Value Beyond Cost Savings

How to Underwrite Sustainable Properties

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GREEN BUILDING FINANCE CONSORTIUM
www.greenbuildingfc.com

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Value Beyond Cost Savings:
How to Underwrite Sustainable Properties

About This Book

This book presents the key findings and conclusions regarding the valuation and underwriting of sustainable properties from three years of independent research by the Green Building Finance Consortium.

Value Beyond Cost Savings: How to Underwrite Sustainable Properties is supplemented by separate publication of six expanded chapters (I, II, III, IV, V, VI), which together provide 400 additional pages of in-depth research, analysis, and performance information, all available without charge to the public from the Consortium's website.

This book has the same table of contents as the Expanded Chapters, enabling readers wishing to delve into more depth on a topic to easily find the appropriate sections in the Expanded Chapters. This book also references many checklists, databases, documents, and resource links in the Expanded Chapters and in the Consortium's web-based Research Library. This Chapter and the book include some color, but the publications are designed to print in black without loss of information.

The Green Building Finance Consortium maintains a searchable Research Library and Industry Links database on its website: http://www.GreenBuildingFC.com. The Research Library and Industry Links databases include thousands of documents coded using the GBFC's unique index designed for the sustainable finance and investment industry. The structure of the index is consistent with the organization of "*Value Beyond Cost Savings: How to Underwrite Sustainable Properties*". Future sustainable performance and related research updating the book on an ongoing basis will be available in the Research Library. An annotated copy of the Research Library index is presented as Appendix A.

The mission of the Consortium is to enable private investors to evaluate sustainable property investments from a financial perspective. To accomplish this, we have identified and developed suggested modifications to valuation and underwriting methods and practices and are widely communicating the results of our work through our book, other publications, web-based research library, speeches, and collaborations.

Importantly, the Consortium is financed independent of green building product or professional organizations, relying on funding from The Muldavin Company Inc. and Consortium Members which include leading real estate industry trade associations and companies, governments, and non-governmental organizations. Trade association members include BOMA International, the Mortgage Bankers Association, the Urban Land Institute, the Pension Real Estate Association, and the National Association of Realtors.

Acknowledgements

The Green Building Finance Consortium wants to acknowledge the leadership and support of its Consortium Members, Implementation Team, and Advisory Board, who together with the contributions of scores of other individuals and groups have made the Consortium's work possible.

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Collaborators/Other Contributors

We are and have been involved in important collaborative efforts addressing database development, energy research, valuation practice, and many other areas critical to financial assessment of sustainable properties with at least the following organizations:

- **Lawrence Berkeley National Laboratory**—energy and health issues
- **CoreNet Globa**l—energy issues
- **Royal Institute of Chartered Surveyors**—valuation issues
- **Appraisal Institute**—valuation issues, training
- **National Association of Realtors**—sustainability curriculum
- **North American Commission for Environmental Cooperation**—policy, finance
- **Vancouver Valuation Accord**—valuation and regulatory issues
- **Database for High Performance and Sustainable Buildings**—database design and development
- **Rutgers Green Building Research Cente**r—REIT valuation research, other
- **International Youth Leadership for a Sustainable Future**—youth education
- **World Business Council for Sustainable Development**—analytics and communications
- **California Energy Commission**—transaction disclosure documents

We also appreciate the scores of other individuals and companies who have provided significant input and assistance in the project through their research and data, review of Consortium work product, and participation in interviews and surveys.

About the Author

Scott Muldavin is Executive Director of the Green Building Finance Consortium, a group he founded in 2006, and President of The Muldavin Company, Inc. For over 25 years, Mr. Muldavin has advised leading real estate companies including CalPERS, RREEF, Bank of America, Mitsui Trust and Banking, Great West Life, Prudential Real Estate, Ohio State Teachers Retirement System, Wells Fargo Bank, The Government of Singapore Investment Corporation, Catellus Development Corporation, Equitable Real Estate, and Standard Insurance Company.

Mr. Muldavin has been a lead real estate consulting partner at Deloitte & Touche, co-founded the $3+ billion private real estate company Guggenheim Real Estate, served on the Advisory Board of Global Real Analytics, an advisor for $2 billion of REIT and CMBS funds, and completed over 300 consulting assignments involving real estate finance, mortgage lending, investment, valuation and securitization. Mr. Muldavin's engagements and work experience provide him with broad experience in equity and debt transaction structuring, underwriting, due diligence, investment fund design, and corporate real estate.

Mr. Muldavin has advised scores of equity investors and developers. As a co-founder of Guggenheim Real Estate, Mr. Muldavin has been involved in capital formation, investment strategy, due diligence and served on the investment committee. He has assisted pension funds including CalPERS, Ohio State Teachers, and Alaska Permanent Fund in their investment and organizational strategies. He has advised investment managers including RREEF, Prudential Real Estate, Amstar, Hunt Realty, and others on strategy, capital formation, organizational change, and due diligence practices.

Mr. Muldavin has been involved in the Real Estate Investment Trust (REIT) market since the early 1980s advising clients including Merrill Lynch, CalPERS, Kilroy Realty and others concerning new REIT securities offerings and investment issues. As an investment committee member of Guggenheim Real Estate, he monitored the REIT market and participated in investment decisions concerning the allocation of hundreds of millions of dollars of REIT investments.

Mr. Muldavin has been involved in mortgage underwriting for over 25 years. He was the lead consultant that developed the first commercial mortgage risk-rating system for Standard & Poor's Corporation in the early 1980's and was a national leader of the Real Estate Financial Institutions practice for Deloitte & Touché, where he worked with financial institutions to improve their underwriting and servicing systems, assess risks in their mortgage portfolios, and estimate loan losses. He also authored the quarterly "Real Estate Finance Update" in *Real Estate Finance*, for 16 years; developed the Real Estate Capital Flows Index, which was published quarterly for many years by the Pension Real Estate Association and Institutional Real Estate Inc.; and authored key articles and reports on mezzanine financing, mortgage servicing, risk management, capital volatility, and other topics.

Mr. Muldavin was also a leader of the corporate real estate practice at Deloitte and Touché and during his career has advised corporations such as Texaco, Phoenix American Corporation, Nissan Motors, Pacific Enterprises, Universal Studios, House of Blues Corporation, Johns Manville, and many others on their leasing, acquisition and real estate strategies.

Mr. Muldavin has been involved in the structuring and due diligence of real estate property and business transactions for over 25 years. He has completed due diligence engagements involving the acquisition of office buildings, retail properties, hotels, multi-family properties, industrial properties, large land parcels, mortgage portfolios, mortgage companies, commercial banks, real estate service companies and other real estate assets.

As an advisor and Investment Committee member of Guggenheim Real Estate, Mr. Muldavin reviewed hundreds of retail, office, industrial and multi-family investment opportunities throughout the United States, as well as investments in mezzanine loans, B-piece investment funds, preferred equity, and REITs.

Mr. Muldavin is a frequent speaker on real estate finance, investment, valuation and sustainability. He has authored over 225 articles published in *Real Estate Finance*, RICS Property World, *Bankers Magazine*, *Urban Land*, *European Real Estate Yearbook*, *The Journal of Property Management*, *The Pension Real Estate Quarterly*, *Real Estate Issues*, *The Investment Property and Real Estate Capital Markets Reports*, *Institutional Investor*, *Builder and Developer*, *The Real Estate Accounting and Tax Journal*, and other industry publications.

Mr. Muldavin is a graduate of UC Berkeley and Harvard University, and has been recognized by the American Society of Real Estate Counselors and the Royal Institute of Chartered Surveyors, each of who have awarded him their highest level of professional certification. Mr. Muldavin is also on the Advisory Board of the Journal of Sustainable Real Estate and an Honorary Fellow of the Institute of Green Professionals.

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Chapter I
Introduction

The real estate industry has made substantial strides in the integration of sustainability into property decisions since the Consortium was formed in 2006. The strategic question of whether investors should consider sustainability issues in their property decisions has largely been asked and answered, with the majority of asset managers and corporate real estate directors now struggling to assess the performance of their properties, identify opportunities for improvement, and make necessary changes in their organizations to address new sustainability priorities.[1]

While strong progress has been made, the real estate industry is struggling to quantify and articulate the value of sustainable property investment. The vast majority of investment decisions, even by sophisticated investors, are being made based on simple payback or simple return on investment (ROI) calculations.[2] Most investors, and many tenants, today understand that sustainable properties can generate health and productivity benefits, recruiting and retention advantages, and reduce risks, but struggle to integrate benefits beyond cost savings into their valuations and underwriting.[3]

The failure by property investors to appropriately incorporate revenue and risk considerations into sustainable investment decisions has led to underinvestment in sustainability. Today, with increasing government regulations and incentives and rapidly growing tenant and investor interest in sustainability, failure to properly incorporate value considerations beyond cost savings will increasingly result in sub-optimal financial results for investors. As a consequence, society will not be able to achieve its carbon reduction goals.

In accordance with its mission and the needs of the industry, the Green Building Finance Consortium (GBFC) presents *Value Beyond Cost Savings: How to Underwrite Sustainable Properties*, a book designed to assist private investors in making better financially based sustainable property investment decisions.

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[1] We use the term investors in many parts of the book to reference the many types of investors including corporations, equity investors (pension funds, REITS, private owners, etc.), lenders, tenants, and developers.

[2] For example, if I invest $100 and get $33 per year in energy savings then my payback will occur in 3 years and my ROI is 33%.

[3] The term “underwriting” in this report refers broadly to the independent due diligence that lenders, equity investors, developers, corporate real estate executives and other real estate decision-makers undertake prior to their sustainable property acquisition, construction, financing, or leasing decisions. The term “valuation” is also broadly used to reference both formal and informal methods of analyzing and communicating private property market value.

This book describes how to address the role of certifications in financial analysis; presents GBFC's Sustainable Property Performance Framework, which identifies the "missing link" in performance assessment critical to valuation; introduces GBFC's Sustainable Property Cost-Benefit Checklist, a comprehensive 40+ page assessment of the positive and negative risks of sustainability; introduces a six-step sustainable property financial analysis methodology; details special considerations in the underwriting of energy efficiency investment and space user demand, and provides specific recommendations for modifications to underwriting and due diligence guidelines for sustainable properties.

Due to the volume of the Consortium's writing, and to make the major findings and conclusions more accessible, *Value Beyond Cost Savings: How to Underwrite Sustainable Properties* is presented here as a 300-page book. Six "Expanded" Chapters with 400 pages of additional data and analysis can be downloaded as separate publications from the Consortium's website along with other more targeted special publications and articles. (www.GreenBuildingFC.com).

In the rest of Chapter I we:

- Describe the Consortium's mission;
- Summarize the content of each of the book's six chapters; and
- Provide detail to assist readers in applying the book's findings and conclusions

A. Consortium's Mission

The Green Building Finance Consortium is research organization founded and led by The Muldavin Company, Inc. The Consortium's work is funded by the real estate industry, select government and non-governmental organizations, The Muldavin Company, and by the efforts of unpaid contributors. The Consortium is an independent research organization that does not accept funding from green building product companies or trade groups for its research.

The Consortium's mission is to enable private investors to underwrite sustainable property investment from a financial perspective. To accomplish this mission, GBFC has developed the underwriting methods and practices required to independently assess sustainable property investment and are widely disseminating the results of its work.

More detail on the Consortium can be found at www.GreenBuildingFC.com.

B. Overview of *Value Beyond Cost Savings: How to Underwrite Sustainable Properties*

Sustainable property underwriting does not require fundamental changes in traditional underwriting or valuation practice, but underwriters, acquisition analysts, appraisers and others will need to collect new information and learn new analytic techniques in order to properly address some of the special considerations of sustainable properties, impacting property value. This book assists in this effort.

A brief overview of each of the six chapters of the book is provided below. A detailed Table of Contents for each of the six Expanded Chapters is presented in Appendix B.

Chapter I: Introduction

This chapter provides an overview of the entire book, with guidance on how to access and apply the book's contents.

Chapter II: Sustainable Property Investment Decisions

Chapter II specifies that, as shown below in Exhibit I-1, the first step in conducting a proper financial analysis is to clearly understand the investment context. The specific analytic methods, data, and decision metrics required will be determined based on the type of investor and investment decision. Additionally, the specific type of property (office, retail, etc.), stage of development (new, existing, etc.), location, set of sustainable features and sustainability certifications will also critically affect the analysis.

Exhibit I-1

Methodology for Underwriting Sustainable Properties

Step 1: Investment Context

Investor →	Decision Type →	Property
Investor/ Landlord	Build	Type
Owner/User	Buy	State of Development
Spec Developer	Operate	Location
Tenant	Lease	Sustainable Features
Lender	Finance	Certification(s)

Chapter III: Evaluating Property Sustainability

Sustainable property certifications play an important role in the financial assessment of sustainable properties. Certifications provide a basis for investors to measure and compare properties, a critical foundation for financial analysis. This part of the book provides a framework for understanding sustainable property certifications and related measurement systems and how to address their importance in financial analyses and valuation.

Chapter IV: Sustainable Property Performance

This chapter presents a reasoned and practical approach to thinking about sustainable property performance and "value" that corresponds with traditional real estate property analytics and decision-making. The Consortium's approach moves away from the quest to design and implement the "killer" quantitative study that proves the incremental value of sustainability, to instead focus on the process and data needed to assess value for specific properties.

Assessing the incremental value of sustainable attributes or outcomes still has a key role in performance assessment, but when viewed in its proper context as a contributor to estimating financial variables like rent, occupancy cap rates, etc., a different picture emerges about the form and content of required data and analytics.

This chapter introduces GBFC's Sustainable Property Performance Framework, a new framework for organizing and evaluating sustainable property performance that directly supports financial analysis, valuation and underwriting. Using this framework, we present our assessment of sustainable property performance.

While many green building publications, when discussing performance, focus on presenting case studies or other presentations of successful projects, this chapter will present both evidence of positive performance as well as evidence of sustainable property failure or underperformance, and select best practices that have been adopted to address problems that have arisen. Contrary to the belief of some, presentation of underperformance and related sustainable building risks—and best practices to mitigate these risks—will not scare investors, but actually significantly increase sustainable investment due to improved confidence by capital sources in their ability to appropriately price and mitigate risk.

Chapter V: Sustainable Property Financial Analysis

In this chapter we present a six-step process for sustainable property financial analysis, present checklists and tools to assist financial analysis, and discuss key considerations in the role and implementation of sustainable property valuation.

Regardless of the type of decision, an independent financial assessment of a sustainable property investment decision typically involves a financial model. We identify financial modeling methods currently being employed for a range of sustainable property investment decisions for new construction, acquisitions, corporate real estate decisions, and investments in specific sustainable property features. We also discuss how to select the best method and data for a given decision.

We focus our presentation on discounted cash flow analysis, the most common approach used for underwriting and valuing real estate, and the central analytic model required to understand the financial implications of sustainable property investment.

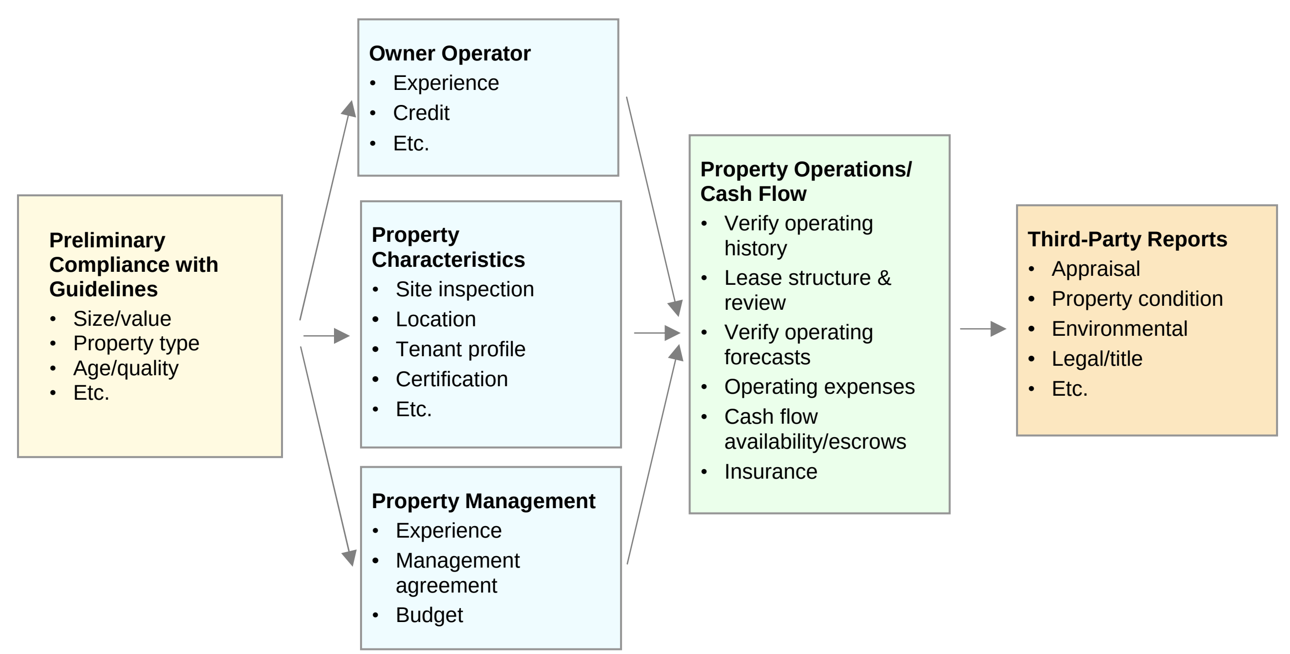
Chapter VI: Sustainable Property Underwriting Guidelines

This chapter outlines the process for conducting underwriting/due diligence on sustainable property investments. While Chapter V focuses on creating pro forma financial models and property valuation reports, Chapter VI focuses on the underwriting/due diligence process that investors undertake prior to making new or existing property sustainability investment decisions. Accordingly, the focus is on risk mitigation and compliance with underwriting guidelines.

We also identify and discuss eight key differences in underwriting sustainable properties and present special sections on the unique challenges in underwriting service providers, energy use, and space user demand.

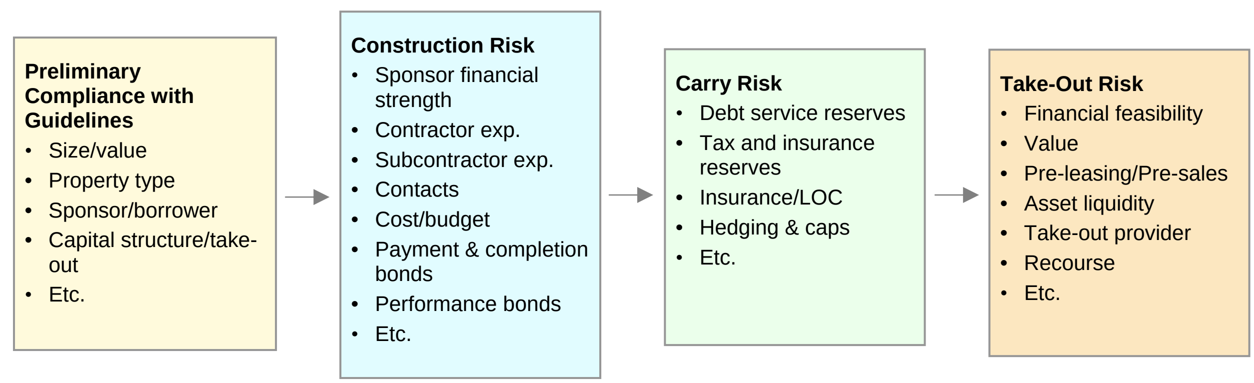
The underwriting and due diligence guidelines we address for existing buildings are summarized below in Exhibit I-2. These guidelines will generally be applicable to both lenders and investors, although lenders and investors may emphasize or de-emphasize particular issues given their specific needs and requirements.

Exhibit I-2
Underwriting/Due Diligence Guidelines
Existing Properties



The key underwriting and due diligence issues for new construction or major retrofits are shown in Exhibit I-3. New projects are subject to very different risks related to the construction process, construction completion, cost control, costs to carry construction interest prior to "lease-up" (or sale), and achieving the market acceptance necessary to achieve an effective "take-out" by a permanent lender or buyer.[4]

Exhibit I-3
Underwriting/Due Diligence Guidelines
New/Major Retrofits



Appendices

The appendices to each chapter are an important substantive component of the book. For example:

- Appendix A provides an Annotated Outline of the Research Library Index
- Appendix B provides a Detailed Table of Contents of all Expanded Chapters
- Appendix III-A is a 30-page menu of sustainable property features. (In Expanded Chapter III)
- Appendix III-D identifies and describes over 100 certification and assessment systems from around the world. (In Expanded Chapter III)
- Appendix C presents a detailed overview of GBFC's Sustainable Property Performance Framework.
- Appendices IV-C and IV-D identify and describe the main findings from over 200 sustainable property-related health and productivity benefits studies. (In Expanded Chapter IV)
- Appendix F identifies and describes over 40 pages of alternative sustainable financial models and analyses.
- Appendix G presents GBFC's 40-page Cost-Benefit Checklist.
- Appendix H presents a real world example DCF Analysis

[4] Typically, construction lenders require a permanent lender to commit to pay-off ("take-out") the construction loan once certain performance criteria have been met.

- Appendices VI-A, VI-B, and VI-C present GBFC's Underwriting Checklists for space users, existing buildings, and new/major retrofits. (These appendices are included in Chapter VI and Appendix I of this book)

C. Applying the Book's Findings and Conclusions

This book has broad applicability to sustainable property investment decision-making. However, the book is directed to specific audiences and decisions in the private commercial real estate market as discussed below.

Target Audiences: The target audiences for this book are corporate real estate decision-makers, equity investors, lenders, developers, appraisers, and commercial property brokers. Sustainable service providers and groups seeking capital for sustainable property investment will also benefit from this book, as well as students and industry practitioners seeking to understand the financial underpinnings of sustainable property investment.

Commercial Real Estate Properties: The Consortium focuses on commercial and multifamily properties. While many of the frameworks and methodologies will have some applicability to the single-family market, single-family property issues will not be addressed in detail. Select single-family resources are also available on the Consortium's website under Research Library code 19.2.

Geographic Applicability: Individuals and organizations throughout the world have influenced The Consortium's work. Additionally, the Consortium's focus on fundamental methods and practices make many of its findings and conclusions transferable across national boundaries. However, the book does have a North American bias given the author's background and experience.

Property-Specific Investment Decisions: This book focuses on underwriting and valuation of a specific property.

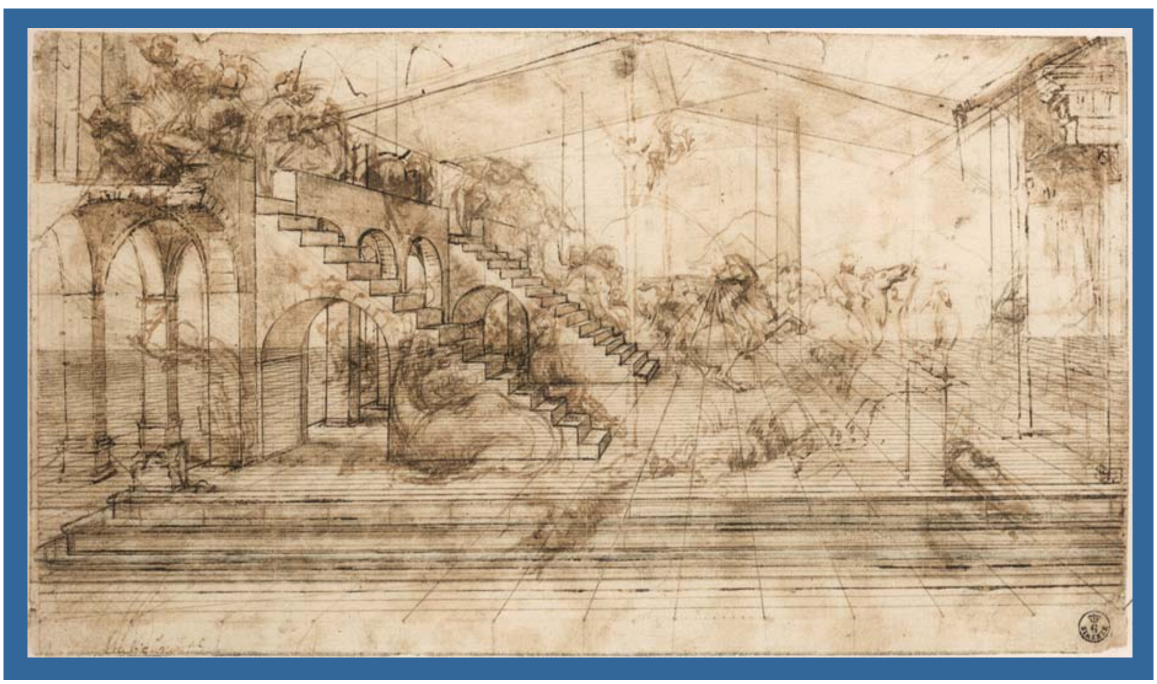
Property Life Cycle: This work is applicable, in varying degrees, to sustainable property investment decisions involving new buildings, existing buildings, and tenant improvements.

Private Investment Decisions: The Consortium focuses on the underwriting of private investment decisions. However, understanding the types and magnitude of public benefits generated by a specific sustainable property investment is important to a private investor because of the potential to monetize public benefits by extracting the value they create for governments and tenants-investors.

Sustainable properties can have substantial social and environmental (public) value, and it is important to quantify and understand such benefits. Methodologically, public and private benefits should be assessed separately. From the perspective of valuation, it is critical to separate the concept of public and private value when evaluating a sustainable investment decision from a private sector perspective. This does not mean that public values and benefits cannot be considered by the private sector when making investment decisions, but only that such decisions should be made with a clear understanding of the differences between private and public values.

D. Conclusions

Rapid regulator, space user, and investor change regarding sustainability requires underwriters and valuers to increase their knowledge base and improve their practices to appropriately value and underwrite properties with sustainable features and certifications. Fortunately, due to the qualitative nature of traditional methods and practices, the real estate industry is well positioned to meet the challenges to underwriting and valuation.



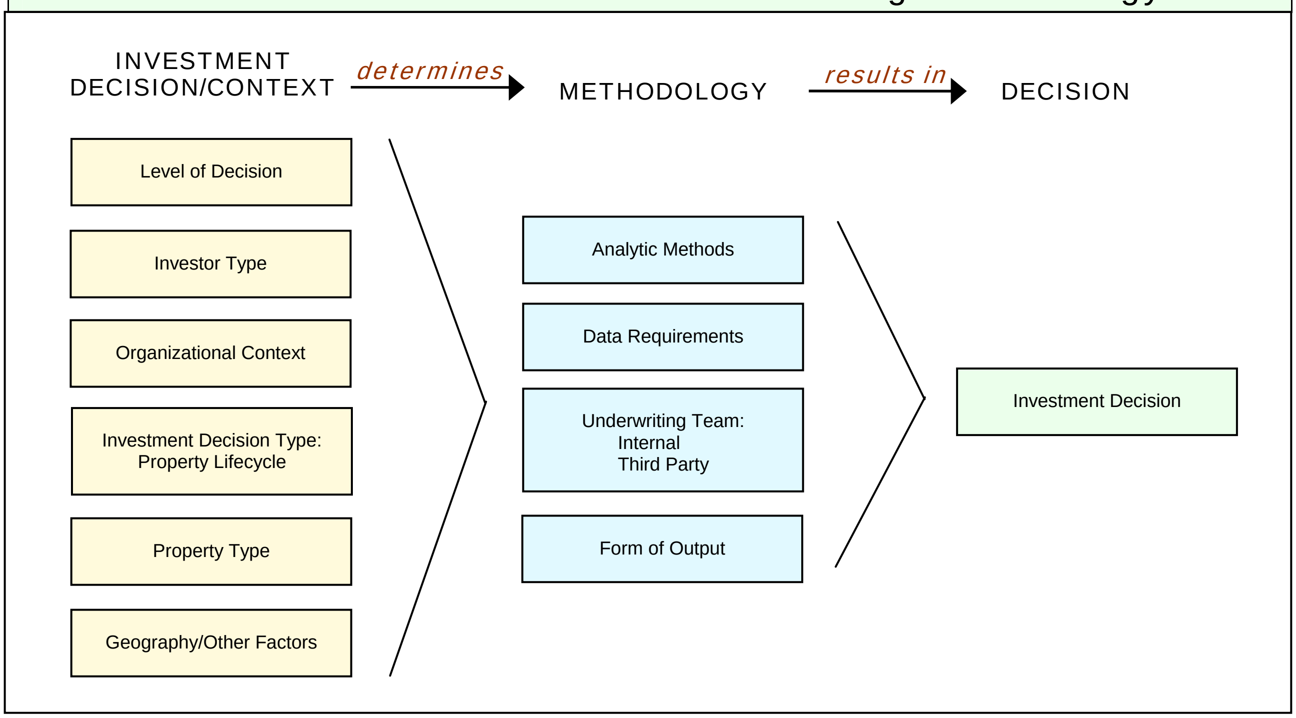
Chapter II
Sustainable Property Investment Decisions

A. Introduction

Chapter II is the second of the six-chapter book *Value Beyond Cost Savings: How to Underwrite Sustainable Properties.* The message of this chapter is straightforward, but necessary, given some confusion in the industry about the proper methods and data inputs for making sustainable property investment decisions. Simply put: the type of decision will determine the financial analysis data and methods.

As detailed below in Exhibit II-1, the level of decision, type of investor, investment type, property type, and geography will all influence how underwriting and valuation should be conducted for any particular sustainable property investment decision. The underwriter or valuer needs to explicitly think through how their decisions will influence the analytic methods they choose, the data they rely upon, and preparation of their work product.

Exhibit II-1
Investment Context Drives Underwriting Methodology



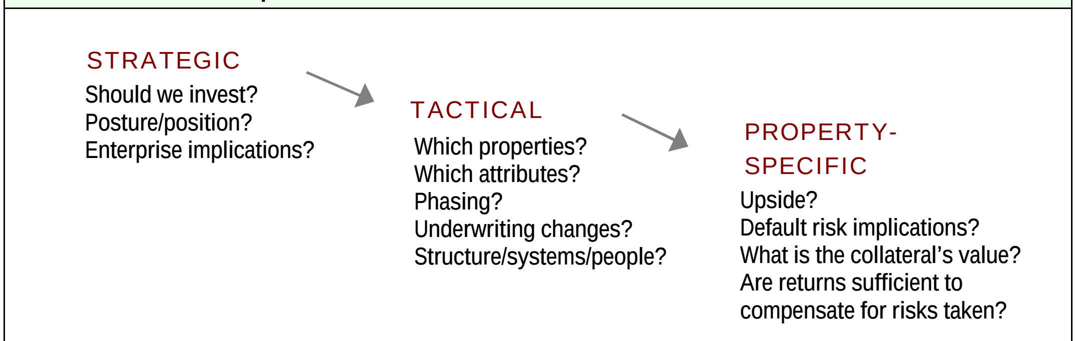
Clear delineation of the decision and investment context is critical to selecting the best analytic methods, determining data requirements, assembling the underwriting team, and preparing effective support for decisions. For example, the underwriting of a new corporate-owned 50,000 square foot suburban office property in Phoenix will differ dramatically from the underwriting for a retrofit of an existing strip mall in Massachusetts or the tactical decision about the phasing of sustainable retrofits for an existing portfolio of properties. Perhaps easiest to understand, a new project involves construction risk and the risk of not achieving modeled performance; while an existing property involves more detailed assessment of the existing asset performance, lease structures, etc.

Thinking explicitly about what will constitute an effective investment package[5] will also make documentation of the work product much easier. Some investment decisions require formal appraisals and due diligence reports, while other decisions can be made based on brief business case white papers and/or oral presentations. Most lenders require formal third-party appraisals and have structured underwriting requirements, while investors and corporations typically have their own customized formats for their real estate decisions.

B. Level of Investment Decision

The level of decision—strategic, tactical or property specific—is critical to proper underwriting, as shown in Exhibit II-2.

Exhibit II-2
Multiple Levels of Investment Decisions



1. Strategic Decisions

Strategic decisions are those made by pension or corporate boards or other organization leaders that are responsible for setting policy and allocating resources. These types of

[5] Investment package refers to the written or digital product of an underwriting/due diligence process. This could be an underwriting summary and all the supporting loan write-ups and third party reports, closing binders, etc. that would be typical for a mortgage; or a memo, financial schedule and/or PowerPoint presentation typical for many higher level strategic decisions.

strategic enterprise-level decisions can be made based on more general business case assessment of costs and benefits, with a key focus on risk.

While most institutional owners and larger corporations have made the strategic decision to investigate the importance of sustainability in their leasing and ownership decisions, many smaller owners and tenants, including many multi-family property owners, have not crossed this strategic threshold. With 74% of the 4.7 million commercial structures in the US less than 10,000 square feet, this represents a significant societal and real estate industry challenge to effectively understand and assist these smaller owners and tenants.[6]

2. Tactical Decisions

The second major types of decisions are tactical decisions. Once a board of directors or other senior management has determined that they need to look more aggressively into sustainable real estate issues, directors of corporate real estate, portfolio managers, leasing specialists and other management personnel must address tactical level decisions such as the sustainable status of current assets, measurement of sustainability going forward, how fast you move, the level of energy efficiency or sustainability that should be sought, property type emphasis, and the phasing of the implementation.

Many tactical organizational questions must also be addressed. What changes to underwriting, acquisition, performance measurement, property management and other structural, system and personnel changes are necessary? The specific type of information and analytic processes required to make such decisions will depend on the specific decisions being made.

3. Property-Specific Decisions

Property specific investment decisions require different types of analytic data than either tactical or strategic decisions. Very clear specification of property type, investment type, and geography are key.

C. Organizational Context

The dynamic nature of the sustainability movement (changing products, tenant preferences, technologies, and regulatory environment) suggest that decision-making in this arena should be based on a long-term outlook, with built in flexibility. While a thoughtful longer term strategy will reap rewards and avoid potential problems from moving too quickly, the speed of change and substantial benefits that can be obtained through a phased transition to sustainability suggest a complementary shorter-term organizational strategy also be developed.

[6] Non-Residential Buildings Energy Consumption Survey (CBECS), Energy Information Agency, 1999.

Select issues and responses for investors to consider are outlined below:

Senior Management: Senior management should begin their education and debate on the importance and durability of sustainability to real estate investment generally, and to their organizations specifically. Depending on the outcome of these deliberations, resources should be allocated, plans should be developed, and monitoring mechanisms established. Evaluating potential synergies between business units will be particularly critical.

Asset/Facility Management: Asset managers will be responsible for tactical decisions and execution of changes to existing portfolios. Senior executives must work with their asset managers to develop the best plan for evaluating the existing portfolio to determine the potential costs and benefits of management and operations changes or retrofitting.

Acquisitions and Development: The relatively small size of the sustainable building market to date prevents a move to a “sustainable buildings only” acquisition program for most investors. However, all new acquisitions of existing buildings need to consider sustainability issues. Acquiring a non-sustainable property is not a problem if it is economically feasible to cure any potential sustainable obsolescence. Accordingly, new acquisitions need to be evaluated relative to their current sustainable performance, and cost to increase performance to levels required by tenants, regulators and investors today, and anticipated in the future.

New developments should be built to be sustainable unless strong arguments are made against such investment given relatively low cost differentials between sustainable and conventional projects. Given strong movement by regulators at all levels, land that is not served by adequate levels of public transit should be carefully evaluated prior to any acquisition.

Research: Research will have a key role in generating the information and content necessary to educate decision-makers and in assisting them in incorporating sustainability issues into their existing due diligence and valuation procedures. Internal property information systems may have to be adapted to “mark” sustainable properties within the portfolio to enable targeted analytic work in the future.

Communications: Boards, clients, operating partners, employees, and major tenants all need to be consulted, educated, and/or informed on the issues of sustainability.

D. Investor Type

The specific decision criteria and key underwriting issues vary by type of investor. For example, if an equity investor takes more sustainable property risk, and is successful, they can achieve superior returns. If a lender takes more risk, and is successful, they typically just get the mortgage payment. Corporations are driven by their strategic objectives, internal rate of return hurdles, risk management, or cost containment policies. Developers are most concerned about their short holding periods and getting paid for investments they make when they sell completed projects.

Within the investor, lender, corporate and development markets there is substantial further segmentation of investment goals and objectives. There are dozens of different types of equity investors including low risk, and low return, "core" investors and high-risk, and high return, "opportunistic" investors. Lenders are also highly differentiated by property type and risk. Land acquisition and construction lenders take the most risk, while permanent lenders with loans on well-leased existing buildings are most risk-adverse. While the debt and equity markets have simplified, and tightened substantially since 2008, it is critically important to understand the goals, objectives, and underwriting and valuation criteria of capital sources before seeking capital.

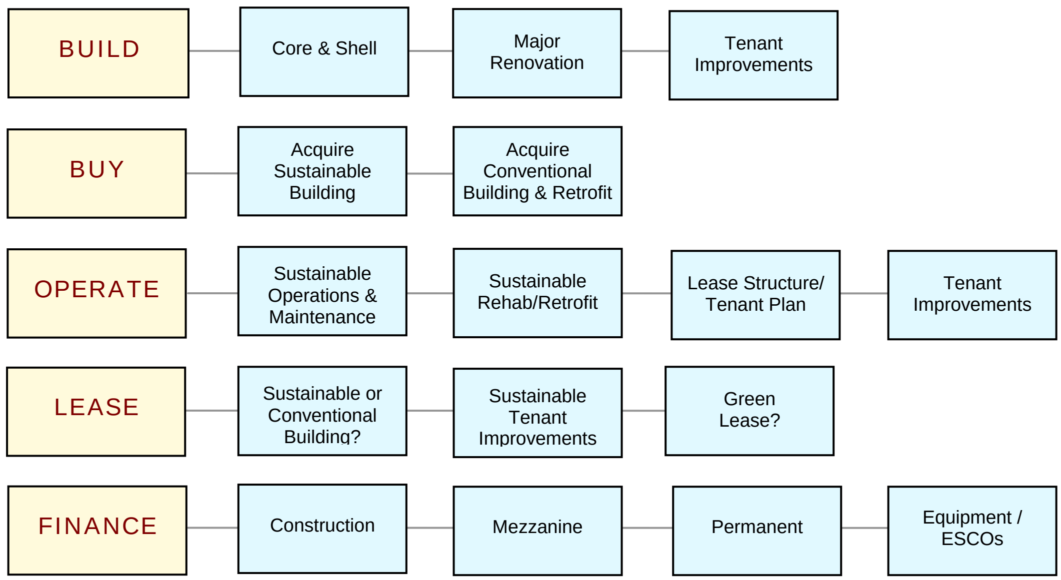
Courtesy Wikimedia Commons, S. Tomasz

E. Investment Type

The focus of the sustainable property investment market historically has been on new development. With the dramatic increased interest in sustainability by investors during the last few years, and with the enhancement and maturity of existing building rating systems (e.g. LEED, and LEED Commercial Interiors, etc.), sustainable property investment decisions now span the breadth of real estate decisions, as shown below in Exhibit II-3.

The particular analytic models, data requirements, and sustainable certifications vary dramatically depending on the specific type of investment decision being made. Importantly, the menu of sustainable features and sustainable certifications will also vary significantly based on the specific decision being made and certification sought. Care should also be taken in evaluating sustainable property research and data that the state of property life cycle is clearly specified in order to assess its applicability.

Exhibit II-3
Sustainable Property Investment Decisions



F. Property Type

In the real estate investment field, much of the underwriting, modeling, and data collection is driven by property type. Sustainability is not a property type, but rather a combination of sustainable features that may or may not be present on any property.

The real estate sustainability sector has had a bumpy start relative to an understanding of the importance of property type to underwriting and valuation, as well as certification. LEED and other certification systems have largely ignored property type differences, resulting in difficult implementation issues and related problems. Most resources and information were focused on large office buildings. Today, leading property-specific trade associations and other organizations have improved their information availability by property type.

From an analytic perspective, and when interpreting data from past sustainable projects, it is critical to make proper adjustments to the financial analysis and data collection to reflect specific property characteristics.

G. Geography/Other Factors

Geography—property location—has many important implications when underwriting sustainability. Government regulations and incentives will vary dramatically by country, state/province, and municipality. Tenant, consumer, and employee sensitivity to sustainability issues also vary dramatically by region, significantly influencing perceived benefits to occupants/space users. Climate, energy sources, energy prices, water availability, transportation congestion, material availability, contractor capacity, bidding climate, and many other factors also vary regionally and must be factored into underwriting/due diligence analyses.

H. Conclusions

Explicit attention to the type of decision and investment context is key to effective underwriting and valuation. Clear understanding of these issues can also serve as an excellent starting point for organizations transforming themselves so as to integrate sustainability into their real estate operations.

Chapter III
Evaluating Property Sustainability[7]

A. Introduction

This is the third chapter of the six-chapter book: *Value Beyond Cost Savings: How to Underwrite Sustainable Properties*. Evaluating a property's sustainability can be difficult and confusing. This chapter provides some insights and methods for evaluating a property's sustainability from a financial performance perspective and identifies resources to assist in this effort.

Sustainable property definitions and certifications play an important role in the financial assessment of sustainable properties. Definitions and certifications provide a basis for investors to measure and compare properties, a critical foundation for financial analysis.

Significantly, existing green building certifications like LEED®, BREEAM, GreenStar, CASBEE, or LEED India measure environmental outcomes, not financial outcomes, and thus cannot be the sole basis for underwriting from a financial perspective. For example, environmental certifications focus on energy, water, and materials design, performance or practices, but not on how the market responds to such performance. Accordingly, environmental certifications are an important building performance indicator, but are a few steps away from offering financial insights (Chapters IV and V focus on these issues).

