



Brownfield Redevelopment Authority
Of Jackson County
Served By The Enterprise Group

RE: Building Sustainably in Jackson County

Thank you for your investment in Jackson County, Michigan! Jackson County and its Brownfield Redevelopment Authority, staffed by The Enterprise Group, work hard to provide business development and expansion opportunities throughout the County. One of the ways we have been able to support these opportunities is through our access to U.S. Environmental Protection Agency Brownfield Assessment Grant funds. We have been able to secure these competitive dollars through our continued demonstration that the funds have been effectively used to restore use of Brownfield sites, improve local economic conditions, and improve the environment.

One way for us to help demonstrate these criteria is to ensure that individuals and businesses are aware of existing information and technologies that help our community conserve energy, preserve natural resources, and prevent environmental degradation. As you engage in your Brownfield Redevelopment project, we want you to be aware of the enormous amount of resources available to help build environmentally-friendly and energy-efficient facilities. This brochure provides access to a great number of resources, tools, financial incentives, examples and institutions available to help you build an exciting project. You can also find a list at the following link – <http://www.envirollogic.com/resources>.

We hope you will take advantage of these resources. Further, we wish for you to share any measures that you were able to utilize in your project and the value it provided. These success stories help us compete for valuable funds so that we will be in a position to help future development projects.

Thank you again for growing your business in Jackson County. We wish you the best of luck!

Amy L. Torres
JCBRA Executive Director on behalf of
The Enterprise Group of Jackson, Inc.

Sustainable Building & Energy Resources

Materials in this folder

- 1) **Green Building Standards** – EPA Smart Growth Information, which compares the various green building standards.
 - » International Code Council's 2012 International Green Construction Code (IgCC)
 - » ANSI/ASHRAE/USGBC/IES Standard 189.1-2011: Standard for the Design of High-Performance Green Buildings Except Low-Rise Residential Buildings
 - » ICC 700-2012: 2012 National Green Building Standard (ICC 700)
 - » Green Globes (Administered by the Green Building Initiative)
 - » U.S. Green Building Council's Leadership in Energy and Environmental Design (LEED)
 - » The International Living Future Institute's Living Building Challenge
- 2) **Sustainable Overview** – Whole Building Design Guide from the National Institute of Building Sciences
- 3) **The Business Case for Green Building** – Executive Summary
- 4) **PACE Financing**
- 5) **The Benefits of Construction and Demolition Materials Recycling in the United States**

Contact Us

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Additional resource links

These links include all items in this folder (*) plus additional resources that may be helpful as you proceed with your development project. You may access the complete list of clickable links at <http://www.envirollogic.com/resources>.

- 1) *Green Building Standards – EPA Smart Growth Information
<http://www.epa.gov/smartgrowth/green-building-standards>
- 2) EPA's Sustainable Design and Green Building Toolkit
https://www.epa.gov/sites/production/files/2014-09/documents/sustainable-design-permitting-toolkit-06_27_13_formatted.pdf



- 3) Green Building Standards and Certification Systems – Whole Building Design Guide (WBDG) – a program of the National Institute of Building Sciences
<https://www.wbdg.org/resources/gbs.php>
- 4) *Sustainable Overview – Whole Building Design Guide from the National Institute of Building Sciences
<https://www.wbdg.org/design/sustainable.php>
- 5) *The Business Case for Green Building
<http://www.worldgbc.org/news-media/business-case-green-building-review-costs-and-benefits-developers-investors-and-occupants>
- 6) National Institute of Building Sciences
<https://www.nibs.org/>
- 7) Energy.gov – Office of Energy Efficiency & Renewable Energy
<http://energy.gov/eere/office-energy-efficiency-renewable-energy>
- 8) U.S. Department of Energy – Building Energy Codes Program – Michigan
<https://energy.gov/sites/prod/files/2016/08/f33/Codes%20Fact%20Sheet%208-25-16.pdf>
- 9) U.S. Department of Energy – Saving Energy and Money with Building Energy Codes in the United States
http://energy.gov/sites/prod/files/2014/05/f15/saving_with_building_energy_codes.pdf
- 10) U.S. Department of Energy - A Common Definition for Zero Energy Buildings
<https://energy.gov/eere/buildings/downloads/common-definition-zero-energy-buildings>
- 11) Harvard Energy & Facilities – The Green Building Resource
<http://www.energyandfacilities.harvard.edu/green-building-resource>
- 12) Energy Star
<https://www.energystar.gov>
- 13) LARA – Department of Licensing and Regulatory Affairs – Michigan Uniform Energy Code
<http://www.michigan.gov/lara/0,4601,7-154-10401-203088--,00.html>
- 14) *The Benefits of Construction and Demolition Materials Recycling in the United States
http://www.cdrecycling.org/assets/docs/exec%20summary_cd%20recycling%20impact%20white%20paper.pdf
- 15) *PACE
<http://leanandgreenmi.com/index>

