economic and environmental issues, all of which will impact the asset value of both green and non-green buildings.

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1 Sayce et al, 2010; Fuerst et al, 2008; Kats, 2003; Robinson, 2005; RICS, 2005

2 Chegut et al, 2013

3 Brounen et al, 2012; Addae-Dapaah et al, 2011; Deng et al, 2012; Newell et al, 2011; Eichholtz et al, 2010 and 2013; Fuerst et al, 2008 and 2011; Miller et al, 2008; Pivo et al, 2010; Demisi et al, 2011.

4 Wiley, 2010

5 Wiley, 2010; Eichholtz et al, 2010 and 2013; Fuerst et al 2008 and 2011

6 Eichholtz et al, 2013; Miller et al, 2008; Pivo et al, 2010

7 Where a range of values have been reported for a particular certification rating by a single author, the vertical bars represent the minimum and maximum reported results, with the marker appearing as an average of the two values.

8 Where a range of values has been reported in the study, the minimum and maximum values are shown as blue bars with the marker showing the mean value.

9 Eichholtz et al, 2013

10 Newell et al, 2011

11 Eichholtz et al, 2013

12 Yoshida et al, 2011.

13 Eichholtz et al, 2009

14 Wiley et al, 2010

15 Newell et al, 2011

16 Eichholtz et al, 2013

17 Miller et al, 2008; Fuerst et al, 2008 and 2011; Wiley et al, 2010; Eichholtz et al, 2010 and 2013.

18 Miller et al, 2008; Fuerst et al, 2008 and 2011; Wiley et al, 2010; Eichholtz et al, 2010 and 2013.

19 Eichholtz, et al, 2013

20 Turner et al, 2008

21 Paul et al, 2008

22 Yoshida et al, 2011

23 Pivo et al, 2010

OPERATING COSTS

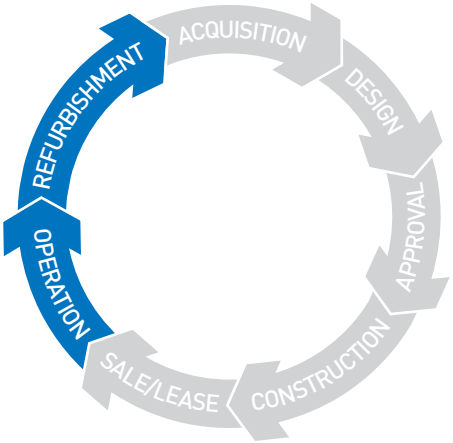
- Green buildings have been shown to save money through reduced energy and water use and lower long-term operations and maintenance costs.

- Energy savings in green buildings typically exceed any cost premiums associated with their design and construction within a reasonable payback period.

- In addition to reduced operating costs, green buildings can offer indirect benefits related to costs for refurbishment and reconfiguration of space.

- High-performing green buildings need to be backed up by robust commissioning, effective management, leadership and communication in order to achieve their predicted performance.

OPERATING COSTS



The true test of green buildings lies in how well the design performs during the building's occupancy phase.

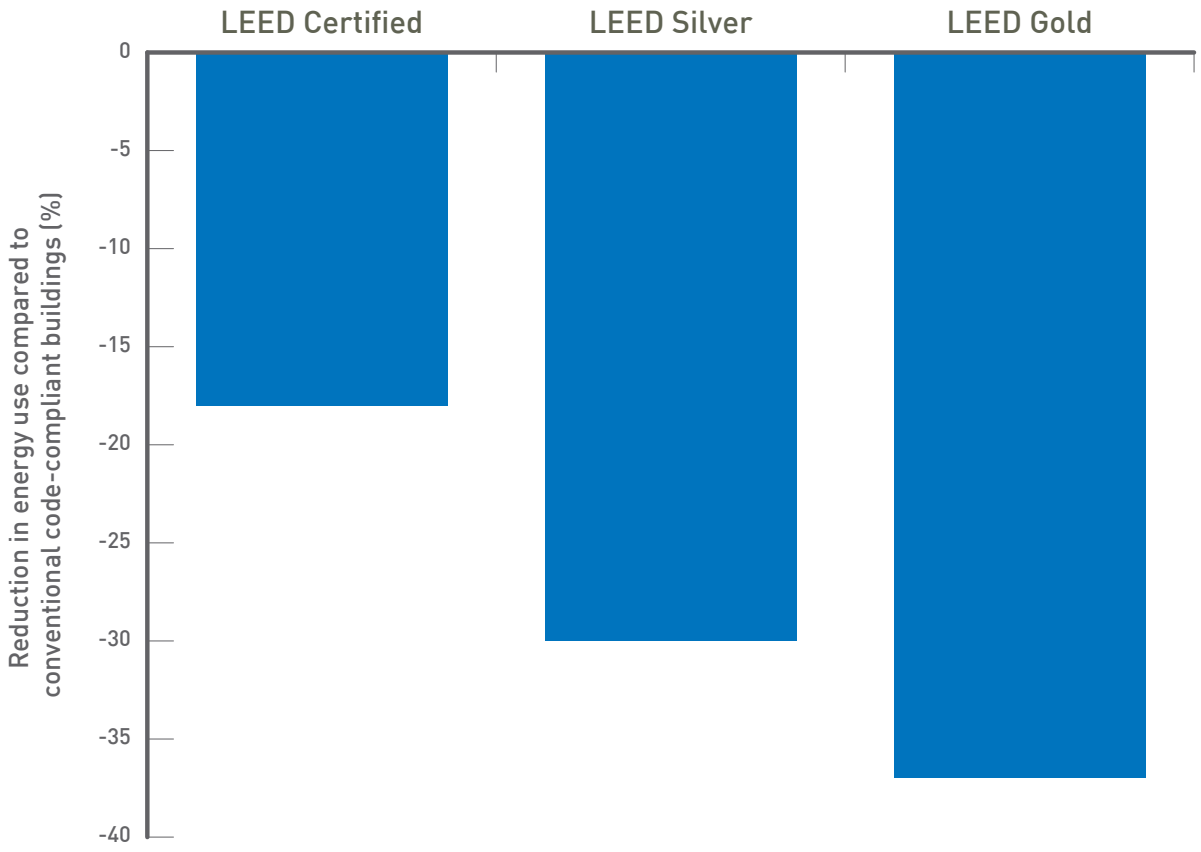
The justification for any added capital costs for green buildings, as well as any increases in market value or rental premium, lies in the realization of occupancy-related benefits in two main areas: reduced operation and maintenance costs; and productivity and health benefits. This chapter focuses on the savings that can be achieved by green buildings in terms of operational costs. Occupant productivity and health are explored in the following chapter.

The main benefits that directly relate to the design of green buildings include reduced energy costs from heating, cooling, lighting and ventilation, and reduced water consumption.

Other benefits, such as reduced operational costs and maintenance requirements, require effective green building management procedures to be put in place prior to the building's occupation in order to reap the maximum benefits of the building's sustainable features. Green buildings also potentially offer indirect benefits related to reductions in property taxes, insurance rates and the costs for refurbishment.[1]

Energy Savings

Reduced energy consumption, and the consequent reduced energy costs, is one of the defining features of any green building. Energy efficiency also has a significant impact on the overall running costs of a property; as energy prices rise, operational energy efficiency will likely become one of the more important drivers for occupier demand.[2] Estimates for the reduction in a green building's energy use compared to a conventional code-compliant building range from 25% - 30%[3] (based on LEED-certified buildings in the United States) to up to 35% - 50%[4] (based on a similar study of green buildings in New Zealand). The LEED study by Kats (2003) also provides figures that indicate that higher levels of certification often correspond to higher percentages of energy savings, as shown in Figure 8. A more recent study by Kats (2010) estimates the water consumption savings resulting from strategies such as water reuse and water-efficient plumbing fixtures as being 39% over that of a comparable conventional building.[5]



*** It should be noted that since this graph is based on 2003 data, the reductions based on today's baseline building may not be as pronounced as they were at the time this study was conducted, however the trend of greater energy reductions corresponding to higher certification levels should still be valid.**

Figure 8
Energy Savings for LEED certified buildings [6,7]

Energy Savings from Green Building Retrofits

The retrofit market for energy efficiency is gaining momentum. Most countries are increasingly aware of the energy inefficiency of their existing building stock in the face of global energy reduction targets. As a result, energy efficiency retrofits are rapidly growing in importance. Retrofit measures may include thermal envelope improvements, heating and ventilation system upgrades, lighting upgrades, sub metering, improved controls, water saving fittings and fixtures, renewable energy installations and mechanical system upgrades such as heat recovery systems and variable frequency drives for fan motors.

The current evidence finds that energy savings for green building retrofits are not as high as those for new builds, but are nevertheless substantial. For example, a study of buildings in Singapore reveals that the resulting energy savings of a sample of buildings is 17% post-retrofit.[8] Transwestern, a private real estate firm from the United States, reports typical savings of 3% to 15% on the utility bills on its managed properties that have undergone energy performance upgrades.[9]

As energy prices continue to rise, the relative benefits of energy efficiency will become increasingly important, and the business case for energy-efficient buildings, as well as energy efficiency retrofits, will strengthen.

Maintenance

Aside from resource efficiency, another typical feature of green buildings is the focus on the durability and longevity of systems and finishes.

A material is usually considered in terms of its entire life cycle, as well as its attributes at the time of installation, utilizing a cradle-to-cradle approach that takes into consideration the embodied energy, toxicity and emissions, replacement cycles and disposal to ensure that a material is 'green' in all aspects.

A properly specified palette of sustainable materials and building systems would provide financial benefit in the long term through less frequent replacement cycles and decreased cleaning and maintenance requirements, as well as benefits linked to healthier indoor environments due to lower toxicity and emissions. Taking it a step further, materials that are truly cradle-to-cradle have an additional cycle of recycling and recovery at the end of their life, creating the potential for an additional income stream, although this process is presently in its infancy.

Refurbishment

Another feature that contributes to the financial viability of a building that benefits both owner and occupier is the aspect of design flexibility, adaptability and future-proofing. Green buildings often incorporate systems that are designed for adaptability, including raised floors and movable partitions, which allow for occupant movement and spatial reconfiguration without excessive disruption, downtime, or cost. In office buildings in Canada, for example, the estimated cost reductions associated with the inclusion of raised floor systems equated to US$4.31 square meters per year, based on 2003 data.[10]

For owners, adaptability means the ease of transition into a new use or reconfiguration of space in order to meet changing market requirements. For both owner and occupier, a future-proofed building in terms of adaptable energy sources, data infrastructure, climate change and new ways of working ensures that the building will continue to be a valuable asset well into the future.

CASE STUDY

Bright Lights, Big City

Straightforward lighting retrofit in New York City make a big difference - literally overnight

The bright lights of New York City aren't famed for their energy efficiency, but Ernst & Young is lighting the way with its newly LED-illuminated headquarters in Times Square.

The professional services company has conducted one of New York City's largest LED lighting retrofits, replacing old lights in its 32 floor office space entirely with LED technology. The project covered new and more efficient custom fixtures, occupancy sensors and controls to manage lighting use, and installation throughout the building's offices, conference rooms and common spaces.

The simple retrofit will save the company almost $1 million each year, cutting previous lighting energy and maintenance costs in half. Yet even before these savings were realised, the company saw a 13% reduction in its upfront costs due to utility rebates identified by the retrofit team.

And Ernst & Young aren't the only ones saving - the initiative will also cut energy use by 54%, or about 2.9 million kWh per year, keeping approximately two million pounds of CO_2 emissions out of the atmosphere annually.

"Green Buildings contribute significantly to achieving savings on energy bills and reductions in ecological footprints," explains Harry Verhaar of Philips Lighting, the company providing the technology. "In these times of economic challenges it is even more important to note that such solutions have important additional benefits, including learning effectiveness in schools, increasing well-being and productivity in our workplaces, and providing attractive ambience."

With this in mind, the project did not focus solely on energy but also considered the space, with lighting designed to match the aesthetics of the building. Care was taken to ensure the appropriate lighting was used for the size and purpose of each area. The result was an improvement in quality of light for the building's more than 5,500 workers.

Surely replacing all of the lighting in 650,000 square feet of office space would be challenging and time consuming, requiring significant down time? Not in this case – by working closely with the local labour union, the new lighting in each area was installed smoothly and swiftly, in just a single night shift.

CASE STUDY

Exemplary by Any Measure

Premier Cape Town property shows that deep energy retrofits don't need deep pockets

Cape Town's V&A Waterfront, a 400,000 square meter mixed-use development that sees 23 million visitors per year, is demonstrating measurable results from its US$2.48 million retrofit that began in 2008. According to Colin Devenish, V&A Waterfront's Executive Manager of Operations, the project's key driver was the business case for 'going green'.

"Most of what we have done is based on sound business practices," explains Devenish. "We considered pay back periods, return on investment, customer perception, and improving our relationship with various other stakeholders. More recently, there has been pressure from staff and our tenants to move towards sustainability."

This business and stakeholder-focused approach led V&A Waterfront to embark on the extensive, deep energy retrofit, which took place gradually over three years. Armed with a clear plan built on careful analysis and review, the project began with measurements of energy and water usage to establish benchmarks. Cost savings and the tasks that would achieve them were prioritized. Simple measures that cost little and paid for themselves quickly were introduced first; adjustments to air conditioning controls, for example, recouped costs in just one month of operation.

Major energy saving initiatives were added over time and included installation of additional power factor correction equipment, energy efficient lighting and a lighting control system, energy efficient escalators and lifts, and use of seawater cooling instead of traditional cooling towers. The project also introduced water conserving and waste management initiatives, with annual savings of US$62,000 and US$100,000, respectively.

The project's approach paid off in other ways, too: incorporating changes into normal end-of-life replacement of equipment, such as swapping old chillers with energy efficient versions at the end of their useful lives, helped to absorb retrofit costs.

The project's twin aims of increasing the operation's sustainability and reducing expenses were carefully monitored, with reporting on savings both internally and externally. As a result, the development can now demonstrate a 17% drop in energy costs and savings of approximately US$640,000 per year.

Since the retrofit, the management of V&A Waterfront has taken a long-term view, with on-going measures in place to maximize benefits. Staff members at the facility are educated about sustainability features, and utility management is addressed as part of on-going staff review processes.

So far, capital costs for the retrofit have not recouped through tenants. Ultimately, the center will structure leases so that energy costs and savings are shared with tenants. Meanwhile, the focus has been on tenant education and updating tenant criteria documents for refurbishments and new tenancies.

The project has also been well received externally, with positive and regular publicity. The development has featured in a number of articles that praise its energy savings and greening initiatives, and V&A Waterfront is picking up numerous awards and winning competitions for its energy saving efforts.