Practically, reliance on a single certification program for underwriting is not realistic because investors must be able to evaluate the financial implications of sustainable property investment, however large or small, regardless of whether a certification has been achieved. Investors with properties in different markets or countries must employ underwriting practices that are adaptable to local conditions.

Financial analysis of a specific property requires a clear understanding of the linkage between how a property is defined as "sustainable" and its related value. How a property is defined as "sustainable" is another way of saying how the property's sustainability is measured. Chapter IV presents GBFC's Sustainable Property Performance Framework that presents a section on "Building Performance" which provides some guidance for

[7] The terms "sustainable" and "green" are used interchangeably in this report, and often in the industry and media. Readers should be aware that the terms "green," "sustainable," and "restorative" design and construction are not well defined or consistently applied or understood in the industry. From a financial perspective, what is important is to understand a property's combination of sustainable features or attributes and to recognize that a property's "sustainability" is really a continuum: from making basic changes in operations and maintenance practices to the design and development of restorative buildings that maximize benefits to the environment and community.

measuring a buildings "sustainability" and clarifies the links to market and financial performance.

Further, as explained in Chapter V, evaluating a property's "sustainability" is just the second step of GBFC's six-step financial analysis process for sustainable properties. Once a property's "sustainability" is assessed, costs and benefits must be identified, the financial implications of the property's sustainable costs-benefits assessed, financial model inputs selected, and a detailed risk analysis conducted.

What is clear is that no single certification or rating system will suffice in conducting a financial assessment of a property's sustainability. At a minimum, the specific threshold sustainability requirements necessary to obtain benefits, or mitigate costs, from regulators, space users, and investors must be identified and evaluated for each specific property.

This section provides a framework for evaluating a property's "sustainability", provides detail on sustainable property features, and assists readers in assessing the role of certifications in financial analyses and valuation.

B. What is a Sustainable Property?

1. Financial Perspective

Proper financial analysis of a property requires explicit consideration of the potential benefits that will accrue through meeting regulator, space user, and investor thresholds for sustainability. The definitions that matter for a property are those used by regulators, space users and investors. Regulators typically have a whole series of required thresholds in building codes and ordinances in order to meet their regulatory requirements and/or obtain incentives, while space user definitions of "sustainability might incorporate an environmental rating such as LEED, internal company energy efficiency guidelines, or broader measures such as the Global Reporting Initiative or Carbon Disclosure Project

The specific certifications/definitions required by regulators, users, and investors will vary dramatically by country, government level, property type, property size, tenant mix and other factors. Fortunately, while evaluating sustainable certifications from a financial perspective can be complicated, analyzing regulator, user, and investor requirements at the property level is a core expertise practiced for decades by real estate underwriters and valuation professionals.

2. General Perspective

While this chapter focuses on financial analysis, it is important to understand the various ways sustainable properties are described to provide background and perspective for interpreting how definitions/certifications influence value.

A general consensus has emerged on the fundamental attributes of a sustainable property. One of the earliest general definitions of sustainability was adopted in 1987 by the United Nations World Commission on Environment and Development (WCED), which defined "sustainable development" as "development that meets the needs of the present without compromising the ability of the future generation to meet their own needs"[8].

Another good succinct definition from the YourBuilding.org website is:

> A sustainable commercial building can be defined as a building with planning, design, construction, operation and management practices that reduce the impact of development on the environment. A sustainable commercial building is also economically viable, and potentially enhances the social amenity of its occupants and community.[9]

Mass transit orientation, community connectivity, and related land-use and planning issues are a critical component of developing sustainable communities and regions, as well as buildings. Sustainable building research and certification systems have historically not adequately addressed these types of sustainable concerns and issues, focusing more on property specific and/or technological issues. Recent changes in LEED have put more priority on site related considerations and organizations like the Urban Land Institute, a leader in the "Smart Growth" movement for years, continue to push these issues to the forefront. [10]

Although there is a general consensus on the range of environmental outcomes that a sustainable building should strive for, there is no consensus on how such outcomes should be achieved, measured, certified, or valued. Fortunately, traditional real estate underwriting and valuation methods and practices are well suited to deal with these complexities.

C. Sustainable Property Features

One way to "define" a sustainable property is by its combination of sustainable features and attributes, as illustrated in the outline of the key sustainable building features of a typical office property shown in Exhibits III-1. Sustainable certifications like LEED®, BREEAM (U.K., Europe), GreenStar (Australia), CASBEE (Japan), or Green Globes™ (US, Canada) can be achieved through adoption of a wide combination of different sustainable features, processes and outcomes.

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[8] Report of the World Commission on Environment and Development, United Nations, 1987.

[9] Danielle McCartney and Patrick Burke, "Definition of Sustainable Commercial Buildings," September 27, 2007 (http://www.yourbuilding.org/display/yb/Definition+of+sustainable+commercial+buildings)

[10] ULI's publication in 2008 of "The City in 2050: Creating Blueprints for Change" and "Climate Change, Land Use and Energy 2009:Investment Niche or Necessity?" in late 2009 are good examples of their continuing work in this area.

Exhibit III-1

Select Sustainable Elements -- New Office Construction

Sustainable Sites

- Optimal daylight exposure through building orientation
- Reflective roof surface to reduce heat island effect
- Brownfield or urban in-fill location
- Habitat restoration or open space preservation
- Bicycle and carpool parking
- Light pollution reduction
- Storm water management/treatment

Water Efficiency

1. Water-efficient landscaping
2. Low-flow lavatory toilets and faucets
3. Storm water retention systems for landscape irrigation

Energy and Atmosphere

- High efficiency HVAC system
- High efficiency interior lighting with daylight dimming and occupancy sensors
- High performance window glazing
- Photovoltaics or other on-site renewable energy
- Additional insulation
- Commissioning of HVAC and other systems

Materials and Resources

- Environmentally friendly construction materials (regional renewable, certified, etc.)
- Waste management plan for diverting construction debris

Indoor Environmental Quality

- Low-emitting paints, flooring and carpet adhesives
- Daylighting and exterior window views
- Zoned heating and cooling
- Under-floor ventilation
- Operable windows
- Air intakes positioned away from pollution sources
- Enclosed, ventilated mechanical rooms
- CO^{2} sensors

Innovation and Design Process

- Integrated design and construction approach
- Expanded design team including energy modeler, solar design expert, and commissioning agent

Courtesy Wikimedia Commons, Terry Whalebone

It is important to note that many sustainable features have multiple impacts on property underwriting. For example, daylighting can contribute to worker productivity and thereby increase rents. It can also reduce energy costs and thereby reduce operating expenses. Daylighting, if not property implemented, can also result in glare and/or thermal comfort problems.

On the other hand, some of the features do not have direct measurable linkages to sustainable property underwriting. Rather, their impact is felt through their contribution to achieving the standard necessary to certify the property as sustainable. For example, bike racks are a sustainable feature of the property, and can be an element that contributes to a sustainable rating or certification. However, aside from the certification itself, this element will not likely have a material direct effect on property cash flows.

1. GBFC Menu of Sustainable Features

A menu of features and elements that, in various combinations and to various degrees, define a sustainable property is presented in Expanded Chapter III Appendix III-A. The list provides a description of each feature, definitions of key terms, and references to LEED® USA, Green Globes™, and a 2007 Draft of ASHRAE's 189P standards[11]. The applicability of each feature for new construction, existing building, core and shell or commercial interiors is identified. This list provides readers with a "menu" of potential sustainable property features and their link to select environmental certifications.

2. Sustainable Property Resources

A proliferation of resources is available to developers, investors, tenants, and corporate real estate professionals to assist them in understanding the general strategies and sustainable features available to them. As the industry has matured during the last 2-3 years, the lists of optional features and strategies have become more specific to the types of decisions being made—new vs. existing, property type, etc.

Significant resources are identified and described in Expanded Chapter III and can be found in the Consortium's Research Library under codes 6.0: Sustainable Property Features; 18.0: Property Specific Analysis; and 28.0: Sustainable Property Guides/Best Practices. A select few sources include:

YourBuilding.org, Australia
http://www.yourbuilding.org/display/yb/Home

One of the best sustainable building websites in the world specifically designed for investors, developers, space users, valuers and other private sector participants. This site is

[11] This menu was prepared in 2007 so some of the 189P, LEED and Green Globe references are not current, but the list and descriptions still provide insight into the range of alternative features and strategies that define sustainability for properties. 189P has gone through years of review and comment and is still under review as of the beginning of 2010.

very rich with detail across many aspects of design, valuation, marketing and many other key areas. Most importantly, it is intelligently organized around terms and categories that will ring true to real estate industry participants.

Better Bricks.com, Northwest Energy Efficiency Alliance, USA
http://www.betterbricks.com/

This is another excellent all around website notable for its organization around property types, separating operations from design and construction, and practical easy to use functionality. Many excellent resources including the High Performance Portfolio Framework which provides some insights on the process of moving towards greater energy efficiency/sustainability from the perspective of owners, users, and other private real estate participants. http://www.betterbricks.com/DetailPage.aspx?ID=673

BuildingGreen.com
http://www.buildinggreen.com/menus/topics.cfm

This is an excellent well-organized web site with an excellent bibliography, searchable product database and a "Learning Center" with links to many lists of key sustainability features and articles. This site is also the home of one of the largest case study databases in the industry.

BOMA International Green Resources and Energy Efficiency Network
http://www.boma.org/BOMA/Templates/Org/GeneralTemplate.aspx?NRMODE=Published&NRORIGINALURL=%2fAboutBOMA%2fTheGREEN%2f&NRNODEGUID=%7bBB26487D-2B2D-45D7-8876-E8A1DBF7E496%7d&NRCACHEHINT=NoModifyGuest#

This site has numerous sustainability resources including 30 easy ways to save energy.

DOE Energy Efficiency Toolkit
http://www.eere.energy.gov/buildings/highperformance/toolbox.html

Excellent site covering all aspects of energy planning and implementation.

Flex Your Power, State of California
http://www.fypower.org/about/

Flex Your Power is California's statewide energy efficiency marketing and outreach campaign. Initiated in 2001, Flex Your Power is a partnership of California's utilities, residents, businesses, institutions, government agencies and nonprofit organizations working to save energy. The campaign includes a comprehensive website, an electronic newsletter and blog, and educational materials. Flex Your Power has received national and international recognition, including an ENERGY STAR Award for excellence.

Whole Building Design Guide: http://www.wbdg.org/about.php

The WBDG is the only web-based portal providing government and industry practitioners with one-stop access to up-to-date information on a wide range of building-related guidance, criteria and technology from a 'whole buildings' perspective. Currently organized into three major categories—Design Guidance, Project Management and Operations & Maintenance—at the heart of the WBDG are Resource Pages, which provide summaries on particular topics.

Another key source of sustainable features ideas and insights are case studies. Most of the case studies performed to date are sufficient for use in identifying and screening ideas, but are not sufficiently detailed or financially oriented to be used effectively for property specific financial analysis. A description and assessment of some important case-study databases is presented in Appendix III-B in Expanded Chapter III. Additional citations of case studies are identified in the Consortium's Research Library and Industry Links sections of their website under index code 15.2.

There are lists and menus to fit most any level of detail and specification. The one list that is not available is the precise list of strategies and features appropriate for your property. That list will have to be determined through an integrated design/values process where you meet with the relevant stakeholders to decide what it is you value and how you want to pursue those values through sustainable design, construction and property operations.

3. Sustainable Property Features and Building Outcomes

A sustainable features based approach to understanding sustainability is a good first step. However, from a financial perspective, the best way to deal with all the complexities of the various features is to focus on actual building performance. The challenge with this strategy is that so much sustainable investment involves forecasting how changes or additions to the sustainable features in a building will change energy or water use. Accordingly, underwriters and appraisers will need to conduct their due diligence using energy performance forecasts prior to getting actual building performance data in many cases. We address this issue in detail in Chapter VI, Section E: "Underwriting Energy/Carbon Reduction Investment" in both this book and Expanded Chapter VI.

D. Measuring a Property's Sustainability

1. Financial Analysis Requires Broad Knowledge of Alternative Approaches

Measuring property sustainability is critical to financial analysis and valuation. The challenge is that there is literally hundreds of sustainability assessment and certification systems in use today. While we understand the substantial number and complexity of systems can be daunting, a specific property will have a unique geography, property type, life cycle, and other attributes that will enable readers to select a more limited number of rating and assessment systems applicable to their situation.

For the purposes of a financial analysis, it is important to understand the range of assessment systems and tools that are in use or under development. In market-based financial analysis or valuation, numerous certification and assessment systems will typically be applied to a single property. To determine which certification and assessment systems are important for a single property, the underwriter/valuer must evaluate how regulators, users and investors utilize and rely upon different assessment systems or tools.

Sustainable property certification and assessment systems come in many forms. In order to aid evaluation and understanding of these alternative approaches, we organize the many measurement and certification systems into six categories:

- Building environmental assessments and certifications;
- Occupier focused assessments;
- Government regulations and assessment systems;
- Other building performance assessments and standards;
- Product/material assessments and certifications; and,
- Service provider assessments and certifications.

Building environmental assessments and certifications include some of the most recognized “green” building certifications like LEED, BREEAM, CASBEE, and GreenStar.

Occupier focused assessments, such as the Global Reporting Initiative or the IPD Environmental Code, are specialized whole building assessments that have particular influence on the real estate decisions of tenants and owner occupants.

Government regulations and incentives cover literally thousands (there are 44,000 local governments in the U.S. alone) of regulations, incentives, codes and related assessment systems being promulgated by Federal, State, local and other levels of government and quasi-governmental agencies such as utilities.

Other building performance assessments and standards include a variety of systems focused on building outcomes and performance, as opposed to just environmental certification.

Beyond building assessment systems, there are scores of **product and material assessments and certifications**. Many of these product, material or feature certifications are incorporated as part of broader whole building rating systems.

Beyond building assessment systems, there are scores of **product and material assessments and certifications**. Many of these product, material or feature certifications are incorporated as part of the broader whole building rating systems such as LEED. The challenge with these product or material rating systems is to find sources of information that have sufficient funds, independence, and technical expertise to provide useful comparative information. Greenwashing—the practice of making sustainability claims that are not backed up or are overstated—is prevalent in the industry and will be a continuing concern.

Product rating systems, like the Cradle to Cradle® product certification system, a private eco-labeling system launched in 2005 which had over 300 products certified as of Fall 2009, provide a reasonably consistent methodology for evaluating products and can help owners and designers in their product selection, but they only rate products who seek them out and pay them, so the number of products reviewed is just a fraction of the total available.

Companies like BuildingEase.com are entering the product and materials space and should improve the process of sustainable product selection and acquisition. BuildingEase.com is a global trade exchange for construction products, designed to be like Amazon.com/eBay/Expedia, but only for the construction industry. It endeavors to be a comprehensive source of products and materials worldwide. They have created a proprietary green filter so search results will appear filtered by how green their attributes are, as well as with side by side comparisons, user feedback ratings, distance from job site and other information. The site is also designed to facilitate aggregate bidding. [12]

Integrating Life Cycle Assessment practices, which measure the embedded energy/carbon required to produce a product, is also an important part of new product rating databases. Given the huge amounts of investment, job implications, etc. of a negative review of a product or system, good information is still hard to find.

Finally, there are a growing number of organizations that identify, assess, and **certify service providers** such as contractors, plumbers, electricians, commissioners, and other professions on their sustainability expertise. The credibility and and rigor involved with these different groups is highly variable. The key here is to understand explicitly the requirements for certification and/or listing in the directory and use the list accordingly. Even if a list requires no special requirements other than interest in sustainability, it could be useful.

It should also be noted, that given the penetration of sustainability through every aspect of building design, construction and operations, sustainability training is now integrated into the general education requirement for many professional certifications.

[12] The author has not done significant verification of the site's claims, but mention this site because its aspirations and proposed approach are important indications of the direction of product and material solutions to the problems of green washing and product and material overload.

Two interesting developments in the certification and assessment of sustainable companies are the B-Corporation and the Sustainable Performance Institute's Green Firm Certification. Both these efforts aim at enhancing the independence and credibility of firm claims of sustainable operating practice and/or competence.

B Corporations are designed to address two problems, which hinder the creation of social and environmental impact through business:

- The existence of shareholder primacy which makes it difficult for corporations to take employee, community, and environmental interests into consideration when making decisions; and

- The absence of transparent standards, which makes it difficult to tell the difference between a 'good company' and just good marketing.

B Corporations' legal structure is designed to expand corporate accountability and enable them to scale and achieve liquidity while maintaining mission. B Corporations' performance standards are designed to enable consumers to support businesses that align with their values, investors to drive capital to higher impact investments, and governments and multinational corporations to implement sustainable procurement policies. http://www.bcorporation.net/why

The Sustainable Performance Institute (SPI) certification program is designed to improve design and construction organizations' ability to manage and deliver sustainable projects by monitoring and certifying their consistent use of processes that consistently result in sustainable building design and construction. SPI certification will examine an organization's performance through documentation of its:

- Strategy, policies, infrastructure and leadership

- Production processes, e.g., schematics, design development, construction administration, etc.

- Support processes, Human Resources, Marketing, Internal design/spec standards, Tools and Resources.

- Partnering, e.g., proposals, contracts scope/fee change, deliverables and working relationships with stakeholders.

- Outcome measures of its own environmental footprint and its projects' performance.

Over a hundred certification and assessment systems from around the world are identified in Appendix III-D of Expanded Chapter III and categorized according to the six categories described above. A brief description and web link to more detailed information is provided in Appendix III-D for each of the systems identified.

Since the bulk of Appendix III-D was created, the United Nations Environmental Programme, Sustainable Buildings and Construction Initiative published a report: "UNEP-FI/SBCI's Financial and Sustainability Metrics," which supplements Appendix III-D with additional performance and certification programs. This report is well done and outlines common performance indicators for sustainable building, discusses in detail key financial indicators for sustainable buildings, and does a comparative assessment of six key certification systems and describes many more.
http://www.unepfi.org/publications/property/index.html

2. Performance Measurement Moves to Forefront in Industry

Measurement and assessment is at the forefront of the private sector commercial real estate industry today. As corporate boards, pension boards, and other senior management have declared their commitment to looking closely at sustainable issues in their real estate, portfolio managers, corporate real estate executives, and facility and property managers are struggling to determine what level of sustainable performance they should strive for, how sustainable their properties are today, and what they need to do to better measure, monitor, and manage sustainability going forward?

There are many ways to think about measurement and certification systems. One of the most important for financial analysis is the difference between certification or assessment systems based on modeled criteria versus those based on actual performance (water use, energy use, carbon output, quality of the indoor environment, etc.). For certification or assessment systems based on modeled criteria, underwriters need knowledge and expertise on how to assess the accuracy and reliability of forecasts. For systems based on actual performance, key issues include selecting the correct items to measure, accurately measuring them, and employing a consistent approach between properties to enable comparisons.

The sustainable property industry has matured resulting in an increasing focus on actual versus projected performance. However, depending on whether you are in the planning, construction, or operations phase of a building, and on the specific sustainable features and attributes planned, different assessment and certification systems may be more applicable and appropriate.

In Expanded Chapter III we identify and assess some important developments in sustainable property assessment in recent years including:

- ASTM Building Energy Performance Assessment and Disclosure Standards;
- International Code Council Green Building Code;
- European Union Energy Performance in Buildings Directive (2009 Recast)

- Wal-Mart's Supply Chain Sustainability Index;
- ULI's Energy Exchange Initiative;
- Europe's Green Rating System;
- IPD Environmental Code;
- Leased Space Leadership and Energy Leadership Group;
- Office of the Future Consortium;
- ASHRAE's Building Energy Labeling Program;
- SBTool 07;
- Responsible Property Investing;
- LEED USA Changes; and,
- ASHRAE 189P High Performance Building Standards

E. How Sustainable Property Certifications Affect Value

Traditional real estate financial analysis and valuation, given its property-specific and qualitative nature, is well suited to address the complexity of multiple certification and assessment methods. The level of certification, types of sustainable features, and the market's response to these features and certifications can be addressed as part of an analyst or appraiser's traditional process for evaluating data and supporting key assumptions.

1. Key Findings Influencing Financial Analysis

- Financial analysis and valuation for any single property is influenced by many sustainability definitions. Valuation and financial analysis are market driven, and the specific sustainability certifications and definitions that influence regulators, users, and investors will drive the financial analysis and valuation.
- Sustainability is not a property type, but a property performance outcome determined by sustainable features, strategies, and certifications. Accordingly, sustainability is just one of many factors to consider in valuation or underwriting, with the majority of risk and value considerations being driven by traditional factors influencing a building's attractiveness to tenants and investors.
- Environmental certifications and assessments cannot be the primary basis for financial analysis or valuation because:
  - Environmental certifications measure environmental performance, not financial performance;
  - Environmental certification levels are not comparable, because they can be based on entirely different combinations of sustainable features and outcomes;

  - Many properties with valuable sustainable features may not be certified.
- The influence of sustainability on value can be analyzed. For example, every office building has a unique combination of features and attributes, but somehow the industry is able to analyze and value office buildings.
- LEED certification has become the definitive market leader in the U.S. and a growing influence internationally for the institutional investment market, and, to a significant degree, the owner-occupant market. While certifications like LEED and other leading certification systems around the world cannot be the sole basis for analysis, they have significant value independent of the attributes or performance of the certified property.
- Sustainable certificates with the strongest market acceptance by regulators, users, and investors will have the highest values independent of the sustainable features or building performance. This "premium" for a specific certification will vary significantly over time by property type, market, and level of certification.

2. Key Steps to Evaluate Environmental Sustainability Certifications

This section provides a brief outline of key questions to ask when involved in evaluating the effect of sustainable certifications/requirements on value.

1. What are the key sustainability features and attributes of the property?

2. What are the key attributes/certifications required by **regulators**?
   - Building certifications?
   - Products and materials?
   - Performance, outcomes?
   - Processes, operations?
   - Today versus the future (risk analysis)?

3. What are the key building features and attributes or certifications required by **space users** in your building?
   - Global Reporting Initiative?
   - Carbon disclosure requirements?
   - Health and safety concerns?
   - LEED certification?
   - Energy costs?

4. What is the relative weighting of sustainability considerations versus other key factors driving user demand?
   - Today versus future (risk assessment)?

5. What are the key sustainability features and/or certifications required by **investors**?
    - LEED?
    - All those features required by tenants?
    - Expense reduction?
    - Today versus future (risk assessment)?

6. What are the underlying requirements of regulators, users, and investors regarding critical expense reduction assumptions?
    - Energy?
    - Water?
    - Capital expenditures (durability/obsolescence assumptions)
    - Management expenses?
    - Depreciation & Reserves
    - Other?

7. How reliable and accurate are "modeled" results and what are the implications of uncertainty on future certifications/requirements?

8. What are the relative expenses of, and risks related to, certification?

9. How applicable is general research supporting higher sales prices, rents, productivity and health benefits, expense savings, etc.?
    - Assess applicability of studies to your property based on comparison of sustainable definitions in studies versus the subject property.

F. Key Research Comparing Sustainable Rating Systems

This section of Expanded Chapter III identifies and describes some of the key research and resources for evaluating the comparative differences between building certification and assessment systems. The best place to obtain more detailed information on specific certification or rating systems is to follow the links for each of the approximately 100 certification assessment systems that are identified in Appendix III-D in Expanded Chapter III, or check the Research Library or Industry Links sections of the Consortium's website under codes 4.0: Sustainable Property Definitions/Certifications and 5.0: Sustainable Products/Materials Ratings/Certifications.

Expanded Chapter III also provides links to the numerous sustainable rating systems promulgated by the ASTM Committee E06 on Performance of Buildings and the International Organization for Standardization.

G. Conclusions

Evaluating a property's "sustainability" is not an easy task given the thousands (when governmental regulations are included) of different certification and assessment systems. Fortunately for underwriters and valuers, the task can be simplified by focusing only on those certifications or assessments applicable to the regulators, users, and investors of the subject property being valued or underwritten.

Courtesy Wikimedia Commons, Alcyone

Chapter IV
Sustainable Property Performance

A. Introduction

Measuring and understanding sustainable property performance is the foundation of financial analysis, valuation and underwriting. While over 100 sustainable property performance and certification systems were identified in Chapter III, all of them left out critical performance information necessary to sustainable property financial analysis and valuation.

To address this deficit, we developed GBFC's Sustainable Property Performance Framework, a new framework for organizing and evaluating sustainable property performance information to directly support financial analysis, valuation and underwriting. GBFC's Framework introduces Market Performance, the "missing link" of sustainable property performance required to assess the financial implications of sustainable property investment.

In the rest of this chapter, we present our assessment of sustainable property performance using the categories identified in GBFC's Sustainable Property Performance Framework:

- Process Performance;
- Feature Performance;
- Building Performance;
- Market Performance; and,
- Financial Performance.

We present evidence of both positive and negative performance as well as best practices that have been developed to address problems that have arisen. Presentation of failure and underperformance evidence, and related sustainable building risks, will not scare investors, but actually significantly increase sustainable investment due to improved confidence by capital sources in their ability to appropriately price and mitigate risk.

The performance assessment presented in this chapter, by its nature, is a point in time assessment, and by no means comprehensive given the huge volume of sustainable performance research available worldwide. Future reports and performance information will be available in the Consortium's Research Library and Industry Links, which have been organized consistent with the GBFC Sustainable Property Performance Framework.[13]

The analysis of risks and best practices outlined in this chapter supplement GBFC's Sustainable Property Cost-Benefit Checklist and risk analysis frameworks presented in Chapter V: Sustainable Property Financial Analysis. The underwriting of risk and risk mitigation is also fully covered in Chapter VI: "Sustainable Property Underwriting Guidelines."

It is important to understand when reviewing the contents of this section that conventional projects also fail and underperform. Accordingly, while this chapter focuses on sustainable properties, it should be understood that sustainable properties do not necessarily have a disproportionate level of problems.

1. Research Methodology

The content for this chapter was generated through a process of interviews, literature reviews, and feedback from Consortium members and other industry experts. We started by conducting initial interviews with a handful of experienced sustainable building professionals. We built on our initial interviews and literature review through interviews with a mix of sustainable property investors and developers and green building service providers and consultants. We also generated insights by "reverse engineering" some of the leading best practice guides. We reference our work and provide hyperlinks to our sources and other research that complements our work. Our conclusions are most applicable to sustainable buildings in the United States, but lessons learned should have broad applicability outside the US.

B. GBFC Sustainable Property Performance Framework

GBFC's Sustainable Property Performance Framework provides a new structure for organizing and evaluating property performance to enable improved financial analysis, valuation and underwriting. A graphic presentation of the framework is shown below in Exhibit IV-1 and presented in more detail in Appendix C.

[13] GBFC's Research Library (www.GreenBuildingFC.com) provides a searchable database of key performance-related documents indexed and organized according to the structure of the GBFC Sustainable Property Performance Framework introduced in this chapter. Index codes 15.1 to 15.10 mirror the structure of Chapter IV, providing a source location to identify and access new process, feature, building, market, and financial performance evidence.

Exhibit IV-1

GBFC Sustainable Property Performance Framework

Process Performance → Feature/System Performance → Building Performance → Market Performance → Financial Performance

Process Performance

- Integrated Design
- Contracts/Legal
- Services Quality & Capacity
- Energy Use Forecasting
- Regulation & Code Compliance
- Commissioning
- Sustainable Certifications
- Measurement and Verification
- Occupant and Staff Training

Feature/System Performance

- Energy/Water
- Indoor Environmental Quality
- Materials and Resources
- Sustainable Sites

Building Performance

- Development Costs
- Resource Use
- Location and Access
- Occupant Performance
- Sustainability Compliance
- Flexibility/ Adaptability
- Public Benefits

Market Performance

- Operating Costs
- Regulator/ Utility Demand
- Space User Demand
- Investor Demand
- Broker Recognition
- Appraiser Recognition
- Lender Recognition

Financial Performance

- Recognition of Market Demand
- Determine Key Inputs
- Calculate Results
- Risk Assessment

The genesis for GBFC's Sustainable Property Performance Framework was our interviews with scores of sustainable property service providers, investors and developers. In asking respondents about their experience with failure and underperformance in their sustainable property practice, we received a wide range of responses, including such comments as:

- "The integrated design process was not implemented correctly";
- "We failed to address responsibilities appropriately in contracts";
- "Our service providers either were too busy or did not have the specific qualifications needed";
- "The daylighting solution seemed to bother occupants more than make them happy";
- "Improper design of the underfloor air ventilation system resulted in temperature inconsistencies and occupant complaints";
- "We exceeded our cost budget";
- "Energy use was significantly greater than forecast"; and
- "We did not achieve the sustainability certificate that we had hoped for."

We began to see a pattern where failure or underperformance occurred with specific processes, specific features or systems, or at the building level. This differentiation between process performance, feature or system performance, and building performance was confirmed in our review of performance literature and case studies.

As our performance research continued, it became apparent to us that a sustainable property performance framework that included just process, features, and building performance was insufficient to assist underwriters and valuers in their assessment of financial performance. As shown in Exhibit IV-1 above, there is no direct way to go from building performance to financial performance. Even if you know how much a building costs, its resource use, potential health or productivity benefits and related building performance statistics, the only way to assess financial performance (return on investment, value and risk) is to assess the market's response to the building's performance. Accordingly, GBFC's Sustainable Property Performance Framework introduces market performance as the fourth critical type of performance that must be measured at the property level to conduct proper financial analyses.

Finally, financial performance of sustainable properties is determined by evaluating how the market's response to the sustainable building will affect its financial inputs including rent, occupancy, absorption, discount rates, cap rates, operating costs, entitlement benefits, and other key variables. Financial performance is measured by the resulting rate of return or value that result from the input of the key financial inputs into a discounted cash flow or related model. Further, sustainable property financial performance must include a full assessment of risk. For example, is a 15% return always better than a 7% return? No, it depends on the nature of the risks taken to achieve the returns.

GBFC's Sustainable Property Performance Framework also provides a structure for underwriters to use in their efforts to mitigate risks. Since most significant sustainable property investment decisions will be based on forecasted building performance (energy use, occupant performance, development costs, etc.) underwriters are, or should be, focused on reducing uncertainty and risk related to the forecasted performance. As has been proven in our research, risk and uncertainty around building performance can be significantly mitigated through underwriting of sustainable processes and features/systems.

C. Process Performance

Strong performance at the process level is the foundation for successful sustainable property investment. Building sustainability is fundamentally a process of best practices that leads to "sustainable" outcomes. It is critically important to get these processes right in order to deliver a successful high performance building. Poor execution of these processes can lead to a variety of negative consequences, including underperforming systems, uncomfortable environments, or increased cost.

There are scores of different sustainable property processes. We focus on seven key sustainable property processes that have been identified by our survey respondents, case studies, and the literature as important potential sources of sustainable property failure and underperformance:

a. Integrated design/project delivery;
b. Contracts/legal;
c. Service provider quality and capacity;
d. Energy use forecasting;
e. Regulation and code compliance;
f. Commissioning; and
g. Measurement and verification.

We provide a brief summary of our key findings and conclusions for each process below. In Expanded Chapter IV, we provide a more complete description of each process, discuss the risks inherent with the implementation, provide a summary of best practices, and identify documents and web links that provide significant additional detail. Information on sustainable property processes and performance can also be found in the Research Library and Industry Links section of the Consortium's website under index codes 15.4: Process Performance; 6.0: Sustainable Property Features; and 28.0: Sustainable Property Best Practice Guides.

a. Integrated Design/Project Delivery

Integrated design ("ID") is a design process that employs a collaborative, multidisciplinary project team throughout design in order to optimize the whole building. This is in contrast to conventional building design, where many individuals or teams are responsible for optimizing their own particular system with limited interactive collaboration. Key risks of integrated design include buy-in and participation by all team members, maintenance of communications, failure to get all participants to the table early enough in the design process, mis-aligned fee structures for service providers, and undocumented design decisions.

Ten best practice ideas are summarized below:

1) Commitment from all parties. In the selection process, the developers should ask tough questions to gauge a professional's commitment to ID. Is it just lip service, or is it real commitment? Do they have the experience of successfully applying sustainable ID techniques to completed projects?

2) Designating a member of the design team as the "integrated design coordinator." This person must be involved from the earliest stage of development and should have experience delivering certified sustainable projects with ID processes. Given the highly collaborative nature of this position, the coordinator must be an effective communicator and a good negotiator.

3) Bringing the team together as early as possible. This helps maximize opportunities for synergies and cost-savings and encourages the buy-in and team aspects that are critical to high performance.

4) Including a diverse set of parties on the team. Include owners, all consultants who would typically be involved in a project, and a construction manager or cost-estimator.

5) Incorporating the requirements for an integrated building design process into the project documents. Set the goals right from the start. The optimal sustainable rating will then evolve out of project decisions made to meet the performance targets.

6) **Consider structuring fees to reward the design team for the initial extra effort and risks of taking the integrated building design approach,** based on its achieving the desired results.

7) Be intentional about the design process. One sustainability consultant told us that the design of the ID process could be even more important than the design of the building for delivering a successful green building.

8) Maintain continued vigilance and commitment to the ID process during design and construction. This is especially true during construction, when change orders and product substitutions can be made based on single-feature based simple pay-back or ROI analysis or scheduling considerations while ignoring the effect on the rest of the building systems.

9) When possible and practical based on the size and type of property investment, do whole-systems analysis that treats the building as a system and takes into account the interactions and synergies between the different components.

10) Remind yourself, sustainability isn't rocket science. Oftentimes, low-tech solutions can be combined to produce stunning efficiencies. Teams with less experience should focus on lower risk solutions and products.

Project Delivery

The concepts of ID have contributed to the evolution of Construction/Development delivery models. The Design-Bid-Build process has been the most prevalent process historically, but Design-Build, Integrated Project Delivery, Intensive at Risk Construction Management, and hybrids of these processes have become more prevalent. These methods, and related risk mitigation ideas are presented below.

- *Design-Bid-Build*

As might be expected, there are three main sequential phases to the design-bid-build delivery method: design, bidding, and construction. This process has some benefits in that the designer is solely representing the owner, bidding can result in more competitive pricing and costs, owners have choices, and bidders get to bid based on complete construction drawings.

The design-bid-build process can also be problematic due to the difficulty—costs, delays and disputes—arising out of changes that arise during the construction process. Development of a low cost rather than high value mentality can be an issue. Most importantly for sustainable building, the contractor is typically brought in post design, limiting the quality of input and communications.

- *Design-Build*

"Design-build focuses on combining the design, permit, and construction schedules in order to streamline the traditional design-bid-build environment. This does not always shorten the time it takes to complete the individual tasks of creating construction documents (working drawings and specifications), acquiring building and other permits, or actually constructing the building, but can result in a more collaborative environment that can reduce change orders, enable a more value-oriented decision process, and improve communications.

By integrating design and construction in the same entity, input by contractors is provided early in the project, communication between key parties to the success of the project is enhanced, and responsibility for successful completion of the project is shared by the designer-builder. These benefits can be offset by a short-cut design process and reduced competition for the construction contract.

- *Intensive at Risk Construction Management*

This delivery method combines the traditional owner's representative construction manager during the pre-construction phase and an "At Risk" construction manager during the construction that agrees to deliver the project at a "Guaranteed Maximum Price".

- *Integrated Project Delivery*

Integrated Project Delivery is a new method where the owner, architect, and contractor enter into a multi-party contract up-front with incentives and penalties. This type of process links the three key service providers up front, forcing a more integrated approach to designing and delivering the project.

- *Hybrid Arrangements*

Hybrids of each of the four are also used in the industry today.

Project Delivery Best Practices-Risk Mitigation[14]

Each of the processes discussed above has pluses and minuses. Best practices to reduce risks include:

- Clear contract specification. Contractors limit risk by following construction contracts closely. Green or sustainability are not clear terms and should be clearly defined in the context of the project. Responsibility (ownership) of each LEED point should be spelled out in a separate exhibit.

- Specific wants/needs of parties should be spelled out in the contract; performance or certification expectations should be clearly defined.

- Avoid over-reaching in marketing and representation.

- Do not accept standard contractor specification of “new materials without defects” if recycled products/materials will be used.

- Explicitly allocate the risks of new technology—consider performance testing of systems and technologies.

- Service provider “green damages” should be limited as to amount (liquidated damages) and amount of corrective work.

- Regardless of project delivery model, follow key Integrated Design best practices.

- Contractors can manage their obligations through use of quality control/assurance plans, a LEED action plan, Credit Management processes, and related project management techniques and documentation of work effort.

- Consider use of “At Risk” construction management process.

- Contractors/architects should stay away from, or only provide after careful consideration and definition, elevated standard of care guarantees/warranties—and carefully review implications of such warranties/guarantees on professional liability insurance

[14] This section is informed by a number of articles, experience, and presentations at GreenBuild 2009. See specifically “The Legal Risk is Building Green: New Wine in Old bottles?”, a USGBC Panel Discussion, April 2008. http://www.greenrealestatelaw.com/2009/04/usgbc-paper-legal-risk-in-building-green/

Resources

Green Building Finance Consortium Research Library and Industry Links. (Index code 24.2: Integrated Design)
http://www.greenbuildingfc.com/Home/ResearchLibrary.aspx

Whole Building Design Guide:
http://www.wbdg.org/

Integrated Design for Sustainable Buildings:
http://www.greenbuildingfc.com/Home/DocumentDetails.aspx?id=188

ASHRAE GreenGuide (2nd Edition):
http://www.ashrae.org/publications/detail/16082

Energy Design Resources Design Brief: Integrated Building Design:
http://www.energydesignresources.com/Resources/Publications/DesignBriefs/tabid/74/articleType/ArticleView/articleId/110/Design-Briefs-Integrated-Building-Design.aspx

Sustainable Building Technical Manual:
http://www.wbdg.org/ccb/browse_doc.php?d=4156

Environmental Building News: Integrated Design:
http://www.buildinggreen.com/auth/article.cfm/2004/11/1/Integrated

Market Transformation to Sustainability Guideline Standard - Whole System Integration Process:
http://www.greenbuildingfc.com/Home/DocumentDetails.aspx?id=908

b. Contracts/Legal[15]

Sustainable properties introduce important legal and related contractual issues that increase development risk if not appropriately mitigated through improved contracts, training, and behavior. Three key issues include:

- Design firm professional liability
- Construction contract risks
- Marketing Risk: misrepresentation and fraud in marketing and leasing protocols

[15] This section provides an overview of select sustainability related issues but is not a complete or detailed treatment of these issues and appropriate legal advice is recommended when addressing these and other legal issues.

Design firm professional liability

Design firm professional liability is primarily an issue for architects and design firms who want to limit the potential for litigation, but improved and more clearly specified contracts will also help investors.

From the owner's perspective, design and construction is already complex, and additional sustainability requirements and issues can make it even more so. Given the leadership of architects and designers in sustainability, it is natural and appropriate for owners to look to architects for education and guidance in this new field. However, it is important that the owner understand that their job is to communicate the importance of the economics, and the values that they are seeking in a project, and it is to their benefit to have contracts that clearly lay out the relative risks and responsibilities between architects and designers and owners.

Architects and owners need to be careful and understand the role of an "advocate" for sustainable design, and appropriately recognize their relative responsibilities and roles. The architectural community has stepped up their responsibilities to sustainable design in recent years:

AIA B101-2007, the standard form of contract between architect and owner makes the architect's sustainable duties immediately apparent. That document provides, in pertinent part:

> 3.2.5.2 The architect *shall* consider environmentally responsible design alternatives such as material choices and building orientation, together with other considerations based on program and aesthetics that are consistent with the Owner's program, schedule and budget for Cost of the Work." (Emphasis added)

Thus under the AIA contract, for the very *first* time, the architect is actually required to consider and evaluate green or sustainable design alternatives as part of the base services

Other potential design risks include:

- Liability for the increased cost of certain types of damages, such as lost profits, lost business opportunities, increased tax burdens, and energy costs.
- Liability for warranting an outcome without having complete control over things such as construction or operations and maintenance.
- Liability for structural problems and leaks associated with green roofs.
- Lack of proper sustainability experience and qualifications on the part of the design team.
- Lack of control over material specifications and substitutions on the part of the contractors.

The American Institute of Architects understands the importance of risk issues and has a series of 14 different memoranda in the risk management best practices strategies section on their website.

A 2009 Marsh Report made the following observations:

> Most markets believe that traditional design professional liability policies provide a significant amount of coverage for the negligent performance of professional design services. However, the general consensus is that a key difference between traditional design and green design involves enhanced performance expectations (i.e., energy savings, employee productivity, etc.) and an evolving standard of care, which may not be covered by traditional architects and engineers professional liability insurance policies.
>
> As of the date of creating this report, no insurance companies surveyed have made changes to their underwriting criteria, pricing and/or coverage with respect to the design of green buildings. Several insurers do provide risk and contract management advice for their design firm clients. Focus is placed on the avoidance of performance guarantees, the appropriate standard of care, and a well-defined scope of services.[16]

Construction Contracts

There are substantial risks in all construction, and it is important to remember in thinking through this issue that most of the risks occur in both sustainable and conventional construction. Key sustainability risks in construction contracts relate to specialized processes, requirements, and performance expectations, and related issues. Participation in the integrated design process, recycling and documentation of construction waste disposal, and specialized subcontractor requirements are a few of the areas where problems have been identified to occur.