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Comparison of Green Building Standards

Updated 2017

Standard	Standard Type <i>(Something established by authority, custom, or general consents as a model or example.)</i>	Mandatory or Voluntary	Building Type(s)	Project Type	Subject Areas
International Code Council's 2012 International Green Construction Code (IgCC)	Model code	Mandatory	Commercial: all Industrial: all but manufacturing systems and equipment Mixed use: all Residential: multi-family with more than 3 stories	New construction Additions Alterations	Sustainable sites Energy efficiency Water efficiency Materials and resource use Indoor environmental quality Emissions Operations and maintenance
<i>A model code that contains minimum requirements for increasing the environmental and health performance of buildings/sites and structures. Generally, it applies to the design and construction of all types of buildings except single- and two-family residential structures, multi-family structures with three or fewer stories, and temporary structures.</i>					
More Information about 2012 IgCC					
ANSI/ASHRAE/USGBC/IES Standard 189.1-2011: Standard for the Design of High-Performance Green Buildings Except Low-Rise Residential Buildings (ASHRAE 189.1)	Model code	Mandatory	Commercial: all Industrial: all Mixed use: all Residential: multi-family with more than 3 stories		Sustainable sites Energy efficiency Water efficiency Materials and resource use Indoor environmental quality Construction and operations plans
<i>A model code that contains minimum requirements for increasing the environmental and health performance of buildings/sites and structures. Generally, it applies to the design and construction of all types of buildings except single-family homes, multi-family homes with 3 or fewer stories, and modular and mobile homes.</i>					
More Information about ASHRAE 189.1					
ICC 700-2012: 2012 National Green Building Standard (ICC 700)	Rating and certification system	Voluntary	Mixed use: residential space Residential: all except institutional uses	New construction Additions Alterations	Sustainable sites Energy efficiency Water efficiency Materials and resource use Indoor environmental quality Operations and maintenance Building owner education
<i>A rating and certification system that aims to encourage increased environmental and health performance in residences and residential portions of buildings. Its criteria apply to the design and construction of homes and subdivisions.</i>					
More Information about ICC 700					

Comparison of Green Building Standards

Updated 2017

Standard	Standard Type <i>(Something established by authority, custom, or general consents as a model or example.)</i>	Mandatory or Voluntary	Building Type(s)	Project Type	Subject Areas
Green Globes™	Rating and certification system	Voluntary	Commercial: all Mixed use: all Residential: multi-family	New construction Additions Alterations Existing buildings	Sustainable sites Energy efficiency Water efficiency Materials and resource use Indoor environmental quality Emissions Project/environmental management
<i>A series of rating and certification systems that encourage improved environmental and health performance for all types of buildings except residential structures. Green Globes™ is administered in the U.S. by the Green Building Initiative.</i>					
More Information about Green Globes					
US Green Building Council's Leadership in Energy and Environmental Design (LEED®)	Rating and certification system	Voluntary	Commercial: all Industrial: all Mixed use: all Residential: all	New construction Existing buildings Additions	Sustainable sites Energy efficiency Water efficiency Materials and resource use Indoor environmental quality Emissions Operations and maintenance
<i>A series of rating systems aimed at increasing the environmental and health performance of buildings, sites and structures and of neighborhoods. LEED® covers the design, construction, and operations of all types of buildings.</i>					
More Information about LEED					
The International Living Future Institute's Living Building Challenge™, version 2.1 (May 2012)	Certification system	Voluntary	Commercial: all Industrial: all Mixed use: all Residential: all	All	Sustainable sites Energy efficiency Water efficiency Materials and resource use Indoor environmental quality Equity Aesthetics
<i>A certification system that advocates for transformation in the design, construction, and operation of buildings. In addition to encouraging improved environmental and health performance, it supports the building of structures that are restorative, regenerative, and an integral component of the local ecology and culture.</i>					
More Information about the Living Building Challenge					
The information included in this document can be found on the EPA Smart Growth/Green Building Standards webpage: http://www.epa.gov/smartgrowth/green-building-standards#note2					