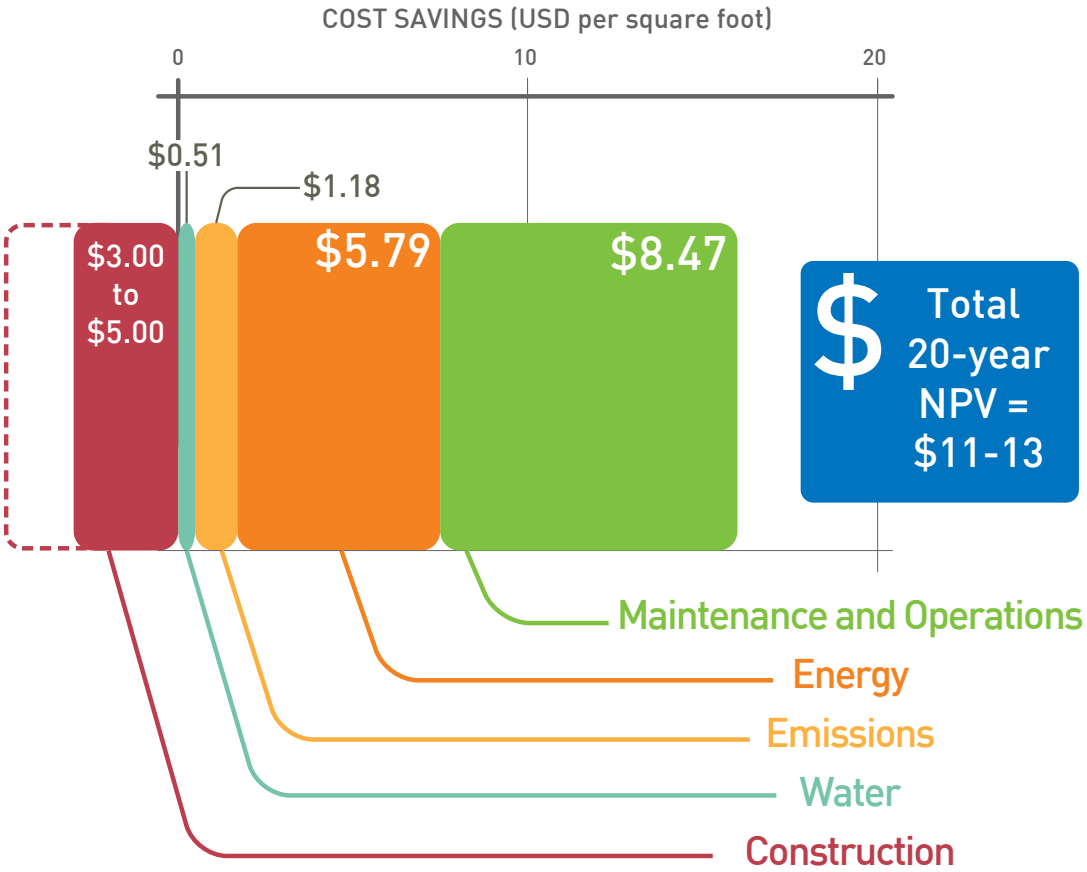
This recognition is another way that V&A Waterfront is experiencing the benefits of its sustainable retrofit, in addition to the cost savings the project has generated that will enable the work to pay for itself in a little over four years.

INITIATIVE	COST (US$)	MONTHLY SAVING (US$)	ANNUAL SAVINGS (US$)
Installation of power factor correction equipment to reduce maximum demand	20,700 (2008)		
9,200 (2009)	1,150	13,800	
Review and restructure of electrical tariffs	No cost	17,200	207,000
Installation of energy efficient lighting and lighting control system (Phase 1)	368,000	8,700	105,000
Installation of more energy efficient lighting and upgrade of lighting levels (Phase 2)	279,000	3,700	44,500
Re-use of excess fittings in other buildings	No cost	Not applicable	23,000
Improvement of air conditioning controls – customize and change operating times in accordance with the seasons and outside weather conditions	No Cost in management actions, but a cost of 5,700 to upgrade the Building Management System	±5,700	82,700
Replace four screw chillers with two centrifugal chillers that are 25% more energy efficient (part of normal end of life replacement). Move from a constant volume to a variable volume system – variable speed drives on air handling units, variable volume diffusers	1,700,000	8,000	96,000
Moving from traditional cooling tower system to seawater cooling	Not available	7,800	93,600
Converted part of irrigation system from spray to drip irrigation for less water usage, reduced weed growth and pest problems (25 liters/10m2 for spray irrigation vs. 10 liters/10m2 for drip irrigation)	Not available	2,300	27,600
Reduced watering times, especially during the rainy Cape Town winter and watering times adjusted according to weather and location (e.g. shade vs. sun)	No cost	Not available	36,700 (2008) 38,000 (2009) 34,000 (2010)
Waste recycling program implemented in 2009. Guaranteed payback of US$6,300 per month on recycled material. Approximately 50% of the precinct's waste is now recycled (180 tons per month)	Not available	8,725	104,700

Overall Operational Cost Savings

Kats (2003) found that a minimal upfront investment of 2% on top of the construction costs of a project yields savings of over ten times the initial investment, based on a life cycle of 20 years for 33 LEED-rated projects in the United States.[12] While this figure includes the savings estimated from increases in productivity and health, looking at operational cost saving alone finds that these savings also exceed any cost premiums associated with green building design and construction (Figure 9). The degree of savings will vary depending on the energy prices in a given location.

In a smaller study carried out in New Zealand in 2006, operational cost savings offset the marginal cost increase of green buildings by five or six times for owner occupiers and that the higher rental premium for tenants would be offset by a factor of three.[13] So, even without productivity in the mix, the savings on operation and maintenance costs alone present a compelling business case for green buildings, particularly as energy costs continue to rise and the capital cost uplift for green buildings decreases.



* It should be noted that since this graph is based on 2003 data, these values may no longer be accurate due to economic changes since then, however the relative difference between maintenance, operations, energy, emissions, water and construction is what is of interest here.

Figure 9
Net present value analysis of the operational cost benefits of LEED certified buildings [11]

THOUGHT PIECE

Making Green Leases Work

Singapore is well recognized as a leader in the Asia Pacific region on sustainability in the built environment, with world-class policies and building rating tools. Recent discussions between property industry and Singaporean Government representatives has shown green leasing as perhaps the last missing piece of the sustainable building puzzle, providing some key factors can be met:

- Green leasing must work hand-in-hand with existing green building rating systems;
- Lease clauses with easily quantifiable benefits, such as energy performance targets, are easier to manage than less-quantifiable (though still worthwhile) initiatives (e.g., workplace productivity); and
- External authorities to enforce lease clauses may further encourage landlord and tenant collaboration.

Green leases are a governance framework between landlords and tenants which facilitate collaboration towards better building performance. Leases can range from 'light' green, with parties focusing on, though not necessarily committing to, specific actions, to 'dark' green, where more rigorous targets, monitoring and penalty mechanisms may apply.

Working alongside green building rating tools, which provide the specific performance indicators to monitor, the green lease helps to bridge the gap between building design and site operation, via target setting, specifying roles and responsibilities, and mediating non-compliance.

The idea sounds simple enough. But how will this work in practice? The concept is relatively new in Singapore, with less than a handful of known examples.

One example involved a site where district chilled water was purchased from a utility provider, with the landlord to be penalized if the return water temperature is too low. The green lease allows the landlord to partially pass through these costs to tenants, if they are returning the chilled water below the pre-agreed limit.

During real-life operation, the landlord was penalized a sizable sum for missing the target and, rather than simply passing on the relevant costs and walking away, is now actively supporting the tenants to resolve this issue. Although cost is a clear driver, the landlord and tenants are both focused on collaboration to achieve better energy performance, which is leading to overall improvements in building operations.

No doubt technology like intelligent Building Automation Systems (BAS) or processes like Building Information Modeling (BIM) will continue to improve building performance; green leasing can add a new dimension to the green building movement and drive real collaboration between landlords and tenants.

by Shengkai Chiu
Jones Lang LaSalle (with thanks to Matthew Clifford)

Bridging the Performance Gap

The evidence presented above demonstrates that operation and maintenance cost benefits do exist and that they are substantial. However, even the most well-designed buildings with high servicing requirements may not perform as predicted if not supported by robust modeling, design and construction management, effective stakeholder communications, proper commissioning and effective management during the occupancy phase.

Figure 10 shows how the discrepancy between predicted versus actual energy performance is not just generated by a single event but of a series of factors that occur throughout the building design and procurement process (the percentages presented in the graph are based on theoretical modeling and extensive industry experience rather than statistical modeling).[14] The role of Integrated Design Process (IDP) is significant here, as it is probably the most useful tool in ensuring that the expected benefits from green design are realized during the building's occupancy phase.

The performance gap has been documented in several studies, and has led to the perception that the cost benefits for green buildings are often not realized[15] and that predicted worker satisfaction and comfort is often not delivered.[16]

So, how can we ensure that predicted building performance matches the performance of the building in operation? The answer lies in the following key strategies:

The positive impacts of **building commissioning** have been outlined in numerous studies, illustrating the influence it can have in identifying malfunctions and other issues related to efficiency that increase the opportunities for energy savings and building systems optimization. Proper commissioning of both new and existing green buildings results in reduced operating, maintenance and repair costs. This also ensures that specifications set out during the design phase are followed through to installation.

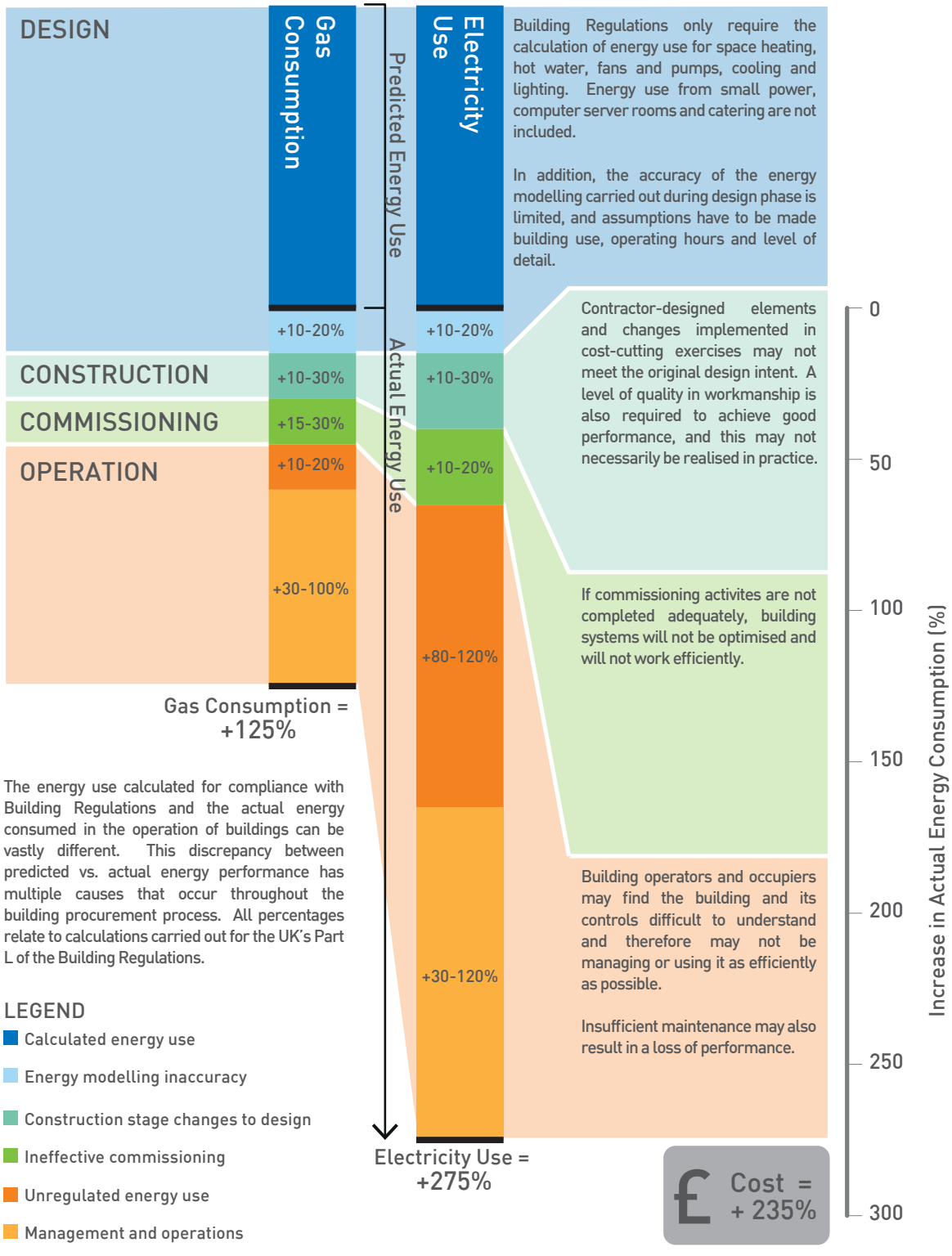


Figure 10
The performance gap between predicted and actual energy performance in the UK

Commissioning should be an on-going process that is carried out for a minimum of the first 12 months after handover in order to be meaningful, as this ensures that the process covers the seasonal variations in weather and occupancy throughout the year.

There is evidence that resulting savings more than pay for the cost of commissioning for both green and non-green buildings. Costs for commissioning have been found to range from 0.3%[17] to 4%[18] of construction costs, while the subsequent reduction of operations and maintenance costs was estimated by Kats (2003) to be in the range of 0% to 25%.[19] A more recent paper by Mills et al (2009) based on a study of 643 buildings in the United States, shows that commissioning costs amounted to 0.4% of the overall construction cost, while the whole building energy savings equated to 16% and 13% for existing buildings and new construction, respectively.[20]

Leadership in the form of **green building management** and effective and transparent communication is crucial. This requires effective collaboration between owners, agents and facilities managers, and effective communication between the owner and the occupier.

Green building management[21] requires that proper objectives are set and monitored with regards to reducing costs and emissions, as well as the effective management of any savings and reinvestment. This could also include the facilitation of data acquisition and sharing between the owner and the occupier, service charges, lease terms and management arrangements (including green leases), and regular meetings between stakeholders to encourage engagement between all parties involved. Split incentives are cited by many as a significant barrier to commercial real estate investment into rented properties. In these properties, the building owners pay for upgrades but do not reap the benefits – tenants do. Green leases[22] are a solution to this problem, where owners and tenants agree to lease terms that share the benefits and costs of the energy efficiency retrofit, thereby providing owners with a financial incentive to undertake the retrofits.

Effective and transparent **communication** of successes and lessons learned can also be used to drive better user behavior and improve the longevity of owner-tenant relationships. It has been found that providing performance feedback to occupants can lead to additional savings. In terms of direct feedback, which includes real-time meters and monitors, savings ranged from 5-15%, while indirect feedback, such as bills or other non-immediate sources of information, can provide additional savings up to 10%.[23]

Tenant awareness programs serve as a good complement to commissioning, and are made more effective by carrying out post-occupancy evaluations, which can provide meaningful feedback between the owner and occupier, as well as assist in ensuring that buildings are used properly and that they are delivering an optimum working or living environment. Studies have shown that occupant behavior plays a central role in influencing a building's operational energy use.[24]

Compelling evidence exists regarding the potential for substantial cost benefits arising from reduced operational and maintenance costs for green buildings. However, a performance gap does exist in many cases and development teams need to ensure that design intentions are followed through to post-occupancy and that leadership and management are needed to ensure that these benefits are realized.