Traditional contracts, while containing much of what is needed for sustainable construction, are not necessarily optimal. In many cases, design-build contracts do not have major incentives for building performance, leading some design-build professionals to ignore building performance as “not their problem”. Even more troublesome is that some professionals’ fees are tied to the cost of the systems they install. This actually gives the professional an incentive to *not* downsize systems. Interestingly, the surety markets have not responded to potential risk issues. Based on a survey by Marsh published in early 2009, the surety markets (that provide payment, completion and performance bonds) have not specifically responded to the green building industry.

The primary way that construction risk is mitigated is through higher equity requirements, fixed price construction contracts, retainage, budget contingencies, and payment, completion, and performance bonds. These practices are still at the heart of risk mitigation

[16] Extracted from “The Green Built Environment in the United States, 2008 Year-end Update of the State of the Insurance Market,” Marsh, February 2009.

for sustainable properties, but legal counsel should review for sustainable nuances and risks as noted above.

Significantly, sustainable properties have both positive and negative risks related to the construction process. Best practice to mitigate risks that do arise is to make sure projects accrue the positive risk benefits that are available. A specific assessment of the key factors that can reduce cost volatility, entitlement risk, and legal risk should be made for the subject property

Marketing Risk: Misrepresentation and Fraud

Sustainable property investors and developers are subject to claims of misrepresentation and fraud resulting from property marketing. These risks arise largely because the marketing process begins well before a project is certified, a lack of knowledge about the studies and data they cite, insufficient consideration of the specific application of studies and data to their project, and the actual variability in sustainability outcomes achieved by properties to date. As a result, sales and leasing brokers or principals marketing their projects have the potential to make claims that are untrue at the time that they make them.

There is also a substantial risk in presenting or promoting a project with unsupported claims. Capital providers, as part of their due diligence, often will uncover poorly supported or misleading facts and statistics, thus undermining the credibility of all of the appropriately argued and supported information in a funding request.

It is particularly important not to cite industry studies without appropriate caveats and/or limitations. Many studies show that actual energy performance is quite volatile with a wide divergence among the individual results that make up an average energy savings. Consequently, if an owner cites averages in marketing their project, there is a high likelihood that they will be wrong. [17]

Project promotion risks can be mitigated through staff training and the development of protocols for reviewing marketing and promotion materials. On a similar note, unsubstantiated or over-stated claims made during the entitlement process can also lead to problems, and potentially be turned around on a developer by becoming part of the requirement(s) of the development agreement.

c. Service Provider Quality and Capacity

The quality and capacity of service providers was identified by our survey respondents as one of the key factors leading to failure or underperformance, and also a significant opportunity for risk mitigation through retention of qualified and experienced service

[17] Cathy Turner and Mark Frankel, "Energy Performance of LEED® for New Construction Buildings," *New Buildings Institute Final Report*, March 2008, pp. 1-4.

providers. Of course, service provider risk is also mitigated through Integrated Design and proper legal review and contracts.

While experienced service providers are critical to any real estate project, issues of service provider quality and capacity take on particular importance in the sustainable property investment marketplace. Rapid growth of the sustainable property marketplace and a disproportionate level of new products, materials, systems and processes enhance the opportunity for service provider underperformance when dealing with sustainable properties. Accordingly, we address the issue of service provider underwriting separately in more detail in Section D: “Underwriting Service Providers” in Chapter VI: “Sustainable Property Underwriting Guidelines.”

d. Energy Use Forecasting

A key ingredient in the energy investment underwriting process is a forecast or projection of the dollar savings that the investment is likely to yield over time. For new construction or major renovations, this projection typically relies on some sort of energy use forecasting model. This model output of energy use can then be compared to a “baseline” building, typically one that meets minimum building code requirements for the jurisdiction in which the property is located, or in the case of a retrofit, can also be compared to existing energy use or use presuming conventional improvements.

The key risk of energy models and their forecasts is that the actual building fails to live up to the performance indicated in the model. Significant underperformance of expected energy savings would have a negative impact on net operating income (NOI), reducing expected building value and the owner/ investor’s rate of return (ROI).

Another broad risk related to energy models is that other investors may begin to perceive all models overstate energy savings. If an energy model of a green building indicates significant savings over a baseline design, future investors may discount this performance if they perceive energy models to be historically unreliable.

Given the importance of this issue we have prepared a special section in this book on “Underwriting Energy-Carbon Reduction Investment” presented in Chapter VI, Section E. This special section provides necessary background information and addresses the key reasons why energy forecasts differ from actual energy performance and how underwriters can assess the reliability and accuracy of property-level energy forecasts.

Resources

Substantial resources are identified and discussed in Expanded Chapter IV, Section F-3: “Building Energy Use” and in Chapter VI, Section E: “Underwriting Energy/Carbon Reduction Investment” as well as in the Consortium’s Research Library and Industry Links under codes 9.0, 15.63, and 24.7.

e. Regulation and Code Compliance

Sustainable property investments, whether they are new construction, retrofits, or commercial interiors, often encounter regulation and code compliance problems. Regulation and code compliance problems can occur in meeting broader regulations that require LEED and/or other levels of environmental certification, or a more micro building code level involving fire and safety regulations, plumbing codes, and operational issues regarding the use of elevators, tenant behavior, management practices, and related issues.

The key risks related to regulation and code compliance problems include delays in project completion, additional costs due to delays or design modifications, reduced environmental or financial benefits, and finally the inability to obtain expected rebates or other financial incentives.

The magnitude of regulation and code compliance risks varies significantly by country, state or province, and municipality. Risks will vary based on the regulating authority's commitment to sustainable principles, the level and complexity of code compliance, the administrative requirements to address regulatory or code compliance problems, and related factors.

Some examples of regulation and code compliance problems include:

- Plumbing codes and union requirements often make waterless urinals more difficult to implement, or more costly if redundant plumbing systems are required.
- Rooftop water storage and other water savings or reclamation strategies often must address and overcome municipal code issues.
- Key fire and safety requirements often affect various energy-saving strategies or materials choices.
- Internal tenant bike racks, showers, green cleaning strategies, and related sustainable design features can conflict with building operating strategies and/or space use limitations in leases.
- Rebates and related financial incentives can be difficult and expensive to document, limiting their value and use.

The most important best practice is to be fully aware of the nature of regulation and code compliance problems that can arise and appropriately research and communicate with local and state officials critical to achieving compliance. It is particularly important to not rely upon the assertions or statements of city leaders or building owners in determining the importance of addressing these issues, given the chasm that often exists between leaders and the people responsible for compliance implementation on the ground.

f. Commissioning

Commissioning (Cx) is the process of ensuring that systems are designed, installed, functionally tested, and capable of being operated and maintained to perform in conformity with the design intent.[18] Commissioning can be done for new buildings, new acquisitions, and on an ongoing basis in existing buildings.

Commissioning for existing buildings (sometimes referred to as retro-commissioning) is a systematic process for investigating, analyzing, and optimizing the performance of building systems by improving their operation and maintenance to ensure their continued performance over time. This process helps make the building systems perform interactively to meet the owner's current facility requirements.[19]

The value of commissioning was confirmed in a July 2009 study by Evan Mills: "Building Commissioning: A Golden Opportunity for Reducing Energy Costs and Greenhouse Gas Emissions". Based on data from 37 commissioning providers representing 643 buildings comprising 99 million sq. ft. of floor space from 26 states, the study reported the following key findings for commissioning:

- Median commissioning costs: $0.30 and $1.16 per square foot for existing buildings and new construction, respectively (and 0.4% of total construction costs for new buildings).
- Median whole-building energy savings: 16% (existing) and 13% (new).
- Median payback times: 1.1 (existing) and 4.2 years (new).
- Median benefit-cost ratios: 4.5 years (existing) and 1.1 years (new).
- Cash-on-cash returns: 91% (existing) and 23% (new).
- Projects employing a comprehensive approach to commissioning attained nearly twice the overall median level of savings.
- Non-energy benefits are extensive and often offset part or all of the commissioning cost.

Carnegie Mellon also reports positive findings on commissioning:

- CMU's BIDS™ has identified seven retro-commissioning case studies indicating an average annual savings of 8.1% in total building energy consumption. These seven studies demonstrate that retro commissioning results in annual energy cost savings of approximately $0.15 per square foot.

[18] "Design Briefs: Building Commissioning," Energy Design Resources (http://www.energydesignresources.com/)

[19] Building Commissioning Association (http://www.bcxa.org/)

- While the benefits of retro commissioning will diminish over an average of four years, the initiative is more than paid for in the first year of savings, and the four-year net present value of the savings averages $0.64 per square foot.

- CMU's BIDS™ has also identified four building case studies that demonstrate an average of 17.4% total building energy savings annually due to continuous commissioning. These four studies demonstrate that continuous commissioning yields average annual savings of $0.30 per square foot for energy alone, with facility management and failure costs not yet quantified.

A key risk factor influencing cost and quality is the availability of competent/experienced commissioning agent(s). Survey respondents have experienced problems in retaining quality commissioning agents due to the lack of qualified commissioning agents.

Another risk is the lack of generally accepted industry standards for a general scope of commissioning work leads to widely varying proposals in terms of scope and costs.

Additionally, if an owner is unwilling to pay for the heightened level of coordination between design, construction and commissioning teams, risk of team members not buying into commissioning increases, making effective commissioning difficult.

Sometimes commissioning problems arise due to the identity of the commissioning agent. Contractors or the engineer of record may have conflicts of interest if they also serve as commissioning agents.

Commissioning can also run into problems when the commissioning agent is brought on too late in the process. Expensive change orders and lack of team buy-in can result.

Commissioning of the building envelope is seen as an increasingly important issue with sustainable properties.[20] Uncontrolled rainwater penetration, condensation and moisture ingress are three of the most common threats to the long-term durability of a property.

Commissioning can be valuable for most building types and situations, but is particularly valuable for the following types of buildings:

- Large or complex buildings (size and complexity not always linked)
- Buildings with very large loads on the mechanical equipment, such as laboratories
- Buildings with highly variant occupancy levels
- Buildings in extreme climates

While best practices for commissioning can get detailed, six straightforward steps can go a long way to improving commissioning:

[20] Daniel Lemieux, AIA, "Trust, But Verify... Building Enclosure Commissioning in Sustainable Design," *Real Estate Issues*, Volume 33, Number 3, 2008.

1) Clear Definitions: Clearly define roles and responsibilities of commissioning participants, the scope of work goals, and the current facility requirements.

2) Bring the commissioning agent on early. Bringing the commissioning agent on in the pre-design phase will ensure that any problems that arise can be fixed during the design stage at minimal cost to the owner.

3) Make sound compensation and quality decisions. Work to match the quality and experience of the commissioning agent(s) with the complexity and sophistication of the job.

4) Manage conflicts of interest. A commissioning agent with no conflicts of interest may be in a stronger position to advocate solely for the building owner.

5) Get buy-in from the team. Incorporate commissioning requirements into specifications so the design and construction teams know what they're getting into.

6) Continuous commissioning or annual re-commissioning. Annual re-commissioning can supplement a good monitoring and verification program to improve O&M and keep the building running optimally.

Resources:

For a complete selection of key commissioning guides, articles and related documents go to the Consortium's Research Library index sub-code 24.3: Commissioning. Additional commissioning websites and documents are available in the Consortium's Industry Links section index code 24.3. . Key resources are identified and described in Expanded Chapter IV, Section C-2f.

g) Measurement and Verification

Measurement and verification (M&V) is an important process for monitoring resource consumption after construction or major retrofit. Did the building or system perform to expectations? Better? Worse? M&V is a set of procedures and testing methods that can help answer these questions.

M&V is a complex process and a definitive accepted industry standard has not emerged on how to implement the process. This is an area that has, and is, receiving much attention due to renewed focus on energy issues, labeling initiatives, and the realities about the information needs of facility managers faced with managing energy use.

M&V design and implementation can be suboptimal if the O&M team is not part of the process. M&V must reflect the realities of the O&M of that particular building, and O&M will provide key input in this regard.

One common risk is a lack of follow through after the project is completed. The developer will spend a good deal of money and time developing a functioning M&V system, but the operations side somehow drops the ball and doesn't fully implement the system.

Another problem with M&V is installing or designing the necessary systems too late in the design process. It is easier and cheaper to set up the meters properly if the design team plans for them from the start.

If engineers or building managers are not properly trained on how to run the building at optimal levels, then even a good M&V process may fail to result in high performance as the staff will not know how to interpret the M&V data or fine tune the building after data starts coming back indicating underperformance.

M&V can also be a risk-mitigating tool. It provides owners with a scorecard of how well the building performs from an energy perspective. This allows the owner to have a better idea of whether the design team has met their contractual obligations and also allows the owner to market the building and provide the data to prove it.

While detailed best practices can be complex, and vary significantly by project type, three simple best practices are identified below:

1) Introduce the M&V concept early in the project, as it's least expensive and most efficient to design the necessary M&V equipment into the systems from the start.

2) Develop an M&V plan that incorporates the goals of the building, the protocol for using the M&V data, and establishes who is responsible for the management of the process. This helps bridge the gap from construction to O&M.

3) Train the O&M staff to read and interpret the M&V data. This ensures that the staff will be able to fine-tune the building to minimize energy use.

D. Feature Performance[21]

The focus of this section is on sustainable property feature performance and risks. The importance of feature performance, relative to financial analysis and valuation, is how it contributes to the overall building performance, which can then, through an assessment of the market's response, be translated into financial performance. Additionally, underwriting of feature selection and performance is an important part of risk analysis and mitigation.

The performance of specific features, systems or strategies has been a critical focus of financial analysis historically in energy efficient/sustainable properties. While this focus

[21] We use the term "features" to refer to the broad array of features, products, systems and strategies employed in the sustainable property industry to address key building functions like lighting, water savings, indoor air quality, etc.

can be appropriate when replacing a particular system or feature in a building, or when making decisions about the relative financial merits within a particular feature (type of light bulbs, windows, or glazing, for example), the industry has grown to understand that a more holistic analysis of buildings, rather than a feature by feature analysis, is the preferred overall design and financial analysis strategy.

Feature based performance analysis have typically focused on cost savings, and, in select cases, a simplified capitalization of operating cost savings, to develop simple pay-back or simple return on investment conclusions. However, as the sustainable investment challenge has moved to determining the maximum technically and economically feasible level of sustainable investment, such cost-based feature-by feature models have become less reliable and accurate. More holistic financial models, like the discounted cash flow analysis discussed in Chapter V, are needed to accurately reflect all benefits and risks that result from investment decisions.

Practically, a complex DCF financial model is not possible, or necessary, for all decisions, but even simple feature-based financial analysis can be supplemented with an independent and intelligently organized assessment of revenue and risk implications that can assist decision-makers. These types of supplementary analyses need to be property specific, address both positive and negative risks, clearly articulate risk mitigating facts and circumstances, and be organized to support an assessment of financial implications through conceptual linkages to the discounted cash flow model. (This is the focus of Chapter V).

Decision-makers should be cautioned that in many cases the specific structure of these financial models, as well as the data on both costs and benefits, are often supplied, either directly or indirectly, from product suppliers and manufacturers, and thus must be appropriately screened and considered.

Features or systems do not always perform as expected. Sometimes underperformance will require replacement of a feature or system or a significant redesign or re-engineering. In fact, based on our survey of practitioners and experience, feature or system problems are more often than not an issue of a mis-use or misapplication, rather than a complete product or system failure. For example, green roofs that are applied when the slant is too severe will often have problems. Materials like cork, which might be great for lower intensity use might not be as effective in a school or highly traveled lobby.

There are scores of feature-based financial analyses available. In Expanded Chapter IV, we present financial performance information from a few important sources including the Rocky Mountain Institute and Carnegie Mellon University. These sources and many others demonstrate impressive rates of return and quick pay-backs for many sustainable and energy efficiency features and strategies including daylighting, energy efficiency lighting, glazing, building controls, cool roofs, and under-floor air distribution. These positive results have been demonstrated prior to consideration of potential revenue and risk benefits.

Feature-based financial models are discussed in detail in Section C, Step 1: "Select the Financial Model," of Expanded Chapter V. Additionally, Appendix F in Chapter V: "Financial Analysis Alternatives" presents 40 pages of financial models and provides links to websites with many more.

1. Performance/Risk Assessment of Six Key Features/Systems

A key purpose of this section is to provide the basis for due diligence/underwriting questions investors should ask consultants and vendors concerning features and strategies they recommend, both today and in the future. The answers to such questions can significantly mitigate risk and uncertainly and provide context for interpreting the results of financial analyses.

Feature-based performance analysis has an important role in underwriting/due diligence. Beyond simple payback or return on investment analysis, it is critical for capital providers to understand the relative risks associated with the implementation of different features or strategies. By understanding key risks and best practices of specific features or strategies, underwriters can conduct analyses that will enable them to better understand the potential risks, reducing uncertainty and required returns.

Our focus on failure or underperformance in this section is based on our belief that a full and straightforward discussion of failure and underperformance provides a critical supplement to the positive feature performance studies and reports that are published and promoted by sustainable building advocates, product suppliers, vendors, and others. It should also be noted that many buildings have installed these features and systems with little or no trouble.

To better understand feature risks, and identify key features to focus on, we interviewed a score of top consultants, developers, investors, and corporate real estate professionals to determine those features with a history of failure and underperformance. Based on this survey, case studies and other research, we made the decision to focus on six important features that were repeatedly mentioned during our survey of respondents as having experienced failure or underperformance:

a. Underfloor Air Distribution
b. Green Roofs
c. Daylighting
d. Lighting Controls
e. Waterless Urinals
f. Materials

Moreover, as this paper is just a snapshot in time, some of these features and strategies, and risks related to them, may be quite different in a few years' time. Not only will technology change, but also service providers, owners, tenants and other occupants will become more experienced, changing the mix of risks and returns.

When applying such general studies to a particular property, it is important to carefully assess the applicability of the research (time of study, property type, comparability of sustainable features/outcomes, geography, etc.), its quality, and key underlying assumptions. In general, particular care must be observed when combining cost and benefit calculations from separate feature analysis due to double-counting and related issues.

Substantial additional information on sustainable features is presented in Expanded Chapter III, Section C: “Sustainable Property Features” and in Appendix III-A of Expanded Chapter III: “Sustainable Property Features Menu” as well as in the Research Library under index codes 6.0, 12.0, 15.5 and 28.0.

a. Underfloor Air Distribution

Underfloor air distribution (UFAD) is an approach to ventilation in commercial and institutional buildings in which conditioned air is distributed through a plenum or cavity created by raised floors, which also typically carry electrical and communications cabling.

One common cause of problems related to UFAD is plenum leakage, either through the plenum into other building cavities or from the plenum into the occupied space via the floor. This leakage can result in many problems, including loss of thermal comfort, wasted energy, ventilation noise, and condensation in the plenum. Such condensation can ultimately lead to growth of biological material or mold, which can seriously impair air quality and may result in liability for the building owner.

Other risks include specifying the proper thermal mass of the slab and plenum, proper design of forced air systems to match floor plates, proper insulation of ducting, and proper coordination of internal tenant improvements and vents.

According to the UC Berkeley Center for the Built Environment, a key researcher of UFAD systems, the key factors to the success of UFAD design are:

1. The experience of the project team
2. Appropriate location and climate
3. Proper integrated design process
4. HVAC control strategies
5. Sufficient training of building management staff.

Vendor input is essential during the design and construction phase for a successful under floor air distribution system.

It should also be acknowledged that UFAD systems are a more difficult challenge for existing buildings, typically much more costly than in new construction, and in many cases are not possible due to physical limitations.[22] However, some creative UFAC solutions to existing buildings have been implemented.

Underfloor Air Distribution Resources

Energy Design Resources Design Brief: Underfloor Air Distribution and Access Floors: http://www.energydesignresources.com/Technology/HVACDesign/tabid/97/articleType/ArticleView/articleId/127/Default.aspx

Center for the Built Environment: Hype Vs. Reality: New Research Findings on Underfloor Air Distribution: http://www.cbe.berkeley.edu/research/publications.htm

b. Green Roofs

While there are many variations, two primary types of green roofs are extensive and intensive. An extensive green roof is a lightweight; vegetated roof installed on top of conventional or slightly sloping roofs and is a strategy used in many green buildings. Extensive roof systems require minimal ongoing maintenance and typically do not allow occupant access. [23] The roof is covered with thin layer of soil that supports light vegetation with no irrigation Due to its lightweight; an extensive green roof can be retrofitted to most structures.

A key potential problem for extensive green roofs is the vegetation. Weeds can overrun roofs or the drains can clog. Other problems can occur that prevent the plants from taking hold, such as a lack of irrigation during the establishment phase.

Some extensive roof installations have seen the membrane warranty voided. Certain manufacturers have partnered to fix this problem, but this issue needs to be addressed before deciding on a green roof. Since roofs often have a 15-year life cycle, a voided warranty could present a serious financial risk to an owner.

Too much moisture is a common culprit to green roof vegetation problems. It is important to note that in our research we found limited evidence that currently employed green roofs are prone to leakage or membrane failure.

Some of the key issues to consider in designing a green roof include:

- Climate, especially temperature and rainfall patterns
- Strength of the supporting structure
- Size, slope, height, and directional orientation of the roof
- Type of underlying waterproofing

[22] The Center for Building Performance at Carnegie Mellon stated that UFAD systems cost $54 per employee for new construction and $422 per employee for retrofits. "Guidelines for High Performance Buildings," 2004.

[23] "FAQ's on Green Roofs," Greenroofs.com, http://www.greenroofs.com/Greenroofs101/faqs.htm

- Drainage elements, such as drains, scuppers, and drainage conduits
- Accessibility and intended use
- Visibility, fit with architecture, and owner's aesthetic preferences
- Fit with other 'green' systems, such as solar panels
- Costs of materials and labor

Green Roofs Resources:

GreenRoofs.com:
www.greenroofs.com

Design Guidelines for Green Roofs:
http://www.greenroofs.com/Greenroofs101/how-tos.htm

AIA Best Practices: Green Roof Design:
http://www.greenbuildingfc.com/Home/DocumentDetails.aspx?id=772

Additional information is available in the expanded book section on Green Roofs and on the Consortium website in the Research Library or Industry Links sections under codes 6.0, 12.0, 15.5, and 28.0.

c. Daylighting

Daylighting is the practice of using natural light to illuminate building spaces.[24] Rather than relying solely on electric lighting during the day, daylighting brings indirect natural light into the building through windows or skylights. Daylighting is a common green building strategy, as it can allow for significant energy savings due to avoided energy use for lighting and heating while also improving occupant comfort and potentially increasing worker productivity.

Daylighting systems typically involve a combination of architectural and other building elements that can include skylights, atriums, clerestories, light shelves, light pipes, window glazing technologies, solar shading systems, and interior lighting systems with sensors and dimmable ballasts. A well-designed daylighting system minimizes thermal gains and excessive brightness due to direct sunlight.

Daylighting systems are more challenging to evaluate in new buildings than in existing buildings because they do not yet exist. Some daylighting elements may not be physically possible or cost effective when retro-fitting an existing building versus a new building, making daylighting upgrades to an existing building more challenging and requiring more scrutiny on the part of underwriters.

[24] "What/Why/What," Daylighting Collaborative, http://www.daylighting.org/what.php

Case studies presented by Alan Whitson, from his seminar "Lighting for Profit, Unlocking Hidden Energy Savings"[25] demonstrate significant savings from daylighting. The case studies presented by Mr. Whitson demonstrate electricity savings of 29% due to daylighting and interior zone dimming, and up to 33% when the use of occupancy sensors was added. Interestingly, the results were consistent in the four geographically distinct cities.

Daylighting Risks

The primary problem with daylighting is too much light entering the building interior. This may actually lead to decreased occupant comfort and productivity, ultimately harming financial performance of the building. The problem of too much light could manifest itself either in glare or uneven distribution of light, as well as excessive cooling loads from the direct solar gains. The upshot is either lost energy savings or occupant discomfort.

Other risks to consider include:

- Advanced lighting and/or shading systems used for daylighting are likely to be more expensive to install, repair and maintain than conventional systems.
- Cost estimates for daylighting systems may be more difficult to pin down due to the customized nature of these systems.
- Incorporating daylighting elements such as skylights increases the risk of unwanted glare from direct sunlight and higher energy costs as a result of increased building temperatures.
- Additional openings (skylights, clerestories, roof monitors, etc.) in the building envelope increase the risk of leaks that can result in water damage or heat loss.
- Photo sensors for daylighting can have problems due to miscalibration, or improper positioning. This can result in missing energy savings, as daylighting typically accounts for about 10% of lighting savings in energy models.
- Another risk in implementing daylighting can occur by spending too much on technology. In offices, which are typically vacant half the time, dimmers may not be needed. Consider also putting daylighting sensors only on the sunny side of certain buildings.

Daylighting Best Practices

Three important daylighting best practices include:

1) Carefully placed windows—it is best to avoid direct sunlight on critical tasks and excessive brightness.

[25] Alan Whitson, RPA, is a leading researcher and educator on sustainable real estate practices and financial analysis through the Corporate Realty Design and Management Institute (http://www.squarefootage.net/).

2) Shading devices—in general, light which reaches a task indirectly--bounced from a white wall--will provide better lighting quality than light which arrives directly from a natural or artificial source.[26]

3) Low-transmission glass—one developer told us that most of his LEED projects required some form of post-construction window treatment to reduce glare.[27]

Daylighting Risk Mitigating Factors

Attention to the practices discussed below can also help mitigate risks:

- The design team has prior experience with daylighting systems containing elements similar to the one proposed.
- The contractor has prior experience installing daylighting systems containing similar elements.
- The building owner or project sponsor has provided a cost estimate from the sub-contractor responsible for installing and/or maintaining the various daylighting elements in the building.
- The building owner or project sponsor has provided adequate support for any rent premiums being forecast including evidence of such premiums from either inside or outside of the market.
- The building owner or project sponsor has provided adequate support for any increases in retail sales being forecast.
- The building owner or sponsor has provided evidence ("commissioning") that the daylighting system is operating as designed.
- The daylighting system incorporates special window glazing or shading elements to mitigate unwanted glare?

Daylighting Resources

LBNL Windows & Daylighting Group
http://windows.lbl.gov

LBNL Lighting Systems Research Group: Controls and Communications
http://eetd.lbl.gov/btp/lsr/l_controls.html

IEA Task 31, Daylighting Buildings in the 21st Century
http://www.iea-shc.org/task31/

USDOE Daylighting Information Resources

[26] Gregg D. Ander, "Daylighting," National Institute of Building Sciences, Nov. 5, 2008. http://www.wbdg.org/resources/daylighting.php

[27] *Sustainable Building Technical Manual*, Chapter 9

http://www.eere.energy.gov/buildings/info/design/integratedbuilding/passivedaylighting.html#shelves

d. Lighting Controls

An essential element of lighting and daylighting in green buildings is effective control of the operations of the electric lighting systems. This requires that controls enable the lights in a room to automatically turn off when the room is unoccupied. Further, it requires that the level of electric lighting be automatically adjusted in response to available daylight in the room.

As presented by Alan Whitson in his seminar "Lighting for Profit: Unlocking the Hidden Energy Savings," there are significant opportunities for savings from lighting controls. Rest rooms are unoccupied 70% of the time, and even single-person offices are vacant 53% of the time. Energy savings can reach 60%, due primarily to automatic off sensors, but also due to dimming.

The potential energy savings from lighting controls and sensors are further supported by research reported by the US EPA in their September 2007 report: "Putting Energy in Profits: ENERGY STAR® Small Business Online Guide which show energy savings of 25% to 75% depending on the room type.[28]

Occupancy Sensors

In typical office buildings, there are many spaces (closed offices, conference rooms, storage rooms, rest rooms, etc), which are occupied sporadically. Such rooms are perfect candidates for the use of occupancy sensors, which detect the presence of people in a space and turn the lights on. If the space becomes unoccupied, the sensor detects that condition and shuts off the lights after a suitable time delay period. Such controls are relatively inexpensive and are mandated by most energy codes for new construction.

Risks of Occupancy Sensors

The risks with occupancy sensors relate to type of sensor, location of the sensor, and adjustment of the sensor. It is important to assure that the entire area controlled by the sensor can be detected by the sensor (which is a function of its range and it angle of sensing). Finally, it is important to assure that there is an appropriate time delay between when the last person leaves the room and the lights are shut off: if it is too long, excess energy will be used; if it is too short, it may result in excessive cycling of the lights during normal use of a room.

[28] "Putting Energy Into Profits: ENERGYSTAR® Small Business Online Guide," US EPA, September 2007.

Occupancy Sensors Best Practices

Substantial detail on lighting controls and sensors can be found in the referenced sources at the bottom of this section. A few simple practices include:

- Make sure you have the proper sensor for each location type.
- Make sure you have the sensors in the proper location.
- Decide on the proper delay time. Owners must balance the energy savings of a short time delay with the occupant nuisance factor.

Automatic Daylight Dimming Sensors

Automatic daylight dimming, or "daylighting," uses a light sensor to measure the amount of illumination in a space. Then, light output from the dimming ballast is adjusted to maintain the desired level of illumination. The combination of daylight dimming with appropriate task lighting is often a very effective and energy-efficient way to light space.

Risks of Daylight Sensors

Poorly calibrated daylight sensors can result in little or no energy savings from daylighting. This can seriously damage energy performance, as properly functioning daylight dimming sensors can in some cases account for up to 30% of lighting savings.[29]

Daylight Sensors Best Practices

Initial commissioning and calibration of light sensors and controls is critical for effective daylighting.[30] In addition to significant setup calibration, daylight-dimming sensors also require on-going fine-tuning to ensure highest performance. Building O&M staff should be trained by the commissioning to test the systems on an ongoing basis.

Daylight Sensors Resources

Energy Efficient Products:
http://www1.eere.energy.gov/femp/procurement/eep_light_controls.html

Energy Design Resources Design Brief: Lighting Controls:
http://www.energydesignresources.com/Technology/LightingDesign/tabid/94/articleType/ArticleView/articleId/134/Design-Briefs-Lighting-Controls.aspx

[29] http://www.energydesignresources.com/resource/22/

[30] http://www1.eere.energy.gov/femp/procurement/eep_light_controls.html

e. Waterless Urinals

In an office building, the water used for flushing urinals is the largest use of water inside the building. Waterless urinals are a commonly used water saving strategy in sustainable design. These urinals use no water for flushing, but instead allow the urine to flow down the drain and into a trap that contains a fluid that allows urine to pass through it and drain off, while keeping odors trapped inside. The urinal is still connected to the plumbing sanitary sewer drainage system but not to the water supply.

The problems associated with waterless urinals primarily come from improper maintenance. This ultimately results in having to replace the cartridge more often, an unnecessary expense, or in user complaints regarding odor.

Some owners have also reported that filters were more expensive than advertised and required changing more frequently than advertised.

Another risk is the build-up of uric acid crystals in the sewer lines, due to the pure urine flowing through the pipe rather than being diluted by flush water. This can cause increased maintenance of the plumbing system, and can be combated by periodically running some water through the drains.

Another risk is the acceptance of waterless urinals by regulators, unions and building owners.

Waterless Urinals Resources

EBN: Why Non-Flushing Urinals Fail (And How to Prevent Those Failures):
http://www.buildinggreen.com/auth/article.cfm?fileName=131104b.xml

Waterless Urinals: Technical Evaluation:
www.cecer.army.mil/techreports/ERDC-CERL_TN-06-03/ERDC-CERL_TN-06-03.pdf

f. Materials

Building materials choices are extremely important in sustainable design, as construction and demolition waste constitute about 40% of the total solid waste stream entering landfills in the United States[31]. Examples of the types of sustainable materials include reused or salvaged materials; materials with recycled content, locally manufactured materials, rapidly renewable material, and certified wood. Other sustainable products include non-toxic adhesives, sealants, paints and coatings; low emitting carpets; and formaldehyde-free wood and agrifiber products.

[31] USGBC

Materials Risks

Materials risks result primarily from uncertainty due to the use of new and untested materials or from traditional products being used in new and untested ways. Additional risk results from "green washed" materials that fail to meet sustainable standards or expectations. Another risk is that the documentation relating to the green features of a product may be incomplete. Since some sustainable certification credits are no-tolerance credits, like the LEED "no formaldehyde" credit, if a product unknowingly contains formaldehyde, this means no points from that LEED credit are earned for the building. This can happen if manufacturers do not control every single aspect of the production process, which can sometimes lead to the discrepancy described herein.

Materials Best Practices

The best approach is to work with material specifiers and contractors who are familiar with the range of green materials products available for particular applications. This may vary by locality, as well as by building type.

Nationally recognized information resources that screen new green products can be helpful, but the rapid growth in new products and materials, and sophisticated sales efforts behind such products and materials, make it valuable to retain experienced assistance in this area.

Materials Resources

Environmental Building News
www.buildinggreen.com/

California Integrated Waste Management Board- Green Building Materials
www.ciwmb.ca.gov/greenbuilding/Materials/

Oikos Green Product Gallery:
www.oikos.com/products/

E. Building Performance

Sustainable property performance at the building level is the foundation for valuation and financial analysis. Understanding development costs, resource use, occupant performance, the level of sustainability achieved, and the location and flexibility of a building is critical to being able to assess potential demand for "sustainability" from the market. However, while building performance is necessary to value a sustainable property, it is not sufficient. The specific market response by regulators, space users, and investors to a building's actual, or projected, performance is a necessary prerequisite to understanding value or financial performance.

Building performance, and how to measure and monitor it, is a big topic and a growing focus of the real estate industry. Building labeling and related energy directives are a reality in Europe and a growing legislative reality at the state and federal levels in the United States. ASHRAE's proposed Building Energy Quotient program is designed to enable both asset and operational ratings for all building types, except residential.[32] ASTM's Building Performance and Energy Disclosure Task Force is working on an ASTM standard to guide the practice of building energy performance assessment and disclosure.

In June 2009, as part of LEED v3, the latest version of the US Green Building Council's program for green building design, construction, operations and maintenance, buildings seeking LEED certification will be required to submit operational performance data on a recurring basis on a precondition to certification.

While numerous, government and trade group efforts in building performance assessment are dwarfed by the thousands of corporate and institutional investors worldwide who are endeavoring to rationalize the process for measuring and monitoring the performance of the buildings in their portfolios. In the United States, EnergyStar benchmarking has become a critical component of many asset managers' sustainability programs.

Measuring building performance and sustainability, and its importance to valuation and underwriting, are fully discussed in Chapter III: Evaluating Property Sustainability. We identify and categorize 100 different green rating and performance assessment systems.

In this section of Chapter IV of the condensed book, we summarize key evidence documenting sustainable property building performance for the following categories:

1. Development ("First") Costs
2. Whole Building Performance Studies
3. Building Energy Use
4. Occupant Performance
5. Durability/Adaptability/Flexibility

In the expanded book, we present substantial additional detail including analysis and discussion of each of the key research studies identified.

1. Development ("First") Costs

An important input into the financial performance of a building project is its initial development/construction cost ("first cost"). Since first costs are not discounted (they occur immediately), they can significantly affect financial performance.

[32] ASHRAE's labeling program differs from existing labeling programs in that it focuses solely on energy use. ASHRAE intends for its prototype labeling program to become a model for mandatory labeling programs that are being considered legislatively.

Summary of Development Cost Research

The evidence from key research and case studies analyzing the performance of sustainable properties regarding development costs (often referred to as "first costs") is that a certified sustainable property costs 0-2% more, with higher levels of certification costing up to 10% more. Many major construction companies (Swinerton, Webcor, Turner, etc.) publicly promote that sustainable construction should cost no more, and the research shows that in many cases it does not. (Expanded Chapter IV provides a detailed analysis of first cost analysis and the most important research to date on the topic)

In November 2009, Davis Langdon completed a Cost Study for the Urban Green Council, which found that LEED certified high rises came in at an average cost of $440 per square foot compared to $436 per square foot for non-LEED projects. On commercial interiors, the cost of $191 per square feet was actually $6 dollars lower than for non-LEED projects. This study was based on construction costs for 38 high-rise multi-family buildings and 25 commercial interiors in New York City.

A July 2009 Study by Davis Landgdon: "Cost of Affordable Green Housing in Portland and Seattle" looked specifically at the costs for affordable green housing and reached the conclusions that there was no statistically significant difference in construction cost between the green-rated and standard populations.

One of the best analysis of comparative cost to date, again competed by Davis Langdon, is shown in: **"The Cost of Green Revisited: Reexamining the Feasibility and Cost Impact of Sustainable Design in the Light of Increased Market Adoption," Lisa Matthiessen, Peter Morris, David Langdon, 2007.**
http://www.davislangdon.com/USA/Research/ResearchFinder/2007-The-Cost-of-Green-Revisited/

This study is an update of Davis Langdon's July 2004 study entitled "Cost of Green: A Comprehensive Cost Database and Budgeting Methodology". The updated study comes to essentially the same conclusion as the earlier study – "there is no significant difference in average costs for green buildings as compared to non-green buildings."

The study methodology was to analyze a total of 221 buildings, 83 of which were designed with a goal of achieving some level of LEED certification and 138 of which did not have a goal of sustainable design. The authors note "it is important to keep in mind that the difference between these groups is simply that the LEED-seeking buildings were designed with LEED certification in mind, while this was not one of the goals for the non-LEED buildings." They further note that most of the non-LEED-seeking buildings would have achieved 10 to 20 LEED points had they applied. The study included an analysis of academic buildings; laboratory buildings, library buildings, community centers and ambulatory care facilities.

Other key findings from the study are as follows:

- In many areas of the country, the contracting community has embraced sustainable design, and no longer sees sustainable design requirements as additional burdens to be priced in their bids.

- The cost of documentation remains a concern for some project teams and contractors, although again, as teams become accustomed to the requirements, the concern is abating somewhat.

- There is such a wide variation in cost per square foot between buildings on a regular basis, even without taking sustainable design into account. . . comparing the average cost per square foot from one set of buildings to another does not provide any meaningful data for any individual project to assess what—if any—cost impact there might be for incorporating LEED and sustainable design.

Perhaps the biggest cost barrier for sustainable property investment is not measured in dollars, but in implementation time and risk. For example, you can show a developer that studies have shown that a sustainable building will only "cost" 2% more, but they still have legitimate "cost" concerns. The sustainable building process will require new types of contracts, leases, insurance, subcontractors, and contractors, and will require a more integrated design and project management process, different than what the developer has been used to. What is the cost of these required changes? Sophisticated discussions of costs and proper interpretation of the surveys that are done in the marketplace require consideration of this question.

In answering the comparative cost question, it is important to understand the significant differences between existing buildings and new construction. Many of the most prominent studies looking at comparative costs are based on new construction, and do not fully consider existing buildings. Comparative cost analysis for existing buildings is significantly more difficult due to the wide variety of building types, the varying ways sustainability is achieved, and the significant underlying variances in the age, construction type, and other variables that will affect comparative cost.

2. Whole Building Performance Studies

The three studies we summarize here offer evidence of building performance across a number of categories including resource use, occupant performance and operational efficiency. Expanded Chapter IV provides a more in-depth assessment of each study.

a. "Innovative Work Places: Benefits and Best Practices," GSA Office of Government-Wide Policy, January 2006

The US General Services Administration (GSA) has been one of the leading researchers and promoters of improved design and efficiency for federal buildings. The GSA describes this publication as a "...milestone workplace publication." The GSA's findings and conclusions in this report are based on years of conducting extensive workplace research and tracking industry-wide best practices.

A select few of GSA's conclusions are presented below:[33]

- **Reduced absenteeism:** Healthier indoor environments reduce sick building symptoms and absenteeism. A Canadian study revealed that approximately one-third of employees' sick leave can be attributed to symptoms caused by poor indoor air quality. The same study found that communication and social support enabled by open office plans are strong contributors to healthy workplaces and lowered absenteeism.[34]

  According to a study by Carnegie Mellon University (CMU) for the Department of Energy (DOE), improving indoor air quality and providing natural light reduces illness and stress. The CMU study[35] showed that occupants closer to windows reported fewer health problems.

  In addition, a survey of three case studies by the Rocky Mountain Institute proved that better lighting and HVAC systems could reduce absenteeism from 15 to 25 percent.[36]

- **Improved recruitment and retention:** The workplace is a proven factor in hiring and keeping a world-class workforce, resulting in improved recruitment and retention rates and decreasing expenses to replace staff. Knoll reports that a Hay Group study found that half the people planning to leave their current employer were dissatisfied with their workplace, while only one-quarter of those staying were dissatisfied.[37] A study commissioned by the American Society of Interior Designers also found that 51 percent of employees surveyed said the physical workplace would impact their decision to leave their job.[38]

- **Increased productivity and performance:** Flexible, adaptable work settings allow people to customize their workspace to suit their individual needs, providing improved comfort. When given control over their environment, workers are less distracted and more productive and satisfied with their jobs. They also report fewer complaints to building management. For example, Public Works and Government Services Canada found that when people were given individual ventilation control, the number of trouble calls decreased significantly.[39]

  Healthier, more ergonomic workplaces can also improve performance and reduce expenses. The Occupational Safety and Health Administration (OSHA) reports that

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[33] The conclusions presented are those of the General Services Administration, and reflect their position as an occupant of the space they own or lease, and the underlying assumption that the government accrues all the benefits that would accrue from innovative and/or sustainable workplaces.

[34] K.E. Charles, et al., "Workstation Design for Organizational Productivity," 2004.

[35] Advanced Building Systems Integration Consortium, Center for Building Performance and Diagnostics, 1995.

[36] J.D. Romm and W.D. Browning, 1998.

[37] Knoll and The Hay Group, 1998.

[38] American Society of Interior Designers, 1999.