Summary of Green Product Certifications

Updated 2017

The following table, and the expanded information directly below it, outlines some of the most commonly used and respected green product certifications in the marketplace.

Product Certification	Single- or Multi-Attribute	Type of Standard or Certification	Managing Organization	Issue of Focus
<u>Energy Star</u>	Single-Attribute	Government certification relying on manufacturer-provided data or third-party testing	U.S. EPA and U.S. DOE	Energy consuming products
<u>WaterSense</u>	Single-Attribute	Government label based on third-party testing	U.S. EPA	Showerheads, toilets, faucets, urinals, and valves
<u>Forest Stewardship Council</u>	Single-Attribute	Third-party certification	Forest Stewardship	Forests and forestry products
<u>SCS Global Services</u>	Multi-Attribute	Third-party certification	SCS Global Services	Wide range of products (i.e. carpets, textiles, wood products, insulation, and more)
<u>Green Seal</u>	Multi-Attribute	Third-party ISO Type 1 certification	Green Seal	Wide range of sectors (paints, adhesives, lamps, electric chillers, windows, window films, occupancy sensors)
<u>Cradle to Cradle</u>	Multi-Attribute	Moving toward third-party certification; based on a proprietary standard	Cradle to Cradle Products Innovation Institute C2CPII	Wide range of sectors (metals, fibers, dyes, plastics)
<u>Greenguard</u>	Multi-attribute	Third party certification	UL Environment	Indoor air quality, children and schools focus

Sustainable | WBDG Whole Building Design Guide

 www.wbdg.org/design-objectives/sustainable

the WBDG Sustainable Committee

Updated:

10-26-2016

Overview

Building construction and operations can have extensive direct and indirect impacts on the environment, society, and economy, which are commonly referred to as the 3 P's ('People', 'Planet', 'Pocketbook'). The field of sustainable design seeks to balance the needs of these areas by using an integrated approach to create win-win-win design solutions.

The main objectives of sustainable design are to reduce, or completely avoid, depletion of critical resources like energy, water, and raw materials; prevent environmental degradation caused by facilities and infrastructure throughout their life cycle; and create built environments that are livable, [comfortable](#), [safe](#), and [productive](#).

Buildings use resources (energy, water, raw materials, and etc.), generate waste (occupant, construction and demolition), and emit potentially harmful atmospheric emissions. Building owners, designers, and builders face a unique challenge to meet demands for new and renovated facilities that are [accessible](#), [secure](#), [healthy](#), and productive while minimizing any negative impacts on society, the environment, and the economy. Ideally, building designs should result in net-positive benefits to all three areas.

In addition to including sustainable design concepts in new construction, sustainable design advocates commonly encourage retrofitting existing buildings rather than building anew. Retrofitting an existing building can often be more [cost-effective](#) than building a new facility. Designing major renovations and retrofits for existing buildings to include sustainable design attributes reduces operation costs and environmental impacts, and can increase building resiliency. The embodied energy of the existing building, a term expressing the cost of resources in both human labor and materials consumed during the building's construction and use, are squandered when the building is allowed to decay or be demolished.

Source: EPA, USGBC

While the definition of *sustainable building design* is constantly changing, six fundamental principles persist.