NEXT STEPS FOR INDUSTRY

- **Undertake new research:** More data is needed about the impact of certification and green buildings on operational costs for other global regions outside of the United States. The seminal study by Kats (2003) is still the primary reference ten years on, and while some smaller studies have been carried out using the same methodology, statistically robust information on bigger samples are few and far between.
- **Understand the performance gap:** Industry needs to understand the nature of the performance gap at each stage of the development process and ensure that these issues are addressed by all stakeholders.
- **Raise awareness:** Promote greater awareness and understanding of the role of commissioning and its inclusion in building regulations and standards.
- **Adopt green management techniques:** Increased adoption of management techniques such as the integrated design process and green leases should be a primary focus.

REFERENCES

1 Lucuik, 2005
2 Ellison et al, 2007
3 Kats, 2003
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5 Kats, 2010
6 Kats, 2003.
7 It should be noted that since this data is from 2003, the reductions based on today's baseline building may not be as pronounced as they were at the time this study was conducted, however the trend of greater energy reductions corresponding to higher certification levels should still be valid.
8 Yu et al, 2011
9 Bernstein et al
10 Kats, 2003
11 Kats, 2003
12 Kats, 2003
13 Fullbrook et al, 2006
14 Arup, 2013
15 Turner et al, 2008
16 Paul et al, 2008
17 Syphers et al, 2003
18 Dorgan et al, 2002
19 Kats, 2003
20 Mills, 2009
21 Smallwood, et al, 2010
22 Better Buildings Partnership, 2010
23 Janda, 2011
24 Janda, 2011

WORKPLACE PRODUCTIVITY AND HEALTH

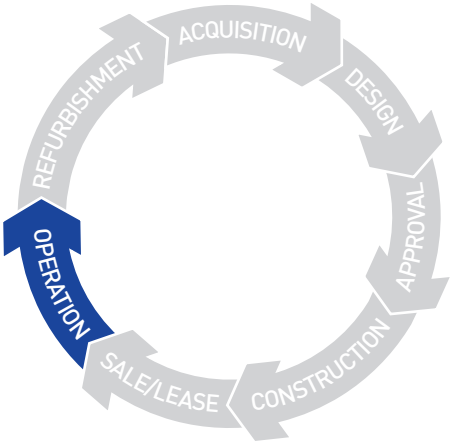
- Research shows that the green design attributes of buildings and indoor environments can improve worker productivity and occupant health and well being, resulting in bottom line benefits for businesses.

- Despite evidence of its impact, improved indoor environmental quality has not been a priority in building design and construction, and resistance remains to incorporating it into financial decision-making.

- This lack of uptake is likely because 'productivity' in the modern workplace can be challenging to measure, its causes woven with a number of factors, and it has not been systematically translated into financial metrics.

- While more research is needed, investing in better indoor environments can lead to better returns on one of every company's greatest assets - its employees.

WORKPLACE PRODUCTIVITY & HEALTH

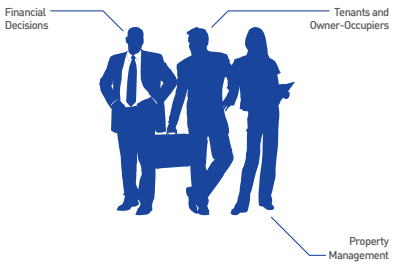


From a business perspective, there are clear incentives for improving employee health and productivity.

Any business owner can tell you that staff salaries and expenditures make up the bulk of operational expenses associated with occupying an office building. Indeed, over 85% of total workplace costs are spent on salaries and benefits, compared to less than 10% on rent and less than 1% on energy.[1]

Research suggests that by making even small improvements to factors such as productivity, health and well-being, businesses can experience greater financial benefit than they would from more efficient resource use in building operations.

It is not surprising that the business community is increasingly interested in how green building design can positively impact its people. Some leading businesses are now shifting their thinking from 'how much will green building cost my business' to 'how much will not investing in green building cost my business?'



Ignoring the Impacts of Indoor Environments

While businesses are increasingly recognizing that buildings that better support their employees also result in better organizational outcomes, they are less certain of how they should be leveraging buildings to positively impact people.

In addition, many businesses believe that people can adjust to any environment[2] and so often make changes to the environment only when it directly interferes with work performance, rather than being proactive and exploring how the environment can positively influence productivity and well-being.

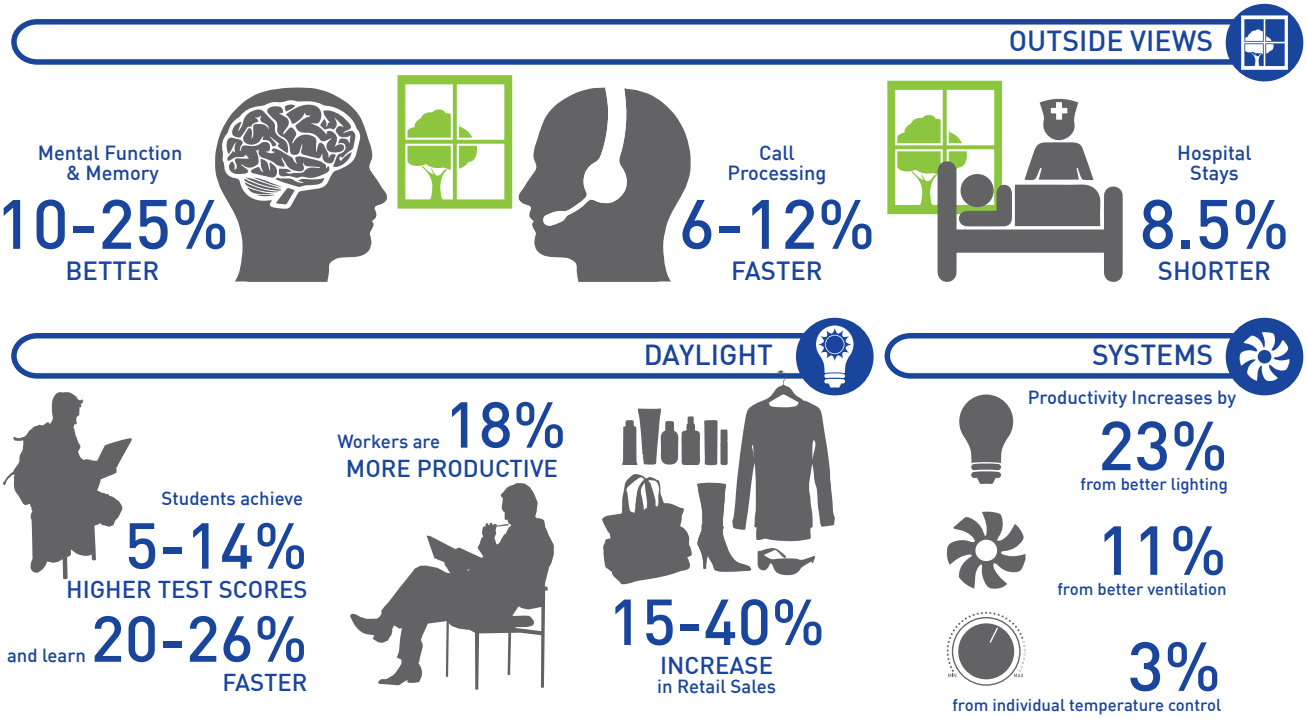


Figure 11
Net present value analysis of the operational cost and productivity and health benefits of LEED certified buildings

THE LINK BETWEEN GREEN BUILDINGS AND WORKPLACE PRODUCTIVITY

Defining Productivity

There are many ways to look at the term 'productivity', which in the context of office-based work is also referred to as 'task performance'.

Productivity generally measures quantity - how much work is performed and delivered into goods and services (inputs and outputs) and how efficiently. Quality of work is also important and in some cases can include easily-tracked outcomes such as errors, number of do-overs, and work completed on time. Yet for many types of knowledge-based work, these types of measurements are more difficult because the impacts of knowledge work are often not realized immediately and not always readily quantifiable.

Other ways of assessing productivity have included measures of standardized cognitive tasks (memory, attention, math tasks, and vigilance). However, this is not productivity in a real work sense, but rather a proxy for the kinds of tasks that many people do.

Indirect measures of productivity that are frequently used include absenteeism, 'presenteeism' and tardiness. The idea behind these measures is that people cannot work as effectively when they are ill or have low levels of motivation. While these are useful measures, it can be difficult to identify the many potential ways these outcomes are influenced. For instance, high levels of absenteeism can be due outside triggers and/or poor management as well as the physical work environment. The best research takes these mitigating factors into account.

For the purposes of this discussion, productivity measurements include: work product outcomes, as well as indicators of health (such as absenteeism) and indicators of well-being (including stress levels and mood).

The Impact of Design

Attributes of green buildings most commonly associated with healthy indoor environments include high levels of natural daylighting, appropriate levels and types of artificial light, use of materials with minimal toxins, appropriate outdoor air ventilation, thermal comfort and open and inviting spaces that increase interaction and physical movement.

One of the challenges of research in this area is that there are a number of physical environment factors that may be simultaneously impacting productivity, health and well-being, and these contributing elements may also be acting synergistically, creating impacts that are not well understood or even known.[3]

However, many studies have been able to isolate specific attributes and their impacts. For example, in a well-regarded study from 2003 performed by Heschong Mahone, performance of call center workers was assessed under differing amounts of access to daylight and to views of nature. Workers with outdoor views to vegetation through windows processed calls 6% to 12% faster and performed 10% to 25% better on mental function and memory tests than workers without views.[4]

The Center for Building Performance and Diagnostics (CBPD) along with Advanced Building Systems Integration Consortium (ABSIC) at Carnegie Mellon University reviewed and assessed the existing research on building design attributes and workplace productivity (Loftness et al, 2003). They found:

- 8 case studies linking the benefits of providing individual temperature control for each worker to measured productivity gains, demonstrating up to a 3% increase in overall productivity;
- 15 studies linking improved ventilation with up to 11% gains in productivity, as a result of increased outside air rates, dedicated delivery of fresh air to the workstation, and reduced levels of pollutants;
- 12 studies linking improved lighting design with up to a 23% gain in productivity related to light levels matched to task, glare and brightness control, and the power of views; and
- 13 studies linking the access to the natural environment through daylight and operable windows to individual (up to an 18% increase) and organizational productivity (such as increased retail sales).[5]

Occupants of other building types have been shown to benefit from these same design features. For instance, in the Economics of Biophilia,[6] the authors highlight a number of reports showing the benefits of views to the outdoors and daylighting across several sectors:

- The seminal study by Ulrich (1984) showing hospital stays reduced by 8.5% as well as supporting studies indicating faster recovery rates in rooms with windows views of nature;[7]
- Patients with a 22% reduced need for pain medication in rooms with bright sunlight;[8]
- Significantly increased sales per square foot in Walmart,[9] a 15 - 20% increase in sales at Target,[10] and a 73-store retail chain in California with a 40% increase in sales due to daylighting;[11] and
- Increased attendance by three days per year, a 5 - 14% improvement in test scores,[12] and 20 - 26% faster learning rates in schools with optimal daylight.[13]

While these green design features have proven benefits, they must be incorporated into a holistic design of the whole building, or they may have unwanted results. The most obvious example is daylighting, which must be incorporated into the design correctly in order to minimize glare and eliminate unwanted heat, both of which can have a negative impact on productivity.

THOUGHT PIECE

Creating Healthy Buildings for Healthy People

Creating the healthiest possible work environment is paramount to achieving optimal levels of employee productivity, happiness, and performance. The building industry stance regarding health and sustainability in work environments must evolve, and in the greater interest of human health, it is critical that organizations with the ability to create meaningful change do so.

At Google, we create work environments that help Googlers perform at their best every day. From concept to design, construction and building operations, we strive to create the healthiest workplaces imaginable that positively impact the health and well-being of our employees, both today and 30 years from now.

That's why we construct healthy workplaces by approaching buildings as living systems, designing in daylight and clean air while designing out harmful toxics and chemicals.

Research has shown that quality of light directly affects the quality of life in a space; people are happier and can work more effectively when they have access to daylight and outdoor views. We design our offices to create a feeling of openness and to take advantage of natural light as much as possible. We believe natural resources should be utilized intelligently and responsibly. Our approach complements the commitment we have made to design buildings that are supportive and regenerative for local and global ecosystems.

Unfortunately, the materials industry is marked by a lack of transparency concerning the composition of building products used in interior fitouts. In the same way you would expect a nutrition label to provide clear information regarding the ingredients of the food you eat, so too should you expect to know the ingredients of the products where you sit, stand and breathe.

Accordingly, we thoroughly screen every product and material that is designed and constructed into our workplaces around the globe. We request full transparency from our vendors by asking them to share comprehensive product and ingredient information, and when this request is not met, we do not use the product. Through this process we feel that we can participate in a positive transformation in the building materials industry.

We applaud the leadership of manufacturers who are transparent about the material contents of their products and are working hard to develop healthier alternatives. The harmful effects of many common chemicals and toxics are proven, and this information should be readily available to everyone. We encourage consumers to request increased levels of transparency about the composition of the materials used in their fitouts from their partners and manufacturers, as increased demand will spur more openness in the marketplace.

Support for platforms such as the Health Product Declaration (HPD) Open Standard, the industry's first common reporting standard for transparency regarding the health impacts of building materials, will only help to hasten market transformation.

Continued leadership is necessary to maintain momentum in the push for product transparency. For Google, by setting high standards, asking difficult questions and encouraging transparency from our partners, we hope to show other organizations how they can create their own healthy and sustainable work environments.

Case study provided by:

Google

by George Salah
Google

THE IMPACT OF GREEN BUILDING ON HEALTH AND WELL BEING

The essence of the productivity argument in green office buildings is that certain design attributes enhance occupant health and well-being, therefore resulting in healthier, happier, more satisfied and ultimately more productive workers.

Healthier Places to Work

The U.S. Environmental Protection Agency defines Sick Building Syndrome (SBS) as "…situations in which building occupants experience health and comfort effects that appear to be linked to time spent in the building and which lessen after leaving the building."[14] Symptoms typically characterizing SBS include, "… headache; eye, nose, or throat irritation; dry cough; dry or itchy skin; dizziness and nausea; difficulty in concentrating; fatigue; and sensitivity to odors."[15]

The advent of Sick Building Syndrome has long been linked to reduced ventilation in building driven by a desire for increased energy efficiency in the 1970s and 1980s. Studies show that SBS is likely the result of a number of building characteristics, with the most commonly cited being low levels of fresh air and high levels of indoor pollutants.[16, 17]

The scope of SBS has been significant, with the World Health Organization (1990) reporting that 30% of buildings globally may have indoor environments that contribute to SBS.[18] Although reports of SBS have declined in recent years, the issue still persists. As Heerwagen notes in 2010, other research shows that up to 20% of workers may be affected.[19]

Solutions for building design and operations include reducing pollutant sources and more and better ventilated air,[20] with some arguing that if building ventilation is increased to keep indoor carbon dioxide levels similar to outdoor levels, SBS symptoms would be reduced by 70 - 85%.[21]

The potential upside for businesses of healthier workplaces is too big to ignore. Fisk (2000) estimates that in the United States,"potential annual savings and productivity gains are US$6 to $14 billion from reduced respiratory disease, $1 to $4 billion from reduced allergies and asthma, $10 to $30 billion from reduced Sick Building Syndrome symptoms, and $20 to $60 billion from direct improvements in worker performance that are unrelated to health."