[39] K.E. Charles, et al., 2004

repetitive strain injuries caused by poor ergonomic design, including computer use, cost business and industry as much as $54 billion annually in workers compensation and other costs.[40]

- **Greater flexibility of building services:** Improved flexibility in workplace design reduces the time and expense required for reconfigurations and daily operations and maintenance. The GSA Adaptable Workplace Lab showed that using easily reconfigured furniture can save 90 percent of reconfiguration costs, and reduce reconfiguration time from days to hours. In another example, the Pennsylvania Department of Environmental Protection reduced average churn costs from $2,500 to $250 per workstation by using more flexible building and furniture systems in their high-performance green buildings.[41]

- **Efficient operations and maintenance.** Innovative workplaces help decrease facility management, operating, and technology expenses. Vivian Loftness et al. at Carnegie Mellon have compiled case studies that show that improved lighting efficiency and control can save up to 40 percent in total building energy costs.[42]

b. "Assessing Green Building Performance, A Post-Occupancy Evaluation of Twelve GSA Buildings," Kim M. Fowler and Emily M. Rauch, Pacific Northwest National Laboratory, July 2008

The intent of this whole building performance measurement analysis was to inform GSA on how its sustainably designed buildings were performing in comparison to traditionally designed buildings. The results are based on a detailed analysis of 12 buildings.

While the study's design appears reasonable, potential issues that need to be considered when applying conclusions from the work are that it is likely that the first wave of sustainable properties at the GSA might be expected to be strong performers. Additionally, willingness to provide information was the final selection criteria for properties included in the study, indicating potential self-selection bias. Offsetting these concerns is the well established fact that lessons learned in initial sustainable property experiences can be quite valuable in improving the quality of sustainable property investment in the future, thus suggesting that this initial sample of GSA buildings may actually not perform as well as future projects.

Key conclusions are summarized below:

- **Water:** The average water use of the GSA buildings in this study was three percent less than the calculated water use indicated for baseline buildings. The conclusions on water use are not clear because domestic water use had to be estimated.

[40] Occupational Health and Safety Administration (OSHA), Dept. of Labor, 1999.

[41] J. Toothacre and Pennsylvania Dept. of Environmental Quality, 2001.

[42] Center for Building Performance and Diagnostics, 2005.

- **Energy:** All of the buildings performed better than the Commercial Buildings Energy Consumption Survey (CBECS) averages and most performed better than the GSA goal. On average the office buildings in this study performed 29% better than the CBECS national average for office buildings. There was wide variability among the 12 buildings studied.
- **Maintenance and operations:** Average maintenance costs (general maintenance, ground maintenance and janitorial costs) for the sustainable buildings were 13% less than the average baseline cost.
- **Waste generation and recycling:** All of the buildings were below the baseline for waste costs per occupant per year.
- **Occupant satisfaction:** All of the GSA buildings in this study scored above the 50^{th} percentile for general building satisfaction based on the Center for the Built Environment (CBE) survey (reformatted by GSA for this study as the Sustainable Places and Organizational Trends (SPOT) survey.) On average, these buildings scored 22% better than the CBE 50^{th} percentile.
- **Transportation:** The commute distance traveled and emissions from the identified transportation modes result in lower emissions than the average office worker commute.

c. "The Economics of LEED for Existing Buildings," Leonardo Academy Inc., April 21, 2008

The survey data presented in this report was gathered in 2006-2007. The survey was sent to the owners or managers of 53 LEED-EB certified buildings and 23 of them returned the survey. This represented a response rate of 43 percent.

The following key conclusions were extracted directly from the report:[43]

- The costs for LEED-EB implementation and certification varied significantly from building to building. The total costs were a mean of \$2.71 per square foot, with a median of \$2.31 per square foot. The results did not follow expectations of higher costs for higher certification levels, but this may be due to the very small sample size available.
- In all the categories of operating costs, more than 50% of the LEED-EB buildings had expenses less than the BOMA average for the region. Total expenses per square foot of the LEED-EB buildings were less than the BOMA average for seven of the eleven buildings (64%).
- Total operating expenses in LEED-EB certified buildings had a median of \$6.07 per square foot, 13% less than the \$6.97 average for BOMA buildings.

[43] While not reported in this report, the study does provide an assessment of the cost to achieve specific LEED-EB points.

3. Building Energy Use

In summary, evidence from the key studies to date looking at actual energy-use savings from LEED certified buildings[44] suggests such buildings use 15% to 40% less "site" energy than non-LEED buildings, consistent with the anecdotal evidence the Consortium has accumulated from numerous case studies.[45] Actual energy savings in EnergyStar buildings has also been found to be in the 30% range.

While average site energy savings range from 15% to 40% in key studies, there is an even wider variability in performance around the mean More importantly for real estate investors, actual energy performance was not closely correlated with modeled performance at the property level, increasing uncertainty and risk in forecasting savings. Many factors are cited to explain the variability in forecasts including the occupancy type and energy intensity of the users.

The most widely cited source of energy performance evidence, the February 2008 New Building Institute study, has been challenged by subsequent research. The 2008 NBI study concluded that LEED certified buildings on average use 25-30% less energy than non-LEED buildings. An initial follow-up study refining the NBI data and analysis concluded that energy savings were as low as 18%, ranging from 18% to 39%, but that 28% to 35% of the LEED buildings actually used more energy than similar conventional buildings. A second follow-up study reported as its main conclusion that LEED office buildings on average used 17% less site energy, but total source energy for LEED buildings was actually higher than the corresponding average for similar commercial stock.

Each of these three key studies brings up a myriad of complex statistical and energy measurement issues, and offers conclusions that suggest investors/valuers need to be careful in applying any general statistics to specific property analysis, and be skeptical concerning forecast energy savings or links between environmental certification and energy savings.

However, as LEED and other environmental certifications are becoming more energy sensitive, and energy technologies and strategies become more tested, results and commentary from properties certified in the first five years of this century will not define what is possible or likely with energy efficiency and renewal strategies. The key is to be an informed consumer of "scientific" research.

Each of the key studies identified below are analyzed in detail in Expanded Chapter IV.

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[44] It should be noted, and considered in evaluating the results, that even the studies cited here published in 2008/2009 only evaluate buildings certified through 2006.

[45] Most building managers are familiar with site energy, the amount of heat and electricity consumed by a building as reflected in utility bills. Source energy represents the total amount of raw fuel that is required to operate the building. It incorporates all transmission, delivery, and production losses, thereby enabling a complete assessment of energy efficiency in a building. More detail on the differences and their importance can be found at http://www.energystar.gov/index.cfm?c=evaluate_performance.bus_benchmark_comm_bldgs .

- “Evaluating the Energy Performance of the First Generation of LEED-Certified Commercial Buildings,” Rick Diamond, Mike Opitz, Bill Von Neida, Shaun Herrera, 2006

- “Energy Performance of LEED NC Buildings,” Kathy Turner and Mark Frankel, New Building Institute, Feb. 29., 2008; G.R. Newsham., S. Mancini, and B. Birt

- “Do LEED-certified buildings save energy? Yes, but...,” The National Research Council of Canada, Aug. 2008

- “A Re-examination of the NBI LEED Building Energy Consumption Study,” John H. Scofield, Oberlin College, OH, August 2009

- “The Financial Benefits of ENERGY STAR Labeled Office Buildings,” Greg Katz and Jeff Perlman, February 2007

- “Participation in Voluntary Programs, Corporate Reputation, and Intangible Value: Estimating the Value of Participating in EPA’s ENERGY STAR® Program,” Lou Nadeau, Jeff Cantin and Richard Wells, June 24, 2003

- “Energy Management & Investor Returns: The Retail Merchandising Sector,” Innovest Strategic Value Advisors, February 2003

- “The Proof is Performance: How Does 4 Times Square Measure Up?” Adam W. Hinge, P.E. and Donald J. Winston, P.E., High Performance Buildings, Winter 2008

- “Energy Management & Investor Returns: The Real Estate Sector,” Innovest Strategic Value Advisors, October 2002

- “Core Performance Guide,” New Buildings Institute, Inc., July 2007

4. Occupant Performance

The fourth key component of sustainable building performance that we cover in this section of the condensed book is occupant performance. Occupants (tenants, owner-occupants, or visitors/customers) are the most critical component of building performance. Individuals and/or enterprises that are healthy, productive, profitable, and happy as a result of their buildings should respond favorably from a market perspective, enabling higher revenues, reduced risk, and improved financial performance for building owners.

Measure of Occupant Performance

Occupant performance has two key components of measurement, as shown below in Exhibit IV-2:

- The actual occupant: individuals working in or using space; and
- Enterprises that lease or own the space.

Exhibit IV-2 Measuring Building Performance: Occupants	
Individual	**Health** **Productivity** **Satisfaction**
Enterprise	**Reduction in Resource Use** • Reduction in energy and water use • Reduction in building waste • Reduction in pollution emissions • Reduction in carbon footprint **Improved Reputation / Leadership** • Recruiting • Employee retention / satisfaction • Public relations / brand management • Retain "social license" to operate • Improved marketing and sales • Increased company market value • Increased company market liquidity • Shareholder concerns addressed **Compliance With Internal / External Policies / Initiatives** • Corporate energy / sustainability requirements • Corporate social responsibility reporting • Global Reporting Initiative • Carbon Disclosure Project • Minimum requirements of socially responsible investment funds **Reduced Risk to Future Earnings** • Legal risks—sick building syndrome and mold claims, business interruptions, building remediation costs, etc. • Reduced sub-leasing risk if downsizing, relocating, etc. • Reduced operating cost volatility • Reduced risk to reputation • Improved defense of competitive advantages • Reduced risk of future compliance costs

While most researchers and industry analysts have focused on individual occupant performance (health, productivity and satisfaction), enterprise-level occupant performance is also critical to measure and understand. As shown above in Exhibit IV-2, enterprise-level occupant performance consists of reductions in resource use, improved reputation/

leadership, compliance with internal/external policies or initiatives, and reduced risk to future earnings. Individual occupant performance—health, productivity and satisfaction are part of enterprise level occupant performance.

Reductions in resource use have been discussed in the prior section. The key focus of occupant performance is the occupant's share of potential reductions in resource use/cost, relative to property owners.

Improved reputation/leadership can be measured directly by surveys, stock analyst reports, and indirectly through assessment of how sustainable property investment has influenced recruiting, employee retention or satisfaction, marketing and sales, and brand awareness. This "evidence" of occupant performance relative to improved reputation and leadership may be found in the surveys and market research done for other parts of an occupant's business, and not typically in a traditional building measurement or monitoring program.

Occupant performance relative to compliance with internal/external policies and initiatives can be measured through an examination of trends in the importance of owned or leased real estate to the Global Reporting Initiative, the Carbon Disclosure Project, the requirements of socially responsible investment funds, government agencies, or a corporation's own Corporate Social Responsibility strategy and communications. At a property level, the question is how important is sustainable owned or leased real estate to the types of tenants expected to be leasing in the building.

The final measure of enterprise-level occupant performance is reduced risk to future earnings. This type of performance can be measured through monitoring of litigation and legal costs, subleasing trends relative to sustainable property, energy cost volatility, and changes in the level of importance of sustainability to key employees, customers, capital providers, vendors, and other stakeholders. If the importance of sustainability increases to the stakeholders, the risks to future earnings, on either a positive or negative basis, could be significantly influenced by sustainable property investment.

Summary Conclusions on Occupant Performance

In summary, based on all of the Consortium's research, including its review of over 200 individual health and productivity studies identified in Appendices IV-C and IV-D of Expanded Chapter IV, its review of resource reduction in sustainable properties, its detailed analysis of the costs and benefits of sustainable properties in Chapter V, and its evaluation of corporate sustainability policies and trends towards sustainable buildings, **there is a clear positive relationship between sustainable property investment and occupant performance**. Occupant performance measurement is in its infancy, as is the occupant market's response to improved occupant performance, but the trends are supportive of further close attention and analysis.

The key scientific studies that support the Consortium's summary conclusion above and more detailed conclusions on health and productivity below are presented in substantial detail in Appendices IV-C and IV-D of Expanded Chapter IV. In Appendix IV-C, we first documented as many of the different alleged health or productivity benefits cited by the industry as we could find, then found the specific research study where the alleged benefit was cited. In this process, we identified over 100 additional, as yet un-cited research reports that may also be of interest. For Appendices IV-C and IV-D, the studies were categorized as follows:

Study Categories	Number of Studies	Percentage
Indoor Environmental Quality	64	27%
Temperature Control	15	6%
Lighting	19	8%
Privacy and Interaction	13	6%
Ergonomics	17	7%
Access to Natural Environment	36	15%
Whole Building	40	17%
Other References	33	14%
Total	**237**	**100%**

As is discussed in detail in Expanded Chapter IV, care must be taken in citing and using specific numerical conclusions from many of the studies, but existing research has established a clear positive relationship between certain sustainable building outcomes and positive health benefits.

Two good additional resources for looking at Indoor Environmental Quality and Productivity issues from a more practical real estate based perspective are a recent study: "*Green Buildings and Productivity*" published in the Fall 2009 Journal of Sustainable Real Estate, and a series of articles and studies presented at the Yourbuildings.com web site under "Indoor Environmental Quality":
http://www.yourbuilding.org/Article/News.aspx?p=82&c=4

Green Buildings and Productivity, by Norm Miller and Dave Pogue, addresses the question of whether green buildings improve productivity, with a focus on office properties. They provide interesting insights on measurement and summarize the results of scientific and more practical studies. They then went further to test the hypothesis that LEED and EnergyStar buildings increased productivity by surveying over 2000 tenants who had moved into 154 LEED or EnergyStar buildings managed by CB Richard Ellis. They received 534 responses and found that 55% agreed or strongly agreed that employees where more productive, while 45% suggested no change. As to sick days, 45% thought there was fewer sick days taken, 45% thought it was the same and 10% thought there were more sick days.

Summary of Health and Sustainable Property Conclusions

Sustainable buildings that control moisture, control pollutant sources, improve ventilation and access to outside air, promote access to the natural environment, and pay attention to ergonomic furniture and interiors have been documented to improve health. Reduction of sick building syndrome, improved respiratory health, headache reduction, reduction of colds, reduction of asthma, stress reduction, and improved emotional functioning and cognition are some of the positive health outcomes that are possible.

The specific property type, size, age, location, and description need to be considered when applying findings from the key scientific studies. Are the indoor air quality, lighting, temperature control and other outcomes projected for a building similar to the outcomes on which the health and productivity studies were based?

Given that most health and productivity studies isolate the effects of a specific outcome like temperature control, it is important not to double count health or productivity gains, and consider the implications of the quality of the scientific studies and the ability to control for factors independently in the analysis of health and productivity benefits. In particular, given the very limited knowledge on the dose-response relationship in many studies, very specific quantitative conclusions may not be reliable. [46]

Fortunately, in the real estate investment community, perfect science or knowledge about the potential health or productivity benefits of sustainable property investments is not required. What is required is appropriate caution in the use of health and productivity studies so as not to mislead decision-makers based on incorrect or incomplete presentation of results and caveats. Application of specialized Health Benefits sub-financial analysis (see detail in Chapter V, Section C-2) can also be important.

Real estate investors are used to dealing with uncertainty. Accordingly, even if it is not scientifically possible to provide a specific quantitative estimate of health or productivity benefits that would result from a particular investment in sustainable property, a thoughtful and independent analysis of the potential benefits to occupants, and how potential occupants for the specific building would react to such information, is particularly important. What has been shown with significant anecdotal evidence, and in occupant surveys, is that due to the "precautionary principle," even a potential for improved health or productivity by occupants will be more than sufficient to justify any additional cost to create the potential benefits.[47]

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[46] While the scientific studies have been fairly conclusive in establishing relationships between outcomes like low ventilation rates and adverse health, the studies have been less successful in clearly establishing a dose-response relationship that would enable more precise understanding of how the level of ventilation rate, or the level of daylighting affects health or productivity.

[47] The *precautionary principle* is a moral and political principle which states that if an action or policy might cause severe or irreversible harm to the public or to the environment, in the absence of a scientific consensus that harm would not ensue, the burden of proof falls on those who would advocate taking the action [Raffensperger C. & J. Tickner (eds.), *Protecting Public Health and the Environment: Implementing The Precautionary Principle*, Island Press, Washington, DC, 1999]. The principle implies that there is a responsibility to intervene and protect the public from exposure to harm where scientific investigation discovers a plausible risk in the course of having screened for other suspected causes. The protections that mitigate suspected risks can be relaxed only if further scientific findings emerge that more robustly support an alternative explanation. In some legal systems, as is the law of the European Union, the precautionary principle is also a general and compulsory principle of law [Recuerda, Miguel A., "Risk and Reason in the European Union Law," *European Food and Feed Law Review,* 5, 2006]. (Wikipedia, August 2009)

The best, and most scientifically sound summary of the potential health benefits of sustainable properties is available on Lawrence Berkeley National Laboratory's Indoor Air Quality Scientific Findings Resource Bank website (http://eetd.lbl.gov/ied/sfrb/).

Summary of Productivity and Sustainable Building Conclusions

Substantial research has established a positive relationship between occupant productivity and improved indoor environmental quality (IEQ), temperature control, lighting/Daylighting, and noise reduction. As summarized in the scores of studies identified in Appendices IV-C and IV-D of Expanded Chapter IV, productivity benefits for individual IEQ, temperature control or lighting attributes range from 1-2% to over 20% in some cases.

Again, these studies provide a strong basis for development of hypotheses about potential gains from productivity that need to be tested at an individual building level. Does the building being valued or underwritten have the features or sustainable outcomes cited in the most important studies? Are the property type, time period, type of occupant, and other details similar to the key important studies?

For productivity studies in particular, it is important to understand the specific measure of productivity used. Productivity measures used in these studies include the speed and accuracy of office work tasks, the speed of completing academic work, the speed and accuracy of typical office tasks, test scores, improved proofreading or creative thinking, etc.

It is also important to understand that most of the studies are independently evaluating a particular attribute, like temperature control, and it is not proper to directly add productivity gains from different features. In fact, given the many different factors that affect productivity, including scores of issues that major companies have been studying and working on for over a hundred years, there are significant statistical problems in controlling for all the factors that affect productivity. Additionally, as with health studies, it is difficult to conduct good studies given the problems in getting cooperation from workers, companies, unions, etc.

A thoughtful two-page summary of the impacts of indoor environments on human performance and productivity can be found at the Lawrence Berkeley National Laboratory's Indoor Air Quality Scientific Findings Resource Bank website: (http://eetd.lbl.gov/ied/sfrb/).

Key Considerations in Assessing Occupant Performance Information

Identifying, evaluating, and applying the results of research testing the relationship between sustainable building features/ outcomes and health and productivity benefits is challenging. Fortunately, the challenge is not dissimilar to the difficulties the business world faces in the application of any scientific or academic study. In addition, as discussed above, perfect studies or knowledge about the relationship between buildings and health or productivity is not required in order to be useful.

Measuring building occupant performance is also important and beginning to get more attention. For example, the National Australian Built Environment Rating System's (NABERS) latest benchmark tool is set to provide building managers with the means to identify potential issues within their buildings, as well as compare how they are performing against their peers. Developed by the NSW Department of Environment and Climate Change, the NABERS Base Building Indoor Environment rating tool will allow you assess the air quality, acoustic and thermal comfort of your building. The rating tool can be used to rate tenancies, the base building or the whole building.[48]

Some of the key issues to be considered in assessing and applying the results of health and productivity studies that are fully discussed in Expanded Chapter IV include:

- Identification of and access to key research.
- Understanding how and why sustainable property outcomes affect health and productivity.
- Linking specific features/strategies to sustainable outcomes.
- Statistical/data problems.

While the studies linking indoor environmental quality, lighting, daylighting, temperature control, noise, and other sustainable outcomes to building health or productivity are robust in many cases, the studies are often insufficiently specific to enable a clear relationship between the amount of the sustainable outcome (lighting, noise, etc.) and building health or productivity. Accordingly, it makes it difficult to assess whether a particular building, with its sustainable outcomes or designed outcomes, will be sufficient to achieve the results identified in the studies.

5. Durability/Flexibility/Adaptability

Durability is an important component of a sustainable building. Durable buildings, and the materials and products that go into them, maximize the time available to benefit from environmental benefits the buildings provide. Additionally, given the substantial embedded energy in existing buildings, more durable buildings reduce energy consumption and carbon output significantly, as well as reduce waste in landfills.[49]

[48] From article posted 11-25-09 at Yourbuildings.org:
http://www.yourbuilding.org/Article/NewsDetail.aspx?p=83&id=2350

[49] The energy required to build a building is approximately 10-20% of a buildings total energy used during its lifetime. This is an estimate from specialists I have talked to, but is highly variable based on the building type, buildings energy use, etc.

Building durability is significantly influenced by its flexibility and adaptability to changing tenant and investor demands. Buildings are frequently torn down or substantially retrofitted due to functional or economic obsolescence, not just structural, product or material failures. Flexibility of space has been studied in the corporate real estate sector for years and is a key attribute sought by corporations. Flexibility and adaptability can be aided by underfloor air distribution and many other design and construction techniques.

One of the problems with durability is that it is difficult to define. Should it be defined as the lifespan of a building, the durability of its components, the level of operations and maintenance required, or some combination of the three? In the GreenSpec Directory©, durability and low maintenance are considered together as a criterion for product selection.[50] Durability can be defined or rated through review of specific building or product requirements, evidence of performance, or through documentation of a process to promote durability.

LEED Canada has directly addressed durability for a few years. LEED Canada's "Materials and Resources Credit 8 – Durable Building" requires building designers to develop a Building Durability Plan to ensure that the predicted service life of the building and its components exceeds the design service life. The credit draws from Canadian document CSA S478 –" Guideline on Durability in Buildings" to establish requirements and minimum benchmarks to achieve the point. A project team is required to demonstrate that the building has been designed to achieve the established service life by "documenting effectiveness, modeling, or testing in accordance with Clauses 7.3, 7.4, and 7.5 of CSA S478" and by completing several tables within the Guideline.

A thorough, more convincing set of recommendations and guidelines for increasing the durability of buildings can be found in Building Science Digest 144, "Increasing the Durability of Building Constructions," written by renowned building scientist Joseph Lstiburek. In this paper, the author describes building failure mechanisms, what we already have in codes and federal requirements to minimize failures, what we cannot control and design for, and the four remaining things that we can design and plan for: water, heat, ultraviolet radiation and insects. These four "damage functions" are the main focus of the document and arguably address more than 90 percent of current industry durability issues."[51]

Key elements of durability include[52]:

[50] "Durability, a Key Component of Green Building," *Environmental Building News*, November 2, 2005.

[51] "Straight Green: Green Building Rating Systems and Building Durability: Walls and Ceilings," Chris Dixon, June 24th, 2008.

[52] This list is summarized from the article "Durability, a Key Component of Green Building," *Environmental Building News*, November 2, 2005.

Moisture control: Moisture problems, due to problems in building envelope design-partially as a result of the sustainability goals of more outside air and daylighting—are a significant cause of durability problems. This is particularly true for residential, but also an issue with some commercial properties.

Thermal Stress: Heat can cause materials to expand and contract, affecting durability.

Sunlight: Ultraviolet light degrades most materials.

Ozone and Acid Rain: Ozone and Acid rain degrade materials.

Insects: Insects, mostly termites, cause billions of dollars of damage annually.

Material Failure: Materials wear out at different rates.

Building Function: A building's ability to adapt to changing needs is key to its durability. Functionality has been shown to be more important to durability than physical issues.[53]

Style: Similar to building function, buildings with "timeless" style tend to last longer and are better maintained.

Natural Disasters: Durable buildings must meet the design requirements of their localities—hurricanes, earthquakes, tornados, floods, and fires.

F. Market Performance

1. Introduction

There is substantial evidence to support enhanced regulator, space user, and investor demand for sustainable properties. The significant demand for sustainable properties is evidenced by expert-based financial analyses, statistical based analysis, survey/market research, and well-reasoned valuation theory.

Market performance is the missing link that ties building performance information to financial performance. Historically, the green building industry has done a poor job of articulating the value of sustainable property investment because they have equated building performance (energy/water savings, health and productivity benefits, etc.) with financial performance, without taking the critical intermediary step of assessing of the response of the market to the building's performance (see Exhibit IV-3 below). Full

[53] Athena Institute Study for Forintek Canada in 2004 examined 277 commercial and residential buildings demolished between 2000 and 2003 in St. Paul Minnesota and found 31% were torn down due to physical condition and 57% due to redevelopment or buildings were not suited for intended use. 63% of the structural concrete buildings, 80% of the steel buildings and only 14% of the wood frame buildings were less than 50 years old. (Minnesota Demolition Survey, Phase II Report, Athena Institute, 2004) http://www.athenasmi.org/publications/index.html

consideration of the market's response to a building's performance ensures proper consideration of revenue and risk, and important issues like the allocation of costs and benefits of sustainability between owners and tenants.

Exhibit IV-3

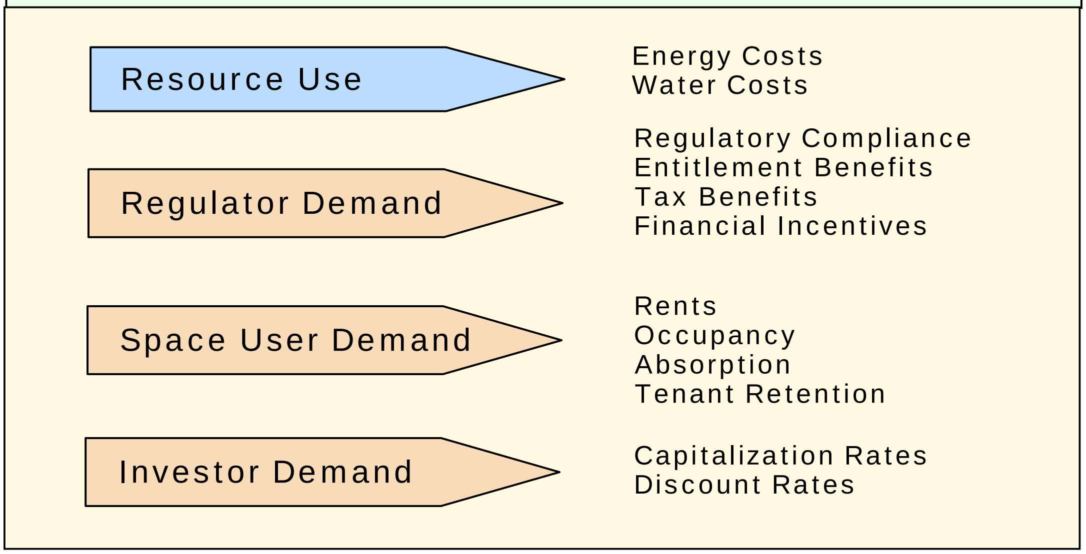
Sustainable Property Market Performance: The Missing Link

Building Performance	Market Performance	Financial Performance
Development Cost Resource Use Location/Access Occupant Performance Sustainability Compliance Flexibility/Adaptability Public Benefits	Market Demand (Indicators) Regulators Level of regulation Entitlement benefits Tax benefits Financial incentives Space Users Occupant type Internal requirements External requirements Cost-benefit allocation Sustainable property options Investors Investor type Internal requirements External requirements Recognition of space user/ regulator demand	Recognition of Market Demand Determine Key Inputs Calculate Results Assess Risks

While downplaying market performance issues is a critical problem in general performance or cost-benefit studies, it is a fatal error in the ability to assess the financial implications of sustainable property investment for an individual property. As shown in Exhibit IV-3, to get from building performance to financial performance for a specific property, you must evaluate the market demand for sustainable property by regulators, space users, and investors, then assess whether brokers, appraisers, and lenders in the specific markets where the property is located recognize sustainable market demand. Finally, you must determine key financial model/valuation inputs factoring in both sustainable and non-sustainable issues.

Regulator, space user, and investor demand are critical to value, as shown below in Exhibit IV-4. If valuers only considered resource use (energy costs, etc.) and ignored market performance, as measured by demand, key value issues affecting entitlements, rents, cap rates and other issues would be ignored. In essence, revenue and risk considerations would not factor into decision-making, a recipe for long-term underperformance.

Exhibit IV-4
Sustainability Demand Affects Value Inputs



To better understand and ease the interpretation of sustainable property market and financial performance research, we segment and categorize the research into four key types:[54]

- **Expert-based financial analyses.** Conducted primarily by valuers/market analysts on a property-by-property basis following traditional valuation practices.
- **Statistics/modeling-based financial analyses.** Conducted primarily by academics applying statistical modeling techniques to large databases of properties.
- **Surveys/market research.** Surveys and related market research studies addressing regulator, space user, and/or investor demand.
- **Foundational background and theory.** Foundational research and theoretical studies that address key issues in sustainable property valuation and financial analysis.

2. Three Principles for Applying Sustainable Property Market Performance Research

Prior to the presentation of the market performance evidence for sustainable properties, it is important to understand some guiding principles to assist in understanding how market performance evidence can be used to aid decision-making. Three important principles are discussed below:

- **Principle One:** Different decisions require different types of market data.

[54] We combine sustainable market and financial performance research together because much of the research in the field covers both these topics in their studies.

- **Principle Two:** Failure to understand market research methods will lead to failure in interpretation and application.
- **Principle Three:** Sweat the details when applying market research to property level decisions.

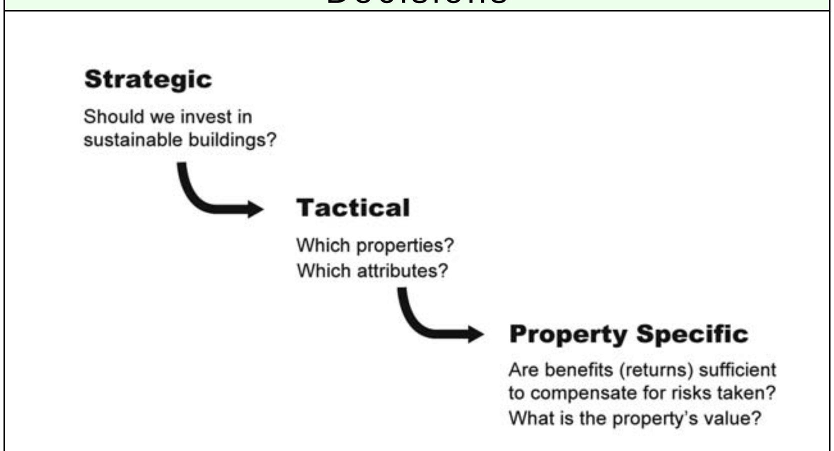
These principles are summarized below and presented in more detail in Expanded Chapter IV.

Principle One: Different decisions require different types of market data

Sustainable property market performance research can be interpreted and applied in many different ways. Unfortunately, if a user of market research does not understand the details of the market research, or the types of decisions that it is most applicable to, research results and conclusions can be misused and misunderstood, as happens frequently regarding sustainable properties in the industry and media.

One particularly important framework for differentiating sustainable property investment decisions is illustrated in Exhibit IV-5 below. This framework, based on traditional management consulting practice, differentiates strategic or enterprise decisions from business unit or operating decisions.

Exhibit IV-5
Sustainable Property Investment Decisions



Strategic decisions are those made by pension fund boards, corporation boards, CEOs, and other leaders who must make decisions about how they are going to respond to the broader issue of sustainability, and the more specific issue of sustainability within their real estate portfolios. Statistics/modeling-based research, surveys, valuation theory and other market/performance research that "generally" addresses the importance of sustainable property is important and applicable to these decisions.

Once a strategic decision is made that sustainable real estate is an important consideration, implementation is passed down to corporate real estate heads, pension fund portfolio managers, asset managers, and others who are charged with the tactical responsibility to determine the nature of the organization's response. Should sustainability investments be phased? How should they be phased? Should we just work on our office portfolios, or are all property types of concern? Which properties should we focus on? Which sustainability attributes? How do we measure and assess where we currently stand and track progress moving forward? The types of research applicable to strategic decisions can help here in developing portfolio strategies, but more detailed "sustainability options analysis" (See Chapter V, Section C-2) and property level analysis become more important.

Property specific decisions are quite different than either tactical or strategic decisions. Key questions include: How do we underwrite the risks and returns of specific investments in sustainable features for a given property? Are the benefits (returns) sufficient to compensate for the risks taken for investment in a particular property? How will the market respond to sustainable property improvements?

Principle Two: Failure to understand types of market research will lead to failure in interpretation and application.

The strengths, weaknesses and purpose of sustainable property market research guide proper interpretation and application.

Expert-based financial analyses provide the most reliable results because the general conclusions offered by such studies are based on detailed property-by-property analysis following traditional real estate market analysis practices. It should be understood that the caveats and hedging of conclusions often found in these studies reflect a recognition by experts that general conclusions based on detailed property analysis are difficult and always subject to caveats. Failure to acknowledge forecasting risk makes research more difficult to interpret by decision-makers.

Statistics/modeling-based financial analyses are primarily applicable to strategic decisions, where general conclusions about markets and properties can be quite valuable in moving enterprise level decision-makers to invest resources to better understand sustainable property investment, but have limited use for property level decisions.

Surveys and market research help valuers/underwriters understand key factors driving sustainable market demand by type of occupant, demographic or geographic characteristics, type of sustainable property attribute and other factors. This work is critical to enabling market demand estimates for specific properties.

Foundational background and theoretical research provides the necessary linkages and intellect required to develop sound market research methodologies and properly apply results.

Principle Three: Sweat the details when applying research to property level decisions.

The most important guidance in interpreting and applying any of the four types of sustainable property market performance research to property level decisions is to sweat the details.

For example, if an attempt is made to apply statistics/modeling-based financial analyses to a property level decision, it is critical to fully understand the data, sample size issues, control factors, and other details. At best, these types of studies will provide general confirmation for financial assumptions that should be derived from more property-specific methods, and may affect the risk or uncertainty of a particular financial assumption. (Expanded Chapter IV, Section F-2 provides significant additional background on interpreting and using statistics/modeling-based studies.)

Sweating the details does not only apply to statistics/modeling-based financial studies but also to surveys and expert-based financial analyses. For surveys, to properly apply the results, it is critical to understand the date the survey was conducted, the specific context for the survey, the specific types of respondents, the date the survey was administered, the geographic regions and property types that were discussed, and the quality (lack of bias in its structure) of the survey questions and vehicle.[55]

For expert-based financial analyses, it is particularly important to understand potential researcher bias, the nature of researchers' expertise, and the depth and comprehensiveness of the analytic procedures that they performed in coming to their conclusions.

3. Presentation of Market Performance Evidence

a. Expert-Based Financial Analyses

Real estate valuers or market analysts typically conduct Expert-Based Financial Analyses. The basis for conclusions in these studies is typically drawn from specific analyses of buildings, following a process that is similar to a traditional market analysis process, although typically more cursory. Key studies of this type draw general conclusions based on detailed property-by-property analysis of a portfolio of properties. Strong single-property case studies, if independently done by a specialist using appropriate practices, would be considered Expert-Based financial research.

In Expanded Chapter IV, we review and present the findings from six important Expert-Based Financial Analyses:

[55] The sustainability and real estate industry would benefit if organizations conducting surveys with the intent of assisting investor decision-making disclosed these and other details when reporting survey results, or provided links where such detailed information can be obtained. Such information should also be provided to the media.

1. "Do Green Buildings Make Dollars and Sense?" Norm Miller and Dave Pogue USD-BMC Working Paper 09-11, Draft: November 6th, 2009
2. "High Performance Green Building: What's It Worth? Investigating the Market Value of High Performance Green Buildings," Theddi Wright Chappell, Chris Corps, May 2009.
3. "Green Value: Green Buildings, Growing Assets," Royal Institute of Chartered Surveyors, Canada, 2005, Oct. 2005.[56]
4. "Valuing Green: How Green Buildings Affect Property Values and Getting the Valuation Method Right," Richard Bowman, John Wills, Green Building Council of Australia, 2008.
5. "Financial Analysis of LEED EB Implementations," Craig Sheehy, Envision Realty, 2008.
6. "Energy Efficiency Improvements: Do They Pay?", Brian A. Ciochetti and Mark D. McGowan, MIT Center for Real Estate, February 2009.
7. "Towards a Green Building Infrastructure Investment Fund," Trent Berry, Compass Resource Management, February 2007.

Summary Conclusions From Expert-Based Analyses

These types of studies and research provide the best evidence of sustainable property market and financial performance. These studies are typically conducted by experts in real estate valuation or market analysis, and follow in form, if not always in depth, the process used by valuers and market researchers to generate rents, cost, and related real estate property financial assumptions.

In summary, the Expert-Based Financial Analyses support the following conclusions:

- Faster absorption of tenants—improved pre-leasing;
- Achieve competitive rents—in some cases higher then competitors;
- Reduced tenant turnover;
- Higher equilibrium occupancies;
- Competitive lease terms;
- Reduced operating and maintenance costs;
- Attract superior grants, subsidies and other inducements; and,
- Achieve high or moderately high tenant satisfaction scores.

The expression of increased occupant demand was not consistent across properties or studies, with some projects experiencing faster absorption and higher occupancy, but not significantly higher rents or better lease terms. Investor and tenant interviews on specific

[56] This study is also sponsored by BC Hydro, the British Columbia government, English Partnerships, Greater Vancouver Regional District, Green Buildings BC, the Canada Green Building Council, Natural Resources Canada, Resources naturelles Canada, and Realpac.

projects supported increased value conclusions and suggested trends of increased tenant and investor demand moving forward. As to the magnitude of potential value increases, this was not specifically quantified, but on average incremental value increases of around 10% was suggested.

The working draft study by Dave Pogue and Norm Miller is particularly interesting in that they draw upon the results of a survey of over 750 occupiers from 154 of LEED or Energy Star buildings. They supplemented their survey with a survey of CBRE property managers of the buildings who provided detailed operations and expense data for each of the subject properties. They found that green buildings were operated more intensively, and overall total operating expenses were not that different. Separate metering was found to be almost as important as a significantly improved EnergyStar score in saving energy. Green buildings had higher wage tenants who indicated they felt more productive, but were not yet willing to say they would pay more.

In one important study of investors in Australia, the majority of investors indicated that they would pay more for a Green Star building. The improved marketability of Green Star buildings is their main current competitive advantage: they are easier to sell and lease, which reduces vacancy times and hence income losses. Many investors and owners/managers believe Green Star buildings are ‘future proofed’ against the risk of rising energy costs, market rejection of non-Green Star buildings and tightening regulations on building sustainability performance.

Another interesting analysis of 59 LEED Existing Building (EB) implementations showed that returns were robust, with an average payback of 1.5 years and a simple return on investment of 69%. All of the 59 projects demonstrated positive returns, with a minimum return of 11% and maximum payback period of 9 years. Returns were strong across geographies and for Certified, Silver and Gold LEED certifications. Implementation cost per square foot averaged a minimal $0.23 and ranged from $0.08 to $0.95 per square foot. The office properties in the analysis averaged 406,000 square feet and were geographically dispersed through much of the United States. Ownership was typically institutional or large private investor.[57]

The results of the study of 59 buildings presented above are most likely influenced by selection bias, making the results more robust than the average results for a typical portfolio of buildings. Selection bias arises because service providers and owners are more likely to prioritize the properties they convert to LEED, with the easiest and most profitable the first to convert. Offsetting the potential selection bias is improvement over time due to experience.

Another observation is that for these buildings, the decision to obtain LEED EB was not a significant investment, suggesting more robust investment and sustainability goals might be

[57] Envision Realty, June 2009.

warranted based on the high level of return that was achieved, even prior to considering any risk or revenue benefits.

b. Statistics/Modeling-Based Financial Analyses

Statistics/Modeling-Based studies typically will involve a large number of sustainable and non-sustainable properties, with statistical modeling focused on determining the incremental contribution of a sustainable certification or rating on rent levels, sales prices, occupancies, or other specific financial variables. These studies are typically completed by academics with real estate and/or finance backgrounds. Six of the most important studies of this type are identified below:

1. “The Investigation of the Effects of Eco-Labeling on Office Occupancy Rates”, Frank Furst and Patrick McCallister, Journal of Sustainable Real Estate, Fall 2009

2. “New Evidence on the Green Building Rent and Price Premium,” Frank Fuerst and Patrick McAllister, Presentation to ARES conference, April 3, 2009.

3. “Doing Well by Doing Good? Green Office Buildings,” Piet Eichholtz, Nils Kok, and John M. Quigley, UC Berkeley Fisher Center for Real Estate & Urban Economics working paper, January 2009.

4. “Does Green Pay Off?” Norm Miller, Jay Spivey, Andy Florance, *Journal of Real Estate Portfolio Management*, Fall 2008.

5. “Green Design and the Market for Commercial Office Space,” Justin Benefield, Jonathan Wiley and Ken Johnson, *Journal of Real Estate Finance and Economics*, forthcoming.

6. “The Greening of US Investment Real Estate—Market Fundamentals, Prospects and Opportunities,” Andrew Nelson, RREEF Research, November 2007.

Summary of Consortium Conclusions on Statistics/Modeling-Based Financial Analyses

The statistics/modeling-based financial analyses cited above provide “general” support for a positive relationship between a green building certification (LEED or EnergyStar) and improved rents and sales prices for commercial properties. However, all of the studies have significant methodological, data, and statistical limitations that limit the reliability/applicability of the numerical conclusions to specific property valuations.

While the specific numerical results may be of limited reliability, it does not imply that the rent and sales price premiums are necessarily overstated, just that methodological and data limitations introduce substantial uncertainty in the specific numerical results.

In reviewing and applying the information from the six studies cited above, it is critical to know what they are, and what they are not. The methodologies in the studies do not reflect industry practice for assessing rent and price premiums in individual properties, and methodology and data limitations are significant, and in most cases acknowledged by the authors in their work. Use of the statistics without appropriate understanding of the caveats and the coverage of the studies is not appropriate. In most cases, the studies cover only office buildings in the United States, so any application to other property types or regions needs to be carefully considered.