- **Optimize Site Potential**

Creating sustainable buildings starts with proper site selection, including consideration of the reuse or rehabilitation of existing buildings. The location, orientation, and landscaping of a building affect local ecosystems, transportation methods, and energy use. It is important to incorporate smart growth principles into the project development process, whether the project is a single building, campus, or military base. Siting for physical security is a critical issue in optimizing site design, including locations of access roads, parking, vehicle barriers, and perimeter lighting. Whether designing a new building or retrofitting an existing building, site design must integrate with sustainable design to achieve a successful project. The site of a sustainable building should reduce, control, and/or treat storm water runoff. If possible, strive to support native flora and fauna of the region in the landscape design.

- **Optimize Energy Use**

With continually increasing demand on the world's fossil fuel resources, concerns for energy independence

and security are increasing, and the impacts of global climate change are becoming more evident, it is essential to find ways to reduce energy load, increase efficiency, and maximize the use of renewable energy sources in federal facilities. Improving the energy performance of existing buildings is important to increasing our energy independence. Government and private sector organizations are increasingly committing to building and operating [net zero energy buildings](#) as a way to significantly reduce our dependence on fossil fuel-derived energy.

- **Protect and Conserve Water**

In many parts of the United States, fresh water is an increasingly scarce resource. A sustainable building should use water efficiently, and reuse or recycle water for on-site use, when feasible. The effort to bring drinkable water to our household faucets consumes enormous energy resources in pumping, transport, and treatment. Often potentially toxic chemicals are used to make water potable. The environmental and financial costs of sewage treatment are significant.

EPA's [New England Regional Laboratory \(NERL\)](#) achieved a LEED Version 1.0 Gold rating. From conception the project was charged to "make use of the best commercially-available materials and technologies to minimize consumption of energy and resources and maximize use of natural, recycled and non-toxic materials." Chelmsford, MA



- **Optimize Building Space and Material Use**

While the world population continues to grow (to over 9 billion by 2050), natural resource use will continue to increase and the demand for additional goods and services will continue to stress available resources. It is critical to achieve an integrated and intelligent use of materials that maximizes their value, prevents upstream pollution, and conserves resources. A sustainable building is designed and operated to use and reuse materials in the most productive and sustainable way across its entire life cycle and is adaptable for reuse during its life cycle. The materials used in a sustainable building minimize life-cycle environmental impacts such as global warming, resource depletion, and human toxicity. Environmentally preferable materials have a reduced effect on human health and the environment and contribute to improved worker safety and health, reduced liabilities, reduced disposal costs, and achievement of environmental goals.

- **Enhance Indoor Environmental Quality (IEQ)**

The indoor environmental quality (IEQ) of a building has a significant impact on occupant health, comfort, and productivity. Among other attributes, a sustainable building maximizes daylighting, has appropriate ventilation and moisture control, optimizes acoustic performance, and avoids the use of materials with high-VOC emissions. Principles of IEQ also emphasize occupant control over systems such as lighting and temperature.

- **Optimize Operational and Maintenance Practices**

Considering a building's operating and maintenance issues during the preliminary design phase of a facility will contribute to improved working environments, higher productivity, reduced energy and resource costs, and prevented system failures. Encourage building operators and maintenance personnel to participate in the design and development phases to ensure optimal operations and maintenance of the building. Designers can specify materials and systems that simplify and reduce maintenance requirements; require less water, energy, and toxic chemicals and cleaners to maintain; and are cost-effective and reduce life-cycle costs. Additionally, design facilities to include meters in order to track the progress of sustainability initiatives, including reductions in energy and water use and waste generation, in the facility and on site.

Building resiliency is the capacity of a building to continue to function and operate under extreme conditions, such as (but not limited to) extreme temperatures, sea level rise, natural disasters, etc. As the built environment faces the impending effects of global climate change, building owners, designers, and builders can design facilities to optimize building resiliency.

Building adaptability is the capacity of a building to be used for multiple uses and in multiple ways over the life of the building. For example, designing a building with movable walls/partitions allow for different users to change the space. Additionally, using sustainable design allows for a building to adapt to different environments and conditions.

Codes and Laws

Standards

- [ASTM E2432](#) *Standard Guide for the General Principles of Sustainability Relative to Building*
- [ASHRAE 189.1](#) *Standard for the Design of Green Buildings, except Low-Rise Residential Buildings*

Additional Resources

WBDG

Building Types / Space Types

Applicable to most [building types](#) and [space types](#).