Reducing Stress in the Workplace

The idea that views to nature can improve office worker well-being has been validated by a number of studies, including a study cited by Heerwagen (1998) showing that workers exhibit reduced signs of stress, including reduced levels of frustration, increased patience and overall satisfaction, when they have views to nature through windows.[22] This is backed up by a 2008 study demonstrating a more rapid recovery from stress by workers in offices with a window view to nature rather than the same view on a plasma screen or working in a windowless room.[23]

There are physiological reasons for this reduction in stress: research shows that interaction and connection with nature can trigger opioid receptors in the brain as well as reduce cortisol levels, blood pressure and heart rates.[24] Levels of daylight are known to impact circadian rhythms as well as serotonin and melatonin levels, influencing our moods and sleep.[25, 26]

This evidence supports the notion of biophilia, or the idea that, "… humans hold a biological need for connection with nature…and that this connection affects our personal well-being, productivity and societal relationships." [27]

Practical application of this knowledge is now being looked into. Research by the National Institutes of Health (Thayer et al, 2010) and supported by the U.S. General Services Administration has begun to identify how different features and attributes of physical space can influence stress responses among federal employees.

Researchers assessed both physiological and psychological indicators of stress in two groups of employees: one in a newly renovated workspace with abundant daylight, visual access to the outdoors, and good air quality; the second in the un-renovated space in the same office with lower daylight availability, blocked views to the outdoors, and poorer air quality. The one-week study measured the physiological response of the participants continuously at work and at home. The research found that:

- Employees in a newly renovated space had lower levels of stress than employees who were in the un-renovated space; and
- The increased levels of stress for those inhabiting the old workspace were higher at both work and at home, showing that the workplace induced stress had broad effects.[28]

Heerwagen (1998) points to work showing that these same design features improve the general well-being and moods of workers[29] and that "positive moods turn out to be critical for a wide range of outcomes…including job satisfaction, work involvement, motivation, organizational attachment and lowered absenteeism."[30]

MAKING THE MOST OF GREEN BUILDING DESIGN

The importance of building design in achieving individual health and well-being as well as individual productivity is a prominent agenda item for the building industry.

While there is a growing body of research and empirical evidence linking building design attributes to productivity, health, and well-being, the results of this body of research has not been well integrated into building design and there has not been a consistent method to link the outcomes to financial metrics.

As result, while the evidence is there, the industry remains skeptical and continues to under-invest in the occupant experience, missing out on what is potentially its greatest return on investment.

The implications reach beyond individual businesses. A recent study from an Australian university asserts that workplace productivity and human performance are major determining factors in overall national productivity and outputs, influencing national growth rates and quality of life.[31]

There is a significant opportunity for business and academia to work more closely to build the evidence for the links between green building design and organizational success, drawing on the wealth of information we already have about its impact on individuals. We need an integrated approach that connects the existing research data to practical applications, financial returns and, ultimately, policies and standards.

A greater evidence base will be crucial to moving our investments in the built environment away from minimizing cost to maximizing employee health and productivity. In doing so, employers should view their physical environments as tools to leverage broader organizational success and unlock significant value. Building investors and owners should recognize and act on the information already available with the understanding that design decisions made now will have an impact on workers over the life of the building and therefore the long-term value of their investment.

CASE STUDY

Refurbishment Reaps Rewards

Aussie resource-efficient design pays off in productivity, comfort and employee satisfaction

When Australian property company The GPT Group (GPT) made the decision to upgrade its head office space in Sydney's central business district, the conversation quickly turned to how a green refurbishment could help transform the Group's operating model and reinvigorate the GPT brand. As the company would soon discover, the upgrade, which has achieved the highest available rating under Australia's Green Star rating system, would transform the working environment and improve conditions for GPT Group employees.

The new office has become a symbol of the organization's approach to business and has delivered a significant boost to GPT's brand. Since the achievement of its green building certification, GPT has been recognized with accolades for the office and business alike, including three state government Green Globe Awards. GPT has also been named the world's most sustainable real estate company for 2012/13 by the Dow Jones Sustainability Index.

The efficient use of sustainable materials was a core tenet of the GPT fit out design brief. Adhering to the philosophy of 'everything old is new again', the project team repurposed and reintegrated many items from the old fit out into the new space and achieved an incredible 96% waste diversion rate.

The GPT Group also entered into product stewardship agreements with all suppliers, ensuring that fit out items have a low environmental impact – now, and at the end of their useful life.

To boost the air change and energy efficiency of the base building's dual active chilled beam and variable air volume systems, the project team introduced supplementary air conditioning for meeting rooms and installed louvers within the façade to increase the levels of fresh outside air. Optimizing air conditioning efficiency has helped to achieve significant reductions in energy use across the tenancy and air change efficiency is now 50% higher than Australian standard requirements.

The significant boost to indoor environment quality was also achieved through the specification of furniture, carpets and soft furnishings that were low in volatile organic compounds (VOCs) and the introduction of more than 500 plants to further improve air quality for GPT workers.

As a result of these efforts, the latest post-occupancy study indicates a massive jump in GPT employees' comfort and satisfaction in their new workplace. Prior to the move, GPT workers rated their overall comfort with aspects of the space including temperature, ventilation and acoustics at 54%, while in the new space the overall comfort ratings have jumped up to 97%.

Further, the first employee self-assessment post-occupancy study for the office – conducted three months after the move – found that employees felt 15% more productive in the new space.

"I find the control I have over the environment as a user of the space is fabulous – being able to move around and chase the sunshine around the building, or adjust the lighting and air as I need it is great," said one GPT worker.

Another GPT employee sums up the sense of pride the people at GPT feel for their new workplace. "I'm proud to say I work in a green environment," the employee said. "Achieving the 6 Star Green Star rating was a wonderful acknowledgement of the importance we place on sustainability. I've never worked in an environment that feels this open, fresh and healthy, while also providing me with all the facilities I need to be productive and effective in my role."

THOUGHT PIECE

Talent Attraction and Retention in Green Buildings

Green buildings, particularly those with improved indoor environmental quality, are being shown to positively impact human health and performance. But can green buildings also improve a company's ability to attract and retain key staff? The experience of those occupying green space seems to affirm this link, and progressive human resource professionals are taking note.

The Importance of Staff Attraction and Retention
Employee turnover is costly to any company[2], but especially in knowledge fields where the competitive edge is human expertise. But turnover is not an adequate term to describe the real costs of losing an employee. These costs include the cost of termination, job postings, interviews, negotiations, lost productivity due to job vacancy, and the learning curve productivity loss.[3] Attraction-retention may be a more powerful way to capture these comprehensive costs rather than the somewhat benign use of the word turnover.

In his paper It's Costly to Lose Good Employees, Dr. Jac Fitz-Enz, an expert in human capital strategic analysis, indicates that when direct and indirect costs are combined, the total turnover cost of a professional or manager is a minimum of one year's pay and benefits and can be as much as two years' pay and benefits.[4]

For this reason and more, Dr. Fitz-Enz believes that "the primary human resources challenge… is the recruitment and retention of competent employees."[5] Indeed employee retention is considered one of the key indicators of "overall organizational success."[6]

A 2009 CBRE report found that "public image, recruitment of and retention of employees are enhanced in green buildings."[7] So it follows that green buildings could result in significant savings in the costly arena of employee turnover.

The Evidence Base
The Colliers International 2012 Office Tenant Survey[10] assessed 300 decision-makers leasing commercial property, representing 5.5% of Australia's total office space. In the two years since the previous survey, key priorities of tenants had shifted from a focus on business expansion to staff attraction and retention.

Simon Hunt, Colliers International Managing Director of Office Leasing, linked attraction-retention with the greenness of the workpace, saying that workers "…want to be able to say they work in a 'green' building." In fact, 95% of tenants said they wanted to occupy a 'green' building, up from 75% in 2010.[11]

A 2008 study by Deloitte and Charles Lockwood[12] examined the motives for companies choosing green retrofits over conventional retrofits. "'Corporate environmental commitment' topped the list of motives for the green retrofit, and more than half the respondents also identified greater indoor air and environmental quality, public relations and publicity, improved employee productivity, and enhanced employee attraction and retention as important drivers," the report found.

Following the green retrofits, 93% of the respondents reported greater ability to attract talent and 81% saw greater employee retention.

Researchers at the Pacific Northwest National Laboratory in the United States13 were able to track absenteeism and turnover for the year prior to their lab renovation and the year afterward. The redesign involved the HVAC system, acoustics, spatial layout and aesthetic upgrades. The researchers found significant differences pre- and post-occupancy in both absenteeism and turnover. Turnover decreased by 60% in the year following the renovation, and absenteeism was reduced from 96 hours per person to 45 hours per person.[13]

PNC Financial Services, one of the U.S.'s largest diversified financial services organizations, reports that employee retention and satisfaction was 50% better in its green facility compared to that of a traditional one.[14]
After their move to a new green building, international design and engineering firm Smith Carter completed a post-occupancy survey that revealed a, "75% increase in employee satisfaction with the new building, ultimately supporting staff attraction and retention."[15]

These examples all show that building design that contributes positively to human well-being and performance is increasingly forming part of a company's strategy to attract and retain workers. In addition, the building itself may act as a symbol of the corporation's environmental and social performance and be a powerful attraction for potential employees. For the design of the Bank of America Tower in New York, Ken Lewis, the former CEO of the Bank of America, stated that he wanted an iconic building that would help attract and retain the best employees. Being the first LEED Platinum skyscraper was a key part of that strategy.[16]

Sustainability Appeals to the Young

A recent report from Johnson Controls, OXYGENZ[16], surveyed people aged 18 to 35 in the United States, UK Germany, India, and China and found that younger generation employees want evidence that their employers are going beyond the minimum levels of environmental compliance; 96% of the 18-25 years want to work in a greener office and 98% of the 26-35 years old respondents do as well."[17] One of the respondents in the Deloitte survey noted, "A lot of our folks here are younger folks, and sustainable interior design and the ability to work in a [socially responsible] place is very important to them… It's important to them to be able to say, 'I'm an environmentally responsible person.'"[18]

The Way Forward

A great deal of time, money and effort is spent by corporations trying to attract and retain good staff. Could one of the solutions lie with the simple strategy of providing a healthy, sustainably-designed workplace that promotes well-being and productivity? Human resource professionals are increasingly exploring this potential competitive advantage. Much more research is needed to demonstrate the direct link between the sustainability of a workplace and the ability of a company to attract and retain key employees – companies moving to green office space or greening their current space need to specifically track statistics on employee attraction and retention before and after the change. Human Resource professionals need to agree on the types of data to be collected including the relevant units of measurement, and design the data base so the green qualities of the work environment can be analyzed relative to organizational commitment. But this much is clear already: with staff turnover costing employers a year or more in effective salary, an enhanced ability to attract and retain employees is a big advantage to business, especially those with a highly-skilled or expert workforce. As younger graduates look increasingly to the sustainability of their employers, companies ignore this powerful benefit of green building at their peril.

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by Nicola Milne

NEXT STEPS FOR INDUSTRY

Industry needs to be proactive about working with researchers to identify the appropriate metrics and methodologies to develop the evidence needed for better financial decision-making. Areas for investigation include:

- Which green building features or combination of features have the greatest impact on human health and productivity and organizational success? How do these vary by building type?
- Can an existing building evaluation system or framework measure and then calculate the cost-benefit of these new strategies?
- Can a building owner or business leverage their healthy and productive building/space to obtain improved financing or health insurance rates?
- How can we best turn the results of productivity measures into meaningful financial metrics?

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RISK MITIGATION

- Sustainability risk factors can significantly affect the rental income and the future value of real estate assets, in turn affecting their return on investment.

- Regulatory risks related to sustainability have become increasingly evident in countries and cities around the world, including mandatory disclosure, building codes and laws banning inefficient buildings.

- Extreme weather events and systematic changes in weather patterns affect the insurability of real estate and lead to questions about the resilience of assets.

- Changing tenant preferences and investor risk screening may translate into risk of obsolescence for inefficient buildings.

- Sustainability represents an assortment of risks and possible rewards for real estate investors.

RISK MITIGATION

Investor risk relates to the potential reduction in value or increase in costs associated with holding an investment. It may also relate to the brand strength of an investor and therefore the ability to attract equity and debt competitively.

There are different risks evaluated at the various stages of the building life cycle, but all can be considered ways in which to 'future-proof' investments. While there are few evidence-based studies quantifying sustainability-related risks, some real estate investors are now performing their own analyses on many of these risks as a part of their decision-making processes.

Real estate investors have responsibilities to their shareholders and other beneficiaries to ensure that profits, which flow because of income produced in rent and increasing capital values of real estate assets, are achieved over short- and long-term time horizons.

The beneficiaries of investors' activities include shareholders in private companies, insurance and pension policy holders, private individuals and public bodies. Many of those whom we identify as 'real estate investors' are merely fiduciaries of other peoples' money, which has been entrusted to their care in the expectation that they will enable that money to grow in value, while minimizing the risk of the investment.

There is no doubt in the minds of most investors – certainly institutional investors and large corporate investors like REITS and property companies – that sustainability is an issue, or set of issues, that need to be addressed. Arguably, what needs to be addressed has been considered by such organizations for a relatively short period of time but how sustainability issues are considered does not rely on new concepts: good real estate investment requires expertise in managing risks and nearly all of investors' decision-making is carried out within a risk management framework (e.g., what, when and where to buy and sell, who to partner with, from whom to borrow capital, etc.).

Dealing with sustainability issues is therefore no different to dealing with other risks; investment decisions are made on the basis of downside and upside risks, including those presented by sustainability. Below we identify some of the most pertinent sustainability issues, why they represent risks and how some investors are currently dealing with them.

Regulatory Risk

Any market exists within a political and regulatory context and investors are obviously used to operating within those boundaries. As real estate investment management is a relatively long-term play, investors need to appreciate how future legislation can impact the value of a building and its cash flows.

Regulation of sustainability issues, like carbon emissions, has become increasingly important to real estate investors because of the fact that the built environment is regarded as 'responsible' for significant environmental impact, leading to climate change. For example, the UK government is committed by the Energy Act 2011 to introducing Minimum Energy Performance Standards for existing buildings, making the most energy inefficient buildings unable to be leased by 2018.