Small sample size, problems in controlling for time, and numerous other statistical problems are particularly relevant for the sales price premium analysis, but also apply to the rent premium analysis in the cited studies. For example, one of the limitations of the studies is that they tend to focus on rents, while many other important value increasing attributes, like faster absorption, better lease terms, higher tenant retention rates, and lower risks (discount and cap rates) are also possible indicators of tenant preference, but these variables are not evaluated in the existing studies

Keeping the caveats and application cautions in mind, what do the four statistical studies actually show?[58] As shown in Exhibit IV-6 below, with the exception of the Wiley and Johnson paper, which we were not able to review in detail, rent premiums from LEED properties were shown to be from 0% to 6%, and EnergyStar premiums ranged from 3.3% to 5%. The Fall 2009 study by Fuerst and McCallister reported occupancy rates in LEED buildings 8% higher, and in EnergyStar buildings 3% higher.

These rent and occupancy results, while subject to significant statistical and methodological issues, at least appear plausible, based on the Consortium's assessment of scores of tenant surveys and discussions with many more tenants and investors. It should be noted that many types of tenants, in different markets and property types, have reported that they would not pay more, suggesting caution in applying any average figures to any particular building. The Consortium's research to date suggests that the increasing space user demand for sustainable properties is more likely to be reflected in absorption rates, tenant retention, and adjustments to risk, rather than a direct rental price premium.

[58] The analysis in "The Greening of US Investment Real Estate—Market Fundamentals, Prospects and Opportunities," by RREEF Research in November of 2007 does not do a controlled statistical study, but rather compares occupancies and rents between certified and non-certified properties, and thus does not meet the statistical rigor that is attempted by the other four studies listed above.

Exhibit IV-6
Statistics/Modeling-Based Sustainable Property Financial Analysis

	Rent Premiums		Sales Price Premiums	
	EnergyStar	***LEED***	***EnergyStar***	***LEED***
Fuerst & McAllister, April 2009[1]	5%	6%	31%	35%
Eichholtz, Kok & Quigley, January 2009[2]	3.3%	0%	16%[2]	0%
Miller, Spivey & Florance, Fall 2008	N/A[3]	N/A[3]	5.8%	9.9%
Wiley & Johnson (forthcoming)	7%-9%	15%-17%	$30/sq.ft.	$130 sq.ft.

[1] Fuerst & McAllister disclose many of the problems with their methodology and data, and conduct a more robust statistical analysis on a smaller, more comparable sample of office properties that results in a 3.7% rent and 19.6% sales price premium for LEED.

[2] The authors make an adjustment for occupancy level, which changes results to show a 6% premium for EnergyStar. The premium for LEED in this adjusted approach was 9%, but not statistically significant. The sales price calculation is not independently derived, but rather based on rent premium and cap rate assumptions using direct cap sales method.

[3] No statistical analysis of rent premium included as part of their analysis.

Sales price premiums from the studies ranged from 5.8% to 31% for EnergyStar properties and 9.9% to 35% for LEED certified properties. Due more severe statistical, methodological, and data problems in sales price analyses, the Consortium places little confidence in these specific numerical results. [59]

The Consortium's work confirms that sustainable properties should be more valuable, due to increases in regulator, space user and investor demand, and a "net" positive risk assessment, but do not believe that the numerical results from most statistics/modeling based studies of sales price premiums are reliable indications of potential value increases at this time.

c. Surveys and Market Research

This category includes a broad array of research including tenant/occupant surveys, investor surveys, general surveys of corporate sustainability trends, sustainable related market or demographic research, tenant segmentation analysis, and other research that would contribute to an understanding of space user and investor demand and its implications on their willingness to pay more for sustainable real estate.

One of the difficulties in presenting market performance evidence for sustainable properties is that market analysis is inherently micro-analysis, involving detailed property-specific analysis. Accordingly, general statements about space user demand are also difficult

[59] Sustainable Real Estate Development: The Dynamics of Market Penetration by John Goering, published in the Fall 2009 *Journal of Sustainable Real Estate*, provides a good summary of statistics-modeling based research, and the issues involved in applying the conclusions of this research. He also looks at the key issues influencing the adoption of sustainable building in the industry.

because the analysis of the market demand by potential occupants for sustainable space is a function of the type of property, the particular geographic market, the profile of actual or potential property occupants, and other factors such as existing lease structures and market conditions.

Investor demand is somewhat easier to address generally, given the more regional, national, or even international capital markets for many real estate properties, but the type, size, quality and other attributes of a property will significantly influence a particular property's investor demand due to its sustainability. Most importantly, investor demand is largely derivative of regulator and space user demand, which are unique to specific properties.

Surveys and related market research make up the bulk of what actual valuers and underwriters use to value and underwrite the risks of sustainable properties. Expert-based research has been very limited to date, with only a handful of credible studies. Statistics/modeling-based market performance research has never been used by the industry to implement detailed property-specific valuation and due diligence. Accordingly, valuers and underwriters must collect and integrate many different sources of quantitative and qualitative research to assist them in deriving their opinions about key financial inputs including rents, occupancies, tenant retention, cap rates, discount rates, and expenses.

Surveys and market research are part of a broader array of supportive "Sustainable Sub-Financial Analyses" that we define and describe in significant detail in Expanded Chapter V-C and Appendix F. Sustainable sub-financial analyses are those analyses and models that provide quantitative insights/data that is typically combined with other information and analyses to aid valuers/underwriters in their specification of key financial assumptions in a discounted cash flow analysis, or a related traditional real estate financial model.

In Expanded Chapter IV, we highlight and discuss three key types of surveys and market research:

- Space user and investor sustainability surveys;
- Corporate sustainability surveys and research; and
- Tenant demographics and market segmentation.

Each of these types of research is briefly presented below.

Space User and Investor Sustainability Surveys

Space user and investor sustainability surveys provide insight into the potential magnitude and/or direction of sustainability demand by type of tenant or investor. Further segmentation by geography and/or property type and other categories is often possible. We identify and briefly describe approximately 50 of the most important tenant and investor surveys in Appendix D.[60] These surveys, which became more frequent starting in 2005 and 2006, demonstrate an increasing trend of tenant and investor understanding of, and interest in, sustainable property. Generally, space users indicate an interest in sustainability, and in some cases a willingness to pay, but also reinforce the importance of cost savings and related financial concerns. While space user demand has continued during the economic crisis, select surveys report an even greater focus on cost savings or value, with a priority on organizational survival, rather than sustainability.

Space user demand is not consistent across types of space users. Government organizations, larger corporations, space users with an affiliation or relationship with the sustainable industry, high technology organizations, and certain other tenant groups tend to show the strongest interest and demand for sustainable properties. Larger, more sophisticated properties and owners are more focused on sustainability generally, but enhanced demand in the multi-family and smaller building segments appears to be growing, though it is hard to pin down based on surveys done to date.

Surveys of investors, which tend to be mixed with other respondents, or part of larger surveys, are beginning to show a stronger interest in sustainable properties. Investors are responding to increased regulator and space user demand, indicating, at least for the larger institutional or private investors, aggressive programs of evaluating the energy efficiency and/or sustainability of their properties, and trying to figure out strategies for measuring, monitoring and improving their portfolios.

Evidence based on our discussions with scores of institutional investors, and as confirmed by select surveys, suggests that many investors are developing acquisition screens and criteria to assist in evaluating the potential economic or functional obsolescence, and the cost to cure such obsolescence in new properties that they buy. These trends are quite important, because they suggest concrete investor response to increased regulator and space user demand.

Corporate Sustainability Surveys and Research

Corporations and other owner-occupants are significant players in the commercial real estate markets. Corporations own approximately half of the commercial real estate market. Additionally, they lease a substantial portion of space owned by others.[61] Corporate sustainability surveys and research incorporate a broad array of work evaluating the

[60] This chronological list of survey research includes space user and investor surveys, surveys of other real estate industry professionals, and surveys of corporations regarding their general preferences for sustainability. Many of these surveys are available on the Consortium's website under index code 15.73 in the Research Library or Industry Links sections.

[61] This estimate is very approximate, based on a 20-year history of capital markets research by Scott Muldavin, and review of the "Non-residential Buildings Energy Consumption Survey" (CBECS) of the Energy Information Administration. According to the EIA and CBECS research as of 1999, there were 4.7 million commercial buildings in the United States, of which 89% were privately owned and 60% of those were owner occupied. A detailed breakout and analysis of the commercial building industry is provided in "Who Plays and Who Decides, The Structure and Operation of the Commercial Building Market, US Dept. of Energy, Innovologie, LLC, John Reed et al., March 2004.

corporate sustainability movement and related issues. The focus of this research from a real estate perspective is to understand how potential corporate space users “value” sustainability, and how important their real estate sustainability strategy is as part of their overall sustainability initiatives.

The results from the many surveys we have reviewed, and related research, show a clear trend of increasing focus by corporations on sustainability, with growing attention to real estate’s key role in sustainability and climate change. (See Appendix D and Research Library index codes 15.73 and 15.74).

Research analyzing the real estate components of the Global Reporting Initiative or Carbon Disclosure Project, analyses of corporate social responsibility reporting, as well as general surveys of corporate sustainability is the type of research categorized here. Additionally, more specialized studies of how corporations value sustainability-related benefits like reduced churn cost, increased space flexibility, or improved health and productivity of employees also fits in this category.

A key component of corporate sustainability research is not only to develop hypotheses of the types of space users that have a greater demand for sustainable real estate today, but also to understand the trends in which future tenants may demand such services. Any investor buying a multi-tenant building today, with leases rolling over years into the future, must be sensitive not only to today’s demand, but also to underlying changes in the market that could affect future demand and performance.

Tenant Demographics and Market Segmentation

This category of market research covers any kind of academic research or related study that provides a detailed understanding of space user demand for sustainability. An example of this kind of survey would be demographic research, such as has been done in the hotel industry, which assesses the demand for sustainability by potential hotel occupants based on their age. Of course, geographic, income, and other demographic characteristics could also be important in defining sustainability demand, enabling more informed decisions to be made by valuers and underwriters relative to the financial impacts of sustainability on key financial variables like rents, occupancies, cap rates, etc.

Important research that evaluates tenant market segmentation and related issues is being conducted utilizing CoStar’s Tenant Module that enables analysis of the types of tenants leasing, or not leasing, in sustainable properties. “Why Do Companies Rent Green? Real Property and Corporate Social Responsibility,” was published on June 4, 2009, authored by Piet Eichholtz, Nils Kok, and John Quigley, and more work is underway by the authors.

“Why Do Companies Rent Green” is an update of a similar paper from a year ago, focuses on the most critical question of every sustainable property valuation assignment—what drives the leasing of potential occupants of “this” building, and how important is sustainability to them? By providing descriptive and statistical analysis of tenant preferences for sustainability from over 1000 sustainable office properties and 3000 tenants of those buildings, Eichholtz, Kok and Quigley have provided invaluable insight to valuers and underwriters trying to understand how different types of tenants will respond to a building's sustainability. Their results on tenant preferences provide excellent hypotheses that valuers can now test through traditional market research and interviews at the property-submarket level.

Significant good work continues to come from Australia. In Benchmarking Sustainability, published June 2009 at Yourbuilding.org:
(http://www.yourbuilding.org/Article/NewsDetail.aspx?p=83&mid=1587,
the results of a Building Use Study, which compared an Australian building (The Szencorp Building) against 55 other Australian and 81 international buildings, and incorporated a follow-up survey of tenants, showed that tenants, three years after an initial survey was done, were dissatisfied with some of the promised sustainable benefits, but showed a high level of tolerance towards achieving solutions due to the buildings sustainability. Tenant education and behavior modification were identified as critical investments to maximize potential productivity benefits.

Courtesy Wikimedia Commons, Jo Duller

Key findings included:

- The Szencorp Building was the highest scoring Australian building in the international sustainable buildings benchmark dataset, achieving a 'Good Practice' rating for overall performance.

- Perceived productivity was in the top 9 percent of Australian buildings, but this was actually a 1.5 percent decrease from the 2006 results, which showed a 13 percent increase in productivity. Building use studies research shows only 30 percent of buildings have positive productivity ratings.

- Tenants rated the Szencorp Building's image and design as very positive, placing it fourth in the Australian dataset for image.

- The speed at which problems such as temperature were addressed rated better than the national benchmark.

- The 2006 study revealed tenants were very happy with the level of artificial and natural light, but the 2009 study showed that the tenants believed there was not enough natural light.

- 86 percent of staff were dissatisfied with ventilation, 70 percent were dissatisfied with cooling and 79 percent dissatisfied with heating. However, forgiveness for these matters was also high.

- 54 percent of tenants said they felt "more healthy" working in the Szencorp Building.

- The building's overall performance rating improved from 76 to 80 out of 100.

- Travel to work by bicycle increased from 5 percent in 2006 to 11 percent in 2009, but 61 percent of occupants travel to work by car, showing the importance of behavior programs alongside good building design.

There is growing market information available on the demand for green by different types of tenants (CoStar data on leases for example) and survey data that reflect different demographics, geographies, and other key issues. These studies are improving and being done more frequently.

For example, CoStar released some very interesting information on the leases and buildings that have been identified as green, as shown in Exhibit IV-7. This chart shows that for all leases signed in the database that CoStar maintains, law firms were the most likely tenant sector to sign leases in green buildings, with over 14% of all leases signed nationally in green buildings. As this data gets more robust, and can be effectively analyzed at a submarket level, it will provide significant insights into the potential space user demand for sustainable buildings based on the likely tenant profile that an owner is focused on serving.

Exhibit IV-7
Demand for "Green" Differs by Type of Tenant
CoStar Data: Leases March 2006 to March 2008

Rank by % Sq. Ft. Green	Industry Sector	Green Leases	Green Sq. Ft.	% Green Sq. Ft.
1	Law firms	131	2,219,470	14%
2	Insurance	49	953,423	10%
3	Financial Institutions	108	2,029,324	9%
4	Agricultural/Mining/Utilities	70	1,661,257	8%
5	Real Estate	38	305,006	5%
5	Accountants	17	127,266	5%
7	Computers/Data Process	43	952,157	4%
7	Engineers/Architects	39	391,518	4%
9	Business Services	95	862,683	3%
9	Medical	23	463,029	3%
9	Government	14	242,322	3%
12	Personal Services	67	899,447	2%
12	Communications	8	206,441	2%
14	Manufacturing	40	1,027,090	1%
14	Retailers/Wholesalers	34	733,814	1%
16	Transportation	6	138,687	0%

Source: CoStar Group Study—Presentation, April 2008

d. Foundational Background and Theory

This category includes foundational background research and theoretical studies that address key issues in sustainable property valuation and financial analysis. This work is typically completed by academics, leading industry specialists, trade groups and/or government. Theoretical research on valuation and financial performance of sustainable properties has received contributions from around the world since about 2000.[62]

Substantial work has been completed providing an emerging theoretical foundation linking sustainable property investment and improved financial performance and value. We present a chronological listing of key work in Appendix E.

[62] We identify a number of key researchers working on sustainable valuation and financial performance, but the list is by no means comprehensive; we apologize in advance for leaving out key researchers and look forward to hearing from others working in the field.

Sarah Sayce, Louise Ellison, and Judy Smith from the United Kingdom began publishing papers around 2003 and early 2004 that began to integrate sustainability into the appraisal of property worth. Their work was part of the Sustainable Property Appraisal Project[63] and was the first we reviewed that specifically addressed the theoretical foundation for linking sustainable property attributes and property performance.[64]

Chris Corps and a team consisting of Cushman Wakefield, LePage, Busby Perkins + Will BuildGreen Consulting, and DTC (UK) led a collaborative project and published "Green Value" in late 2005, still one of the best theoretical and empirical pieces of work linking sustainable property attributes and value. Chris Corps continued his work in the valuation arena through his founding of the Vancouver Valuation Accord and his continuing authoring of important theoretical and empirical works, including his May 2009 co-authorship with Theddi Wright Chappell of "High Performance Green Buildings: What's It Worth?" and "Valuing Sustainability," which he wrote as a special report of the Commission for Environmental Cooperation in the fall of 2007.

David P. Lorenz and Thomas Lütztendorf of Germany, who have written a series of papers that explore in detail the relationship between sustainability and market value and risk, have made substantial contributions. Simultaneous with the work by Lorenz and Lütztendorf, a number of Australians, including Richard Reed, John Robinson, Georgia Myers, Phillip Kimmet, and Stefan Trück, began developing additional theoretical support for the relationship between sustainability and the value of buildings. Their work and the work of many other important Australian sustainability authors was formalized into the YourBuilding.org website (http://www.yourbuilding.org/), which today is one of the best organized and most accessible websites providing a foundation for the linkage between sustainable property attributes and financial performance and value, written from a commercial real estate perspective.

Researchers in Japan have also made important contributions. Since 2005, Sumitomo Trust has been studying environmental added value. The Japan Real Estate Institute is studying sustainable valuation practices internationally. Professor Tomonari Yashiro of the Institute of Industrial Science at the University of Tokyo has been actively involved in key valuation research and has helped to tie together the relationship between sustainability and value. Kei Owada, of the Mitsubishi Research Institute and Masato Ito, of the Sumitomo Trust and Banking Company, Ltd., have also been publishing more recently on the critical relationships between sustainability and value. "A Note On Environmental Added Value for Real Estate" can be found at:
http://www.sumitomotrust.co.jp/csr/innovation/real-estate/pdf/200511.pdf
Sumitomo Trust's research on environmental added value is available at:

[63] This research project was made possible through the financial support of the Department of Trade and Industry, Prudential Property Investment Mangers, Investment Property Forum, Boots Properties, and the ongoing support of Drivers Jonas, IPD, Universities Superannuation Scheme and Forum for the Future.

[64] Sarah Sayce has been publishing papers on these and related topics since the 1990s.

http://www.sumitomotrust.co.jp/csr/innovation/real-estate/01english.html

It is also important to acknowledge the significant theoretical and background research contributions of all of the authors of the research studies discussed earlier in this chapter. These researchers include Norm Miller, Jay Spivey, Dave Pogue, Andy Florance, Piet Eichholtz, Niles Kok, John Quigley, Franz Fuerst, Patrick McAllister, Brian Ciochetti, Mark McGowan, and Jonathan Wiley, Justin Benefield and Ken Johnson and others. While the focus of the statistics/modeling-based research is on proving an empirical relationship between sustainable certification and rent or value, each of the key papers authored by these individuals provided important theoretical and background research that built off the foundation that had been established by earlier authors.

The Royal Institute of Chartered Surveyors and the Appraisal Institute have also provided leadership in developing the theoretical foundation for sustainable valuation. The Royal Institute of Chartered Surveyors, an international organization (operates out of 146 countries) of over 100,000 property professionals, has been a key sponsor and promoter of much of the work done to date in the industry. In addition to organizing and sponsoring meetings of sustainable valuation professionals, sponsoring specific research in Canada, United States, United Kingdom, Australia, Germany, and other countries, and supporting groups like the Green Building Finance Consortium and others working on these issues, the Royal Institute of Chartered Surveyors has an active sustainability publication program, publishing special reports and surveys on sustainable property issues. In addition to their specific work on sustainable property valuation, they are active worldwide in many other aspects of the relationship between sustainability and property.

The Appraisal Institute, a global membership association of professional real estate appraisers with 25,000 members in 91 chapters throughout the world, has supported publication of green valuation articles and sponsored the development of a green valuation educational seminar, created by Theddi Wright Chappell and Timothy Lowe, which provides a strong introduction on the key green value issues confronted by valuers.[65]

CoStar (http://www.costar.com/), the largest provider of real estate information, marketing and analytics in the United States and the United Kingdom, has also demonstrated strong leadership by making its data useable and available for sustainable property research, providing financial support for research, and contributing significant staff time to support better research and analysis.

G. Financial Performance

Sustainable property financial performance is not a simple concept, and needs to be clearly defined and articulated when presenting financial performance evidence. For example,

[65] Theddi Wright Chappell and Tim Lowe are pro bono members of the Green Building Finance Consortium's implementation team. Chris Corps is a member of the Consortium's Advisory Board.

when talking about sustainable property financial performance, you must first clearly specify whether you are talking about value or returns for the property overall, or the incremental rate of return or value contribution of incremental investments in sustainable features and strategies.

Sustainable property financial performance can also refer to feature-based financial performance measured by simple payback and rate of return analyses. These types of analyses are conducted for individual sustainable features or strategies like green roofs, daylighting, underfloor air distribution, etc. It is also important to keep clear whether one is talking about projected or actual financial performance.

The complexities of sustainable property financial performance is further highlighted by the scores of different types of sustainable property investment decisions, including minor retrofits, major retrofits, commercial interiors, new acquisitions, new construction, and many variations in between. The appropriate measurement and analysis for determining sustainable property financial performance will vary by the type of decision and other factors.

The key focus of the Consortium is to enable private sector investors to properly integrate revenue and risk considerations into their decision-making. Accordingly, simple payback and simple return on investment analyses, and other feature- or strategy-based financial analyses, are not the focus of our work.

As is detailed in Expanded Chapter V, to understand the implications of sustainable property investment on financial performance, one must consider, at least conceptually, a discounted cash flow analysis. The DCF produces specific financial performance measures including an internal rate of return and value. Of course, no estimated rate of return or value estimate can be properly interpreted, and incorporated into a sustainable property investment decision, without a full and comprehensive understanding and consideration of risk.

Summary of Sustainable Property Financial Performance Evidence

The evidence for sustainable property financial performance was presented in prior sections of this chapter. Section D: “Feature-Based Financial Performance” of Expanded Chapter IV presents further evidence for specific features or strategies. Evidence of the implications of sustainable property investment on property rates of return and value were presented in the “Market Performance” section, under the Expert-Based and Statistics/Modeling-Based Financial Analyses headings.

In summary, the volume of sustainable property financial performance evidence is still small. The significant dearth of sales and leasing transactions, and substantial value and rent declines since 2008, will also continue to make it difficult to generate statistics/modeling based empirical evidence. However, evidence from the key expert-based financial analyses and statistics/modeling-based financial analyses presented in the prior sections shows a clear trend towards improved rents, occupancies, risks, and resulting rates of return and value. Additionally, by fully identifying and assessing the positive and negative sustainability risks of specific properties, and carefully evaluating surveys/market research, there is hope for more intelligent assessments of the value contributions of sustainable property investment.

Not unexpectedly, enhanced rate of return and value performance evidence to date has been more incremental than dramatic. This result is reasonable given that sustainable features and strategies are just one part of the rate or return or value equation for any particular property. Additionally, the key forces driving value—enhanced regulator, space user and investor demand—have only recently been increasing measurably.

H. Conclusions

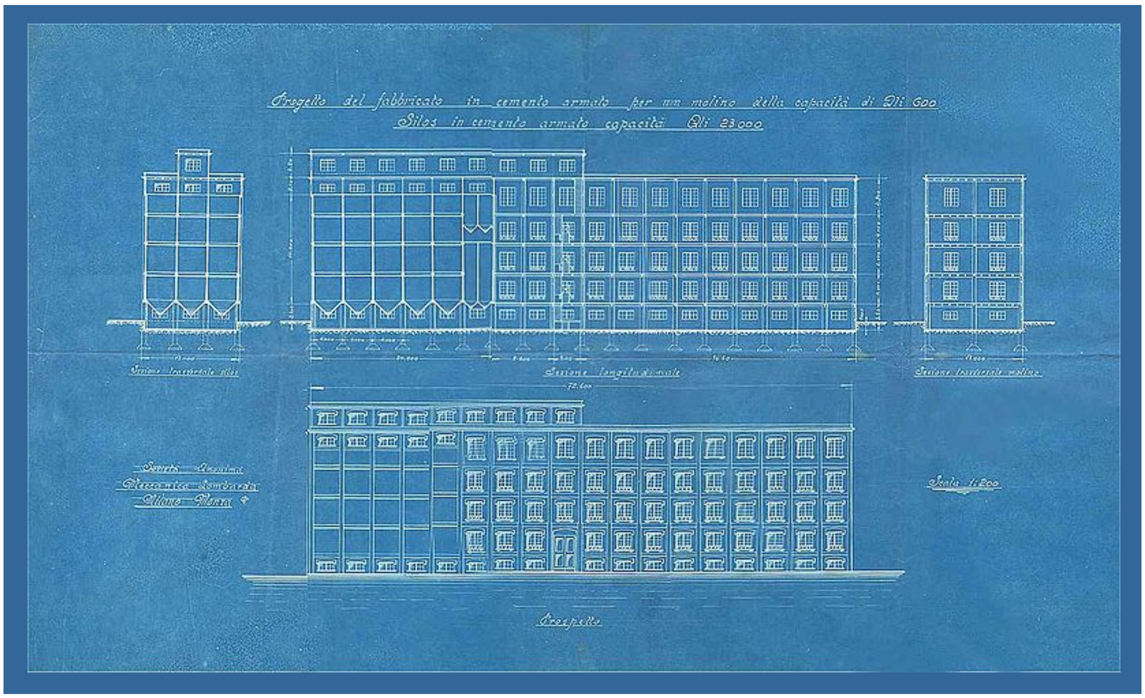
Sustainable property performance measurement and monitoring must evolve to include market performance to enable the full value of sustainable properties to be more easily quantified. Process and feature performance assessment need to be modified to focus more on their contribution to risk mitigation than incremental payback. Building performance measurement needs to sharpen its focus on the key things occupiers' value including resource use, carbon footprint, and the potential health, productivity and satisfaction of building users. Property owners must also be wary of changing social attitudes and regulatory changes that could negatively affect even "high performance" buildings that are auto dependent.

Fortunately, even if measurement efforts lag, and data availability (number of sustainable property sales, for example) remains constrained, real estate valuers and underwriters can still assess potential market response to a property's sustainability, and incorporate revenue and risk considerations into value. Real estate valuers and underwriters often work with significant data constraints and highly qualitative information, but traditional valuation and underwriting processes have evolved with these limitations and can accommodate them.[66] In many cases, less than perfect information—potential health and productivity information for example—can provide important insights that can reduce the uncertainty in a forecast, adding significant value.

For those people designing performance measurement and monitoring programs, it is important to consider explicitly the financial models and decision-making processes that capital sources are employing to insure that measurement and monitoring systems are delivering what decision-makers need. To reinforce the key point above, accurate and

[66] For example, real estate markets around the world frequently have gone through periods of volatility. Markets are down today, and were previously as a result of the Internet bust of the early 2000s, the Asian debt crisis, the Russian debt crisis, and other events or market changes. During such times, the number of sales and leasing transactions reduces dramatically and those transactions that are completed are often distressed and/or from a few months earlier when market conditions may have been quite different. Valuers adjust to these limitations through more detailed focus on tenants, market forecasts, leases, and risk analysis.

timely information on energy-use and related resources is a key base, but ignoring more qualitative measures like tenant-occupant satisfaction surveys and sustainable focused "peer group" comparables market surveys may undercut the ability to properly assess the building's market performance.



Courtesy Wikimedia Commons

Chapter V
Sustainable Property Financial Analysis

A. Introduction

Financial modeling and analysis are key components of an independent underwriting of sustainable property investment. Financial models are tools that enable investors to translate their opinions about the costs and benefits of a sustainable property investment into a measure of financial performance. Private sector investors typically require a financial model and analysis as part of the broader due diligence and underwriting of any investment decision. The focus of this chapter is on property level decisions. (See Chapter II, Section B: "Level of Investment Decision," for clarification of this important point)

1. Chapter V Outline: Six Steps to Sustainable Property Financial Analysis

The six-step process for thinking through and incorporating sustainability considerations into a property financial model analysis is shown below in Exhibit V-1**.**

Exhibit V-1 Six Steps to Sustainable Property Financial Analysis
1. Select Financial Model 2. Evaluate Property "Sustainability" 3. Assess Costs/Benefits of "Sustainability" 4. Evaluate Financial Implications of Costs/Benefits 5. Determine Financial Model Inputs 6. Risk Analysis and Presentation (RAP)

B. Summary Conclusions

The **most important conclusion** of this chapter is that financial models that generate results based solely or primarily on initial development costs and operating costs savings, like the most commonly used Simple Pay-Back or Simple Return on Investment (ROI) models, are inherently flawed because they fail to consider revenue or risk. These limitations are not new, but dramatic increases in regulator, space user and investor demand for sustainable properties during the last few years have substantially enhanced the negative implications of these limitations.

Fortunately, the **second most important conclusion** is that the most widely recognized financial model for evaluating real estate investments—discounted cash flow analysis (DCF), is well suited to address the financial implications of sustainability. Discounted cash flow analysis provides a conceptual framework and model that enables the user to integrate quantitative and qualitative analysis to measure sustainable property financial performance. Most importantly, it provides the means to translate the "intermediate" sustainable property cost and benefit outcomes like health or productivity benefits, expedited permitting, or lower operating costs, into financial measures like rate of return or net present value traditionally used by real estate capital providers.

A third key conclusion is that even if you do not execute a full DCF model in your underwriting, you must employ the logic and linkages inherent in a DCF model to accurately articulate potential implications of sustainable property attributes on financial performance. If you do not rigorously follow the framework, it is easy to under- or over-estimate the magnitude, and even the direction of, potential financial performance implications.

A fourth important conclusion is that sustainable property financial modeling and analysis requires a more sophisticated and explicit analysis and documentation of the risks—both positive and negative—that influence the cash flow to provide decision-makers the proper context for interpreting rate of return, net present value, or valuation conclusions.

Thinking explicitly about what will constitute an effective investment package[67] will make documentation of the work product easier. Some investment decisions require formal appraisals and due diligence reports, while other decisions can be made based on brief business case white papers and/or oral presentations. Most lenders require formal third-party appraisals and have structured underwriting requirements, while investors and corporations typically have their own customized formats for their real estate decisions.

[67] Investment package refers to the written or digital product of an underwriting/due diligence process. This could be an underwriting summary and all the supporting loan write-ups and third party reports, closing binders, etc. that would be typical for a mortgage; or a memo, financial schedule and/or PowerPoint presentation typical for many higher level strategic decisions.

The fifth key conclusion is that different types of decisions require different types of financial models, analysis and data. This concept, while obvious, is thoroughly examined in Chapter II, and is a primary theme in the Consortium's work.

Practically, many decisions involving sustainable property investment do not require sophisticated financial analysis in order to make the "Go" decision. For example, many operations and maintenance actions on existing properties cost little, or have Simple Payback (time required to pay back initial investment from operating cost savings) times of a year or less and can be paid for out of operating budgets or with minimal capital investment. However, even these decisions would be improved by consideration of risk and revenues—a more profitable (and environmentally beneficial) level of investment might be justified by a full financial assessment.

As society and the industry strive for higher levels of sustainability and energy efficiency, and investors move beyond the low hanging fruit, more structured financial analysis using the DCF framework and integrating risk and value considerations more explicitly will be required. Additionally, better financial models will enable more sophisticated decision-making about the level and phasing of sustainability investment.

Financial analysis and modeling, and particularly the presentation of the results of such analyses, need to be sensitive to the type of investor. Investors need models that properly allocate sustainable costs and benefits between tenant and landlord and take taxes and capital expenses into account. Corporations need to be able to integrate potential financial benefits to the enterprise (employee health, productivity, and retention, for example) and developers need models that capture the additional risks—both positive and negative—of sustainable development and accurately reflect their ability to monetize any longer term benefits prior to exiting the project. Lenders care most about default probability and loss severity in the event of default.

The final key conclusion is that the biggest challenge to sustainable financial analysis is not the modeling, but the integration of sustainability considerations into the determination of the input assumptions. Not only must the underwriter clearly identify potential costs and benefits of sustainable property features, but also properly consider non-sustainable factors when determining rents, occupancies, and other key financial model inputs. This sounds difficult, and is, but is not substantively more difficult than what investors, developers, and appraisers do every day when considering the myriad of factors that affect the value and success of an investment.

Investors historically have recognized that precise quantification of the relative value contribution of different property features—investment in landscaping versus investment in the lobby, for example—was not statistically reliable, nor did it need to be. Key financial model assumptions for a specific property, like rents, occupancies, absorption, or capitalization rates, are derived based on qualitative judgment and analysis of the best quantitative and qualitative information available. Real estate financial analysts and valuers need to accept and "own" the qualitative nature of their work, and get down to business doing a better job of it.

C. Step 1: Select Financial Model

1. Investment Context

The starting point for underwriting a sustainable property is to clearly understand the investment decision being addressed, and the context in which the decision is being made as was presented above in Chapter II.

Clear delineation of the decision and investment context is critical to selecting the best analytic methods, determining data requirements, assembling the underwriting team and preparing effective support for the decision.

The type of financial analyses required is significantly influenced by the sustainable property investment decision (see Exhibit II-3 in Chapter II). New construction, retrofits, existing building acquisitions, or leasing and financing decisions have always required different models and data. Sustainable property financial analysis requires some new thinking and analytic techniques to properly collect and analyze the data inputs to the models, but the fundamental approaches to decision-making used by the real estate industry will remain largely the same.

2. Sustainable Property Financial Analysis Alternatives

Financial analyses alternatives can logically be separated into four categories:

a) Traditional Sustainability Financial Analyses;
b) Traditional Real Estate Financial Analyses;
c) Sustainability Sub-Financial Analyses; and
d) Public Sustainable Benefits Analyses

A summary of the approximately forty sustainable property financial analyses alternatives is presented below in Exhibit V-2 and in substantial detail in Appendix F. More detailed descriptions; examples, observations and key links are also provided in Expanded Chapter V and in the Research Library under index codes 1.1 to 1.5.

Exhibit V-2

Sustainable Property Financial Analysis Alternatives

A. Traditional Sustainability Financial Analyses

1. Simple Payback
2. Simple Return on Investment (ROI)
3. Simple Change in Asset Value: Direct Capitalization (SCAV-DC)
4. Simple ROI and General Cost-Benefit Analysis
5. Life Cycle Costing (LCC)
6. Value Engineering
7. ENERGY STAR Building Upgrade Value Calculator for Office Properties
8. ENERGY STAR Cash Flow Opportunity
9. Life Cycle Assessment (LCA)
10. Post Occupancy Analyses (POE)

B. Traditional Real Estate Financial Analyses

1. Cost Management
2. Discounted Cash Flow Analysis (DCF)
   - Change in Asset Value
   - Net Present Value
   - Internal Rate of Return
3. After Tax Cash Flow Analyses
4. Valuation
5. Total Occupancy Cost (Cost of Ownership) Analysis
6. Economic Value Added

C. Sustainability Sub-financial Analyses

1. Comparative First Cost Analysis
2. DCF Lease-Based Cost-Benefit Allocation Models
3. Sustainability Options Analysis
4. Churn Cost Savings Analysis
5. Productivity Benefits Analysis
6. Health Cost Savings Analysis
7. Government/Utility Incentives and Rebates Analysis
8. Enterprise Value Analysis
9. ENERGY STAR Financial Value Calculator
10. Risk Analysis and Presentation (RAP)

D. Public Sustainability Benefits Analyses

1. Reduced Infrastructure Costs
2. Environmental & Resource Conservation Benefits
3. Land-Use Benefits
4. Climate Change Reduction
5. Economic Benefits
6. Security Benefits

a) Traditional Sustainability Financial Analyses

The first ten models and analyses shown in Exhibit V-2 are those that have traditionally been used in the real estate industry to make energy efficiency/sustainability investment decisions for buildings, features and equipment. Historically, Simple Payback and Simple Return on Investment (ROI) models have been the primary financial analyses used in making energy efficiency or sustainability decisions.

Traditional Sustainability Financial Analyses are appropriate and sufficient for many types of sustainable investment decisions that can be justified on cost savings alone. However, with major retrofits, the acquisition of an existing sustainable building, or new construction, more sophisticated analyses that consider all costs, benefits (revenue enhancement), and risks will be required to ensure proper allocation of sustainable property investment dollars. In these cases, traditional real estate analyses like Discounted Cash Flow Analysis will need to be employed.[68]

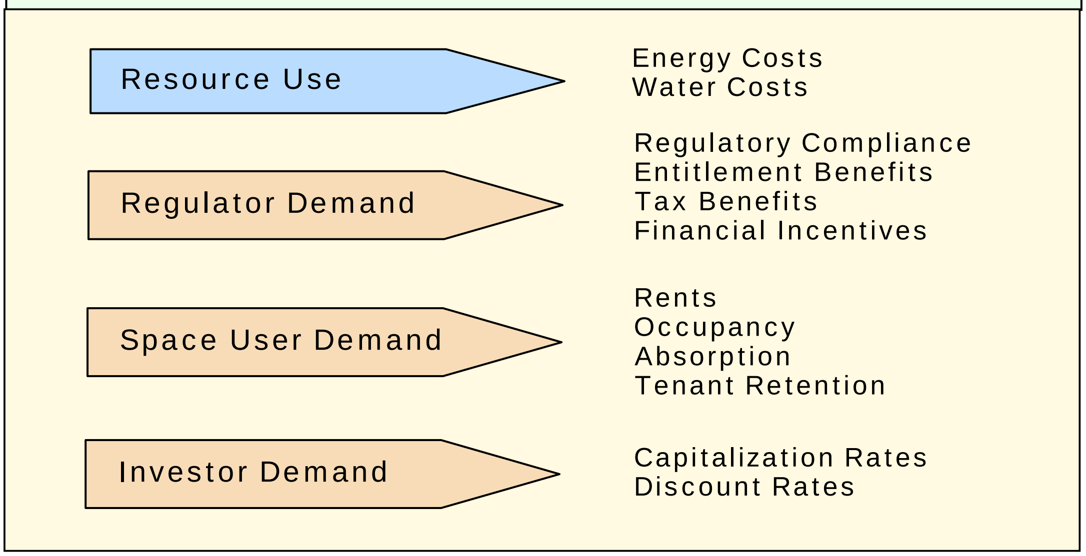
Today, and more so in the future, as regulators, space users and investors increase their demand for energy efficient and sustainable buildings, relying on Traditional Sustainable

[68] For many decisions it is not necessary or appropriate to complete a DCF analysis, but in order to properly account for present and potential revenue and risk implications, a conceptual understanding of the DCF model is required.

Financial Analyses that ignore revenue and risk will result in significant underperformance by investors.

Regulator, space user, and investor demand are critical to value, as shown below in Exhibit V-3. If valuers only considered resource use (energy costs, etc.) and ignored market performance, as measured by demand, key value issues affecting entitlements, rents, cap rates and other issues would be ignored. In essence, revenue and risk considerations would not factor into decision-making, a recipe for long-term underperformance.

Exhibit V-3
Sustainability Demand Affects Value Inputs



Summary of Traditional Sustainability Financial Analyses Alternatives

The ten traditional sustainability financial analyses are described in detail in Appendix F. A full range of sources and links is presented in Appendix F with additional detail and updates available in the Consortium’s Research Library and Industry Links sections under index code 1.2. A summary is provided below.

b) Traditional Real Estate Financial Analyses

Traditional real estate financial analyses integrate comprehensive cost, benefit, and risk information into measures of return and/or value. Rate of return or value estimates are based on detailed specification of financial model inputs such as energy costs, rents, occupancy, tenant retention, discount rates, etc.

Traditional real estate financial analyses are differentiated from traditional sustainability financial analyses in that they are focused on property level decisions, rather than more limited decisions about specific sustainable features, strategies, or outcomes like energy efficiency, thermal comfort, or productivity. Most importantly, they are differentiated from traditional sustainability financial analyses in that they more explicitly consider revenues and risk, rather than focus primarily on costs, as is the case with traditional sustainability financial analyses.

c) Sustainability Sub-Financial Analyses

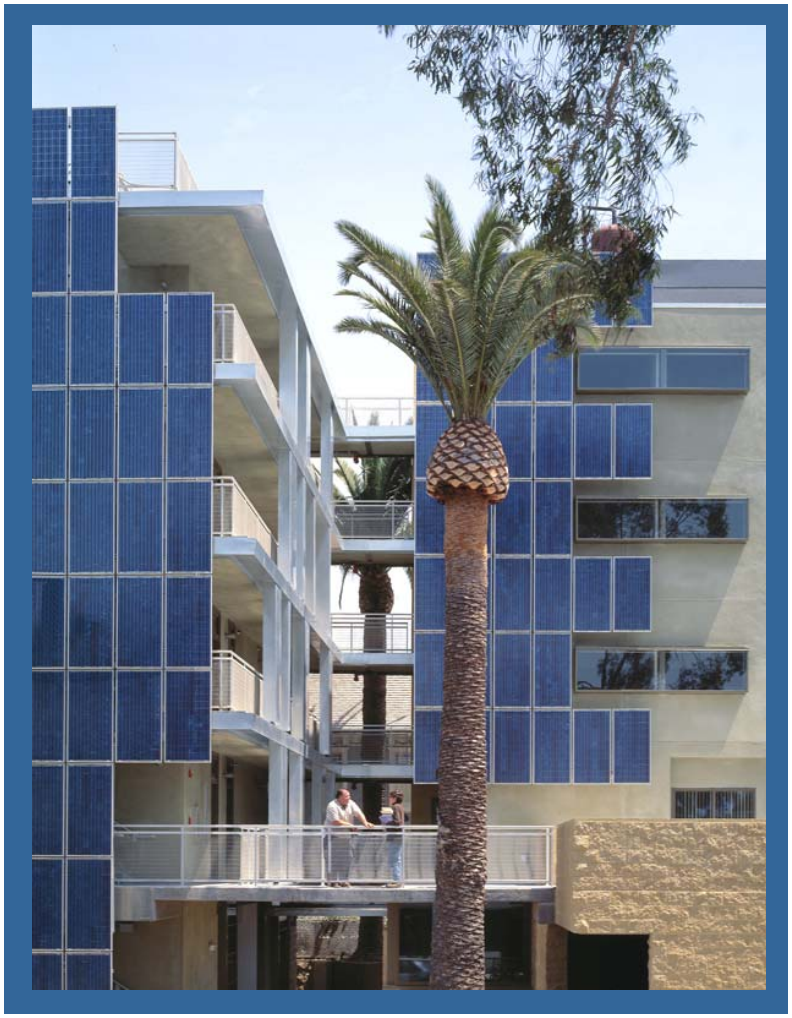
Sustainability sub-financial analyses are those analyses and models that provide quantitative insight/data that is typically combined with other information and analyses to aid valuers/financial analysts in their specification of key financial assumptions (rent, rent growth, occupancy, absorption, tenant retention, and operating costs) in a DCF analysis, or related traditional real estate financial model.