Design Objectives

Information in these Sustainable pages must be considered together with other [design objectives](#) and within a total project context in order to achieve quality, high—performance buildings.

Products and Systems

[Building Envelope Design Guide—Sustainability of the Building Envelope](#)
[Federal Green Construction Guide for Specifiers:](#)

Project Management

[Building Commissioning](#)

Tools

Federal Agencies

- [Federal High Performance and Sustainable Buildings](#)
 - [Executive Order 13693, "Planning for Federal Sustainability in the Next Decade"](#)
 - [High Performance and Sustainable Buildings Guidance](#)
- Department of Defense

- Department of Energy
- Department of Health and Human Services
 - [NIH Health in Buildings Roundtable](#)
- Department of State
 - [Green Initiatives](#)
 - [Guide to Green Embassies](#)
- Department of Veterans Affairs
 - [Sustainable Design Manual May 2014 and website](#), Office of Construction and Facilities Management (CFM)
- Environmental Protection Agency
 - [Green Building](#) website
 - [Greening EPA](#) website
- General Services Administration
- NASA
 - [Sustainability](#) website

Publications

- Federal
- Organizations, States, and Universities
- Cost
 - [Green Building Costs and Financial Benefits](#) by Gregory H. Kats. 2003.
 - [Sustainable Federal Facilities: A Guide to Integrating Value Engineering, Life-Cycle Costing, and Sustainable Development](#) by Federal Facilities Council. Washington, DC: National Academy Press, 2001.
- Magazines and E-Newsletters

Organizations

Others

- [ASTM International](#)—A globally recognized leader in the development and delivery of international voluntary consensus standards. Today, some 12,000 ASTM standards are used around the world to improve product quality, enhance safety, facilitate market access and trade, and build consumer confidence.
- [Austin Energy Green Building Program](#)
- [Building Green from Principle to Practice](#)—Online resource created by the Natural Resources Defense Council guides building professionals through green building process, from putting together a business case to design, construction and marketing.
- [Building Research Information Knowledgebase \(BRIK\)](#)—an interactive portal offering online access to peer-

reviewed research projects and case studies in all facets of building, from predesign, design, and construction through occupancy and reuse.

- [FedCenter.gov](#)—FedCenter, the Federal Facilities Environmental Stewardship and Compliance Assistance Center, is a collaborative effort between the Office of the Federal Environmental Executive (OFEE), the U.S. Army Corps of Engineers Construction Engineering Research Laboratory, and the U.S. EPA Federal Facilities Enforcement Office. FedCenter replaces the previous FedSite as a one-stop source of environmental stewardship and compliance assistance information focused solely on the needs of federal government facilities.
- [Green Building Advisor](#)

Tools

- [GSA Sustainable Facilities Tool \(SFTool\)](#)—SFTool's immersive virtual environment addresses all your sustainability planning, designing and procurement needs.
- [The Waste Reduction Model \(WARM\)](#)—WARM calculates and totals life cycle GHG emissions avoided through alternative waste management practices (reduced, recycled, combusted, or composted) in comparison to a baseline scenario (landfilled) for various materials

Training Courses

Case Study

- [Bertschi School Living Science Building](#)

Topics:

[Sustainable](#)

The Benefits of Construction and Demolition Materials Recycling in the United States

A CDRA White Paper

December 2014

Version 1.1

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Prepared for the Construction & Demolition Recycling Association by
The Department of Environmental Engineering Sciences,
Engineering School of Sustainable Infrastructure and Environment, University of Florida

Timothy Townsend, Principal Investigator; Christina Wilson, Student Assistant; Blaine Beck, Student Assistant

Executive Summary

Construction and demolition materials (C&D) are recognized as one of the largest components of the solid waste stream in the US. While much of this material is recycled for purely economic reasons, avoidance of landfill disposal of materials such as concrete, wood, gypsum drywall and asphalt shingles has benefits well beyond financial ones. C&D materials recycling results in a greater job creation and industrial activity relative to landfilling. Avoidance of landfilling also provides for a greater degree of environmental protection, a smarter use of natural resources, energy savings, and a net decrease in greenhouse gas emissions. This report summarizes an effort conducted to assess the benefits of the C&D recycling industry in the US. The numerical estimates presented herein were determined using available C&D industry data from the literature, additional information surveyed from the C&D recycling community, and the authors' professional experience.