Regulatory risk is by no means confined to Europe. Some US cities, such as New York and San Francisco, have followed the lead of other jurisdictions around the world by mandating the public disclosure of energy use data for certain buildings, with the intention of encouraging occupiers and investors to incorporate this information into their leasing and investment decision-making.

These kinds of initiatives will potentially have significant implications for investors, who may risk decreasing income from existing assets and their capital values consequently suffering until the energy performance is improved.

In many countries, building regulations and codes tend to focus on new buildings and seek to ensure that their sustainability performance is far better than much of the existing stock. Investors' portfolios will rarely consist of a large proportion of new buildings, meaning they need to ensure that their existing assets are able to compete against new buildings for occupiers and purchasers. In doing this, they will try to ensure that they future-proof their assets against evolving regulations which tend to require ever better sustainability performance.

Regulatory risk does not only include the performance of a building itself, but of its location as well. Although planning regulations covering urban transport and increased density requirements are now prevalent in some countries, it is possible that in the future these requirements will be widespread and change the importance of accessibility for both tenants and building owners.[1] Investors have traditionally placed the highest value on location factors and will have to reassess the sustainability risk factors pertaining to some building locations.

There is increased consensus that governments will implement regulations that target sustainability factors far more aggressively than has previously been the case, and investors will need to understand what the consequences will be.

They will need to consider how the building performs in terms of its own sustainability profile - where risks might arise because of its perceived ability to be efficient in the consumption of resources compared to other buildings' compliance with regulatory requirements. If investors' buildings fail to meet the changing requirements of regulations, or seem to perform less favorably when compared to other buildings, then they will suffer from increased risk of obsolescence.

CASE STUDY

Energy Efficiency Shines

French investment house uses sustainability risk assessment to maximize long-term asset value

At the end of 2009, Caisse des Dépôts et Consignations (CDC) initiated the GRECO project in anticipation of the French environmental law Grenelle 2, requiring a 38% reduction in energy consumption from existing commercial property stock by 2020. CDC wanted to promptly address the issue to limit the depreciation risk for its existing portfolio and spread the refurbishment cost over time.

First, energy audits were carried out on the whole portfolio. Actual consumption invoices (from both tenants and owner) were used to determine a breakdown of energy consumption per use (for HVAC, lighting and other uses) and recommendations issued. Major upgrades were timed to coincide with the replacement of components at the end of their life, in order to be covered by the planned budgets for major repairs and maintenance.

At a building level, refurbishment costs and payback periods were not the only criteria used for decision-making. By comparing the refurbishment cost and the energy consumption abatement target CDC was able to demonstrate the cost efficiency of various refurbishment scenarios and assess the impact of a number of different actions required to meet the reduction targets.

Accounting only for energy expenses, the investment payback period exceeded eight years. The comparison between refurbishment cost and asset value was used to indirectly assess the risks linked to the regulatory obsolescence generated by Grenelle 2. While this ratio depends on the functional quality of the asset and its location, even with long payback periods, it may be more beneficial to refurbish if the asset market is likely to be concerned with a demand for greener buildings.

The impact of environmental upgrades on value was illustrated through a deep refurbishment undertaken in 2010 of the 1930s era Franklin building, a 7,500 square meter or 80,000 square feet property in the Paris CBD.

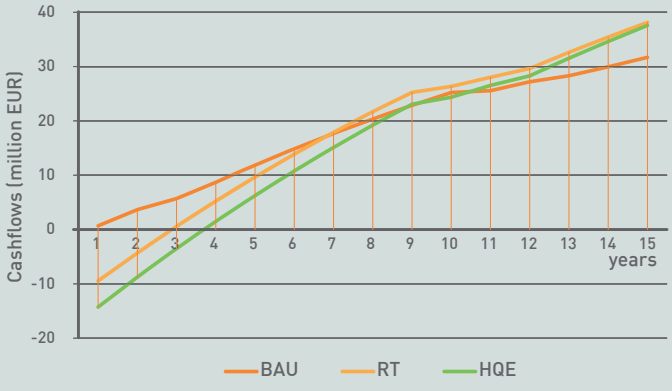

Figure 12

Evolution of the cumulated discounted cash flows over time

The building is now completely leased, making it possible to compare predictions with effective data. In order to assess the added value from the environmental retrofit, different scenarios were considered with the following results:

- Business as Usual (BAU): No refurbishment, only standard maintenance. Rental prices used correspond to rental prices for second hand buildings. Asset liquidity deemed as poor, leading to higher exit yield and higher vacancy.
- Conventional Refurbishment (RT): Refurbishment meets current regulatory requirements. The asset is valued as a first-hand building but does not benefit from a green premium (average rental price in first-hand market). Asset liquidity deemed to decrease over time.
- Green Refurbishment (HQE): Energy upgrade enables owner to benefit from a green premium in rental prices and very good liquidity.

The valuation was performed using a discounted cash flow method. To account for the difference in values due to the absence of environmental features, longer vacancy periods in between leases were used in addition to the differences in rental and exit values. The discounted cash flow calculation (Figure 12) shows that the two refurbishment scenarios (RT and HQE) lead to lower cash flows respectively until years seven and nine. Yet, over the long run, they present the highest net present value (NPV). However, refurbishment appears financially beneficial from the start since it enables the owner to increase its rental revenue and decrease future depreciation risks. The initial investment costs are offset by the future benefits, in particular because of a higher expected return rate.

The green refurbishment (HQE), with a cost of approximately one-third of the initial building value, enabled the investor to nearly double the initial value of its asset. In addition, it led to a 10% value premium compared to the conventional refurbishment (RT) scenario. These results highlight that traditional payback calculations accounting only for energy savings can be misleading as they do not account for the long-term asset value.

As energy retrofits become a regulatory requirement, investors will require energy efficiency strategies at a portfolio scale in order to mitigate risk. Decisions will not only concern choosing refurbishment scenarios within buildings according to technical criteria, but will also require prioritizing between assets to maximize the value of the portfolio over time according to financial and environmental criteria.

Market Risk

As well as responding to regulatory pressure, real estate investors simultaneously need to understand how sustainability affects them from a market perspective - in terms of supply, demand and associated factors. Investors will consider factors relating to asset-specific risks and risks affecting the performance of their portfolios, like their ability to raise capital:

Occupancy Risk
The financial performance and valuation of a real estate asset is to a large part determined by the security of its cash flow. The likelihood that tenants might leave a building, or not lease it in the first place, because of its inadequate sustainability performance is recognized as a key risk by investors. One study contends that as more green buildings become available and occupiers become less willing to occupy non-green buildings, it will increase the speed of depreciation for non-green buildings at an exponential rather than linear rate.[2]

Evidence for preference amongst occupiers for green buildings can be found in a number of surveys[3] in which the cited drivers relate to factors such as: proximity to public transportation; cheaper running costs and utility bills being reflected in lower service charge costs; better productivity; human resource factors like recruiting the best talent; and public association with sustainability.

Although there is plenty of anecdotal evidence, there is still no systematic evidence on tenant retention and lease renewals in green buildings. This is an issue that needs to be investigated more thoroughly.

Asset Purchasing and Disposal Risk
As the 'Asset Value' chapter of this report lays out, there is evidence that the sustainability profile of assets impacts investment returns over the holding period and at exit.

Many researchers and market practitioners believe that there is a strong correlation between those buildings that retain their value because they are 'prime' buildings (i.e., physically high quality assets, with occupiers of good covenant in good locations) and those described as 'green'.

The question that therefore becomes more and more important is: will an asset will suffer from a 'brown discount', or increased obsolescence because it is not green? In light of this, investors need to identify the potential impact that a purchase or disposal might have on the risk profile of their portfolios.

Portfolio Performance
Overall, studies have demonstrated that greener portfolios have better operating performance and are exposed to less market risk.[4] However, most property investors are not convinced of the shareholder value potential associated with energy efficiency or other environmental investments.[5] This could be because real estate investors do not sufficiently and clearly report their sustainability performance and the risk reduction this affords.[6]

Recently, a study has indicated that the financial performance (stock price) of REITs with a higher percentage of certified buildings (Energy Star and LEED) shows lower risk exposure (less volatility) than those with a lower percentage of certified buildings.[7] This mirrors the effect that high carbon emissions have on firm value in other industries.[8]

In the context of real estate investment, identifying the value impact of sustainability is, of course, vital and this must be measured over time rather than as a snapshot.

In a study from the Netherlands,[9] buildings labeled as more energy efficient (A, B, or C rated) increased rental value over a five year period, when compared with buildings that were labeled E, F, or G (where the study controlled for the most important determinants of rental values, including location, building age and size). Other studies suggest that lower capitalization rates have been observed for greener buildings, indicating lower risk perceptions and higher values.[10]

In order to explore whether more environmentally efficient real estate portfolios may be able to outperform their peers in terms of risk and return, a number of 'green property' indices have been developed. In the U.S., for example, the FTSE Group, the U.S. Green Building Council and the National Association of Real Estate Investment Trusts have jointly developed a green property index for institutional and retail investors. Similarly, in the UK, the Investment Property Databank (IPD) has developed the "Eco-Portfolio Analysis Service" (EcoPAS) which seeks to enable investors to understand potential environmental risks in their portfolios.

Investment Sourcing Risk
In all business sectors, there are potential risks to a company's brand and performance arising from the activities and associations of its investment partners. A study by Bauer and Hahn (2011) confirms that companies with better environmental performance exhibit cheaper debt financing costs, supporting the contention that firms with more socially responsible practices have higher valuation and lower risk.

The impact of real estate investors' asset and portfolio-level sustainability performance – and their management of the associated risks – can be felt in their ability to attract equity and debt at competitive rates. It is for this reason that an increasing number of real estate fund managers and their investors subject their portfolios to sustainability benchmarking. Although there is limited evidence of investors deciding not to invest in funds based on sustainability criteria alone, some investors are including sustainability performance to identify 'best in class' opportunities.

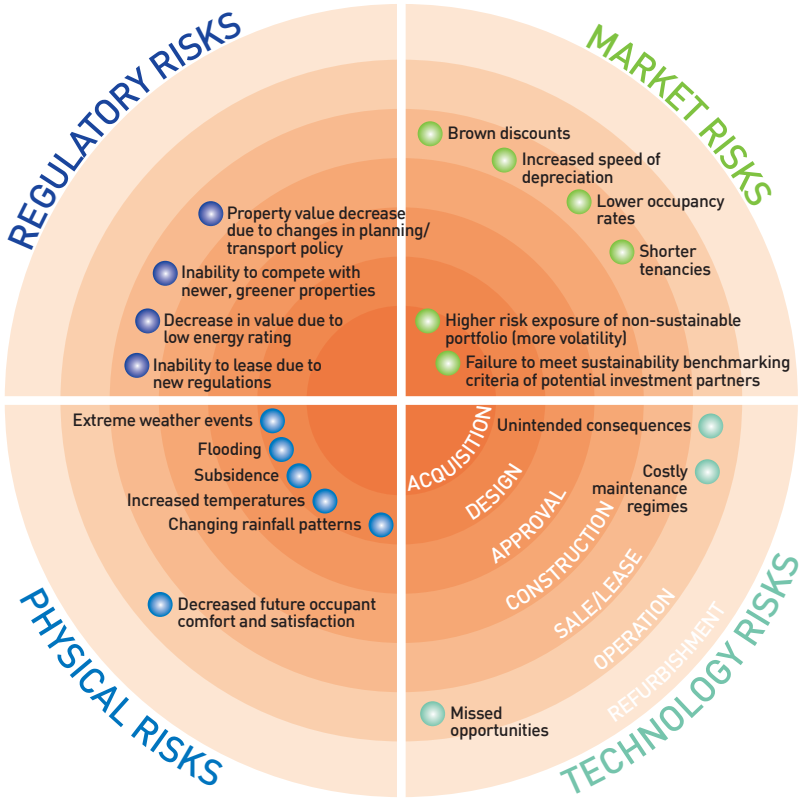

Figure 13
Risk radar

Physical Risk

Climate change predictions represent a real risk for investors. The scientific consensus on future temperature increases indicates that changes to weather patterns will be significant in terms of the built environment's capability to cope with them.

Notwithstanding any societal adjustments that climate change may bring, real estate investment decision-making will have to evolve to reflect changes in the economic viability of different locations and the ability of different building types and designs to stand up to a changing environment.

A useful risk management context within which to consider this is in terms of resilience and the extent to which investments are future-proofed. As experienced recently in New York, Australia, Europe, and in many other places around the world, there are many physical risks that are associated with climate change. Investors will increasingly need to factor the ability of buildings to withstand predicted impacts into their decision-making. Perhaps chief amongst these impacts will be extreme weather events, flooding, subsidence and the ability of building skin and systems to cope with increased ambient temperatures and changing rainfall patterns.

For investors, one of the key risks they face in this regard is the insurability of buildings – without this, a building's value could be substantially reduced, even to nil. Some insurers have taken the view that in certain locations, such as the UK and Australia, it is no longer economically viable to provide flood protection cover against risks to buildings and the businesses that operate from these buildings.

Given that insurers and reinsurers are likely to extend their thinking in this manner as extreme weather events and subsequent insurance claims become more commonplace, investors will need to start considering the risks to their assets' cashflows if they have not already done so.

Investors will also have to consider the issue of building comfort and the ability of buildings' systems to ensure that occupiers will view premises as desirable; with increased temperatures predicted there is a cash flow risk for buildings which are not sufficiently resilient to ensure future occupier satisfaction.

How investors deal with these issues will of course vary from place-to-place and building-to-building but it is inconceivable that efficient investors are not undertaking sustainability risk profiling of their portfolios (which should include assessment of regulatory risks as discussed above).

In some instances, real estate owners will be able to mitigate these physical risks by sharing them, or their costs, with their tenants, but to do so they will need to ensure that leases make suitable provision for this. Other mitigating measures will include retrofitting buildings with adaptations to deal with climate change effects, such as solar shading, improved drainage and water harvesting. Investors will also need to look at the resilience of local infrastructure, as even a resilient building will be compromised if it is located in a city that has done little to manage physical risks. Again, landlords will need to be certain as to where the cost burden for such works will lie.

THOUGHT PIECE

Sustainability at the Portfolio Level

Legislation is an important driver of green building adoption in the real estate sector. But while the pace and strength of legislation is affected by the volatility of policy making, there is another force in green building investment quietly happening every day, driven by the capital market.

With the global growth of green building over the past decade, energy efficiency and sustainability in the built environment have now become vehicles to enhance and to protect the assets held by the largest investors across the globe – endowments, pension funds and insurance companies. These 'institutional investors' increasingly realize that the sustainability performance of buildings is directly affecting the financial performance of their real estate investments, which is especially relevant given the long-term investment horizons of these investors.

Institutional investors typically invest 5 to 10% of their total assets in real estate, and this exposure is mostly build up indirectly – via privately managed funds, or via listed property companies (REITs). Institutional investors are thus not so much interested in the energy efficiency of just one building; they are interested in the average efficiency of a portfolio compared with the average efficiency of peers. So, to assess the sustainability performance of institutional real estate investments, information is needed at the portfolio level, rather than at the level of the individual asset.