Sub-financial analyses are not unique to sustainable properties. For example, prior to making a determination of rental rate inputs in a pro-forma, valuers would typically develop or review forecasts of supply and demand, make adjustments to rent comparables for timing of lease signing, space differences, floor height, and other factors, and evaluate comparable property strategies relative to rents and occupancy levels. Each of these sub-financial analyses are then integrated qualitatively by the valuer with other information to set rent levels in the financial model.

The ten sustainability sub-financial analyses listed in Exhibit V-2 are a selection of some of the specialized analyses that have been developed in recent years to aid in the financial analysis of sustainable investment. These analyses include Comparative First Cost Analysis, DCF Lease-Based Cost-Benefit Allocation Modeling, Sustainability Options Analysis, Enterprise Value Analysis, and Risk Analysis and Presentation (RAP).

These ten are only a few of the scores of sub-financial analysis that have been developed by practitioners. While many sustainability sub-financial analyses are uniquely derived for specific property situations, the importance of quality independent analyses of this type is critical to the articulation of value and risk in sustainable properties.

An important point in understanding sustainability sub-financial analyses is that in most cases these analyses do not result in data that you can input directly into a DCF analysis. As their name implies, these types of analyses provide information and insight, which is combined with non-sustainable considerations in the final selection of key inputs such as rent, absorption and occupancy.



Courtesy Wikimedia Commons, CalderOliver

d) Public Sustainable Property Benefits Analyses

Public sustainable property benefits analyses are financial analyses used to quantify potential public sector benefits. The concept is simple—if a building owner can clearly and factually articulate the public benefits that arise from their building, they are more likely to convince regulators, tenants and investors to pay for those benefits.

Such “monetization” of public value is created from governments or utility companies through enhanced entitlements/permitting, public grants, favorable financing, tax benefits, and carbon credits or payments, and from private companies through their contribution to Enterprise Value and resulting increases in space user demand.

Sophisticated sustainable property investors and developers will conduct their own detailed assessment of the public benefits of their projects to enable clear articulation to regulators, potential tenants, employees, and capital sources. A starting point for clearly articulating public benefits is to have a framework for thinking through and organizing public benefits analyses. One such framework is presented below in Exhibit V-4 and discussed in more detail in Appendix F. Public benefits research is also presented in the Research Library and Industry Links sections of the Consortium's website under index codes 1.5, 7.9, 11.0, 15.67, 15.77 and 20.5.

Exhibit V-4

Public Benefits of Sustainable Buildings

Public Benefits of Sustainable Buildings
Reduce Infrastructure Costs
• Water collection, storage, treatment and distribution • Energy production and distribution • Road & bridge construction/maintenance • More efficient use of existing infrastructure
Environmental & Resource Conservation Benefits
• Conservation of natural resources • Reduce carbon output • Landfill reduction • Reduce air pollution • Reduce water pollution • Increase biodiversity • Reduce soil erosion • Reduce deforestation • Reduce desertification • Preserve ozone layer • Reduce drought risk
Land Use Benefits
• Preserve open space and natural habitat • Protect agricultural land • Maintain vibrant urban areas • Reduce traffic congestion
Climate Change Reduction
• Reduce vulnerability to climate change • Reduce costs to respond to change • Reduce spread of infectious respiratory disease • Reduce acidification • Contribute to many environmental and resource conservation benefits • Improve public health
Economic Benefits
• Job creation • Improve public health and well-being • Reduce insurance costs • Reduce public health costs—Medicare • Government worker productivity: reduce government costs • Worker productivity: increase earnings and tax revenues • Community competitiveness—quality of life
Security Benefits
• Reduce reliance on foreign energy sources

D. Step 2: Evaluate Property Sustainability

Sustainable property definitions and certifications play an important role in the financial assessment of sustainable properties as described in Chapter III. Definitions and certifications provide a basis for investors to measure and compare properties, a critical foundation for financial analysis.

Most importantly, from a financial perspective, to determine which certification and assessment systems are important for a specific property, the underwriter/valuer must evaluate how regulators, space users and investors utilize and rely upon different assessment systems or tools, and the specific sustainability thresholds to achieve benefits from each group for the subject property.

E. Step 3: Assess Costs-Benefits of Sustainability

After selecting the most appropriate financial analysis and assessing the property's "sustainability," the valuer needs to evaluate the subject property's sustainable costs and benefits. It is this detailed **property specific analysis** that separates independent valuation and underwriting of a sustainable property from the more prevalent "general business case" analysis.

1. Understanding the Role of Cost-Benefit Analysis

Before we introduce GBFC's Sustainable Property Cost-Benefis Checklist, it is important to reflect back on the key drivers of sustainable property financial performance as presented in our discussion of sustainable property performance in Chapter IV.

To properly analyze financial performance you must understand how it is derived. Process execution drives the performance of individual sustainable features/systems that determine the building's performance. Financial performance is calculated from financial model inputs (rents, occupancy, operating costs, etc.) that are derived based on an analysis of the market's response to building performance.

The key point is that sustainable costs and benefits are not typically directly inputted into a financial model. Sustainable costs and benefits are typically "intermediate" outcomes that must be integrated with other data and analysis during the process of making the final determination of financial model inputs. Any shortcuts in thinking or careless assertions regarding costs and benefits and their financial implications are almost certain to be wrong for a particular property.

2. Linking Sustainable Features/Outcomes and Costs-Benefits

One of the biggest challenges to underwriting sustainable property investment is to develop a process that enables an underwriter to assess financial performance implications resulting from any combination of sustainable features, products, materials, systems, and certifications. There is almost an infinite combination of features that can "define" a sustainable property.

Reliance on traditional sustainability analyses like simple payback and "value" engineering have reinforced the focus on the incremental costs or benefits of individual features like water recycling systems, lighting upgrades, high efficiency HVAC, etc. Accurate assessment of the financial implications of sustainable properties requires underwriters to refocus their thinking on sustainable performance outcomes and the market's response to such performance.

The rationale for the focus on outcomes—like resource use, occupant performance, and sustainability compliance—is that this is what regulators, space users, and investors rely upon to make investment decisions. In fact, it is an axiom of sales that customers care more about benefits than attributes, and salespeople who understand this are invariably more successful.

The task in sustainable property financial analysis, which is often based on projected outcomes, is to understand enough about the types of sustainable features and processes to assess the risk of achieving the building performance represented. Accordingly, the underwriter must not only assess the market's response to sustainable building performance, but also to the risks and uncertainty in the forecasts of such performance.

The key to properly evaluating the link between sustainable property features (products, materials, systems, etc.) and financial performance is to understand that you must assess how the features contribute to building performance, then assess the market's response to the building's performance.[69] A full menu describing the types of sustainable features and strategies is presented in Expanded Chapter III, Appendix III-A.

3. Sustainable Property Risk Mitigation

Assessing costs and benefits of sustainability also requires the assessment of sustainable property risk mitigation. In many cases, sustainable properties have risk increasing and risk decreasing attributes. Development costs are a good example where the direct cost may be somewhat higher, but through entitlement benefits, better planning, and reduced change orders, the additional direct costs can be mitigated through potential cost reductions. Risk is also mitigated directly through insurance, surety, contracts, and other mechanisms.

[69] If you focus only on the marginal impact of a feature on operating costs it may be sufficient to support some decisions, but leaves revenue and risk out of the decision, which may result in a less environmentally and financially beneficial investment.

Construction, carry, and exit/take-out risk and mitigation strategies are presented in Chapter VI: "Underwriting Guidelines for Sustainable Properties."

Sustainable property risk can also be significantly mitigated through an assessment of process and feature performance. Because most sustainable property investment decisions--with the exception of buying an existing sustainable building--must rely upon forecasts of costs and benefits, much of the effort in putting together an "accurate" estimate of financial performance involves risk mitigation. (See Expanded Chapter IV, Sections C and D for a detailed presentation of this topic).

Confirmation of the importance of green building risk issues from the perspective of the construction industry is presented in "*Green Building: Assessing the Risks*", published by Marsh in 2009 (http://global.marsh.com/news/articles/greenbuildingsurvey/index.php). This report identifies the most significant risks associated with green design and construction based on a series of four interactive forums in major US cities. A total of 55 construction industry executives identified five major categories of risks as being most significant: financial, standard of care/legal, performance, consultants/subconsultants and subcontractors, and regulatory.

In addition to identifying the key risks, the Marsh Report also identified potential solutions and reaches the following conclusion in its Executive Summary:

> "Despite the concerns about these exposures, many of these risks can be addressed to varying degrees through the availability of commercial insurance and surety solutions, or in some instances mitigated through contractual agreements. The commercial insurance market is evolving with respect to green building exposures. As underwriters become more adept at assessing and quantifying the risks associated with green building, we may see a growth of green building-specific coverages."

4. Applying the GBFC Cost-Benefit Checklist

GBFC's Sustainable Property Cost-Benefit Checklist is a comprehensive listing of the potential costs and benefits of sustainable properties. Put another way, it provides a comprehensive identification of potential positive and negative risks of sustainable property investment. It does not purport to be a complete listing of property costs and benefits, but only those incremental risks of sustainable property investment.

The organization of the list of costs and benefits is designed to make it easier to apply to financial analysis and valuation. First, costs and benefits are organized around eight categories related to financial model inputs: Development Costs, Development Risks, Space User Demand, Operating Costs, Building Operations, Cash Flow/Building Ownership Risks, Public Benefits, and Investor Demand. Separate lists of risks for potential building costs and potential building benefits are prepared for each of these eight categories. These separate "parallel" cost and benefit listings make it easier to analyze the "net" cost or benefit of a sustainable property.

The primary purpose of GBFC's Cost-Benefit Checklist is to provide an organized inventory of potential costs and benefits for sustainable property investment. For valuers or underwriters, the checklist can help in the determination of data and analysis requirements, and provide a comprehensive questionnaire to ensure key costs and benefits are fully identified and addressed.

An important secondary use of the checklist is as a due diligence framework for use by due diligence officers and investment/lending committees. The checklist suggests questions to ask borrowers seeking a mortgage or operators seeking equity to develop judgments about the quality of thought and analysis that potential capital seekers applied in preparing their investment packages.

The process for implementing the checklist for valuers and underwriters starts with an inventory of the specific costs and benefits that might be applicable to the subject property. To do this, the valuer/underwriter needs to go through the GBFC Sustainable Property Cost-Benefit Checklist presented in summary form in Exhibit V-5 and in significant detail in Appendix G.

Appendix G provides important detail on each of the potential costs and benefits identified in Exhibit V-5. Benefits and costs are described, and the process for assessing the potential applicability of a benefits and costs from the general checklist to specific properties is presented. Additional detail on development and cash flow risks is also presented in Chapter V, Section H: "Step 6: Risk Analysis and Presentation."

Key questions to be addressed for each potential cost or benefit include:

1. Is the specific cost or benefit applicable to the subject property?
2. How was, or will, the specific benefit or cost be achieved?
3. What evidence supports the existence of the specific cost or benefit for the subject property?
    - Performance information
    - Research and risk analysis
    - Quantitative or qualitative assessments
4. What evidence or analysis supports the magnitude of the specific cost or benefit at a property level?
5. Is there evidence from the "Process Execution" or "Feature/System Performance" (see Appendix C) that provides support for the quantitative assessment of costs and benefits, and/or that provides insight into potential mitigation of cost concerns?
6. Which specific financial model inputs will be influenced by the specific cost or benefit?

7. What evidence is available of the magnitude and/or importance of the cost or benefit to the specific subject property, in the context of other factors influencing the property's financial performance?
   - Regulator response
   - Space user response
   - Investor response
   - Market conditions
   - Geographic considerations
   - Mitigating factors
8. Did the property/project sponsor consider the cost or benefit, and its potential implications on financial performance? Why or why not?

Courtesy Wikimedia Commons, Banana Patrol

Exhibit V-5

GBFC Sustainable Property Cost-Benefit Checklist

I. Potential Building Benefits

A. Reduced Development Costs

1. Government incentives
2. Better private financing
3. Downsizing of some systems (HVAC, etc.)
4. Reduced number and magnitude of change orders
5. Reduced operational start-up costs

B. Reduced Development Risks

1. Reduce construction risk
2. Reduce carry risk
3. Reduce exit/take-out risk

C. Increased Space User Demand: Higher Revenues

1. Increased demand from space users concerned about enterprise value
2. Increased demand from government tenants with mandated sustainability
3. Increased demand from vendors/supply chain required by big customers (GE, Wal-Mart, etc.) to be more sustainable
4. Increased demand from tenants with direct tie to sustainability business—architects, engineers, consultants, contractors, lawyers, energy firms, product companies, etc. etc.
5. Increased demand from tenants wanting to "do the right thing"

D. Reduced Resource Use / Operating Costs

1. Lower energy use
2. Lower water use
3. Reduction in sewage/stormwater run-off
4. Reduction in building waste
5. Reduction in construction/demolition waste
6. Reduction in carbon footprint
7. Lower emissions
8. Lower property/casualty insurance costs
9. Lower maintenance costs

E. Improved Operations/Capital Costs

1. Reduced cost of changing space
2. Fewer tenant/occupant complaints
3. Reduced frequency of capital expenditures
4. Reduced tenant turnover/re-leasing
5. More reliable functioning of systems

F. Reduced Cash Flow/Building Ownership Risk

1. Improved ability to meet future regulatory requirements
2. Ability to capitalize on future government incentives
3. Improved ability to meet changing space user demand
4. Improved ability to meet changing investor demand
5. Prevent risk of loss of "social license" to operate building
6. Limit liability due to building related health issues—sick building, mold claims
7. Limit exposure to future compelling health and/or productivity research
8. Reduced risk of reliance on grid (terrorism)
9. Increased flexibility/adaptability
10. Reduced risk of building not operating as designed
11. Limit exposure to energy/water cost volatility
12. Reduced exit/take-out risk
13. Overall reduced potential loss of value due to functional, economic and physical obsolescence

G. Public Benefits[70]

1. Infrastructure cost benefits
2. Environmental and resource conservation benefits
3. Land-use benefits
4. Reduced climate change
5. Economic benefits
6. Security benefits

[70] Public benefits become private investor/landlord benefits when the investor/landlord can monetize the benefits through government regulatory relief, incentives, tax benefits, etc.

Exhibit V-5

GBFC Sustainable Property Cost-Benefit Checklist

(continued)

H. Increased Investor Demand

1. Reduced capitalization and discount rates: higher values
2. Reduced exit/take-out risk
3. Increased FAR—zoning---density bonuses
4. Improved access to debt financing

II. Potential Building Costs

A. Increased Development Costs

1. Certification, energy modeling, legal and commissioning costs
2. Higher cost specialized service providers
3. Higher cost products and systems
4. Higher tenant improvement costs for green improvements
5. Higher finance costs—more high cost equity; increased construction interest
6. Project delays

B. Increased Development Risk

1. Construction risk (cost and delays)
2. Legal/contractual risks
3. Exit/take-out risk

C. Decreased/Unchanged Space-User Demand

1. Excess investment cost relative to market demand
2. Space user demand does not meet expectations
3. Building operating problems

D. Increased Operating Costs

1. Higher maintenance costs--training, manuals
2. Vendor availability and pricing
3. Product or system failure/underperformance
4. More costly lease analysis and implementation
5. Higher real estate taxes
6. Costs of required additional monitoring/measurement
7. Resource cost increases

E. Building Operating Problems/Capital Costs

1. Products underperform
2. Service providers underperform
3. New systems learning curve for engineering staff/maintenance staff/etc.
4. New/different systems can reduce economies of scale for engineering staff for a concentrated portfolio of similar assets
5. Capacity/seasoning of service providers/contractors
6. Tenants do not cooperate

F. Increased Cash Flow Risk

1. Risk of rapid functional obsolescence
2. Process underperformance
3. Operating cost underperformance
4. Revenue underperformance
5. Value/sales price underperformance

G. Limited/No Increase in Investor Demand

1. Increase/no change in capitalization and discount rates
2. Energy cost declines increase pay-back periods, reduce value of sustainable investment
3. Existing leases limit ability to pass costs to tenants--capture sufficient benefits to justify costs
4. Failure of appraisers/brokers to accept value/enhanced performance

F. Step 4: Evaluate Financial Implications of Costs/Benefits

Now that sustainable property costs and benefits have been identified and evaluated, the next step is to determine how the subject property's sustainable costs and benefits will influence the financial performance of the property.

1. Linking Costs and Benefits to Financial Performance

For real estate investor, developer and lender decisions, financial modeling typically involves an estimate of the development, acquisition, or retrofit costs and construction of a pro forma cash flow statement outlining actual or projected revenues and operating expenses on a monthly, quarterly, and/or annual basis. Revenues are calculated based on assumptions for rents, periodic rent increases, absorption/lease-up timing, equilibrium occupancy levels, tenant retention and other variables. Operating expenses are estimated based on an analysis of energy, water, maintenance, management, landscaping, property taxes, and other operating expenses. For multi-tenant properties, financial models to assess incremental investments in sustainable attributes must also incorporate a specific consideration of the allocation of landlord and tenant costs and benefits based on lease terms.

Discounted cash flow analysis (DCF) is the standard approach used by real estate investors to assess commercial property value and financial potential. In DCF, the net present value, or return, on a project is determined by looking at the project outflows (development & operating costs) and inflows (revenues & net sales proceeds) over time. The net costs or revenues over time are converted to present value through a discount rate that reflects the risk of the cash flow as determined by investors.

While the specific type of financial model will vary based on the type of decisions being underwritten, the logic and structure of a DCF model provides the conceptual framework needed for interpreting how sustainable features influence return and/or value. Even if perfect data is not available, by thinking through the specific assumptions within a DCF model, users can gain important insights about the magnitude of the financial implications of sustainable property investments. The key financial model inputs of the DCF model directly affected by sustainable costs and benefits are shown below in Exhibit V-6.

Exhibit V-6
Linking Sustainable Costs-Benefits to Financial Model Inputs

Sustainable Costs/Benefits	Affected Financial Model Inputs
Development Costs	• Rebates/incentives • Financing costs • Tax cost • Cash flow received earlier
Development Risks	• Discount rates • Capitalization rates • Sales prices
Space User Demand	• Contract rents • Rent growth • Occupancy • Absorption • Tenant retention: renewal probability • Downtime between tenants • Etc.
Operating Costs	• Energy costs • Water costs • Waste costs • Insurance costs • Maintenance costs
Operations/Capital Costs	• Leasing costs • Tenant retention: renewal probability • Tenant improvement costs
Cash Flow Risks	• Discount rates • Capitalization rates • Sales prices
Public Benefits	• Revenues—through impact on space user demand • Development costs/risks—through impact on government demand • Capitalization & discount rates—through impact on investor demand
Investor Demand	• Capitalization rates • Discount rates • Sales prices

2. The Evaluation Process

First, it is important to conduct a sustainable cost-benefit net impact analysis. The key point here is that while costs and benefits are presented in a linear form and analyzed independently in the checklist in Exhibit V-5, true insights and actionable information can only be developed through an analysis of the **net impact** of sustainable costs and benefits.

The GBFC Sustainable Property Cost-Benefit Checklist in Exhibit V-5 and Appendix G is designed to enable net impact assessment. First, all sustainable costs and benefits are organized under key categories that are closely tied to developing the inputs to financial models:

- Development costs
- Development risks

- Space user demand
- Resource use/operating costs
- Building operations/capital costs
- Cash flow/building ownership risk
- Public benefits
- Investor demand

By organizing the cost-benefit checklist in this manner, it feeds into the preparation of a net impact analysis. While specific costs or benefits sometimes exist outside of the eight categories identified above, it is difficult to assess their potential implications on financial performance unless they can be appropriately categorized under one of the eight categories.

3. Assessing the "Net Impact" of Sustainable Costs and Benefits

This section provides a general summary discussion of the kinds of issues that come up in assessing the "Net Impact" of costs and benefits for each of the key Cost-Benefit categories used in the GBFC Sustainable Property Cost-Benefit Checklist. Appendix G provides a more detailed discussion of the considerations in assessing the potential applicability and magnitude of each of the 84 costs and benefits identified in the checklist.

In assessing the "net impact" of costs and benefits relating to any specific financial model input, risk mitigation must be considered. In many cases, potential risks (uncertainty) of sustainable property investment may appear to outweigh benefits. For sustainable property investment, "net impact" analysis should factor in the costs (risks) after consideration of risk mitigation measures including integrated design, specialized contracts, insurance, green leases, surety, commissioning, and service provider due diligence.

Development Costs

The net impact of sustainability on development costs is often misunderstood, or presented either as only a cost or a benefit issue, while a true understanding of the issue can only be determined by evaluating the net impact of costs and benefits after consideration of risk mitigation measures.

Sustainability can lead to increased development costs due to costs of certification, energy modeling, legal, and commissioning costs. Also, depending on the particular type of property, level of sustainability, and geographic market, products, materials, contractors, and service providers can also cost more than traditional non-sustainable investment. In addition, delays due to product or system deliveries, or over-stressed service providers or contractors can increase construction interest costs and delay the receipt of revenues.

Equally important, but seldom discussed, is the "cost" that developers, investors or owner occupants face due to required changes in their standard operating procedures. The most successful sustainable projects have specialized contracts, specialized subcontractors, more upfront planning and an integrated whole building approach to design and construction. Finding and developing new vendors, subcontractors, architects, and other service providers can be costly. Furthermore, learning new development processes, altering contracts and leases, and other required sustainable activities could be daunting to many. While experienced owners and service providers claim that costs and process issues are not significant, new investors to the sustainable property market need to be aware of these less quantifiable "costs."

Sustainable property investments can realize significant reductions in development costs through their ability to capitalize on incentives offered by utilities, local, state and Federal governments. Expedited permitting and approvals, design and code flexibility, rebates, financing assistance, and tax benefits are just some of the incentives available in the marketplace today to offset potential increases in development costs.

Development costs may also be reduced through improved private debt and equity financing. As the capital markets have shifted from ready availability of capital to limited access, a potential benefit of sustainable projects will be their improved access to financing. Improved access might take the form of better loan to value or debt service coverage ratios, more lenient reserve/holdback requirements, or simply meeting a minimum standard required by an investor. The growing availability of Socially Responsible Investment capital for real estate suggests that some sustainable real estate projects will have access to financing that might not otherwise have be available were they not sustainable projects.

It is important to caveat the discussion of the magnitude of potential financing benefits from sustainability because real estate finance is not driven by sustainability. Typically, it is unlikely that sustainable property attributes will overcome the usual factors that prevent projects from accessing reasonable cost financing, including poor market conditions, insufficient equity, inexperienced sponsorship, unsubstantiated financial projections, bad location, or an unsustainable competitive advantage.

A critical component of an analysis of sustainable development costs is to evaluate a property on an integrated basis. While some sustainable features, such as renewable energy systems, green roofs, new windows, and other improvements can cost incrementally more than non-sustainable alternatives, it is often possible to downsize some systems (such as HVAC systems) and reduce costs in other parts of the budget.

Finally, while integrated design, improving contracts, and commissioning can increase costs, costs can also be reduced due to reductions in the number and magnitude of change orders, reduced operational startup costs, and other operational improvements.

Development Risks

The type and level of sustainability and the experience of the design and construction team significantly influence development risk. Owners seeking the highest levels of sustainability, where more pioneering design, construction, products and systems are employed, will experience higher levels of risk. While such risk is inherent in those companies or individuals taking a leadership role in sustainability, the positive benefits of leadership are also powerful and need to be carefully evaluated.

Development risk is driven by property cost uncertainty, property performance uncertainty and legal and contractual risks. Pioneering design and construction, the availability of experienced contractors and subcontractors, pioneering products and systems, building code and regulation complexities and limitations, and other issues drive property cost uncertainty. Property performance uncertainty arises due to energy cost volatility, unreliable energy modeling, and underperformance of products, materials, systems or contractors. Legal and contractual risks arise due to the enhanced expectations on architects, contractors, subcontractors and LEED consultants. Finally, all of these risks can affect potential completion of the project, delaying revenues and increasing construction costs.

The most important way sustainable properties can reduce development risks is through the reduction of entitlement risk. Sustainable projects can be beneficial in overcoming potential neighborhood opposition, improving the timing and content of regulatory approvals. This risk benefit is most important when a project is first completed, but may continue over time as sustainability regulations continue to tighten.

The primary way development risks are addressed in sustainable properties is through mitigation. Integrated design, which encourages earlier and more explicit goal setting, value clarification among project participants, and better communications can reduce risk. Early, comprehensive, and ongoing commissioning can reduce costs and improve performance. Legal and related contractual risks can be addressed through more explicit service provider contracts, insurance, surety, and earlier and better communication.

Finally, it is important to place sustainably related development risks in context. New developments or major retrofits of any kind are risky endeavors. Cost volatility, product failures, subcontractor problems, delays, legal risks, and other issues are not “sustainability” issues per se, and the incremental aspect of sustainability needs to be kept in mind when evaluating “sustainability” risks.

Space User Demand: Revenue Impact

An increase in demand by space users primarily results from value that a potential space user believes a property contributes to its overall business or organization. With a rapid increase in demand for sustainability generally, and sustainable properties in particular, the number of potential space users interested in sustainable properties is on the rise:

- Companies concerned about cost reduction and volatility, occupant productivity and health, improved building operations, improved reputation/leadership, and compliance with internal or external sustainability policies and initiatives (companies with younger employees, competitive talent acquisition, high turnover, etc.).
- Government tenants with mandated sustainability requirements.
- Vendors and others in the supply chain who are being pressured to be more sustainable (by GE, Wal-Mart, etc.).
- Space users with a direct tie to the sustainability business: architects, engineers, consultants, contractors, lawyers, energy firms, product companies, etc., etc.
- Value driven tenants—“friends of sustainability”

Assessing the potential benefits of increased space user demand requires a specific consideration of the types of tenants and/or users of a particular property. Factors that influence or mitigate potential increases in space user demand and its potential implication on financial model inputs include lease structure, the education level of tenants, the importance of price and other factors in space use decisions, liability limits in marketing sustainability benefits, and other factors.

Additionally, it is important to make sure that attributes critical to space users are not traded away as part of the process of making a building more sustainable. If the building has experienced operating problems as a result of sustainability improvements, this could also reduce space user demand. Additional detail on space users is presented in Chapter VI, Section F: Underwriting Space User Demand.

Resource Use/Operating Costs

Evaluating resource use and related operating costs is more straightforward than evaluating space user demand, but is not without its challenges. Perhaps the most important challenge is that many, if not most, sustainable property investments are made based on projections of resource use and cost. Energy forecasts are not always reliable, and can vary based on changing energy costs, the schedule and use of a building, the quality of the data inputs, the energy model and energy modeler employed, and other factors. (See Chapter VI, Section E: Underwriting Energy-Carbon Reduction Investment for more detail)

The key to evaluating represented reductions in resource use or operating costs is a clear explanation of how the use and cost reduction is achieved. The benefit—cost reduction—is typically offset by high levels of uncertainty, so the assessment of “net impact” is primarily a due diligence activity to assess the quality of forecast savings. Careful evaluation of which parties realize cost savings is also important. Critical risk mitigation measures include commissioning, appropriate measurement and monitoring systems, staff and tenant training, lease review, and service provider due diligence and compensation assessment.

While forecasts of energy use can be tricky, reductions in property/casualty insurance costs, and lower maintenance costs due to reduced need to change light bulbs, vacuum, and some other savings can be reasonable estimated.

Building Operations/Capital Costs

Improved building operations can result from commissioning and re-commissioning, more durable and flexible design and materials, and a general reduction in tenant/occupant complaints due to satisfaction with the building and working environment. These benefits can improve the financial performance through reduced frequency of capital expenditures, reduced leasing commission and tenant improvement costs, and general increases in space user demand.

Improved space flexibility is particularly critical today as occupant space needs undergo rapid changes due to economic difficulties and rapid product development and sales cycles. Durability and flexibility are not just sustainable concepts, because for any building to remain economically and functionally relevant today, and in the future, it must be able to adapt. Durability and flexibility are a sustainability issue primarily due to the embodied energy in a building envelope and its tenant improvements.

Potential benefits to building operations must be carefully considered in light of potential building operating problems due to product or service provider underperformance, uncooperative tenants, new system learning curves for engineering and maintenance staff, and potential reductions in economies of scale for facilities management staff, who may have to learn and service a broader array of systems,

Cash Flow/Building Ownership Risk

By far the most important financial benefit of sustainable property investment is the potential reduction in cash flow/building ownership risk. Reduced cash flow/building ownership risk is an important contributor to an increase in space user demand, which can directly improve revenues, and to an increase in investor demand, resulting in higher values through reduced discount and capitalization rates.

Cash flow and ownership risks are most significantly reduced due to the ability of a sustainable/energy efficient building to cost-effectively meet the changing needs of regulators, space users, and investors. It is almost a certainty that local, state and federal regulations regarding sustainability will increase, perhaps dramatically, in the coming years. A building that cannot, at a reasonable cost, adapt to meet future regulatory requirements or capitalize on incentives, will be less valuable. A building that cannot adapt to meet increasing demand for sustainability by space users and investors will also lose value through economic obsolescence.

Sustainable buildings also reduce the risk of reliance on the energy grid (terrorism or natural disasters), limit exposure to energy/water cost volatility, and limit both current and future potential liability due to building-related health issues. All of these benefits reduce exit or takeout risk by maximizing the potential pool of buyers or investors, and the availability and cost of financing.

While the benefits related to cash flow risk can be significant, sustainable properties can increase cash flow/building ownership risk. For example, investments in new technologies, systems or products that are at risk of getting leapfrogged increases the risk of losing value due to functional obsolescence. Investors can also miss the market, over-investing in sustainability relative to market demand. Worse, features attractive to occupants could be eliminated to enable sustainable features or systems to be added.

The reliability and accuracy of energy forecasts, as well as the risk due to energy price declines, can also be important over a short time period. Finally, liability risk relative to performance claims and marketing need to be carefully evaluated. Risk issues are extensively addressed throughout this book. Key sections include IV-C: Process Performance, IV-D: Feature Performance, Sections V-E: Assess Costs/Benefits of Sustainability, V-H: Risk Analysis and Presentation, and much of Chapter VI: Sustainable Property Underwriting Guidelines.

Public Benefits

The public benefits section of the GBFC Cost-Benefit Checklist is the only part that doesn’t have a corollary cost category. While the focus of the Consortium’s work is on private value—that public value which can be monetized—fully understanding and being able to articulate a project’s potential public benefits is important. All sustainable projects will generate substantial public benefits beyond those of a non-sustainable property.

Such “monetization” of public value is created from governments or utility companies through enhanced entitlements/permitting, public grants, favorable financing, tax benefits, and carbon credits or payments, and from private companies through their contribution to Enterprise Value and resulting increases in space user demand.

Depending on the specific type of sustainable project, and the level of sustainability, it may generate substantial public benefits including reduced infrastructure costs, environmental and resource conservation, improved land use, less or more manageable climate change, financial benefits, and security benefits as was detailed in Exhibit V-4. Some of the sustainable features and performance that contribute to public and private benefits are shown below:

Location	• NOT on fragile landscapes • NOT contributing to urban sprawl • Close to mass transportation

Site	• Focus on surface water reduction (holding ponds, porous paving) • Xeriscape landscaping (no irrigation) • Lower impact on local ecology • Increased green space (small building footprint, minimal surface parking)
Building Exterior	• Window canopies or light shelves • Alternative energy systems (solar or wind) • Green roofs • Efficient, targeted exterior lighting (minimizing light pollution)
Building Interior	• Minimal materials (exposed structural materials) • Flexible layouts (movable walls, raised floors) • Occupant controls of heat and light (as opposed to large zone thermostats or light switches) • Abundant natural light and access to views • Good air quality • Plumbing fixtures with reduced water usage characteristics • Operational promotion of "green" practices (such as recycling)
Hidden Attributes	• Highly efficient building envelopes • Materials selected to meet building goals (low environmental embodied effect, low VOC's) • High efficiency mechanical systems integrated with electrical, structural, and architectural elements • Efficient lighting systems • The use of equipment without materials or components that could damage the environment (e.g., ozone depleting substances in air conditioners) • The use of maintenance materials (e.g., detergents) that also meet the green goals • Continued measurement and optimization of system performance over time.

Source: A Business Case for Green Buildings in Canada, Mark Lucuik, March 2005

What you need to know and do to effectively articulate a project's public benefits include:

- Develop a structured understanding of the types of public benefits a sustainable project can generate (see Exhibit V-4);

- Be able to articulate and show the link between types of property features, systems and sustainable outcomes and the specific public benefits;

- Analyze how the subject property specifically contributes to each of the public benefits claimed;

- Specify the magnitude of benefits, and appropriately caveat method used to quantify. Because in many cases a single property will contribute only a small portion of the broader public benefit, cite both the larger benefit and likely property contribution. Because substantial sums of money are spent to deal with peak demand loads and related infrastructure costs, which are not typically incremental costs, the marginal benefit of many sustainable features/systems, which can address peak demand issues, may be much higher than originally contemplated.

- Present the subject property's public benefit contributions in relative terms to other conventional properties. This relative presentation, particularly if quantified, can provide a basis for a "relative" allocation of incentives or regulatory relief.

The challenge in the application of Sustainable Public Benefits Analyses is that most of the data and analyses that have been done to date have been done at a general industry level, not at a property specific level. For example, it is one thing to demonstrate the general relationship between certain sustainable features and productivity, but quite another thing to determine how the productivity research is applicable to a specific property, based on the types of building occupants and/or the particular market conditions. This is a challenge, and a constraint to the ability to "quantify" the financial implications of sustainable property investment. However, the types of analyses required are not materially different from the types of analyses that valuer/financial analysts complete every day.

In today's economy, and due to strong government interest in spreading the benefits of the Green Revolution, economic benefits of sustainability have become particularly central to government decision-makers. It is important in articulating economic benefits to not only talk about the number of jobs, but the types of jobs, the spread of jobs throughout the population, and the creation of long-term as opposed to just construction-related jobs.

Investor Demand

Investor demand for sustainable properties has, and will continue, to increase. Increased space user demand, lower operating costs; reduced cash flow risk, favorable depreciation and other tax benefits, and the reduced risk of functional and economic obsolescence are powerful motivators for investors. Reduced take-out risk and improved access to debt financing, as well as the potential for increased zoning and/or density bonuses are other key positives for investors.

Some potential limits to increases in investor demand include unsophisticated or uneducated investors, energy price declines that increase payback periods and reduce the value of sustainable investment, existing leases that limit the ability to pass costs to tenants, and the failure of appraisers, brokers, and lenders to accept the value or enhanced performance.

G. Step 5: Determine Financial Model Inputs

Step five is distinct from step four in that previously we were only trying to assess or measure and describe how a property's **sustainability** could affect key financial model inputs. In step five, the goal is to specify specific financial model inputs—like rents, occupancies, tenant retention, etc.—taking into consideration, simultaneously, all factors, both sustainable and non-sustainable, that affect the financial model inputs.

For example, most office space user real estate decisions are driven by a host of key issues only marginally related to sustainable property:

- Supportive of strategic mission;
- Internal integration with other business units;
- Flexibility to meet changing space needs;
- Technology requirements; and
- Occupancy expense (cost) for space.

If a space cannot help space users achieve their strategic missions and provide the flexibility to meet changing needs, it will not be in strong demand. As the availability of sustainable space in the marketplace grows, it is likely that certain sustainable property attributes will become more of a minimum requirement, critical to implementing the strategic mission of space users.

1. The Discounted Cash Flow Model

In step four, we described the basic workings of the discounted cash flow (DCF) model. Prior to laying out the process for integrating sustainable and non-sustainable factors in the determination of discounted cash flow model inputs, it is important to understand in more detail the structure and input assumptions of the DCF model. To do this, we present a hypothetical DCF model based on a real world non-sustainable office building. A 12-page presentation of this financial model is presented in Appendix H.

Our hypothetical example of a Discounted Cash Flow analysis is based on a 25-story, 375,000 square foot CBD office building located in one of Southern California's primary metropolitan areas. The building is a conventional (non-green) office building built in the mid-1980s. In addition to revenue received from office space leasing, the property also derives revenues from approximately 12,000 square feet of ground floor retail space and 750 parking spaces located in a subterranean parking garage. The DCF analysis presented reflects a 20% office vacancy rate during the first year.

The DCF model takes into consideration revenues and operating expenses to calculate net operating income, as shown below in Exhibit V-7 and in more detail in Appendix H. Discounted cash flow models utilized in valuations typically cover a ten-year period, with the net operating income in year eleven capitalized to obtain a residual value.[71] The residual value is important because the difference between the original acquisition price and the eleventh-year sales price captures the appreciation in value over the holding period. Revenues and operating expenses will change over a ten-year holding period based on the terms of new and existing leases, changing costs, varying occupancy levels, and other factors.

The capitalization rate is a measure of investor demand that reflects the return required by investors to acquire the stream of net operating incomes from a property. The capitalization rate can significantly affect the rate of return of a property. If a sustainable property generates increased investor demand, its capitalization rate will be lower, increasing residual value and net sales proceeds. The financial impact of the residual sales price is reduced because proceeds are received in the future and must be discounted back to the present, but is still typically significant in a real estate investment.

The DCF model is used by the appraisal profession as one of their three approaches to value. The three approaches are the Income Approach (typically a DCF Model), the Sales Comparison, or Market Approach, and the Cost Approach. To calculate value from the DCF model one selects a discount rate (based on market evidence) to apply to the stream of cash flows to determine the net present value. The discount rate is the rate of return required by most likely buyers to invest in the subject property's projected net operating income. Accordingly, the discount rate, similar to the capitalization rate, incorporates the market's perception of the risk of a subject investment. The discount rate is used to translate cash flows received over the holding period to a present value. The higher the discount rate, the more risk an investor perceives in the pro forma cash flows, and the lower the net present value will be.

The financial performance (internal rate of return value) of a property is determined by all the specific financial inputs shown in Exhibit V-7. Some assumptions, like rent, occupancy, or energy costs are very important, and others, like water costs, trash removal or insurance, are less important.

Consequently, in assessing how, and how much, sustainable property outcomes (energy efficiency, certifications, etc.) will affect financial performance; it is critical to understand the relative magnitude of the different financial model inputs for the specific subject property being evaluated. Typically, rent and revenue related assumptions would be more significant than operating cost assumptions. Accordingly, traditional sustainability financial analyses that ignore revenues are often inappropriate or inaccurate measures of financial performance.

[71] A simple ROI or Life Cycle Costing model are variations on discounted cash flow analysis that incorporate more limited assumptions and varying life cycles. Discounted cash flow holding periods will also vary significantly depending on the strategy of the investor, with three, five and seven year holding periods often considered as an alternative, or in addition to a ten year time frame.

Just because water, trash removal, sewage and other operating costs are typically less significant when looking solely at their relative magnitude to revenues and other operating costs does not mean they do not have value. Sustainability features, systems and practices that reduce water, sewage, and trash, or achieve other sustainable goals, contribute significant public value and enable high level sustainability certifications, which can be critical to increased demand by regulators, space users, and investors. Demand by these groups drives potential revenue enhancement and risk reduction. Accordingly, "value engineering" as it is typically done today that focuses only on costs can potentially lead to cuts that will significantly reduce the value of a sustainable property.

Exhibit V-7

Discounted Cash Flow Model
Calculation of NOI

	Year 1
Revenues	
Contract and Market Rents	$14,535,362
Less: Absorption and Turnover Vacancy	(1,939,548)
Scheduled Base Rental Revenue	$12,595,814
Add: Expense Reimbursement Revenue	150,928
Add: Parking Other Income	2,273,518
Total Potential Gross Revenue	$15,020,260
Less: Credit and Vacancy Loss	
Effective Gross Revenue	$15,020,260
Operating Expenses	
Janitorial	222,572
Porter	72,816
Window Cleaning	44,625
Supplies	42,483
Trash Removal	28,150
Fire and Life Safety Supplies	31,760
Repairs and Maintenance	505,807
Tools and Equipment	13,500
Utilities	
- Electricity	647,633
- Gas	43,883
- Chilled Water	588,000
- Water and Sewer	21,797
Security	209,200
Landscaping Contract	23,200
Administrative	259,890
Advertising and Promotion	25,900
Real Estate Taxes	2,376,310
Non-Reimbursable Expense	37,670
Insurance	188,000
Management Fee	$300,405
Total Operating Expenses	$5,683,601
Net Operating Income	$9,336,659

The key financial performance indicator from a DCF model is the internal rate of return (IRR). Technically, the IRR is calculated by determining the discount rate applied to the stream of cash flows from the property that would generate a zero net present value.[72]

Investors rely upon the internal rate of return, or related variations of the technique, for many real decisions, but then must fully consider whether the risks inherent in the pro forma cash flow upon which the IRR is based are properly compensated by the internal rate of return that the property produces.