C&D generation statistics are not rigorously tracked in the US, and predictions of the amount of C&D landfilled and recycled vary dramatically. For this analysis, the amount of C&D generated in the US in 2012 was estimated at approximately 480 million tons. The C&D consists of approximately 100 million tons of mixed C&D, 310 million tons of bulk aggregate (primarily concrete), and 70 million tons of reclaimed asphalt pavement (RAP). Over 70% of this waste stream was projected as being recovered and put to beneficial use by the C&D recycling industry (corresponding to a 35% recycling rate for mixed C&D, an 85% recycling rate for bulk aggregate, and an over 99% recycling rate for RAP). The area of landfill avoided by recycling this amount of C&D is equivalent to over 4,300 acres (at a waste depth of 50 ft).

The energy savings and greenhouse gas (GHG) emissions avoidance as a result of recycling C&D components instead of landfilling them was assessed using emission and energy factors developed by the US Environmental Protection Agency. In 2012, the estimated magnitude of GHG emissions offset corresponded to taking 4.7 million passenger cars off the road for an entire year. The energy savings resulting from C&D recycling was equivalent to over 85 million barrels of oil.

Using industry survey results and the waste recycling projections, the C&D recycling industry was projected to be responsible for the direct support of 19,000 jobs in the US in 2012. Facility owners have invested over \$4.5 billion in the development and construction of C&D recycling infrastructure. The direct annual output (revenue) of the C&D recycling industry was estimated to be approximately \$7.4 billion, and when considering indirect and induced economic output, the industry represented an over \$17 billion contribution.



WHAT IS PACE?

Property Assessed Clean Energy, or PACE, is a long-term financing tool for commercial property owners in Michigan to pay for energy efficiency, water efficiency, and renewable energy upgrades. Property owners receive 100% pre-funding for energy saving upgrades on their facilities and pay the loan back through their property tax bill.

BENEFITS OF PACE FINANCING

- Long-term financing up to 20 years or the useful life of the project
- No upfront cost - 100% financing
- Immediate positive cash flow
- Runs with the land, transferring to the subsequent owner upon sale of the property
- Solves split incentive problem - payments can be passed easily to tenants
- Fixed interest rate (negotiated on each deal)

ELIGIBILITY

Qualifying Properties

- Manufacturing facilities
- Agricultural operations
- Office buildings
- Non-profits, including faith-based institutions and hospitals
- Multifamily housing properties
- And more!

Qualifying measures

- Energy efficiency
- Water efficiency
- Renewable energy (nearly all)

WHY?

Buildings consume 40 percent of energy in the United States and 30 percent of this consumption is wasted due to inefficiency. However, the payback period is simply too long on many energy efficiency and renewable energy measures - so businesses continue wasting energy and money! PACE solves this problem by offering long-term financing at a fixed rate, leading to no upfront cost and *immediate positive cash flow*.

ABOUT PACE AND LEAN & GREEN MICHIGAN

Local governments facilitate PACE financing by allowing commercial property owners to repay private lenders via a special assessment on their property tax bill. To take advantage of PACE financing, the property owner signs an agreement with a private lender and the local government, and the loan repayment is then added to its property taxes.

Lean & Green Michigan, a program of Levin Energy Partners, is Michigan's PACE marketplace, growing and managing one, statewide PACE program in collaboration with local governments, lenders, contractors, and property owners. Lean & Green Michigan offers PACE in jurisdictions representing more than 62% of all Michiganders, with these numbers growing every month.

Lean & Green Michigan

Email: info@levinenergypartners.com

Phone: 313-444-1474

THE CASE FOR GREEN BUILDING BUSINESS



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



SKANSKA



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.

Read the entire report here - <http://www.worldgbc.org/news-media/business-case-green-building-review-costs-and-benefits-developers-investors-and-occupants>

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 price comparable to those for conventional buildings and these costs can be recouped through operational costs savings and, with the right design features, through 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.