In addition, a typical pension fund or institutional investor is not necessarily interested in a 'green property fund' per se. What investors are concerned about is the risk inherent to the real estate portfolio, including risk from an environmental perspective. This is often not a number one priority—that's still location, access to public transport, etc. But somewhere on the priority list, there's environmental risk. Investors are used to investigating the presence of asbestos, land contamination, and other environmental elements. Now, investors should be thinking about energy efficiency and water efficiency, and how well a building is positioned compared to peers.

To address sustainability at the portfolio level, a consortium of more than 40 pension funds, insurance companies and other large investors are now actively screening their investments in property portfolios, using the Global Real Estate Sustainability Benchmark (GRESB) – a quantitative tool that benchmarks a property company or fund's energy efficiency and broader sustainability performance at the portfolio level. More than 450 property companies and funds currently report to GRESB, representing $1.3 trillion in assets under management, and some 36,000 properties.

The basis for GRESB is an annual survey measuring the environmental and social performance of real estate companies and funds at the portfolio level. Based on responses to the annual GRESB survey, a benchmarking framework has been created that captures almost 50 data points measuring sustainability, including energy and water consumption, but also sustainability policies and, of course, asset-level certification.

The largest, most sophisticated investors in real estate are increasingly taking the necessary initiatives to improve the energy efficiency and sustainability of their portfolios, in order to protect and increase the value of pensions and endowments. But for the capital markets to function properly, information transparency on environmental, social and governance (ESG) metrics is a key ingredient. At the building level, LEED and other green rating systems provide that insight. At the portfolio level, schemes like GRESB that assist investors the capital market will ultimately shape the role of green buildings in our society.

by Nils Kok
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Technology Risk

Innovative technologies in new buildings have their own risks (e.g., LED lighting, HVAC equipment, solar installations) arising from unintended outcomes from their use – or the fear of these – or concerns about appropriate maintenance regimes. These can be barriers to implementing sustainability solutions.

However, reticence to use new technologies that can change demand-side behavior (e.g., wireless measurement of energy use at appliance level) could increase the risk of obsolescence and missed opportunities for reduced operational costs.

It is clear that sustainability represents a number of risks and potential rewards for real estate investors. In order to mitigate the former and benefit from the latter, investors need to understand the full range of sustainability issues that will affect their assets.

Undertaking suitable risk management of sustainability issues should not be considered outside of efficient portfolio, asset and property management, it should be very much a part of it.

Failure to heed this message will result in lower income, smaller capital receipts, higher costs and the possibility of legal action, whereas by future-proofing their assets, investors should be able reap the rewards flowing from more secure cashflows, greater liquidity of their assets and an increased ability to access debt and equity funding.

NEXT STEPS FOR INDUSTRY

- **Understand the implications of regulatory and climate change:** Investors need to understand the implications of regulatory and climate change and factor this into sustainability risk assessments for the development, ownership and occupancy of buildings.
- **Appreciate the growing demand for green buildings:** Building owners need to appreciate occupier preferences for 'green' buildings, particularly which 'green' features appeal to them.
- **Consider brown discounts and green premiums:** The real estate investment sector needs to determine the extent of 'brown discounts' for properties which do not have 'green' certification.

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SCALING UP FROM GREEN BUILDINGS TO GREEN CITIES

- By greening the built environment at the neighborhood and city scale, we can deliver on large-scale economic priorities such as climate change mitigation, energy security, resource conservation and job creation, long-term resilience and quality of life.

SCALING UP FROM GREEN BUILDINGS TO GREEN CITIES

The Business Case for Green Building has so far outlined the value that an individual green building - or a portfolio of green buildings - can deliver in terms of design and construction costs, asset value, operational cost minimisation, productivity and risk mitigation.

In its simplest form, a city is a collection of buildings, and the next section of this report broadens the focus from a building-by-building approach to sustainability to one which looks at how we green entire neighborhoods, districts and communities.

It is only by leveraging the lessons learned from greening individual buildings that we will unlock the potential of our built environment to deliver on macro social and economic priorities such as climate change mitigation, energy security, resource conservation and job creation, long-term resilience and quality of life.

As mentioned in the introduction, it is the 'big picture' benefits that are the priority issues for governments around the world, and are increasingly drivers for both public and private green building programs. All of these challenges require large-scale solutions and can only be solved if we scale up to green cities.

Leaders at the city level, in particular, are demonstrating that addressing climate change can make our cities better, more liveable places.

In this chapter, we look at how city governments, particularly through the C40 Cities Climate Leadership Group, and industry leaders are transforming their existing cities and ensuring green is prioritised in emerging cities.

City governments generally have closer relationships with their residents, businesses and institutions than state and national governments, which enables more rapid and decisive action on regulation, policies and targets. At the same time, rising utility prices, tightening regulatory requirements and more stringent insurance risk assessments are placing pressure on governments at the city level. These factors are motivating them to seek out solutions – and many are recognising that green building programs provide an unparalleled opportunity to reinforce fiscal responsibility, increase productivity and worker satisfaction, address health issues and 'future proof' investments.

THOUGHT PIECE

The Carrot and the Stick

Cities around the world are at the epicenter of the battle to curb the impacts of global climate change. In a relatively short amount of time, global trends such as population shifts to cities and the inability of national governments to commit to long-term, binding global climate change reduction targets, has transferred international attention to the work being undertaken by cities and their governments.

Cities have two primary methods of helping to drive the 'greening' of private buildings: through mandatory requirements, or 'sticks'; and through incentives, referred to here as 'carrots'.

The business benefits of green buildings are most fully realized by cities that are able to enact regulations and/or to provide incentives to green the city's building stock and develop a local market and industry for energy-efficient buildings. The world's leading cities in this area are those that collaborate with the property sector to utilize both carrots and sticks to achieve their energy efficiency goals.

The Benefits of Good Incentives and Sound Regulations

Regulations provide the certainty the property sector requires to manage its assets and to make long-term decisions about energy efficiency retrofitting and developing new green buildings. Regulations also create a level playing field by mandating or prohibiting actions by all property owners with buildings subject to the regulation.

The business benefits of incentives to the property sector include:

- Improving the overall return on investment and business case for energy efficiency measures;
- Rewarding early adopters of technologies or retrofit models; and
- Helping to develop the energy efficiency market and industry players in each city.

When a city administration combines a thoughtful, stable and forward-looking package of policies and programs, regulations and incentives, it encourages sustainable action by property owners while simultaneously moving the city towards achieving its long-term emission reduction targets, with their accompanying macroeconomic benefits.

BEST PRACTICE CARROTS AND STICKS IN LEADING CITIES TODAY

Capacity to Act

Every city around the world has a different combination of possible incentives and regulations, which are functions of their individual city powers and determined by their governance structures and the political context within which they operate. Great examples of leadership have been set by cities maximizing each of their available carrots and sticks, including, for example with New York City's Greener Greater Buildings Plan (GGBP) and Tokyo's Cap-and-Trade Program, both of which are discussed below.

SUMMARY OF BEST PRACTICE STICKS

Regulatory best practices fall into a few key categories, ranging from energy efficiency codes for whole building energy consumption to individual measures like mandatory smart metering or lighting upgrades.

Mandatory Emission Reduction Programs

One of the most innovative examples of a city using its regulatory power to mandate actual emission reductions from its largest buildings is Tokyo's Cap-and-Trade program. Launched in April 2010, it applies to over 1,300 of Tokyo's largest commercial and industrial buildings.[1] The clear rules and targets to 2019 enable property owners to plan their approach and make necessary investment decisions that suit their circumstances.

First year results from Tokyo's program have been impressive: statistics show that by providing market certainty for long-term action, 38% of all applicable buildings have already achieved the end of 2014 target and a further 26% have already achieved the end of 2019 target, resulting in emission reductions of 1.44 million tons (equivalent to a 13% average reduction across applicable buildings) in one year.

Mandatory Energy Disclosure

A number of cities, especially in the United States, have passed regulations requiring the disclosure of energy consumption data in commercial buildings of a certain size. The cities of Austin, Washington D.C., New York City, Philadelphia, San Francisco and Seattle have all passed mandatory disclosure regulations for commercial buildings, and this data has quickly become invaluable means for cities to gain better understanding of their energy consumption patterns; and, where made public, as a market driver to improve poorly performing buildings.

Policy Packages
Leading cities will often package some or all of the above types of regulations to provide a comprehensive suite of policies to drive energy efficiency in the private sector building space. New York City, for example, has now passed a suite of four local laws as part of its GGBP, including requirements for mandatory disclosure of annual energy and water consumption data, periodic audit and retro-commissioning measures for large buildings, renovation or alteration projects meeting current codes, and lighting upgrades and sub-meters in large non-residential buildings.

Taken together, New York's GGBP provides a world-class example of how cities with strong political leadership and long-term thinking can collaborate with all necessary stakeholders (including the property sector, utility companies, NGOs and other levels of government) to utilize the full extent of their powers and pass meaningful green building and energy efficiency regulations that result in real consumption and emission reductions in cities.

SUMMARY OF BEST-PRACTICE CARROTS
Incentives currently used by cities can be loosely divided into four categories:

1. Access to money or tax relief to be used to offset costs associated with energy efficiency services and equipment;
2. Administrative incentives like expedited permitting;
3. Access to outside funding for energy efficiency projects from third-parties (utilities, energy companies, banks and others); and
4. Utilizing the mayor's visibility to encourage leadership in energy efficiency amongst private property owners.

Money/Tax Incentives
Governments most commonly use funding support in the form of rebates, tax relief/abatement and loans. Examples of rebate programs include:

- Berlin provides free assessments and €195 per square meter in funding, up to one-third of total costs, for homeowners and multi-unit residential building owners to invest in solar thermal systems. [2]
- San Francisco offers, in partnership with the public utility, free audits for single-family homeowners and incentives where at least a 15% energy reduction will be achieved via the retrofit measures.

Tax relief offerings by cities are another widely used form of incentive:

- Houston has established a partial tax abatement for commercial buildings that achieve LEED certification,[3] providing an incentive for property owners in deciding whether to install energy efficiency measures and achieve certification.
- New York City has a program under which building owners can deduct a portion of capital spent on a solar photovoltaic system from their property taxes.[4]

Another tool growing in popularity is providing loans for energy efficiency improvements to existing buildings with more favorable terms than those commercially available to property owners:

- Toronto has several loan offerings through the Toronto Atmospheric Fund and Better Buildings Partnership. These range from interest-free loans for existing private multi-family buildings to market-attractive loans for commercial buildings.
- Philadelphia also offers below-market loans ranging from US$100,000 to $1 million for energy efficiency retrofits, available to owners of commercial, industrial and mixed-use buildings, as well as to tenants in commercial buildings.

Planning Incentives
Cities may also provide an incentive to property owners through administrative means, such as expediting building permits or increasing the gross floor area (GFA) allowable for buildings incorporating energy efficiency into their plans. A few prominent examples include:

- Chicago's Green Permit Program[5] offers an expedited permit process and possible reduction in permit fees of up to US$25,000. To be eligible, commercial, multi-unit residential and smaller residential projects must earn LEED certification and comply with one or more 'menu items' listed by the city, including green roofing, renewable energy and passive ventilation.
- Singapore's Green Mark Program includes a GFA incentive scheme for buildings achieving the highest Green Mark ratings. Up to 2% additional GFA is available both residential and non-residential buildings, including both new and existing buildings undergoing enhancements.[6]
- Hong Kong continues to offer a similar GFA concession for buildings achieving certain levels of green standards under their BEAM rating system. [7]

The Carrot and the Stick (continued)

Incentives to Facilitate Access to Retrofit Finance
Cities can also facilitate access by property owners to retrofit finance from third parties while simultaneously assuring finance providers that the government is contractually committed to helping them to recover their capital. Programs like this are in place in Australia's two largest cities, the United States and, most recently, Singapore:

- Both Melbourne and Sydney have programs that allow for the signing of a tripartite 'Environmental Upgrade Agreement' between a property owner, the financier and the city whereby the city helps the financier recover their capital through the assessment of a statutory charge on the property.[8]
- Property Assessed Clean Energy, also known as PACE, programs exist in several U.S. cities, including Los Angeles and San Francisco, and allow for repayment of retrofit costs through local property tax assessment, incentivizing both the property owner and financier.
- Singapore is running a pilot program in which the city shares the default risk with finance providers on loans to commercial building owners undertaking retrofit projects via energy performance contracting.[9]

Voluntary Leadership Programs
Several cities and their mayors have shown increased interest in utilizing the visibility of the mayor's office to reward private sector building owners that demonstrate leadership and action on energy efficiency.

Houston, Chicago, Toronto, New York and London, among others, have launched voluntary programs whereby private property owners commit to minimum energy reductions in exchange for positive publicity.

Mayors' offices promote the leadership demonstrated by program participants through various avenues; for example, the City of Chicago arranged for a full-page ad in the Chicago Tribune to appear specifically naming the first seven property owners who signed up for the city's 'Retrofit Chicago Initiative'. [10]

These are in addition to programs developed for public sector buildings to make similar commitments.

Costs and Impacts
While many of the above policies and programs are new and their impacts are still being tracked, some figures on financial savings for businesses are reported while others have been projected as part of the implementation of these policies.

Toronto's Better Buildings Partnership, for example, which has been established for almost 20 years, has been tracking the impact of its loans, incentives and technical assistance program and reports that, as of December 2012, it has helped to undertake 1,972 projects resulting in CDN$655 million in economic impact; annual cost savings of $59 million; annual carbon dioxide emission reductions of 444,000 tons and a total of 29,000 person years of job creation.[11]

Singapore Building and Construction Authority anticipates that if it reaches the goal of 80% of the building stock being green by 2030, then building owners could save S$1billion in energy costs alone.[12]

San Francisco's energy labeling, disclosure, and audit requirements for existing buildings are estimated to have a net present value of US$612 million over the first ten years of implementation, with the benefits of energy efficiency significantly exceeding the costs. From an environmental perspective, the Mayor's Task Force on Green Buildings estimated that the cumulative effect of adopting the green building ordinance from 2008 to 2012 would result in saving 220,000 megawatt-hours of power per year and potable water savings of 100 million gallons or 370 million liters.[13]

As noted in the piece in this report from the City of New York, implementation of the GGBP is estimated to net building owners across the city a total of US$7 billion. Further, measures enacted by New York's Green Codes Task Force are projected to save $400 million by 2030.

Public and Private Sectors Working Together
Cities have been clear that emissions from all building types will have to come down if they are to meet their emission reduction targets. By utilizing a range of regulations and incentives, cities can achieve these objectives while improving the financial bottom line of building owners, supporting job creation and stimulating both their local economies and real estate sectors.

As part of this, many cities have recognized the need to increase engagement with stakeholders of all kinds, including the very important group of private sector building owners. In turn, they have found that this market of property owners is willing to act when presented with forward-looking regulations and meaningful incentives.