Reduced risk is perhaps the most significant benefit of sustainable property investment. To measure, or get a feel for the magnitude of value premiums due to potential risk reduction, one must evaluate how sustainable property investment influences discount and capitalization rates. Practically, with few sales of sustainable buildings completed to date, and the difficult chore of separating out the effect of sustainability on sales prices, evaluating risk benefits relies more on a structured assessment of positive and negative risks than a purely statistical or quantitative analysis. This will be discussed in more detail in Step 6: Risk Analysis and Presentation.

Net operating income is not the end of the story in a DCF model. For investment decision-making purposes, investors often need to consider leasing and capital items, debt service costs, and taxes. Importantly, sustainable properties can achieve favorable timing and reduced costs for capital expenses, tenant improvements and leasing commission costs, improving returns to investors.

Prior to the last few years, low interest rates enabled debt to significantly increase financial performance. Essentially, investors could reduce their use of expensive equity, and replace it with low-cost debt, increasing their rates of return. Today, with debt service costs significantly higher, and loan to value and debt service coverage ratios lower, debt is less valuable than it used to be, but still cheaper than equity.

2. Discounted Cash Flow Model Inputs

The key financial model inputs for the discounted cash flow model are shown below in Exhibit V-8. Those inputs shaded in yellow are some of the assumptions most influenced by sustainable property investment.

[72] In some cases, due to the reinvestment assumptions and other issues with the IRR calculation, a modified IRR or use of other measures—net present value, etc.—is warranted for decision-making

Exhibit V-8

Discounted Cash Flow Model Inputs

Revenue

- Contract rental rates and other lease terms
- Market rental rates:
  - Ground floor retail $1.50/SF NNN
  - Office: floors 2-5 $2.50/SF FSG
  - Office: floors 6-10 $2.60/SF FSG
  - Office: floors 11-15 $2.85/SF FSG
  - Office: floors 16-19 $3.00/SF FSG
  - Office: floors 20-23 $3.20/SF FSG
- Annual rent growth
  - Year 1 3.0%
  - Year 2 6.0%
  - Year 3 5.5%
  - Year 4 5.0%
  - Year 5 4.5%
  - Years 6-10 4.0%
- Vacancy and collection loss - 5.0%
- Office lease terms and other assumptions - new and renewing tenants
  - Lease term - 5 years
  - Free rent - 0 months
  - Annual rent escalations - 3.5%
  - Downtime between tenants - 9 mos.
  - Renewal probability - 65.0%
- Parking revenues
  - Reserved parking - $225/space
  - Unreserved parking - $190/spacae
  - Annual parking revenue growth - 5.0%

Expense

	Year 1
• Janitorial	$ 222,572
• Porter	72,816
• Window cleaning	44,625
• Supplies	42,483
• Trash removal	28,150
• Fire & life safety supplies	31,760
• Repairs & maintenance	505,807
• Tools & equipment	13,500
• Utilities	
– Electricity	647,633
– Gas	43,883
– Chilled water	588,000
– Water & sewer	21,797
• Security	209,200
• Landscape contract	23,200
• Administrative	259,890
• Advertising & promotion	25,900
• Real estate taxes	2,376,310
• Non-reimbursable expenses	37,670
• Insurance	188,000

- Management fee - 2.0% of Effective Gross Income
- Growth factor for real estate taxes - 2.0%
- Growth factor for other expenses - 3.0%

Leasing Expenses & Capital Reserve

- Office tenant improvements
  - New tenants/2nd gen. space $ 15/SF
  - Renewing tenants $ 10/SF
  - Shell space $ 55/SF
- Leasing commissions
  - New leases 4.0%
  - Renewing leases 2.0%
- Capital reserves $0.35/SF

Property Acquisition & Disposition

- Property acquisition inputs
  - Purchase price $110.0 million
  - Closing costs 1.75% of purchase price
  - Loan fee 0.75% of loan amount
  - Total acquisitions costs $112.5 million
- Property disposition inputs
  - Residual capitalization rate 8.5%
  - Broker's fee and closing costs 2.0% of sales price

Investor Tax

- Ordinary income marginal tax rate 35.0%
- Capital gains tax rate 15.0%
- Cost recovery recapture tax rate 25.0%
- Allocation of cost basis to improvements 80.0%
- Depreciation schedule for improvements 39 years

Financing

- Loan amount $73.0 million
- Loan-to-value 65.0%
- Interest rate 7.5%
- Loan term 10 years
- Amortization schedule 25 years
- Loan points 1.0%
- Annual debt service $6.5 million

The model inputs are broken into the following categories:

- Revenue;
- Expense;
- Leasing Expenses and Capital Reserves;
- Property Acquisition and Disposition;
- Financing; and
- Investor Tax.

Key inputs influenced by sustainable properties include rental rates, annual rent growth, down time between tenants, renewal probability, utility expenses, tenant improvements and leasing expenses, and a growth factor for expenses other than real estate taxes. The input assumptions shown in Exhibit V-8 are those that generate the financial performance results as presented in the full DCF model presented in Appendix H.

As the DCF input sheet in Exhibit V-8 illustrates, many factors beyond rents or sales prices influence financial performance. In many cases, depending upon the particular market conditions and nature of the sustainability improvements, market rental rates or annual growth rates may not change significantly, but renewal probabilities, the downtime between tenants, absorption levels, operating expenses and other changes can result, increasing value. It will depend on the nature of the property, space users, market conditions, and other factors.

Perhaps most importantly, sustainable property investment can reduce the risk associated with a particular property's cash flow. As discussed earlier, lower risk could reduce capitalization rates applied to final year net operating income, increasing potential appreciation on a property and reducing the discount rate applied to the property's cash flow over the holding period.

Investors evaluating property investment options should directly consider reduced risk due to sustainability investment. Investors are willing to accept lower returns if risks are demonstrably lower. For example, investors that are confronted with multiple options for their investment dollars will not always choose the investment with the highest rate of return. In the real world, different types of investments have highly different risks, and on an informal "risk adjusted" basis, lower risk, lower return investments are often selected over more risky, higher return investments. Factors like the quality and mix of tenants, the specific length and nature of existing leases, the level of implied occupancy increase in the cash flow, and many other factors affect the relative risks of a stream of cash flows. As will be discussed in the next section, better analysis and articulation of these risks will result in increased value for sustainable properties.

A well-constructed DCF model that enables detailed sensitivity analysis can be an important tool in determining the financial implications of alternative sustainable property investments. In our real world office property example, a 30% reduction in electricity costs can result in a 0.5% increase in the internal rate of return. Interestingly, the effect on financial performance of a 30% reduction in energy costs is equivalent to:

- A 2.5% increase in contract and market rental rates,
- A 2.1% increase in effective gross revenue, or
- A 60 basis point change in the year 11 capitalization rate.

In contrast, a 30% decrease in water costs results in an insignificant one basis point change in the internal rate of return, reinforcing the critical importance of integrating the importance of water use reduction to revenue and risk considerations due to its potential positive effect on regulator, space user and investor demand.

More likely, if the evidence shows that space user and investor demand for a sustainable property would be higher than for a conventional property, then you will see small changes in a variety of the key variables, including market rental rates, annual growth rates, tenant retention, vacancy and collection loss, office lease terms, office tenant improvements, leasing commissions, and other demand-related variables.

3. The Process for Determining Financial Model Inputs

The starting point for determining DCF financial model inputs are the results from Step 4 – a detailed assessment of the net impact of sustainable property investment.

- Development costs
- Development risks
- Space user demand
- Resource use/operating costs
- Building operations
- Cash flow/building ownership risk
- Public benefits
- Increased investor demand

The next step is to identify and assess the “non-sustainable” factors influencing the financial model inputs. Key issues affecting space user demand such as support for the strategic mission, flexibility, and cost need to be evaluated for the subject property. In addition to space user demand, key “non-sustainable” factors influencing revenues, operating costs, leasing and capital costs, acquisition and disposition, financing, and taxes also need to be considered.

Next, the relative importance of each of the sustainable and non-sustainable factors needs to be evaluated. Some of the key analyses to be utilized include:

- Detailed analysis of comparable built and to be built properties. This analysis is done with a particular focus on the competitive advantages or disadvantages of the subject property, with a particular eye on the relative benefits of sustainable property attributes.
- Analyze existing national or local space user surveys. The key here is to evaluate survey research to see how the opinions and results might influence the specific space users identified for the subject property. Critical to this analysis are a very clear understanding of the respondents and the nature of the questions that were asked in these surveys. Many such surveys are done on a regular basis (see www.GreenBuildingFinanceConsortium research library and Industry Links, index code 15.73, and Appendix F, Enterprise Value Analysis).
- Develop a clear understanding of the existing and/or likely tenants in the property, and conduct an analysis of the potential demand for green buildings currently, and in the future. Key factors that will influence this are the specific region, industry, ages of occupants, specific ties to green or sustainable businesses, and other factors.
- Conduct market research. Do independent surveys of tenants, brokers, and others in the marketplace. Focus not only on existing trends or opinions, but expected trends over time. This will provide additional understanding of rollover risk.[73]

The process of measuring the relative importance of factors is by its nature a qualitative process, but should be based on significant quantitative research. Sophisticated forecasts of rents, occupancies, and other market factors are often relied upon. Market information allowing segmentation of green building demand by different types of tenants (CoStar data on leases for example) and survey data that reflect different demographics, geographies, and other key issues is becoming more available.

Finally, the last step is to integrate all the information collected on both sustainable and non-sustainable factors, for each of the key financial model inputs, and make decisions. For investors who rely on the discounted cash flow model and internal rates of return, they will be focused on the key financial variables discussed in this section. Also, as discussed earlier, the particular allocation of cash flow benefits between owners and tenants as specified in leases, and related risks, need to be carefully assessed.

For corporations and other owner occupants, financial analysis including discounted cash flow or total occupancy cost analysis may be supplemented by financial assumptions for improved productivity, improved health, reduced litigation or health cost risk, worker satisfaction, improved recruiting and employee retention. Whereas an investor must focus on an assessment of the market's response to the particular property that they are offering

[73] Rollover risk refers to the risk of not being able to secure new tenants at favorable rates and terms when existing tenant leases in a building terminate. The risk also incorporates the leasing and tenant improvement costs to resign new tenants if tenants choose not to renew their leases. The rollover risk of a property will be unique to its particular portfolio of leases and markets conditions.

to the marketplace, a corporation or other owner occupant can presume to accrue many, if not all, of occupant-based building performance benefits. Owner occupants must assess the value they ascribe to potential health, productivity, reputation and leadership benefits and make decisionst accordingly.

4. Special Sources of Sustainable Revenue

Sustainable properties can generate specialized revenue streams from Power Purchase Agreements, Renewable Energy Certificates, and a wide variety of government and utility tax credits, rebates, and other subsidies. These issues are briefly discussed in Expanded Chapter V.

H. Step 6: Risk Analysis and Presentation (RAP)

RAP is key to the future of sustainable property investment. Sustainable properties face increased risks due to new processes, products, materials, and regulations, but also benefit from reduced or mitigated market, regulatory, construction, legal, and operating risks. Sustainable property decisions require a clear organized presentation of both positive and negative risks to provide appropriate context for assessing sustainable options and related return on investment calculations.

One of the most important issues in underwriting the financial performance of sustainable properties is a full understanding of the risks associated with the pro-forma cash flows in the DCF model. For the purposes of improving sustainable investment decision-making, more detailed documentation of the risks of sustainable property investment, both positive and negative, are necessary to provide decision-makers with proper context for evaluating pro-forma financial performance.

RAP should be part of the investment package that goes to decision-makers for any investment decision. The form and content of the RAP will vary based on the context of the investment decision, but should be directly linked in the presentation to the quantitative valuation and rate of return calculations.

In this section we address four important risk issues:

1. Property risk focus
2. Why RAP is key to the future of sustainable property
3. How to RAP
4. Background on Cash Flow and Building Ownership Risk

1. Property Risk Focus

This book focuses on the assessment and integration of risk analysis into property-level decisions. Property specific decisions include building retrofits, commercial interior build-outs, acquisition of an existing building, or new construction. The presentation and discussion of risk occurs in many different situations:

- **Feature Decisions:** Risk and uncertainty are often part of the general discussion and presentation of a simple payback, simple ROI, or life cycle costing analysis for a specific feature (green roof, HVAC system, etc.).

- **Investors/Valuers Cap Rate Selection:** Risk is, or should be, a central determinant in the **s**election of an appropriate residual capitalization rate in an existing property acquisition. This is most often discussed in assessing the relative cash flow and related risks of sales comparables.

- **Investment Due Diligence:** In the context of decision makers evaluating the reasonableness of a rate of return estimate from a DCF analysis. The rate of return (typically an internal rate of return) reflects the mathematical result of the underwriter or valuer's opinion on scores of specific inputs, without full consideration of risk or uncertainty. For example, three different retail property investments might have forecasted rates of return of 7%, 9% and 11%. To determine which is a better investment, investors consider the relative risks associated with each project and determine, on an informal "risk-adjusted" basis, which project best fits their needs. While this process of considering risks is not a formal mathematical process, it can, and should be, rigorous and well reasoned.

- **Corporate Real Estate Decisions:** Corporate real estate decision-makers consider many similar factors to an investor, but typically have different, and often unique, investment considerations and return hurdles. Businesses are particularly sensitive to risks that would threaten their ongoing operations and long term company value.

- **Valuation:** Valuers must also consider risks and uncertainty in their determination of discount and capitalization rates in order to calculate value using the Income Approach to Value. This is often done while evaluating the "comparability" of sales or rental comparables.

- **Lending:** Lenders' consideration of risk is more focused on the probability of default (which is a function of risk and uncertainty in the cash flows required to pay debt service) and the severity of losses in the event of default (which is primarily a function of the loan to value ratio). Risk mitigation is key because unlike investors, lenders do not directly share the "upside" if a risk pays off, only the downside if it fails.

Real estate asset risk is also typically understood to have two components: systematic and unsystematic risk. Systematic, or market risk, cannot be mitigated through diversification, and is common to all assets. Unsystematic, or asset-specific risk is unique to a particular asset. Asset-specific risk can be mitigated through diversification--by increasing the number of assets randomly assembled in the portfolio. These concepts, and the relative covariance between real estate and other asset classes, are key concepts in the construction of real estate portfolios, but less important in our discussion of property-specific risk in this section.

2. Why RAP is Key to the Future of Sustainable Property Investment

Sustainable property investment has dramatically increased during the last few years. However, many investors and occupants still need to be educated, and many who are actively investigating sustainable property investment are under-investing due to insufficient or incorrect consideration of revenues and risk. Superior RAP will be a critical component of the changes necessary to overcome sustainable investment obstacles.

Some of the key reasons RAP is so important to the future of sustainable property investment include:

- Sustainable investment is relatively "new" and untested;
- Volume and magnitude of "positive" risk;
- Value of sustainable property to corporations/occupants;
- History of sustainable property advocacy;
- Critical role of risk mitigation;
- Enhanced role of risk in investment decision-making.

3. How to RAP

There are as many ways to RAP as there are different types of sustainable property investment decisions. However, the following guidelines should be helpful in thinking through the preparation of any RAP.

- **Clarity:** Perhaps the most important advice in preparing a RAP is that the presentation be clearly prepared and easy to consume. Discussions of positive and negative risks need to be specifically tied to the particular financial assumptions or other key assumptions in the investment package and/or financial model. The presentation should be logically consistent, discuss positive and negative risks, and provide rationale for how "net" risk impacts are assessed.

- **Comprehensive**: Perhaps one of the most important guidelines is that risks be fully presented. Real estate decision-makers are well versed in dealing with highly complex and risky decisions, and a project has a much better chance of being approved if the risks are fully presented. There is nothing more damaging to an investment approval decision than an investment committee member uncovering biased or incorrect information in a presentation, or uncovering risks that were not presented.
- **Process and Feature Focus:** As presented in Chapter IV: "Sustainable Property Performance," the success of a sustainable property can be significantly increased if sustainable processes and features are appropriately undertaken. Proper integrated design, energy modeling, commissioning, and related processes are particularly critical to sustainable property risk mitigation. The selection and implementation of features can also reduce risk if properly done.
- **Enhanced Sensitivity Analysis:** Enhanced sensitivity analysis that enables decision-makers to understand the relative importance of particular risks can be particularly helpful in sustainable property investments. Many of the negative risks can be controlled through risk mitigation, and often the risks themselves are of relatively small magnitude, particularly in comparison to the positive risks possible through market and/or financial performance upside.
- **Risk Mitigation:** Risk mitigation that is undertaken through legal, surety, insurance, or other forms of due diligence should be clearly delineated.
- **Advanced Risk Analysis Techniques:** Depending on the type of decision, the sophistication of the underwriting/due diligence team, and the sophistication and requirements of the decision-makers, advanced risk analysis techniques should be considered. These types of risk techniques will vary based on the industry and situation, but would include multiple scenario analyses, alternative contracts and compensation, "value at risk" financial risk management tools, and many other techniques.

Sustainable property investors have a significant opportunity to maximize the level of investment in sustainable properties through better risk analysis and presentation. Real estate people like risk; it is how money is made. They just want to be able to understand it well enough to properly price and mitigate it.

4. Background on Cash Flow and Building Ownership Risks

By far the most important financial benefit of sustainable property investment is the potential reduction in cash flow/building ownership risk. Reduced cash flow/building ownership risk is an important contributor to an increase in space user demand, which can directly improve revenues, and to an increase in investor demand, resulting in higher values through reduced discount and capitalization rates.

Cash flow and ownership risks are most significantly reduced due to the ability of a sustainable/energy efficient building to cost-effectively meet the changing needs of regulators, space users, and investors. It is almost a certainty that local, state and federal regulations regarding sustainability will increase, perhaps dramatically, in the coming years. A building that cannot, at a reasonable cost, adapt to meet future regulatory requirements or capitalize on incentives, will be less valuable.

Analogously, a building that cannot adapt to meet increasing demand for sustainability by space users and investors will also lose value through economic obsolescence. Sustainable buildings also reduce the risk of reliance on the energy grid (terrorism or natural disasters), limit exposure to energy/water cost volatility, and limit both current and future potential liability due to building-related health issues. All of these benefits reduce exit or takeout risk by maximizing the potential pool of buyers or investors, and the availability of financing.

While the benefits related to cash flow risk can be significant, sustainable properties can also increase cash flow/building ownership risk. For example, investments in new technologies, systems or products that are at risk of getting leapfrogged increases the risk of losing value due to functional obsolescence. Investors can also miss the market, over-investing in sustainability relative to market demand. Worse, the potential elimination of non-sustainable features attractive to occupants may reduce tenant demand, increasing cash flow risk. The reliability and accuracy of energy forecasts, as well as the risk due to energy price declines also can be important over a short time period. Finally, liability risk relative to performance claims and marketing need to be evaluated.

Risk Analysis and Capitalization and Discount Rates

The traditional way discount and capitalization rates have been generated is through market research. Capitalization rates are calculated based on evaluating comparable sales of commercial properties, and discount rates are typically determined through an analysis of the most likely buyer of a project, and their rates of return requirements, through surveys or other means. Market derived discount and capitalization rates are then adjusted for the specific concerns and considerations of the particular property, given its risk attributes.

When market transactions are limited, and capitalization and discount rates are difficult to determine based on market evidence, or the number of property sales for a particular specialized property type is too low (as is often the case with sustainable properties), the derivation of capitalization and discount rates relies more upon a detailed articulation and reconciliation of the risk- increasing and risk-decreasing factors of a particular property.

While anecdotal (based on many interviews and discussions, but not a random or statistically significant survey), our research shows that for most institutional investors, new development projects are already seeking a relatively high level of sustainability, and institutions are moving rapidly to assess their existing portfolio’s sustainability related potential for functional or economic obsolescence due to sustainability. Many of the largest real estate owners are developing specific acquisition screens to eliminate potential risks from properties that are unsustainable, or where the cost to cure potential obsolescence from sustainability is not financially feasible.

Additional surveys, anecdotal evidence, and actual valuation evidence will increase in the future, improving the capability to analyze this issue. One important caution in trying to determine the incremental effect of sustainability on property value is the tremendous increases in value between 2005 and 2007 and the subsequent substantial decreases in value starting in early 2008. Given these substantial valuation changes, as much as 2% a month during certain time periods, any statistical efforts to isolate sustainability will continue to be difficult.

I. Valuation Considerations

The bulk of *Value Beyond Cost Savings: How to Underwrite Sustainable Properties* is applicable to valuation. Chapter II on investment decisions addresses critical issues in clearly specifying the valuation assignment. Chapter III on evaluating a property's sustainability addresses the implications of certifications and performance measurement on value. Chapter IV presents new valuation-focused performance frameworks and comprehensive sustainable property performance data. Chapter V provides detailed guidance on financial modeling and a six-step process for implementing the Income Approach to Value (Discounted Cash Flow Analysis). Chapter VI provides additional insights into sustainable property risks and risk mitigation, giving valuers better understanding of how capital sources think about sustainability, and also provides detailed guidance on underwriting service providers, energy, space user demand, regulator demand, and potential health and productivity benefits.

This section summarizes some of the Consortium's key findings and conclusions that arise from our research regarding valuation of properties with sustainable attributes:

1. Sustainable properties should be more valuable
2. Valuation is not just about formal full narrative reports
3. Valuers have skills to make significant contributions to sustainability
4. Fundamental valuation methodologies do not need to change
5. Sustainable valuation must look beyond costs
6. Public value has increasing importance to private value
7. The income approach is critical to understanding sustainable value
8. Valuers need to get better at integrating risk analysis into value
9. Valuers must prove value of sustainability one property at a time
10. Performance measurement is key to sustainable property performance
11. Energy is a more critical issue for sustainable property valuation

1. Sustainable Properties Should Be More Valuable

Sustainable property performance evidence presented in Chapter IV supports a compelling **general** argument that sustainable properties should be more valuable. Development costs are only marginally higher, and can often be mitigated or successfully managed.[74] Operating costs are lower. Revenues are higher as a result of regulator incentives and subsidies and enhanced space user demand. Investor demand is up as they begin to respond to potential regulator and space user demand increases and other investor climate change pressures. A detailed assessment of the "net" risks of sustainable properties is quite positive, lowering required discount and capitalization rates. Finally, many of the real risks of sustainable properties can be mitigated through contracts, insurance, and other strategies that have developed as the industry has matured.

2. Valuers Must Prove the Value of Sustainability One Property at a Time

The general business case for why sustainable properties should be more valuable provides a valuable "hypothesis" that must be tested for individual properties being valued.

One of the biggest challenges for valuers is that the general research methodologies and data supporting why sustainable properties should be more valuable is of limited use in quantifying the value of a specific property with its own unique combination of sustainable attributes. General statistical studies that support higher rents, higher values, lower energy use, better occupant satisfaction, and similar conclusions are typically based on average results from scores to thousands of properties. These studies, if appropriately applied, can help with property specific valuation assumptions, but the conclusions cannot be easily applied. There are no easy solutions to valuation of sustainable properties—they need to be valued the old fashion way—one property at a time. (Much more on this concept and its importance in interpreting current sustainable property performance evidence is presented in Chapter IV, Section F: Market Performance).

3. Valuation is not Just About Formal Full Narrative Reports

Many sustainable property investment decisions do not require formal full narrative valuation reports.[75] Formal full narrative valuation reports are typically required when third-party finance is involved, but in most other investments by corporations or investors, formal full narrative valuation reports by third-party valuers are not required or used in

[74] Substantial information on initial sustainable development costs indicate a 0-5% premium for new sustainable development costs, with experienced providers more likely to achieve the 0% premium. Research on premiums for major or minor retrofits is more limited, and it is more difficult to make general statements about initial development costs for existing buildings due to the wide variations in the types of retrofits and initial conditions in existing buildings.

[75] Valuation reports can include varying levels of analysis, documentation, and reporting depending on their purpose, the valuer, and the language used in the report.

practice. However, less formal valuation is used by many decision-makers and in almost all sustainable property investment decisions the concepts of value need to be more rigorously applied. Even if a formal report is not completed, applying the methods and practices of valuation will enable capital seekers to accurately assess and present the revenue and risk implications of sustainable property investment that are either left out, or poorly presented today.

The specific role of value, or a more formal full narrative evaluation or appraisal report, will vary based on the type of investor and investment decision. For example:

Corporate Real Estate Decisions

Corporate sustainable property investment decisions do not typically require or involve a formal full narrative real estate appraisal or valuation report. However, sustainable properties have value beyond reductions in energy, water or maintenance expense. Potential health or productivity benefits, recruiting, employee retention, and reputation value, reductions in liability and regulatory risk, and other benefits of sustainable properties or investment in sustainable property features are important.

Corporate owner/users have many of the same considerations and motivations as investors, however the primary difference is that all of the benefits of energy efficiency, and related higher sustainability ratings, flow directly to the owner/user. Some of these benefits include:

- Energy savings (both in the short- and long-run)
- Better recruiting and retention
- Improved corporate image
- Access to Socially Responsible Investment capital

Investors/Landlords

The majority of commercial and multi-family equity investment decisions are not typically based on a formal full narrative appraisal report, but discounted cash flow analysis and internal rate of return analyses and risk assessments. Because of the reliance on discounted cash flow analysis for decision-making, the important concepts of value can be integrated into investment decision-making, with the key constraint being the availability of data and knowledge of how to effectively do that. Value is explicitly considered in the selection of a residual capitalization rate and discount rates.

Developers

Sustainable investment decisions made by developers are significantly influenced by formal appraisals because appraisals are required for construction and/or permanent take-out loans necessary to move development projects forward. Less formal valuation considerations need to be more rigorously used by developers during the design and "value" engineering process. Developers have the most difficult challenge with valuation because they are dependent on assessments by third-party valuers hired by capital sources who may not yet have the education and experience to properly value properties with sustainable features.

Lenders

Lenders, particularly if they are federally regulated in the United States, require formal market appraisals prepared by licensed appraisers following the Uniform Standards of Appraisal Practice (USPAP), governed by the Appraisal Foundation prior to originating a commercial mortgage.[76]

Lenders have been slow to recognize the benefits of sustainability and/or energy efficiency in their underwriting practices. Some smaller banks are offering more favorable financing terms for green buildings, including higher LTVs and lower interest rates. Some larger banks are in the process of developing programs that provide some recognition of sustainable property attributes, but both larger and smaller bank lending policies and procedures are undergoing significant change, beyond sustainability, due to current financial market upheavals.

4. Valuers Have the Skills Necessary to Make Significant Contributions to Sustainability

Valuers, underwriters, or brokers, not engineers or architects, are better positioned and trained, and have the requisite skills and experience to judge how space users and investors will respond to a building's sustainable performance (resource use, occupant performance, etc.). In fact, as illustrated in GBFC's Sustainable Property Performance Framework discussed in Chapter IV, valuers and brokers play a critical role because there is no way to assess the financial implications of sustainable property investment without measuring the market's response to a building's sustainable property performance.

For example, once the science is clearly presented about how a sustainable property could affect occupant health, it is up to the valuer, underwriter or broker to judge whether the occupants for a particular subject property will "value" such benefits, and at what level, in the context of the particular types of occupants expected in a building, current market conditions, and the many other factors driving occupant space decisions.

Not only should all certified valuation professionals have the requisite skills to contribute to sustainable property valuation (with appropriate additional education), they will need such skills to value any property in the future. As sustainable attributes and outcomes become more important to regulators, space users and investors, no credible valuation of a non-sustainable property will be possible without consideration of potential sustainability

[76] The Appraisal Foundation has international representation, not purely U.S. direction. Sixty countries support the International Valuation Standards Committee.

related economic or functional obsolescence. As sustainable considerations increase in prominence, valuer sales comparison analysis, lease/rental comparables analysis, operating expense analysis, etc. for non-sustainable properties will have to appropriately consider sustainability.

5. Fundamental Valuation Methodologies Do Not Need to Change

The fundamental approaches to value, in most cases, do not need to change. Fortunately, discounted cash flow analysis (Income Approach) is well suited to deal with the challenges of integrating the new information and "sub-financial" analyses necessary to accurately assess the implications of sustainability on value. Valuers will need to think about the world, and properties a bit differently, but the changes required, while significant, are analogous to changes necessary to deal with globalization, outsourcing, warehousing and industrial sector technology changes, the Internet, significant demographic transformations, and the increased technology component of buildings. For these game-changing trends, valuers just had to get smarter, and do some new types of analysis without changing fundamental methods, and sustainability is no different.

A few areas that need to evolve include building performance measurement, property descriptions (for both subject properties and comparables), and enhanced consideration and presentation of risks.[77]

6. Sustainable Valuation Must Look Beyond Costs

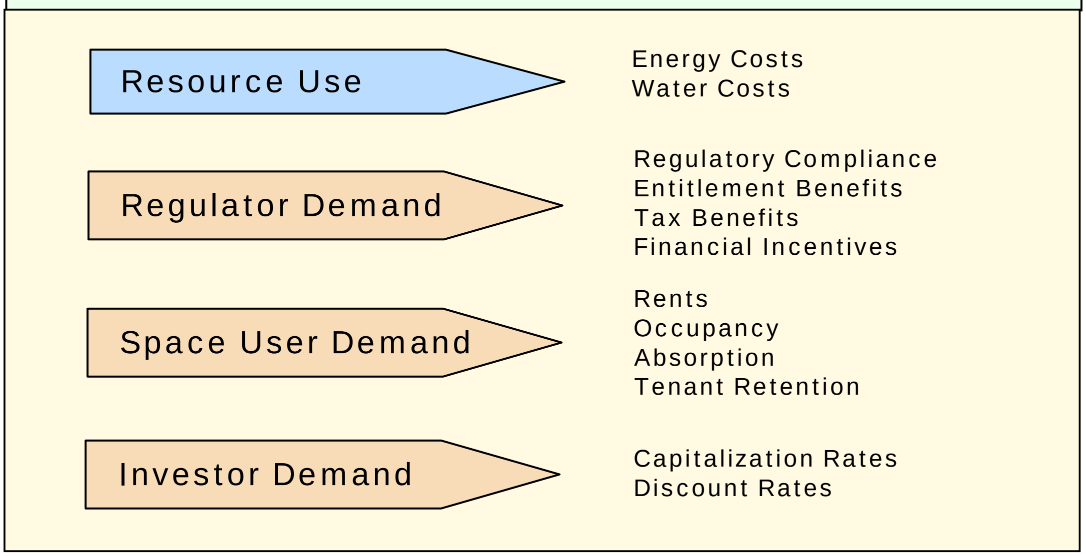
Valuation is critical to sustainable property investment. To date, most sustainable property investment decisions have been based on simple-payback or simple return on investment analyses that factor in development costs and operating cost savings, but fail to properly consider revenue and risk implications. This failure to properly integrate revenue and risk considerations has contributed to bad decisions historically, but with recent (since 2008) dramatic increases in the demand for sustainable/energy efficient properties by regulators, space users and investors, the problem has escalated. Relying on such practices in the future will erode the quality of sustainable property investment decisions further.

Regulator, space user, and investor demand are critical to value, as discussed throughout *Value Beyond Cost Savings: How to Underwrite Sustainable Properties* and illustrated below in Exhibit V-9. If valuers only consider resource use (energy costs, etc.) and ignore the affect of sustainable property investment on market demand, key value issues affecting entitlements, rents, cap rates and other issues would be ignored. In essence, revenue and risk considerations would not factor into decision-making, a recipe for long-term underperformance.

[77] It could be argued that these are fundamental changes in methodology, but we see them more as data and presentation issues rather than changes in basic methods.

For example, the benefits of investment in sustainable features that lead to significant energy efficiency extend well beyond energy cost savings to potential increases in tenant demand due to corporate sustainability requirements, the ability to utilize government incentives, the general reduction in the risk of projected cash flows due to reduced energy cost volatility and protection against future government regulatory actions effecting energy efficiency.

Exhibit V-9
Sustainability Demand Affects Value Inputs



The Consortium's mission is to enable private investors to evaluate sustainable properties from a financial/fiduciary basis. Accordingly, *Value Beyond Cost Savings: How to Underwrite Sustainable Properties* focuses primarily on market value:

> The most probable price, as of a specified date, in cash, or in terms equivalent to cash, or in other precisely revealed terms, for which the specified property rights should sell after reasonable exposure in a competitive market under all conditions requisite to a fair sale, with the buyer and seller each acting prudently, knowledgably, and for self-interest, and assuming that neither is under undue duress.[78]

In considering owner-occupant real estate decision-making, the concept of investment value, or worth is appropriate to consider. In such situations, decision-makers are not just considering a property's market value, but the value of the property to their specific enterprise, which may go beyond what typical market participants consider.

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[78] *The Appraisal of Real Estate*, 12th Edition, The Appraisal Institute, 2001, page 22

7. Public Value Has Increasing Importance to Private Value

Public value has become more valuable to private value because of the increasing demand for sustainability by regulators, space users and investors. The concept is simple—if a building owner can clearly and factually articulate the public benefits that arise from their building, they are more likely to convince regulators, tenants and investors to pay for those benefits.

Such "monetization" of public value is created from governments or utility companies through enhanced entitlements/permitting, public grants, favorable financing, tax benefits, and carbon credits or payments, and from private companies through their contribution to Enterprise Value and resulting increases in space user demand. If space user demand increases, private owners can monetize private benefits through rent premiums, faster absorption, higher occupancies, or other direct financial measures.

Sophisticated sustainable property investors and developers will conduct their own detailed assessment of the public benefits of their projects to enable clear articulation to regulators, potential tenants, employees, and capital sources. A starting point for clearly articulating public benefits is to have a framework for thinking through and organizing public benefits analyses. One such framework is outlined in Exhibit V-4 and discussed in more detail in Appendix F.

While the concept of public interest value, and the move for the valuation industry to take a more direct role in assessing public values is important, the key public values for determining private market value are those that can be monetized through government incentives, protection against enhanced competitive response to government regulations, and premiums paid by occupiers and/or investors.

8. The Income Approach is Critical to Understanding Sustainable Property Value[79]

Valuation involves a consideration of three approaches to value: the Income Approach, the Market Approach, and the Cost Approach. Final value opinions reflect the valuer's reconciliation of the three approaches, applying appropriate weighting (consideration) to each approach based on the specific fact and valuation context.

The Income Approach to Value, of which Discounted Cash Flow (DCF) is a primary methodology, is most important in most cases in valuing commercial properties. For properties with sustainable attributes, the income approach offers the best method to factor in the "value" of sustainability because it is based on detailed revenue and expense information, forecasts of performance, and explicitly addresses risk and the timing of

[79] These observations are a general discussion of a complex and involved topic. The three approaches to value are for a market value appraisal. There are many other types of value that use different methods and terminology, and terminology will vary by region and country.

expenses and revenues. **More definitively, if one does not at least conceptually understand the DCF methodology, it is difficult if not impossible to accurately assess the financial implications of sustainable property investment**. The DCF methodology forces one to make explicit links between sustainable property performance and financial inputs like rents, and reinforces that such analysis can not be done in isolation of all the other non-sustainable factors that also influence financial inputs, like rents.

The Market, or Sales Comparison Approach, is also important for commercial and multi-family properties. In this methodology, "comparable" sales (to the subject property being valued) are identified, and sales price adjustments are made between the subject and comparables based on a review of their comparability on key issues such as location, zoning, access, size, market quality, property quality, date of sale, etc. The valuer typically makes a series of qualitative adjustments to each variable based on quantitative and qualitative analyses of the subject and comparable sales. The importance of the market approach is enhanced if there are numerous high quality comparable sales in the submarket and high quality data is available on the key attributes of properties that valuers judge are important to sales price.

As of early 2010, the Market Approach has significant limitations in most sustainable property valuations due to a lack of a sufficient number of comparable sales, limitations on the availability of key sustainable property performance data on subjects and comparables, insufficiently detailed property descriptions in sales comparable databases, and the challenges inherent in the broader market due to the reduction in the number of sales transactions and significant value declines (upwards of 50% in many cases) which make date of sale adjustments difficult and sometimes unreliable.

However, the Market, or Sales Comparison Approach, can still provide significant insights into the behavior of regulators, space users, and investors that will provide context for interpreting Income Approach results and determining key financial model inputs. Additionally, the Income Approach also extensively relies upon property market comparisons as a basis for selection of rents, occupancies, absorption, tenant retention and expenses.

The Cost Approach can be important for commercial properties, primarily as a cross check for the Income and Market Approaches. The Cost Approach is typically more reliable with newer properties, where depreciation estimates are more reliable due to the limited passage of time. (In the Cost Approach, the cost to build a new property is adjusted for depreciation). Depreciation, which is calculated by evaluating a property's physical, economic and functional obsolescence can be quite complicated to calculate and involves much of the market, economic and comparables analysis that is done in the other approaches from a different perspective.

For sustainable properties, the cost approach has limitations due to data availability, the difficulty of properly incorporating positive functional and economic obsolescence, and other factors. In particular, in the corporate world real estate assets are often booked at cost, which will typically under-value sustainable properties and features, often negatively affecting the proper allocation of capital to sustainable improvements.

9. Valuers Need to Get Better at Integrating Risk Analysis into Value

Valuers have historically done a poor job of analyzing and presenting their assessment of how property risk affects property value. In formal full narrative valuations, where a complete DCF is implemented, valuer's assessment of risk is largely reflected in their selection of discount and residual capitalization (cap) rates.[80] Valuer's selection of discount and cap rates is primarily based on their assessment of the returns required by investors to invest in a particular property. Generally, the assessment of risks is not well presented, with a focus on the source of market rates. When market data on required capitalization and discount rates is limited, valuers do more work to assess and present potential risks and "build-up" likely discount rates.

Because so many sustainable property investment decisions are not based on formal full narrative valuations, but on internal rates of return, simple payback analysis, and other types of financial analyses, where risk and related value considerations are often not well presented, valuers that want to assist decision-makers when completing less formal valuation work need to do a more rigorous and logically presented assessment of risks. Valuers are further compelled to more thoroughly understand risk issues because sustainable property valuation issues are largely tied to risk considerations (see 40-page GBFC Costs and Benefits Checklist in Appendix G).

While valuers need to do a better job, investors and lenders have even more compelling reasons to improve their practices as discussed in the Risk Analysis and Presentation section of this Chapter. Valuers need to be aware of the potential valuation affects of enhanced risk consideration by investors as the industry matures.

10. Performance Measurement Is Key to Sustainable Property Performance

Valuation quality is significantly influenced by the access to proper data that is consistently available for both the subject property and comparables. For sustainable properties, property information from the subject and comparables has to be sufficiently detailed in the areas of property descriptions, resource use, occupant satisfaction, and select other areas to enable valuers to properly adjust sales and lease comparables to reflect the value of sustainable attributes.

As discussed in depth in Chapter IV, Section F., valuers need to improve their assessment of the market response to sustainable building performance. Better data and methods are needed to consistently measure regulator, space user and investor demand.

[80] In a ten-year DCF analysis, capitalization rates are typically applied to 11th year Net Operating Income to estimate a residual sales price, which is then discounted back to the present along with the Net Operating Incomes from years 1-10 to get a present value.

11. Energy is a More Critical Issue for Sustainable Property Valuation

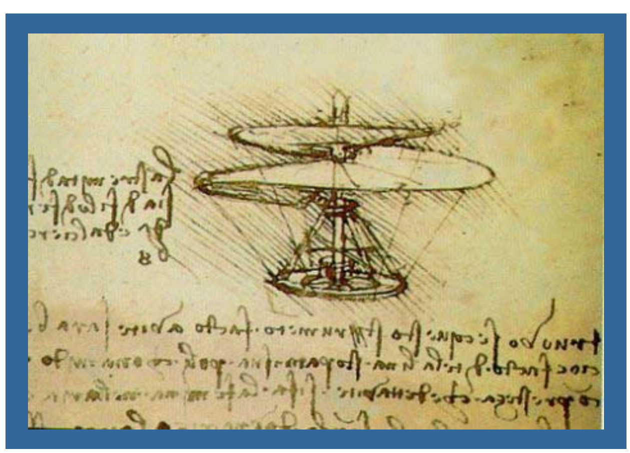
Energy/Carbon reduction is more critical to sustainable property value because of the substantial projected energy savings of many sustainable properties and the growing importance of the value of energy/carbon reduction investment beyond its operating cost savings.

Many sustainable properties project energy savings of 30% or substantially more. The cost savings alone from a 30% reduction in energy costs can result in 2+% increase in value. Accordingly, since such savings can not be verified by historic energy use data for similar (non-sustainable buildings) or traditional rules of thumb, valuers need to apply more due diligence to such estimates than they have in the past. In Chapter VI, Section E, we present an entire section on underwriting energy/carbon reduction investment that focuses on assessing the reliability and accuracy of forecasts.

More important than costs is the critical role that reduced energy/carbon use has in achieving environmental certifications and meeting growing space user and investor thresholds for minimum energy/carbon efficiency. It is important to understand that while energy/carbon efficiency may contribute significantly to value, the value loss due to obsolescence (because property does not meet current market standards) will be limited and affected by the cost to cure such obsolescence.

J. Conclusions

Sustainable property financial modeling and analysis presents challenges in integrating qualitative costs and benefits information into more quantitative financial decision-making measures like value and rates of return. Fortunately, traditional discounted cash flow analysis, widely used and understood in the real estate industry, provides an excellent framework for conducting this analysis.



Chapter VI
Sustainable Property Underwriting Guidelines

A. Introduction

The underwriting guidelines presented in this chapter are based on a review of numerous underwriting guidelines, due diligence processes, and internal real estate decision-making documents. They can be applicable to both debt and equity investments, with particular focus or emphasis based on the type of investment decision and investor.