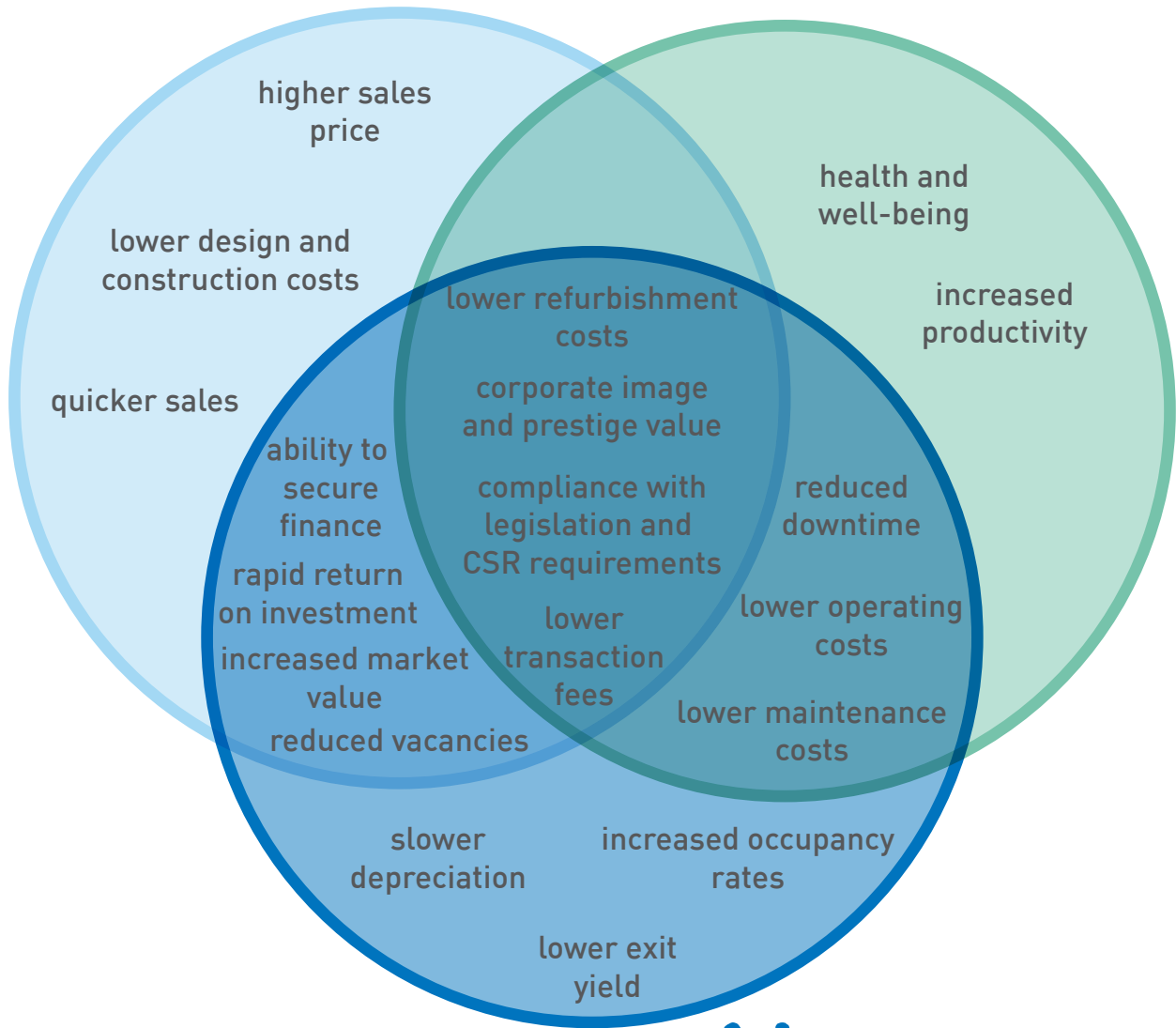
What is clear is that there is mounting evidence that in many markets across the world, part of being a better quality building means being a green building. In premium markets in particular, green is increasingly expected by tenants and owners – it is just part of what good 'quality' means.


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?