This interplay between the public and private sectors recognizes the increasingly important role that the building sector plays in both local and national economies. It is this combination of proactive local leadership and industry action that is driving the creation of a more valuable, more resilient building stock that benefits us all.

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C40 CITIES
CLIMATE LEADERSHIP GROUP

ABOUT C40 CITIES CLIMATE LEADERSHIP GROUP
The C40 Cities Climate Leadership Group is a network of 63 large and engaged cities working collaboratively to reduce the greenhouse gas emissions and climate risks in each member city, with a focus on areas such as transportation, waste, and reducing energy consumption from major sources, including buildings.

by Jonathan Laski
C40 Cities Climate Leadership Group


www.usc.co.uk

CASE STUDY

Green Places are Great Places

Liverpool city center rehabilitation combines sustainability, innovation and economic benefits

Historically, Liverpool had been a thriving industrial city and an important shipping dock. The slowdown of the shipping industry brought a period of significant under-investment across all sectors for decades. During this time, Liverpool slumped in retail rankings and lost business to surrounding centers, with Liverpudlians often travelling outside the city to shop and work further afield.

This was a sad fate for a previously magnificent city and one steeped in rich history. However, the Liverpool City Council saw an opportunity in this situation, and in 2000 selected Grosvenor as development partner for a 42-acre parcel of inner-city land. Much of this area had been heavily bombed during the war and was derelict, never having been rebuilt in a comprehensive fashion.

The result is Liverpool ONE, a mixed-use development that opened in 2008, bringing vitality and reinstating a strong sense of local pride and loyalty. The scheme includes 160 shops, 500 apartments, two hotels, 3,000 square metres of offices, and more than 20 bars and restaurants - all centred around the revitalised five acre Chavasse Park, a new focal point for social activity, community events and sports leagues.

This project represented an opportunity not only to construct green buildings, but to be ambitious and think at a larger scale to create a sustainable neighborhood. The fundamentals of the site were excellent: brownfield city center land, accessible to a large catchment area and located on existing public transportation nodes.

The developer adopted a 'buildings in the city' approach, with different architecture firms selected to design the 26 buildings, resulting in a varied streetscape in keeping with the history and original footprint of the city. All buildings are certified BREEAM Good or Very Good standards with all residential properties also achieving 'Good' or 'Very Good' EcoHomes ratings.

Creating a development at this scale enabled Grosvenor to consider sustainable travel holistically, creating a new bus station as well as new cycle and walking routes, all developed in collaboration with the council and local cycling and walking groups.

A green travel plan encourages staff and customers to use public transport, resulting in only 30% of Liverpool ONE's visitors arriving by car (compared with close to 100% in most large regional malls). The car park is situated underground, creating one of the largest green roofs in Europe, home to numerous species of wildlife.

Developing at this scale has also enabled the project to trial new technologies, including an innovative bio-diesel plant (the first of its kind in the country) that produces enough fuel – from used cooking oil from on-site restaurants – to power all on site vehicles, a food waste biomass initiative, and a new 'waste to water' system to deal with food waste.

Arguably the most exciting legacy of Liverpool ONE is the work being undertaken with local schools, colleges and universities. The project offers various opportunities to people in local communities, employs local apprentices, and has provided jobs for many youth, local and previously long-term unemployed for the construction as well as long term positions in retail units, creating 5,000 jobs in total.

Liverpool ONE now attracts 26 million visitors a year, helping move the city from the 16th to the fifth most popular destination to shop in the UK, and is a model for how collaboration and holistic thinking can bring about large-scale benefits.

CASE STUDY

Codes, Compliance and Collaboration

Waking the sleeping energy-efficiency giant in Jakarta

Marketplaces with vibrant green ecosystems depend on all of the pieces of the puzzle fitting together across the value chain: from investors to developers, from manufacturers to energy service companies, and from municipal governments to those who own, live, and work in green buildings.

With the aims of mitigating carbon emissions and improving building efficiency in the capital city of the world's fourth most populous country, a new set of green building codes is being implemented in Jakarta in April 2013. The codes, along with a host of complementary measures, are the result of two years of partnership between the government, local industry and the International Finance Corporation (IFC).

Jakarta Green Building Program

While climate change remains an abstract concept in many places, its effects have been quite apparent in Jakarta in the last few years. It is considered one of the cities most vulnerable to climate change in South East Asia. It is also one of the major contributors to greenhouse gas (GHG) emissions in the region. Floods caused by rainfall and sea level rise, increased urban heat islands causing higher air temperature, poor air quality, regular disease outbreak and increasing fresh water scarcity (despite having 13 rivers running through the city) are now common occurrences in Jakarta.

Indonesia also has a fairly 'dirty' source of its electricity, the cost of which is heavily subsidized by the government. The building sector accounts for about one third of the country's total energy consumption and has been identified as one of the key areas of focus for the national emission reduction plan. The Jakarta provincial government has set itself a target of 30% GHG reduction by 2020 as compared to a business-as-usual scenario. At the same time, the country is experiencing rapid construction growth and has a lack of stringent green building regulations, making achievement of these targets challenging. This combination of the economic and environmental conditions and policy conditions led the collaborators to use a variety of means to catalyze green building growth, including:

- Mandatory green building codes to improve the baseline building performance;
- Fiscal and non-fiscal incentives to increase the uptake of green buildings;
- Market awareness and capacity building to increase acceptability and understanding of officials, professionals and building owners; and
- Financial instruments to overcome the first cost barriers.

Local Context

When this project commenced, the situation in Jakarta's construction sector was characterized by having both a lack of national standards guiding energy and water efficiency and too few trained staff within government to enforce the standards. Further, products like energy-efficient chillers and glass were not being manufactured locally, and these imported products had a high cost.

While there is strong societal interest in green buildings, the average awareness among professionals and building owners was fairly low. The local 'Greenship' green building rating system developed by the newly-established Green Building Council of Indonesia was growing in popularity, but the number of certified buildings was fairly small.

Development Process

The goal was to create a code that was simple to implement, effective, and easy to monitor. The project's analysis modeled a range of possible changes for each commercial building type in Jakarta that met clear criteria for market preparedness and ease of implementation, while maximizing the benefits of energy, greenhouse gas emissions and water reduction in a cost-effective manner.

The details of the code have been developed in close consultation with government as well as private sector stakeholders, including developers, landlords, and professional associations.

The new Jakarta Green Building Code stipulates energy, water and site efficiency requirements for both new buildings and existing buildings. Due to the limited existing implementation and enforcement capacity, the floor area threshold for buildings that are required to meet the code has been kept fairly high.

Bottom Line Impacts on the Local Market

A detailed market study was undertaken to estimate the construction and installation costs of the items being tested for inclusion in the code. The sensitivity analysis also involved calculation of energy and water savings for numerous conservation measures for all building types as well as the simple payback period for each measure. Only measures with reasonable paybacks (typically less than six years) were recommended for inclusion in the code.

Typically, the overall cost increase for all the recommended strategies was between 3 to 6% and the simple payback between four and eight years. The payback calculations were done using the current electricity rates for Jakarta, which are heavily subsidized. The government has announced its intention to gradually remove the subsidy over the next few years, which would reduce the payback periods even further.

Costs for some of the high-efficiency technology measures such as chillers and glass are also expected to come down as the demand increases after the code becomes mandatory.

In order to soften the impact of the increased first cost, options for fiscal or non-fiscal incentives are being considered by the government.

IFC is also working on setting up investment facilities through other financial institutions to finance construction of new buildings meeting or exceeding the green building code requirements. These facilities could finance construction loans for developers as well as 'green mortgages' for buyers.

Challenges and Solutions
Although the project potentially faced many challenges, through collaborative effort with industry, proactive solutions were found:

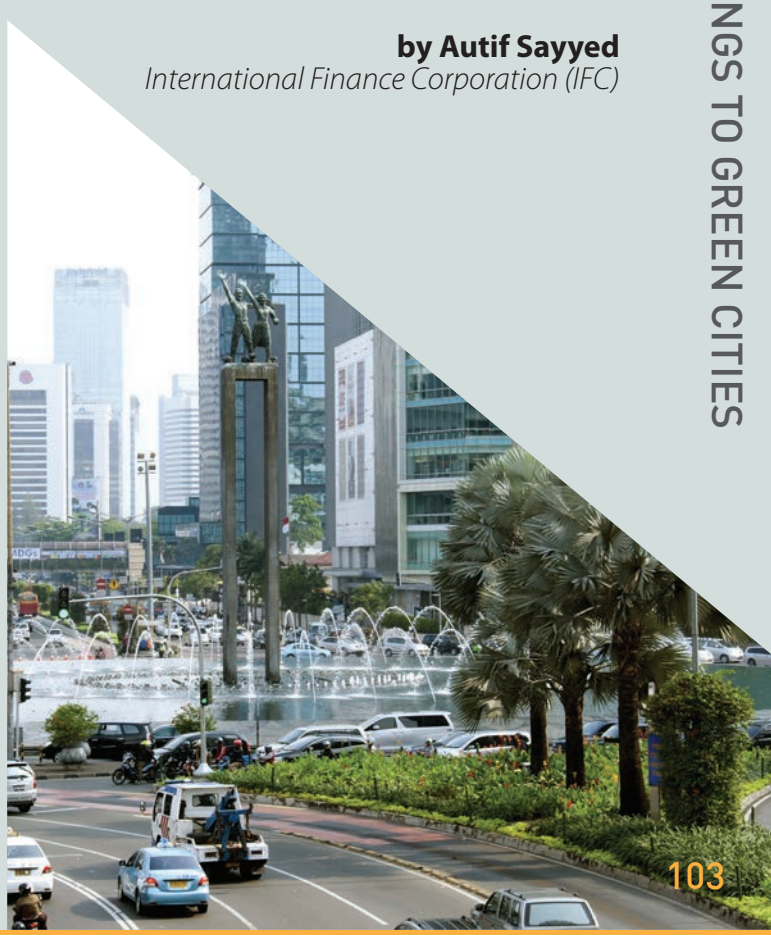
CHALLENGE	SOLUTION
Lack of existing data on construction practices and costs, and building energy consumption	Conducting detailed market research and building surveys
Lack of training/ capacity	Providing workshops, hands-on exercises, detailed user guides and tools
Lack of private sector support	Establishing local teams and networks, including local consultants to coordinate the project with the local government
Apprehension about complexity of process	Running a series of pilot projects in close collaboration with design teams
Resistance to change	Increasing awareness of the eventual change in artificially-low energy tariffs and encouraging quick and regular updates of national standards
Risk of poor implementation	Adopting a multi-pronged approach, including capacity building/ training, development of suitable financial instruments, and incorporation of green building curriculum in professional degree courses

The development process and resulting codes and programs have been widely seen as successful by those involved. As a result, the Jakarta Green Building program is being viewed as a template for application in other provinces around the country. The true test, of course, will lie in the outcomes of the implementation, both for the marketplace and for the environment.

IFC International Finance Corporation
World Bank Group

ABOUT THE IFC
International Finance Corporation (IFC), part of the World Bank Group, is the world's largest private sector-focused development bank. In FY12, IFC committed US$1.6 billion in climate-related investments ranging from renewable energy, waste management to sustainable water, agriculture and forestry projects. The green building sector is at the forefront of this business as it represents one of the most effective ways to reduce global carbon emissions that are primarily responsible for climate change

by Autif Sayyed
International Finance Corporation (IFC)



THOUGHT PIECE

Greening a City the PlanNYC Way

PlaNYC is New York City's citywide sustainability plan grounded in environmental and economic analysis to meet an ambitious but achievable goal of 30% reduction in greenhouse gas (GHG) emissions by 2030. Launched in 2007, PlaNYC focuses on the fundamental elements of a successful business climate, such as efficient infrastructure and quality of life, and puts in place policies to ensure a thriving economic environment while reducing citywide emissions and enabling long-term resilience for the city. The research behind PlaNYC shows that infrastructure and quality of life are strongly tied to buildings. As the figures below show, buildings represent a resource-intensive sector and the largest source of emissions.

Realizing the important role that existing buildings play, New York City initiated the Greener, Greater Buildings Plan (GGBP), the most comprehensive set of energy efficiency laws in the US addressing energy information transparency and continuous improvement.

GGBP requires all buildings to follow the local energy code, which is more stringent than the state energy code, with further requirements for large, existing buildings (more than 50,000 square feet or 4,645 square meters, or a group of buildings on a single lot that are collectively more than100,000 square feet or 9,290 square meters).

Large buildings make up just 2% of the city's properties, but account for half of the city's square footage and 45% of citywide GHG emissions. As part of GBBP, these buildings must:

- Annually submit energy and water use for public disclosure and data analysis;
- Perform energy audits and retro-commissioning every ten years;
- Upgrade lighting in non-residential spaces to current code by 2025; and
- Provide sub-meters for commercial tenants that occupy over 10,000 square feet (929m^2) by 2025.

Implementing GGBP will result in the reduction of almost 5% in GHG emissions while generating roughly 17,800 construction-related jobs. Estimates show that by 2030, GGBP will cost building owners US$5.2 billion in capital costs, yet save them $12.2 billion in direct energy costs, resulting in a net savings of $7 billion citywide.

To ensure a comprehensive look at local policies, the City also assembled a Green Codes Task Force (GCTF) in 2008 to recommend cost-effective changes to current building codes and regulations. Of its 111 proposals, 37 have already been incorporated into City law or practice. Each proposal was thoroughly vetted by numerous committees for impacts on resource efficiency, GHG emissions, health and toxicity, and more. Additionally, all proposals were put through a cost-benefit analysis, addressing categories such as standard construction costs, incremental costs, cost changes from total construction cost, annual savings, and payback periods.

The GCTF measures that have already been implemented are expected to reap numerous benefits by 2030:

- Reduce citywide emissions by almost 5%;
- Lower daily water consumption by the equivalent of 30 Central Park Reservoirs;
- Annually divert 100,000 tons of asphalt from landfills;
- Train over 2,100 architects and engineers to implement the city's new energy code;
- 15 million gallons of concrete waste water will be treated before entering the sewer system; and
- Reduce lighting energy costs by 10%.

The 29 measures passed as of February 2012 alone will save $400 million citywide by 2030.

With these and other efforts, such as the Mayor's Carbon Challenge, and a 30% emissions reduction goal for municipal buildings, New York City is on track to meet its 30% reduction goal by 2030. The city's 2012 carbon inventory report already shows a decrease of 16.1%. By following Mayor Bloomberg's leadership in sustainability, and implementing policy based on research and cost-benefit analysis, the city is clearly demonstrating how to reduce GHG emissions and support the long-term health of its economy while creating today's jobs, bottom-line business benefits, and a higher quality of life for New Yorkers.

Hilary Beber & Stacy Lee
New York City Mayor's Office of Long-Term Planning and Sustainability

CASE STUDY

Abu Dhabi's First Sustainable Mandate

Abu Dhabi has undergone a rapid change in the last fifty years, with the economic rewards from oil and gas reserves propelling the city into the modern capital it is today.