 **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.

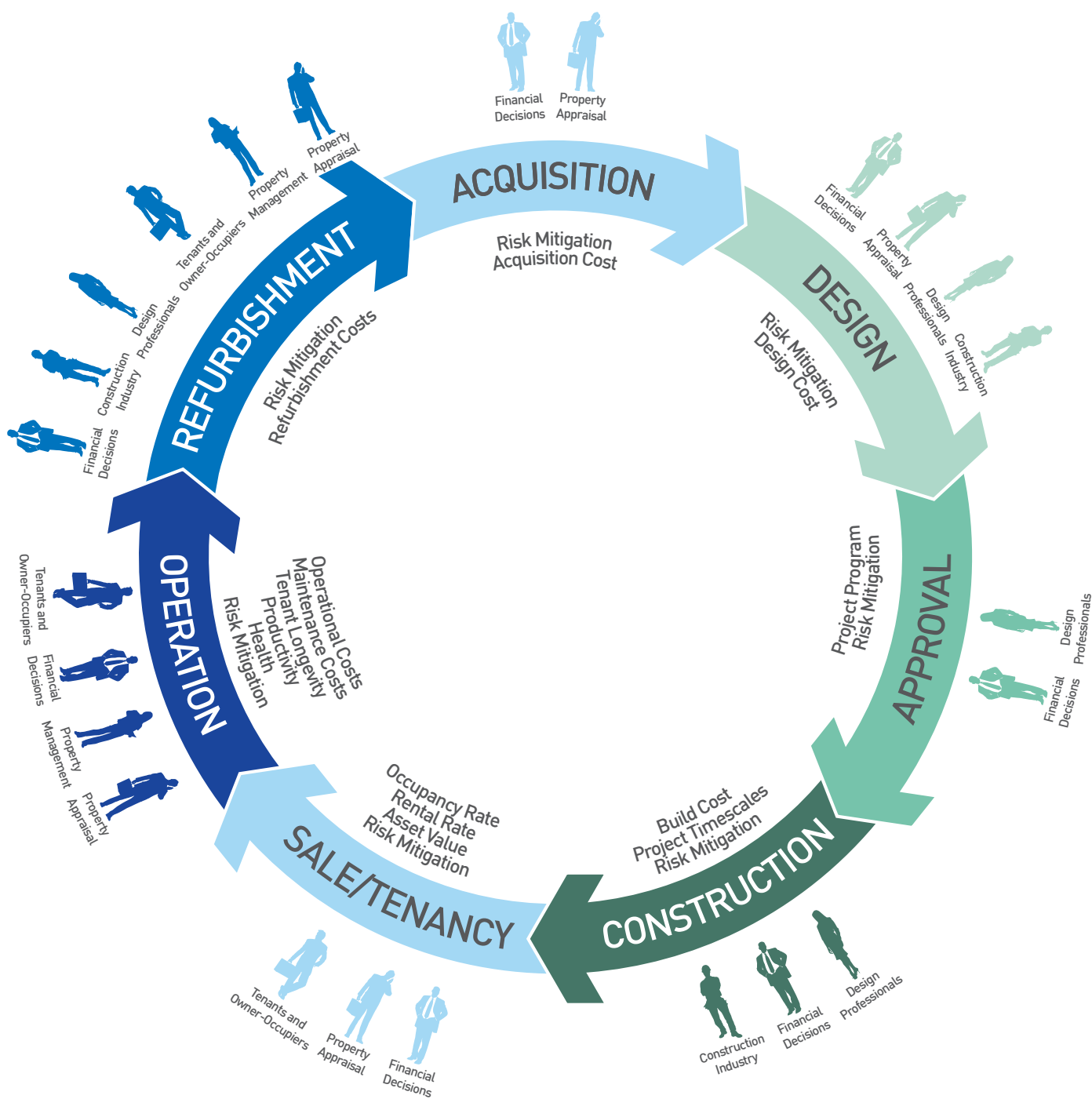
While the environmental benefits of green buildings have been firmly established, green buildings also deliver a range of compelling financial and social benefits, which can be found in this report in the chronological order in which they are extracted. Starting with the benefits that may be obtained 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.





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.