Previously, the region was a predominantly nomadic herding, fishing and pearl diving culture, with date and vegetable plantations contributing to the local economy. Bedouin life, while hard and without many of today's creature comforts, required little from the land and made little impact in return; wasting nothing, the Bedouin way of life was truly sustainable.

Today, Abu Dhabi and the United Arab Emirates have some of the highest resource consumption rates and per capita carbon emissions in the world. In part, this is due to the environment. The Middle East is challenged with one of the world's harshest climates; hot summers of up to 50°C (120°F) in the shade and hyper-arid conditions pervade each year. The precious water used for drinking, agriculture and industry requires significant fossil fuel resources due to the dependence on the desalination of seawater sourced from the Arabian Gulf. At the same time, utility tariffs are heavily subsidized by the government; the electricity subsidy in residential buildings ranges from 55 to 90% and the water subsidy ranges from 79 to 100% (see Figure 14).

In recent years, the number of government-funded projects, which includes housing for its citizens, represents 72% of all new development. The total cost to government for these projects includes both the initial capital and a significant proportion of operational expenditure as a result of the substantial subsidies. Reducing consumption and government costs is therefore a key factor supporting the business case for sustainable development in Abu Dhabi.

To respond to these challenges, the Abu Dhabi leadership identified and committed to the need for a sustainability framework to guide development of the city at every level. The Abu Dhabi Urban Planning Council (UPC) has developed 'Vision 2030' - a plan to evolve the city into a vibrant metropolis complete with world-class industry, commerce, education, healthcare, transport and tourism.

Vision 2030 was developed to respond to the local climate, way of life and values of the people and is based around four key pillars: social, cultural, economic and environmental. This framework is called Estidama - the Arabic word for sustainability.

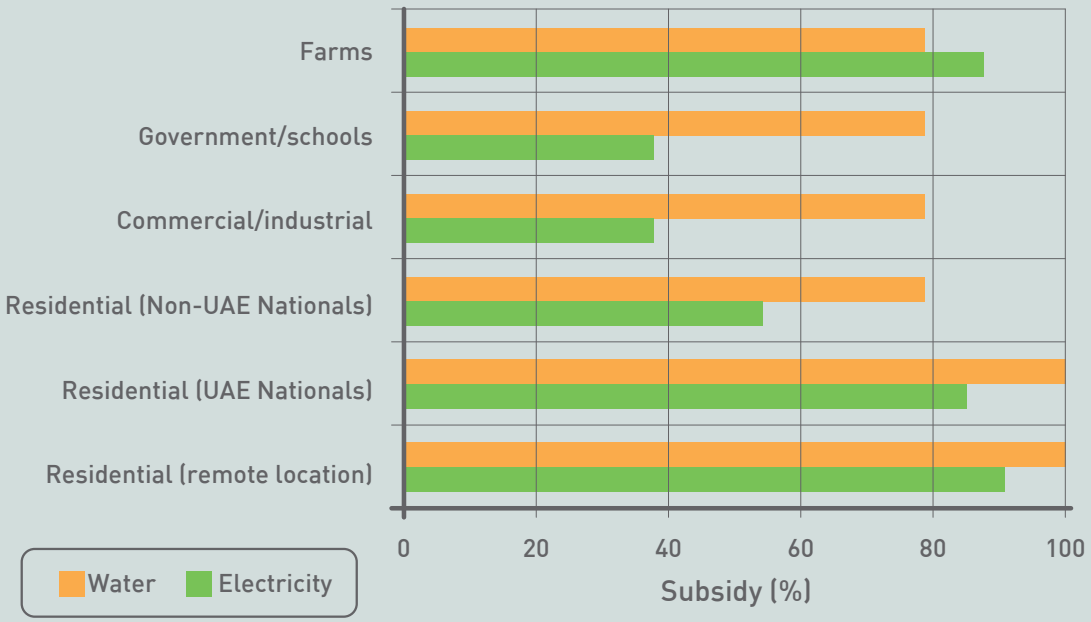


Figure 14
Figure Regulation and Supervision Bureau: Customer Tariffs & Charges. http://www.rsb.gov.ae/

Estidama is focused on delivering results on the ground to safeguard the interests of future generations and also represents Abu Dhabi's contribution to the global sustainability agenda. As a tool for sustainable development, Estidama is being used as a foundation for the design of every new building and community.

In order to support and accelerate the implementation of sustainability targets, the Pearl Rating System (PRS), a key component of the Estidama program, received government mandate in July 2010. Every new building and community must adhere to the system's minimum requirements, with higher levels of sustainable achievement encouraged to promote positive change and competition.

Unique features of the system include the integration of cultural, religious and social values combined with an emphasis on both energy and water saving in the scoring system to reflect the strain placed on the nation's natural resources and fragile ecosystem.

To improve efficiency of the construction process and to keep costs down, audits are carried out at four stages of the construction period, and on-site testing reduces defects and liability issues and removes instances of non-compliance. The Pearl Operational Rating System ensures continuity of building performance and efficiency through mandating operational maintenance protocols, extending both building and system lifetimes.

Implementation of the Estidama program has been provided free to industry by the government to ensure all new projects are included and supported. Comprehensive training has accelerated the spread of awareness through the construction industry and wider population.

Since it was formally implemented three years ago, the Estidama PRS program has already made headway into making a positive change with 234 rated developments, equating to 6,630,000 square meters of GFA (more than 71 million square feet) with 4,200,000 million constructed (45 million square feet); 5,800 people trained; and 197 construction audits carried out.

An initiative of the Urban Planning Council called 'Complete Sustainable Communities' has been established to ensure today's communities build a sustainable future for tomorrow. Connectivity is a key element of this initiative, with a holistic plan for transport aiming to connect internal and intercity rail links with much-needed bus and taxi services.

The Estidama framework is continually being interwoven into emerging regulations, policies and building codes to produce an integrated approach to Abu Dhabi's sustainable development. Engagement with stakeholders including utilities companies, government and planning agencies has been undertaken to create smoother, more cost-effective sustainable development.

Guided by Abu Dhabi Vision 2030, a large-scale urban master plan for the city is also being developed, progressing the ethos of Estidama to provide a world-class sustainable, secure and dynamic society with the values of the nation's culture at its core.

Echoing the ideals of its Bedouin ancestors' ecological and cultural principles, Abu Dhabi is well on its way to nurturing a first generation green society.

إستدامة
estidama

GLOSSARY

Appraisal
An expert opinion on the value of a property; the act or process of estimating value.

Asset
A resource with economic value that an individual, corporation or country owns or controls with the expectation that it will provide future benefit.

Building Research Establishment Environmental Assessment Method (BREEAM)
A method of assessing the sustainability performance of both new and existing commercial buildings primarily based in the UK. [1]

Commissioning
A quality assurance process intended to confirm that all systems of a building—heat, air conditioning, electrical, plumbing, safety, security—are operating as intended by the building owner and designed by the architect and engineer.

Energy Performance Certificates (EPC)
A mandatory certification required when a building is being sold, built or rented, that provides an energy efficiency rating (from A-G) and recommendations for improvement. [1]

Energy Star
An energy performance rating system for commercial, institutional and industrial buildings developed by the US Environmental Protection Agency. The rating can also be used to determine whether a property qualifies for Energy Star recognition. [1]

Fiduciary
A person legally appointed and authorized to hold assets in trust for another person. The fiduciary manages the assets for the benefit of the other person rather than for his or her own profit. [2]

Financial Return
The gain or loss of a security in a particular period. The return consists of the income and the capital gains relative on an investment. It is usually quoted as a percentage. [2]

Green Certification
Schemes which provide third-party assessment of green building measures on a wide variety of building types.

Green Lease
A "green lease" seeks to remove disincentives in a commercial lease to reduced energy, water and raw material consumption, increased recycling, as well as the use of sustainable materials in tenant improvements, and encourages sustainable practices by both the landlord and the tenant. A green lease works to ensure that tenants and landlords are required to adopt environmentally friendly practices.

Green Mark
Voluntary scheme which was launched in January 2005 By Singapore's Building and Construction Authority as an initiative to drive Singapore's construction industry towards more environment-friendly buildings.

Green Star
A voluntary environmental rating system for buildings in Australia, launched in 2003 by the Green Building Council of Australia.

Haute Qualité Environnementale (HQE)
A standard for green building in France that considers environmental issues in building construction, designed to improve the environmental quality of buildings and monitor environmental impacts.

Human Capital
A measure of the economic value of an employee's skill set. The concept of human capital recognizes that not all labor is equal and that the quality of employees can be improved by investing in them. [2]

Integrated Design Process
An integrated design approach requires that the primary stakeholders of a building are involved in the entire design process and continue to provide input through construction so that all of the objectives are met.

Leadership in Energy and Environmental Design (LEED)
The green building certification program created by the United States Green Building Council (USGBC). The comprehensive rating system (based on prerequisites and points) takes a whole building approach factoring in community resources & public transit, site characteristics, water efficiency, energy efficiency, materials & resources, indoor environmental quality, awareness & education, and innovation. [3]

Liquidity
The degree to which an asset or security can be bought or sold in the market without affecting the asset's price. Liquidity is characterized by a high level of trading activity. Assets that can be easily bought or sold are known as liquid assets. [2]

Market Value
The estimated amount for which a property should exchange on the date of valuation between a willing buyer and a willing seller in an arm's-length transaction after proper marketing wherein the parties had each acted knowledgeably, prudently and without compulsion. [1]

NABERS
The National Australian Built Environment Rating System, measuring the energy efficiency, water usage, waste management and indoor environmental quality Australian buildings, tenancies and homes.

Net Present Value
The difference between the present value of cash inflows and the present value of cash outflows. NPV is used in capital budgeting to analyze the profitability of an investment or project. [2]

Obsolescence
The loss of desirability or usefulness due to changes in design, use or advances in market requirements. [1]

Plug Load
The electrical current drawn by all equipment that is connected to the electrical system. [6]

Portfolio
A grouping of financial assets such as stocks, bonds and cash equivalents, as well as their mutual, exchange-traded and closed-fund counterparts. Portfolios are held directly by investors and/or managed by financial professionals. [2]

Real Estate Investment Trust (REIT)
A security that sells like a stock on the major exchanges and invests in real estate directly, either through properties or mortgages. [2]

Whole Life Cost
The total cost of ownership over the life of an asset, through planning, acquisition or development, operation, maintenance and refurbishment and ultimately replacement or disposal. [1]

Valuation
See Appraisal.

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Jane Henley is the CEO of the World Green Building Council (WGBC). Jane was on the founding board then the founding CEO of the New Zealand Green Building Council from 2006 to 2010. Jane has been a director of the WGBC since 2007 until becoming the CEO in 2010. Jane was also a director of the United Nations Sustainable Building Climate Initiative board and is an active speaker and passionate about business leading change.

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Lisa Fay Matthiessen is an architect with over 23 years of experience in design and construction, with an emphasis in sustainable design. Through her groundbreaking research and analysis of the financial costs and benefits of building green, Lisa has transformed construction markets worldwide and advanced public policy and the evolution of environmentally responsible design. Lisa is currently a principal with Integral Group, an engineering firm dedicated to deep green design.

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ABOUT THE PROJECT PARTNERS

About the World Green Building Council

The World Green Building Council is a network of national Green Building Councils in more than 90 countries, making it the world's largest international organization influencing the sustainable built environment.

Green Building Councils are member-based organisations that work with more than 25,000 organizations worldwide to accelerate the transformation of their building industries to create more sustainable buildings, communities and cities.

The WorldGBC collaborates with its member councils to advocate for green building policies and provide a common voice for a growing industry.

Our mission is to ensure we unlock the potential of our sector to reduce carbon emissions and resource consumption while also delivering affordable housing, energy security, job creation and better quality of life for people around the world.

About PRP

PRP is an international multi-disciplinary practice providing a range of design and consultancy services including Architecture, Urban Design and Masterplanning, Landscape Design, Environmental, Research and development, Project Management and Planning.

We operate across the United Kingdom and in overseas markets where our knowledge and expertise in housing, sustainable design and place-making adds value to the regeneration and development of towns and cities. At PRP, we are committed to improving the design and technical performance of the built environment and advocating sustainability as a means of catalyzing change in the industry. Our research and development projects focus on the future – leading the industry in developing new ideas, processes and solutions for our rapidly changing world. Our diverse and dynamic team of creative and highly skilled researchers and technical experts use innovative approaches to research and development in the fields of low carbon buildings, sustainable communities, smart cities and smart systems.

ABOUT THE PREMIUM SPONSORS

SKANSKA

About SKANSKA

Throughout 126 years, Skanska has been a modern and innovative developer and contractor, building what society needs. Today, Skanska is one of the world's leading project development and construction groups with expertise in construction, development of commercial and residential projects as well as public-private partnerships. The Group currently has about 57,000 employees in selected home markets in Europe, in the US and Latin America. Skanska is headquartered in Stockholm, Sweden and listed on the Stockholm Stock Exchange. Sales in 2012 totaled SEK 132 billion (USD 19.5 billion, EUR 15 billion).

Skanska's ambition is to be the leading green project developer and contractor, an ambition that has been translated into our Journey to Deep Green™, the company's approach toward delivering projects with a near-zero environmental impact. Our approach is signified by the numerous LEED Platinum, BREEAM Outstanding and CEEQUAL Excellent certified projects we helped deliver to our customers. To find out more about Skanska's Journey to Deep Green™, please visit us at http://group.skanska.com/en/Sustainability/Our-Journey-to-Deep-Green/.

About Grosvenor

Grosvenor is a privately owned property group with offices in 18 of the world's most dynamic cities. The Group operates and invests in three different business areas; direct proprietary investment in real estate through our Operating Companies in Britain & Ireland, the Americas and Asia Pacific; indirect proprietary investment in real estate managed by others, which is the responsibility of the holding company; and our international fund management Operating Company - Grosvenor Fund Management - which manages capital on behalf of investors. As at 31 December 2011, the Group had total assets under management of £12.5bn. Unusually for a private company, Grosvenor publishes a full Annual Report & Accounts, available at: www.grosvenor.com

About Abu Dhabi Urban Planning Council

Estidama, which means "sustainability" in Arabic, is both a founding principle of The Government of Abu Dhabi's Plan 2030 and a programme of complementary policies developed by the Abu Dhabi Urban Planning Council. Based on four pillars – environment, economy, society, and culture – the Estidama Programme guides sound investments in the built environment -- to ensure ecological heritage is protected, neighborhoods are connected, buildings achieve and retain quality, and water, energy and material resources are stewarded prudently.

The Estidama Pearl Rating System through a governmental mandate sets minimum sustainability standards for all new buildings, villas, and communities as well as voluntary guidelines to reward world class projects and advancement of the building industry. It tracks performance throughout the lifecycle of projects, with reviews at the design stage, during construction, and after building operation. Importantly, government-funded projects are required to achieve higher standards, both to realize greater returns on investment in resource efficiency and to provide leadership by example.

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