As a starting point, it must be understood that real estate investors do not want to eliminate risk. Risk enables investors to achieve higher returns and provides opportunities for investment. However, investors must be able to identify and understand risks well enough to price and or mitigate the risk. The underwriting process enables investors to better understand risks (market analysis, lease reviews, environmental and engineering due diligence reports, etc.) and mitigate them (legal review and contracts, insurance, loan to value or cost limits, reserves, guarantees, etc.)

The underwriting process will vary by property type, type of investor, type of investment decision, and other factors as described in Chapter II. However, in all cases, underwriting goes beyond financial analysis and valuation to address the full range of risks inherent in real estate investment.

Chapter VI outlines the underwriting process for sustainable property investment.[81] Key differences in sustainable property underwriting are analyzed and modifications to conventional property underwriting guidelines are presented. Special considerations in underwriting service providers, energy/carbon reduction investment, and space user demand are highlighted and discussed in detail.

This chapter addresses existing and new/major retrofit underwriting separately. The risks and mitigation strategies for each type of investment are quite different. Such risks for existing properties include legal, environmental, physical, owner/operator, property

[81] The term "underwriting" in this report refers broadly to the independent due diligence that lenders, equity investors, developers, corporate real estate executives and other real estate decision-makers undertake prior to their sustainable property acquisition, construction, financing, or leasing decisions. The term "valuation" is also broadly used to reference both formal and informal methods of analyzing and communicating private property market value.

management, and insurance. New or major retrofit projects face construction, debt interest carry, and take-out risks.

Substantial detail on sustainable property risk and risk mitigation is presented throughout *Value Beyond Cost Savings: How to Underwrite Sustainable Properties* and the Expanded Chapters. While we endeavor to incorporate references and summaries of that knowledge in the discussion of the Underwriting Guidelines below, a complete assessment of potential modifications to traditional underwriting or due diligence practices will have to incorporate knowledge and risk analysis from other parts of the book and Expanded Chapters. Key underwriting guidance from the book and Expanded Chapters is found in each Chapter:

- Chapter II helps focus the Underwriting Approach required, by outlining how underwriting will change based on the specific type of decision being made.

- Chapter III summarizes the methods required to factor in specific "definitions" of property sustainability into underwriting.

- Chapter IV outlines the facts and methods necessary to incorporate the lessons learned from prior experience with sustainable processes and features into the underwriting approach. The sections in Chapter IV-C: Process Performance that deal with integrated design, contracts/legal, and commissioning are particularly important, identifying key risk issues and best practices to mitigate potential problems.

- Chapter V describes how risk analysis is incorporated into the financial analysis and valuation of sustainable properties. Section E: Assess Costs/Benefits of Sustainable Property, and the referenced 40-page GBFC Sustainable Property Cost-Benefit Checklist; provide an organized guide to identifying and analyzing the cost-benefit trade-offs at the property level. Section F: Evaluate the Implications of Costs-Benefits presents a "Net Impact" methodology to help translate costs and benefits into information that can be applied in a financial analysis. In Section H: Risk Analysis and Presentation, key background on cash flow and building operating risks are summarized and a methodology for assessing and presenting risk in the context of sustainable decision-making is presented.

- The special challenges and issues involved in underwriting energy, space user demand and service providers is highlighted in Chapter VI, given their importance to sustainable property underwriting.

The ideas and recommendations presented in Chapter VI are not meant to be exhaustive. This chapter focuses on underwriting modifications, which may be warranted for a particular property due to its sustainability. Accordingly, we do not provide a complete assessment of the underwriting actions that need to be undertaken under each of the checklist items, but focus on marginal changes to process and procedures. Many aspects of the underwriting process involve legal considerations including leases, contracts, mortgage documents, purchase agreements, etc. The analysis in *Value Beyond Cost Savings: How to Underwrite Sustainable Properties* is not intended as legal advice or as a substitute for consulting appropriate counsel.

B. Underwriting Perspectives by Investor Type

1. Underwriting Output and Investor Type

The specific decision criteria, key underwriting issues, and form of output vary by type of investor. Mortgage underwriters typically have specific requirements that must be addressed. It is particularly important to understand that while equity investors can reap rewards for taking risks, lenders just get the mortgage payment. Consistently available cash flow to pay debt service is key for debt providers.

Sponsors or promoters of sustainable projects will be most successful in attracting capital if they understand explicitly what drives investment decisions for different types of capital providers. For example, the perspectives of different types of equity investors can vary dramatically. "Core" investors seeking returns of 6-8% and "opportunistic investors" seeking returns over 20% have very different investment criteria and underwriting perspectives. However, all equity investors will be more receptive to capital requests if well-reasoned support for taking risks is documented.

Tenant real estate decisions, once strategic goals are met, have historically been cost driven, with three-year or shorter simple-paybacks (sum of operating expense reductions exceed investment cost within three years) required for investment. Recognition of sustainable real estate's contribution to enterprise value (recruiting, productivity, social license to operate[82], etc.) has accelerated recently, but clear support for non-cost related benefits needs improvement.

2. Corporate Real Estate Underwriting

Corporate property decisions, whether new construction or existing buildings, will be subject to many of the underwriting and due diligence guidelines presented for investors and lenders, but are also subject to additional underwriting and due diligence issues as summarized in Exhibit VI-1 and outlined in the Space User Underwriting Checklist shown in Appendix I.

Since the primary purpose of real estate in a corporate or space-user situation is to contribute to the successful execution of the business's overall strategic goals, all real

[82] Successful companies effectively maintain a social license to operate. For example, when its customers view a company negatively, or worse as unethical or criminal, the company's social license to operate can be diminished.

estate property decisions must be evaluated for their strategic compliance, including their ability to promote marketing and sales, increase innovation, improve productivity, increase flexibility, and reduce costs.

Exhibit VI-1

Underwriting/Due Diligence Guidelines

Key Space-User Issues

Strategic Goal Compliance

- Sales & Marketing
- Innovation
- Employee recruiting/retention
- Productivity
- Flexibility
- Reduce costs
- Meet energy/ sustainability goals
- Etc.

Property Specific Requirements

- Security
- Technology
- Life & safety systems
- Parking
- Quality/image
- Occupant mission
- Design and engineering standards
- Etc.

Financial Analysis

- Corporate return on equity
- Economic value-added
- Total occupancy costs
- Simple – payback
- Value engineering
- Asset valuation
- Risk/options analysis

Pre-Purchase/ Lease Due Diligence

- RFP Requirements
- Utility bill analysis
- Benchmark energy costs
- Energy audit
- Interview principal users
- Identify and test systems
- Review prior energy model

Corporate real estate decisions are often triggered by very specific property requirements related to security, technology and systems, parking, quality or image, and the specific mission of whoever is going to occupy the space.

Corporate real estate financial decisions are also underwritten differently than typical investors. Corporate return-on-investment hurdles are important. Simple payback analysis, total occupancy costs, risk and option analysis, and other analytic techniques are also employed.

C. Key Differences in Sustainable Property Underwriting

One of the most important conclusions of the Consortium's research from the last three years is that underwriting and valuation do not have to fundamentally change for sustainable properties. That said, the underwriting process is different. Many sustainable property decisions will require additional sub-analysis, new types of data, and a re-emphasis on different parts of the underwriting and valuation process. Seven of these key differences are summarized below:

1. New mix and priority of service providers
2. Modified list of costs and benefits (risks)

3. Priority of energy/carbon reduction investment
4. Importance of process and feature underwriting
5. Priority of government regulations and incentives
6. Underwriting health and productivity benefits
7. New sustainable "sub-financial" analysis

1. New Mix and Priority of Service Providers

Sustainable properties require new services and service providers to be successful. Additionally, many traditional service providers need sustainable property experience. Capacity and quality issues are critical underwriting concerns for capital sources because experienced and capable service providers can significantly reduce investment risk. Section D below provides additional detail on underwriting sustainable property service providers.

2. Modified List of Costs and Benefits (Risks)

Sustainable properties are subject to some different risks than conventional properties. Sustainable properties face some increased risks due to new processes, products, materials, and regulations, but also reduce or mitigate many market, regulatory, construction, legal, and operating risks. Sustainable property decisions require a clear organized presentation of both positive and negative risks to provide appropriate context for assessing sustainable options and related return on investment calculations.

One of the most important issues in underwriting the financial performance of sustainable properties is a full understanding of the risks associated with the pro-forma cash flows in the DCF model. For the purposes of improving sustainable investment decision-making, the Consortium recommends more detailed documentation of the risks of sustainable property investment, both positive and negative, to provide decision-makers with proper context for evaluating pro-forma financial performance.

An important component of *Value Beyond Cost Savings: How to Underwrite Sustainable Properties* is the 40-page detailed assessment of the costs and benefits of sustainable properties presented in Appendix G.

The primary purpose of the GBFC Cost-Benefit Checklist is to provide an organized inventory of potential costs and benefits for sustainable property investment. For valuers or underwriters, the checklist can also help in the determination of data and analysis requirements, and suggest questions to ensure key costs and benefits are fully identified and addressed.

An important secondary use of the checklist is as a framework for use by due diligence officers and investment/lending committees to cross examine borrowers or operators seeking equity to develop judgments about the quality of thought and analysis that potential capital seekers applied in preparing their financial analyses and related support documentation in their investment packages.

3. Priority of Energy/Carbon Reduction Investment

Energy/carbon reduction investment has become a more significant component of property value and risk due to climate change and the dramatic response by regulators, space users (owner occupants and tenants), and investors. As demand for energy efficient property by these groups increases, properties that are well positioned relative to energy/carbon (either already efficient or the cost of necessary improvements is economically feasible) will increase in value and those that are not will lose value due to economic and functional obsolescence.

Additionally, most sustainable property investments are based on projections of, often substantial, energy/carbon reduction, rather than actual use. Accordingly, given its enhanced importance, underwriters need to conduct an enhanced level of due diligence relative to the accuracy and reliability of forecasts. Section E below provides a detailed discussion of underwriting energy/carbon reduction investment.

4. Importance of Process and Feature Underwriting

GBFC's Sustainable Property Performance Framework presented in Chapter IV highlights the importance of separating the different elements of sustainable property performance in order to properly evaluate financial performance. Our research shows that process performance drives the success of sustainable features and systems, which, in turn, determine building performance. To assess potential financial implications of a building with a specific level of sustainable performance, one must next measure the market response (regulators, space users and investors) to the building's sustainable performance. Keeping the data and types of performance separate helps to assess the fit and relative importance of information.

GBFC's Sustainable Property Performance Framework also provides a structure for underwriters to use in their efforts to mitigate risks. Since most significant sustainable property investment decisions will be based on forecasted building performance (energy use, occupant performance, development costs, etc.) underwriters are, or should be, focused on reducing uncertainty and risk related to the forecasted performance. As has been shown in our research, risk and uncertainty around building performance can be significantly mitigated through underwriting of sustainable processes and features/ systems.

GBFC's Performance Framework prompts key lines of inquiry on sustainable processes, including: was the integrated design process implemented appropriately? Were contracts sensitive to the issues of sustainable properties? Did service providers and contractors have the requisite competence and capacity to get the work done? Have sufficient resources been spent on commissioning, measurement, and verification, as well as the training of occupants and staff?

The Framework also prompts feature-based questions like: are the features and systems specified in the building pioneering, or do they have proven track records? (Pioneering systems, features or materials are not necessarily negative because significant benefits can be achieved, but there may be some additional risk that will offset the benefits of their implementation unless properly mitigated.) Fortunately, the sustainable property investment market is significantly more mature today than even a few years ago, enabling significant risk mitigation through proper attention to process and features performance issues.

5. Priority of Government Regulations and Incentives

Government regulations and incentives are a more important part of the economics and risks of sustainable properties and must be more diligently underwritten.

Government Incentives

Significant benefits are available from local, regional, state or provincial, and federal governments as well as utilities and other organizations. These benefits can be quite substantial and include:

- Increased Floor Area Ratio and zoning/density bonuses
- Expedited permitting and approvals
- Design and code flexibility
- Rebates, construction cost off-sets, grants
- Financing assistance, subsidies
- Tax benefits: Federal, State, and Local—credits, favorable accounting treatment (Tenant Improvements, etc), tax reductions, etc.
- Government mandated carbon trade value

The specific sustainability or energy efficiency thresholds required by each governmental level in order to obtain incentives must be identified and evaluated. These thresholds should then be compared to the project's actual or projected sustainable outcomes/ performance to enable an assessment of the magnitude of potential benefits. Better understanding and articulation of a property's potential public benefits can reduce the risks of achieving benefits.

Many lenders are also resistant to "crediting" value added by incentives, tax benefits and other subsidies because they might not be available to them if they must foreclose on a property, and governments can change/modify benefits. Borrowers must address these concerns and articulate how, or if, sustainable property benefits should be treated differently.

Government Regulations and Policies

Federal, state, provincial, and municipal regulations relative to sustainability are increasing in breadth and level of sustainable/energy efficiency requirement. Thousands of governments around the world now regulate energy efficiency and sustainability. Building energy labeling and sustainable mandates are becoming more common as governments shift their reliance from incentives to regulation.

The importance of sustainability and energy efficiency are significantly enhanced by these regulations. Lenders and investors need to be concerned about the ability of properties to meet changing regulations in a cost effective manner. Properties that cannot meet regulations cost effectively could lose significant value do to required capital expenditures.

Local, state and federal governments can even more directly impact property value because of the growing sustainability requirements for the properties they own and lease.[83] Sustainable property requirements for new construction have been prominent in many governments for some time, and requirements for government leases are increasing.

7. Underwriting Health and Productivity Benefits

Sustainable properties can produce significant health and productivity benefits for occupants. Thus, best practices underwriting of sustainable properties should include an evaluation of potential health and productivity benefits because occupants (tenants, owner-occupants, or visitors/customers) are the most critical component of building performance. Individuals and/or enterprises that are healthy, productive, profitable, and happy as a result of their buildings should respond favorably from a market perspective, enabling higher revenues, reduced risk, and improved financial performance for building owners.

Measure of Occupant Performance

Occupant performance has two key measurement components:

- The individuals occupying the space; and,
- The Enterprises that lease or own the space.

While most researchers and industry analysts have focused on individual occupant performance (health, productivity and satisfaction), enterprise-level occupant performance

[83] Governments occupy approximately 18% of commercial space in the United States according to “Who Plays and Who Decides, a March 2004 Study completed by Innovologie, LLC for the US Department of energy.

is also critical to measure and understand. Enterprise-level occupant performance consists of reductions in resource use, improved reputation/leadership, compliance with internal/external policies or initiatives, and reduced risk to future earnings.

A key focus of occupant performance is the occupant's share of potential reductions in operating costs versus the share going to property owners. Who pays for the sustainable investments and who gets the benefits? To properly allocate costs and benefits between landlords and tenants, leases terms controlling these distributions must be analyzed.

Improved reputation/leadership can be assessed directly by surveys, stock analyst reports, and indirectly through assessment of how sustainable property investment has influenced recruiting, employee retention or satisfaction, marketing and sales, and brand awareness. This "evidence" of occupant performance relative to improved reputation and leadership may be found in the surveys and market research done for other parts of an occupant's business, and not typically in a traditional building measurement or monitoring program.

Occupant performance relative to compliance with internal/external policies and initiatives can be measured through an examination of trends in the importance of owned or leased real estate to the Global Reporting Initiative, the Carbon Disclosure Project, the requirements of socially responsible investment funds, government agencies, or a corporation's own CSR strategy and communications. At a property level, the question is how important is sustainable owned or leased real estate to the types of tenants expected to be leasing in the building?

The final measure of enterprise-level occupant performance is reduced risk to future earnings. This type of performance can be measured through monitoring of litigation and legal costs, subleasing trends relative to sustainable property, energy cost volatility, and changes in the level of importance of sustainability to key employees, customers, capital providers, vendors, and other stakeholders. If the importance of sustainability increases to the stakeholders, the risks to future earnings, on either a positive or negative basis, could be significantly influenced by sustainable property investment.

Key Considerations in Assessing Occupant Performance Information

Identifying, evaluating, and applying the results of research testing the relationship between sustainable building features/ outcomes and health and productivity benefits is challenging. Fortunately, the challenge is not dissimilar to the difficulties the business world faces in the application of any scientific or academic study. And, as discussed above, perfect studies or knowledge about the relationship between buildings and health or productivity is not required in order to be useful.

Some of the key issues to be considered in assessing and applying the results of health and productivity studies include:

Access to key research

It is difficult and time consuming to identify and access the key scientific research related to health and productivity benefits. Expanded Chapter IV, Appendices IV-C and IV-D identify and describe over 200 studies and the Consortium's Research Library and Industry Resources sections (see index codes10.1, 10.2 and 15.63) provide additional detail and updates of ongoing scientific research. As with the selection of comparable properties, it is difficult to know if someone advocating the potential health and productivity benefits of a property has identified the key studies, or just included those that support their point. The best way to address this issue is to seek independent sources, and rely upon meta-studies[84]

Understanding how and why sustainable property outcomes affect health and productivity.

While there has been a significant amount of research, as presented in Appendix IV-C and IV-D, that test whether sustainable outcomes like indoor environmental quality, temperature control, lighting, privacy and interaction, ergonomics, and access to the natural environment affect health or productivity, the science on *how and why* these sustainable outcomes influence health and productivity is still not well understood in many cases. What are the physiological and psychological characteristics of light, temperature control, or noise that influence health and productivity. Better understanding and articulation of these linkages will result in improved hypotheses and better, more logical testing and presentations that will be more convincing to the business community.

Linking specific features/strategies to sustainable outcomes

While studies demonstrating a relationship between ventilation, dampness, daylighting, etc. and health and productivity outcomes are well established, the volume and quality of research that links specific sustainable features or strategies to specific ventilation, dampness or daylighting outcomes is often not as robust. Importantly, even when the linkages are well understood, many scientific studies do a poor job describing sustainable features or strategies, making application of these studies to specific buildings with a defined set of features or strategies difficult.

Statistical/data problems

The reliability and accuracy of the specific quantitative results from many of the health and productivity studies is questionable. This is due to the extreme difficultly in the collection of data, and controlling for the scores of variables that influence occupant health or productivity. Since health and productivity studies tend to focus on a particular

[84] Meta-studies are those completed by an expert in a particular field that provide a summary assessment and analysis based on a review of key studies. The review is based on a qualitative, and often quantitative, assessment of the results of studies that have been done in the field. The websites of key research organizations like the Lawrence Berkeley National Laboratory, Carnegie Mellon and others can also be helpful in this regard.

sustainable feature or outcome, the problem of evaluating a whole building, with a combination of sustainable features and outcomes, is also difficult.

One framework that we particularly like that assists in understanding the statistical relationship between building science and health is one created by Mark Mendell, an epidemiologist working at Lawrence Berkeley National Laboratories, and a board member of the Consortium. Dr. Mendell has created a practical framework for categorizing the basis for believing something causes an adverse affect. His "What We Know" framework is summarized below.

Documented causal relationships
Significant, replicated, consistent, unbiased, dose-related, plausible
Persuasive scientific findings
Replicated, significant findings, and alternate explanations seem unlikely
Suggestive scientific findings
But "correlation does not prove causation"
Beliefs based on informal observations
Sometimes guides and predicts future science, but sometimes based on error, coincidence, or hidden factors

Dr. Mendell's framework is similar to a related framework used by the Institute of Medicine in their official reviews of health issues.

Dose-response relationships

While the studies linking indoor environmental quality, lighting, daylighting, temperature control, noise, and other sustainable outcomes to building health or productivity are robust in many cases, the studies are often insufficiently specific to enable a clear relationship between the amount of the sustainable outcome (lighting, noise, etc.) and building health or productivity. Accordingly, it makes it difficult to assess whether a particular building, with its sustainable outcomes or designed outcomes, will be sufficient to achieve the results identified in the studies.

This book and the Expanded Chapters cover the issues of health and productivity in many places. The six-step process for financial analysis (Chapter V, Section A), clarifies the steps required to assess how occupant performance (including health and productivity benefits) influences occupant space demand which then influences rent, occupancy, tenant retention and other financial performance variables. The evidence supporting how sustainable properties affect occupant performance is further detailed in Expanded Chapter IV, Section F-4, Expanded Appendices IV-C and IV-D, and expanded Chapter V, Section C2.

8. New Sustainable "Sub-Financial" Analysis

Sustainability sub-financial analyses are those analyses and models that provide quantitative insight/data that is typically combined with other information and analyses to aid valuers/financial analysts in their specification of key financial assumptions (rent, rent growth, occupancy, absorption, tenant retention, and operating costs) in a DCF analysis, or related traditional real estate financial model.

Sustainable sub-financial analyses include Comparative First Cost Analysis, DCF Lease-Based Cost-Benefit Allocation Modeling, Health Benefits Analysis, Sustainability Options Analysis, Enterprise Value Analysis, and Risk Analysis and Presentation (RAP). While many sustainability sub-financial analyses are uniquely derived for specific property situations, the importance of quality independent analyses of this type is critical to the articulation of value and risk in sustainable properties.

The key point in understanding sustainability sub-financial analyses is that in most cases these analyses do not result in specific data inputs that you can input directly into a DCF analysis. As their name implies, these types of analyses provide information and insight, which is combined with non-sustainable considerations in the final selection of key inputs such as rent, absorption and occupancy.

For example, there are scores of studies that demonstrate the relationship between building outcomes, such as increased ventilation rates, and improved health (reduction in sick building syndrome or asthma, for example). However, even if a specific dollar health cost savings could be estimated for a building, further analysis (new "sustainable sub-financial analysis) would have to be done to determine how the health cost savings would accrue to a potential space user.

A health related sustainable sub-financial analysis for an owner-occupied building (corporations, governments, institutions, non-corporate business entities) would generate an analysis of potential occupant benefit that would depend on the level of health costs paid by the building owners for their employees and a few other factors. Much of the potential health cost savings would accrue to the building owner-occupants.

However, for an investor owned building, the key issue in estimating the financial impacts of health cost savings is to look at how tenants value such potential benefits, and then how they value these benefits in the context of all the other benefits and factors that enter into their selection of space. Accordingly, any health cost benefits analysis is only a contributing factor to the development of financial inputs for a traditional real estate analysis. However, such analyses, if independently done and appropriately presented, can significantly influence leasing and/or investment decisions resulting in improved financial performance.

D. Underwriting Service Providers

1. Introduction

The quality and capacity of service providers was identified by our sustainable performance survey respondents as one of the key factors leading to failure or underperformance, and also a significant opportunity for risk mitigation through retention of qualified and experienced service providers.[85] Rapid growth of the sustainable property marketplace and a disproportionate level of new products, materials, systems and processes enhance the opportunity for service provider underperformance when dealing with sustainable properties.

2. The Sustainable Property Services Markets

The services required to successfully complete a sustainable project will generally differ from a conventional project in two key ways: 1) the core service providers will have certain specialized knowledge about sustainability; and 2) the project will likely require several additional specialized services. Specialized services are required on many sustainable projects because they often have systems, features and verification requirements that conventional buildings do not have.

For the purpose of this section and the broader purposes of the *Value Beyond Cost Savings: How to Underwrite Sustainable Properties* book, we define the service provider markets broadly, incorporating a full range of real estate and construction/development services as shown in Exhibit VI-2 below. More specialized sustainability related services are presented in bold, further emphasizing the importance of properly underwriting the services team.

The issues of service provider quality and capacity will vary significantly by property type, market, and the specific type of service. Given the rapid growth in the sustainable marketplace, some of the specialty consulting services such as daylighting consultants, commissioning agents, and other sustainable specialists are typically the hardest to find.

[85] The Consortium conducted a survey of experienced sustainable consultants, developers and investors to assess those sustainable features and processes that had the highest level of failure and underperformance. The results of this survey and related research are presented in Chapter IV, Sections D and E, which address sustainable process and feature performance.

Exhibit VI-2
Service Provider Markets*

Real Estate Services	Construction-Development Services
1. Diversified national real estate service firms	**1. LEED consulting**
2. Real estate consulting	**2. Sustainability/strategy consulting**
3. Appraisal	3. Systems/management consulting
4. Commercial property brokerage	**4. Commissioning**
5. Tenant representative brokerage	**5. Energy/other performance contracting**
6. Residential property brokerage	**6. Energy modeling/consulting**
7. Commercial mortgage/equity brokerage	**7. Energy audits/assessments**
8. Residential mortgage brokerage	**8. Renewable energy consulting**
9. Property/asset management	**9. Daylighting consulting**
10. Real estate law	10. Cost estimation
11. Real estate tax consulting	11. Construction management/consulting
12. Real estate accounting	**12. IAQ analysis and consulting**
13. Planning	13. Urban design
14. Property condition due diligence	14. Landscape design and architecture
15. Environmental due diligence	15. Project architecture
	16. Interior design
	17. General contracting/building
	18. Specialized sub-contracting (HVAC, roofs, plumbing, electrical, etc.)
	19. Specialized equipment/ product installer
	20. Renewable energy contracting
	21. Engineering: general
	22. Engineering: electrical
	23. Engineering: mechanical
	24. Engineering: civil
	25. Engineering: soils/geotechnical
	26. Engineering: other specialties

* "New" sustainable property focused services are highlighted in bold.

3. Service Provider Risks

Service provider capacity and quality are linked. When the capacity of experienced service providers is more limited, the quality of service provider options can suffer. Key failures or underperformance due to service provider capacity and quality problems include:

- Project delays that disrupt potential occupants and/or increase costs to the project development process.
- Insufficient or inadequate commissioning, leading to startup delays and additional occupant complaints and longer-term costs.
- Less experienced service providers may have more difficulty in "buying-in" to the integrated design process and create team problems due to less sophisticated communications.
- Reduced willingness to implement more pioneering or sophisticated sustainability approaches, which could result in long-term reductions in operating performance. What is pioneering or sophisticated to a less experienced service

provider may be understood to be less risky to a more experienced service provider.

- Higher cost is a definite potential result of poor service provider capacity or quality. When demand exceeds supply, price will, and has, gone up for most experienced service providers. More importantly, those service providers with experience significantly reduce the relative cost disadvantages of sustainable property investment. Major builders like Swinerton, Webcor, Turner and many others assert publicly that construction of projects that are certified LEED should cost little or no more than a conventional project.

4. Service Provider Underwriting Best Practices

One of the ways to address potential service provider quality problems is to carefully design contracts, carefully review warranties, and move towards performance-based compensation, at least for some parts of service provider compensation. Greater specification of goals and outcomes, as well as the specific process and approach that a service provider will follow, can also be important.

Credentials and education can assist in the “vetting” process of evaluating service providers, but it will be important to understand the specific course of study and requirements of accreditations, certifications or other professional labels that people acquire. A credential does not mean that a specific individual or firm will be better than an individual or firm without such accreditation, but it shows a focus and willingness to understand the unique aspects of sustainable property investment that could make your project run smoother.

Given that the service provider undersupply problem is not likely to be rectified in the short term, owners and developers should also invest to train in-house staff in sustainable building principles and practices. Some owners/developers complain that if they spend a lot of money to train their people in sustainability they will just leave and get another job. This does happen, but owners/developers must remember that the alternative is that you don’t train them and they stay.

Another critical best practice element to understand is that sustainable practice is only a portion of what a real estate or a construction/development services provider needs to know. Depending on the specific area of specialty, it is critical that owners/developers do not over-emphasize sustainable training or focus to the detriment of fundamental real estate and construction/development skills. For example, fundamental leasing, construction, or architecture skill, independent of sustainable knowledge, is critical to successful projects. Owners/developers need to be careful trading off experience in the fundamental skill sets required to complete a project for a firm or individual’s specialization on sustainable practice.

Finally, there are a growing number of organizations that identify, assess, and certify service providers such as contractors, plumbers, electricians, commissioning agents, and other professions on their sustainability expertise. The credibility and rigor involved with these different groups is highly variable. The key here is to understand explicitly the requirements for certification and/or listing in the directory and use the list accordingly. Even if a list requires no special requirements other than interest in sustainability, it could be useful.

It should also be noted, that given the penetration of sustainability through every aspect of building design, construction and operations, sustainability training is now integrated into the general education requirement for many professional certifications.

Two interesting developments in the certification and assessment of sustainable service companies are the B-Corporation (http://www.bcorporation.net/why) and the Sustainable Performance Institute's (SPI) Green Firm Certification. Both these efforts aim at enhancing the independence and credibility of firm claims of sustainable operating practice and/or competence.[86]

In this section of Expanded Chapter VI we provide a more detailed presentation of the B-Corporation and SPI Green Firm Certification and discuss and what decision-makers should look for in selecting three key sustainable properties service providers:

- Design Team
- Contractor
- Asset Manager

E. Underwriting Energy/Carbon Reduction Investment

1. Introduction

Energy/carbon reduction is a critical driver of sustainable property value. Energy has become more central to achieving and maintaining environmental certifications and meeting corporate and regulator minimum occupancy standards. Accordingly, it is a key contributor to property value beyond energy cost savings. In this section, we summarize some of the key issues in underwriting energy/carbon reduction investment from a capital provider perspective. More detail is provided in this section of Expanded Chapter VI.

Given the increasing attention being paid to climate change and the role of greenhouse gasses in that change, public and private decision-makers are becoming increasingly concerned with carbon efficiency. Since the analysis and methodologies addressed in this

[86] The author has not done a detailed assessment of the claims and assertions of these two entities and their programs, but cites them as two interesting and credible efforts to address the issues involved in conducting due diligence on service providers.

book are primarily couched in terms of energy efficiency, it is important to understand the distinction between energy efficiency and carbon efficiency. While we have chosen to use the term “energy efficiency” in our book, underwriters need to understand the difference.

A simplified example will help to clarify this distinction. A building may derive all of its energy needs from onsite solar power. With regard to onsite energy consumption, the building will have a zero carbon contribution. At the same time, it may be equipped with inefficient equipment and be operated inefficiently, resulting in a relatively high consumption of energy on a per square foot basis. While it is not an energy efficient building, it is a carbon efficient building. This is why various measures of energy efficiency, and the EPA’s ENERGY STAR program in particular; include measures of a building’s source energy (the energy used to generate or transport the energy used onsite) and the greenhouse gases associated with that source energy.

2. Introduction to Measuring Energy Performance

First of all, what is energy, how is it measured, and what does it cost? Energy is the capacity to do work and can take a number of forms such as thermal, mechanical, electrical and chemical. Common units of measurement are the British thermal unit (Btu, or in thousands, kBtu) and the watt-hour (Wh, or in thousands, kWh), where 1 kWh = 3.413 kBtu.

ENERGY STAR has become the most important measure of energy/carbon performance in the United States and is cited in many building environmental certification programs as well as being an important benchmarking tool in its own right. A summary of two key ENERGY STAR programs is presented below.

ENERGY STAR’s Portfolio Manager: Portfolio Manager is the EPA’s energy consumption benchmarking tool for existing buildings. It allows users to enter data on a building’s basic characteristics and energy consumption, and generates an Energy Performance Rating (EPR) which is essentially a percentile ranking (1 to 100) of the building’s energy performance in relation to its peers. Buildings with an EPR of 75 or higher are eligible to receive the ENERGY STAR label.

ENERGY STAR generates an Energy Performance Rating on a scale from 1 to 100. An EPR of 50 implies that the building’s energy performance is equivalent to that of an average building. The rating is based on source energy, which includes energy used to generate and distribute the energy used at the site. The rating is also weather normalized, thereby taking into consideration heating and cooling demands by region.

ENERGY STAR also produces a Statement of Energy Performance that provides summary information on energy intensity, energy cost, and CO_2 emissions for the current period, a baseline period, and comparisons to the industry average and the minimum ENERGY STAR labeling requirements.

Verification is an important part of the labeling process because it gives third party decision-makers confidence in the reliability and accuracy of the rating and the information provided to get it. Further, the verification confirms the existence of other attributes that are important to investors.

In order to receive the ENERGY STAR label, a Professional Engineer (PE) must certify information submitted to ENERGY STAR.

ENERGY STAR's Target Finder: A second EPA ENERGY STAR tool, called Target Finder, allows users to enter data on a proposed building's basic characteristics (the same as Portfolio Manager with the exception of energy use) and a target EPR (75 or higher to be ENERGY STAR labeled), and generates the projected energy use required to meet the target. The estimated design energy use can then be compared to the target use to see if the proposed building will meet its goal. If it does not, the building can be redesigned to be more energy efficient to the extent necessary to meet its target.

Target Finder uses the same statistical framework as Portfolio Manager, flipped around to solve for a different variable. It should be noted that energy modeling or forecasting to estimate design energy use is conducted outside of Target Finder.

3. The Importance of Energy Prices

Energy prices impact the underwriting of sustainable properties in several important ways – in estimating energy cost savings, in projecting cash flows and determining value, and in assessing risk.

First, energy cost savings anticipated from an investment in energy efficiency are defined as the quantity of energy saved times the price of energy. In modeling energy cost savings, engineers typically utilize the then current rate schedule from the utility companies that serve or will serve the subject property. Higher than anticipated energy prices result in higher savings, and lower than anticipated energy prices result in lower savings, for the same level of investment, all other things being equal.

Secondly, the absolute level of energy prices will determine future operating expenses and thereby impact projections of NOI and the appraised value of the subject property.

Finally, the risk associated with rising and/or volatile energy prices will be mitigated by reductions in energy consumption at the subject property, and conversely will remain un-mitigated in the absence of such reductions. The perception of reduced (increased) risk can cause cap rates and discount rates to be lower (higher).

Historical energy prices for electricity, natural gas and all energy sources (Total Energy) have demonstrated volatility over time. While prices are generally trending upward, spikes and fluctuations occur in the short run. This volatility is even more apparent when assessing monthly data. One indication of the uncertainty regarding energy prices is the fact that Total Energy prices rose at an average annual rate of 14.6% from 1970 to 1982, only 1.1% from 1982 to 2000, and increased at an average annual rate of 5.7% from 2000 to 2004.

Total energy expenses will depend on the mix of energy use at the subject property and the price of each source. Electricity and natural gas comprise the lion's share of energy consumption for commercial buildings in the U.S., accounting for approximately 80% of energy use for buildings over 100,000 sf, 94% for smaller buildings, and averaging 87% for all buildings. The mix of energy consumption is generally consistent over different building sizes, although larger buildings tend to use less natural gas.

4. Sustainable Property Energy/Carbon Reduction Features

Energy efficiency in commercial buildings can be achieved through a variety of combinations of features, some of which are physical and some of which are operational. Examples of physical characteristics of an energy efficient building are a properly sized, high efficiency HVAC system or motion sensors. Examples of operational characteristics are calibrating thermostats or the practice of day cleaning by the janitorial crew.

A proliferation of resources is available to developers, investors, tenants, and corporate real estate professionals to assist them in understanding the general energy/carbon reduction strategies and sustainable features available to them. As the industry has matured during the last 2-3 years, the lists of optional features and strategies have become more specific to the types of decisions being made—new vs. existing, property type, etc.

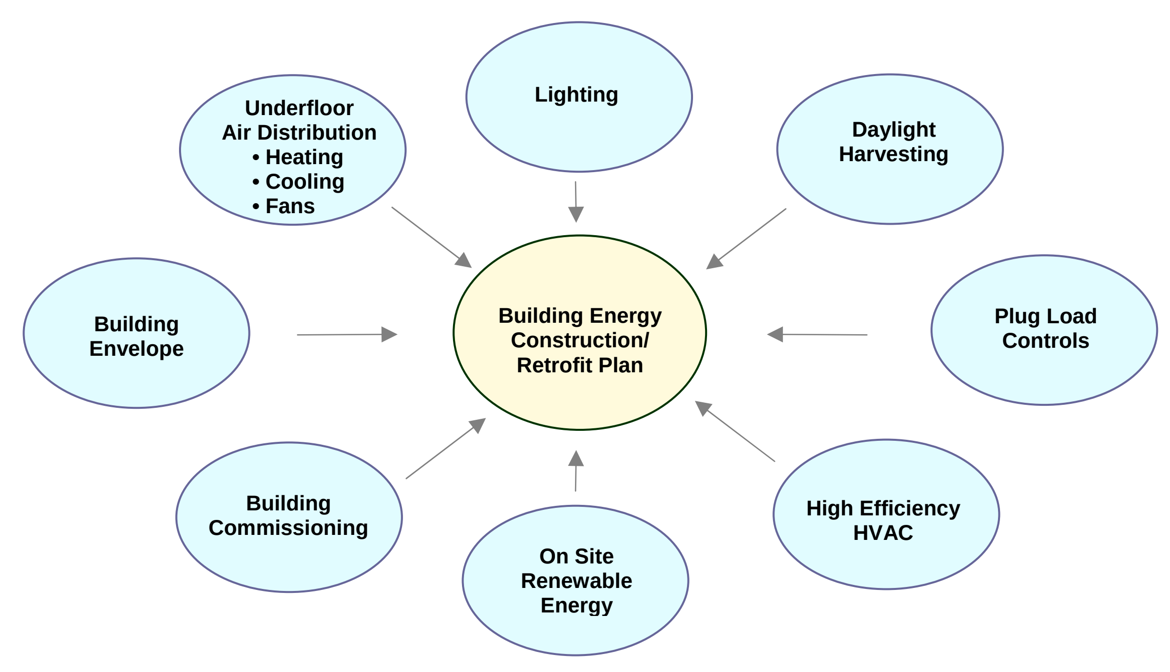
Another key source of sustainable features ideas and insights are case studies. Most of the case studies performed to date are sufficient for use in identifying and screening ideas, but are not sufficiently detailed or financially oriented to be used effectively for property specific financial analysis.

There are lists and menus to fit most any level of detail and specification. The one list that is not available is the precise list of strategies and features appropriate for your property. That list will have to be determined through an integrated design/values process where you meet with the relevant stakeholders to decide what it is you value and how you want to pursue those values through sustainable design, construction and property operations. Expanded Chapter III, Section D and Appendix III-A provide comprehensive listings of sources to assist in identifying potential energy features and strategies to meet different investment needs.

5. Sustainable Property Energy Features and Building Outcomes

A sustainable features based approach to understanding sustainability is a good first step, and necessary to financial analysis, but it is the eventual measurement of building outcomes/performance that will have the greatest long-term effect on financial performance. As shown in Exhibit VI-3 below, there are at least eight major "features" to employ in developing a building energy construction or retrofit plan: lighting, daylight harvesting, plug load controls, building envelope improvements, high efficiency HVAC, on-site renewable energy, under-floor air distribution, and building commissioning.

Exhibit VI-3
Strategies to Improve Energy Efficiency



The key point illustrated by Exhibit VI-3 is that, depending on the features chosen, and the specific strategy employed for a particular property, there are many different ways to achieve building energy efficiency.

Process issues are also critical to determining the best combination of sustainable features for a property. Critical to potential energy performance is having electrical engineers and building operations people provide appropriate early input. Experienced building commissioning agents can also provide value from the start of a project, rather than just performing a test at the end.

6. Feature/Strategy Based Financial Analysis Tools

There is also a plethora of modeling and evaluation tools for individual energy efficient features that provide not only estimates of energy savings but in some instances, financial evaluations as well. One very useful source of information for many of these features is the U.S. Department of Energy (DOE) Energy Efficiency and Renewable Energy website[87]:

http://www.eere.energy.gov/buildings/tools_directory/subjects.cfm/pagename=subjects/pagename_menu=other_applications/pagename=subjects

http://www.eere.energy.gov/buildings/tools_directory/

http://www.eere.energy.gov/buildings/tools_directory/alpha_list.cfm

A comprehensive assessment of Traditional Sustainability Financial Tools well suited to cost-based feature and strategy analysis is presented in Expanded Chapter V: "Sustainable Property Financial Analysis," Section C-2 and in more detail in Appendix F.

7. Underwriting Process for Energy/Carbon Reduction Investment

A key ingredient in the energy investment underwriting process is a forecast or projection of the dollar savings that the investment is likely to yield over time. For new construction or major renovations, this projection typically relies on some sort of energy model to analyze how the interaction of the specific design features of a property affects overall energy use.

In this section, we identify key energy forecasting risks and outline best practices for underwriting focused on assessing the reliability and accuracy of energy forecasts from a laypersons (non-engineering) perspective.

Energy Forecasting Risks

The key risk of energy models and their forecasts is that the actual building fails to live up to the performance indicated in the model. A significant underperformance of expected energy savings would have a negative impact on net operating income (NOI), reducing expected building value and the owner/ investor's rate of return (ROI). In an extreme scenario, this underperformance could even cause the building to breach a debt service coverage ratio covenant, or at a minimum drastically alter Simple Payback or Simple ROI calculations upon which investment decisions may have been based.

Below, we discuss the reasons why 1) energy forecasts differ from actual energy performance; and 2) energy savings forecasts may differ from (i.e., fall short of) actual energy savings. These findings are based on a review of key literature and interviews with ten top energy-forecasting specialists.

[87] While we note this as a source of information on modeling individual energy efficiency features, it is also a source of information on whole-building energy simulation models.

1. Energy forecasting models, while generally considered fairly accurate, are subject to some level of intrinsic error ranging from 10% to 20%. This forecasting error is interpreted as the percentage error between actual energy consumption and forecasted energy use based on a building's actual design characteristics and use profile, including actual energy used.

2. The accuracy of the forecasts closely depends upon the skill level of the modeler. Skilled modelers can tweak or trick the model to adjust for factors that might otherwise be outside the capabilities of the model.

3. Given the proliferation of new building technologies, it has been increasingly difficult for modeling software to keep up.

4. The design parameters of the building fall outside of the range that the model can adequately handle.

5. The model or modeler does not adequately address property type issues that arise, for example, in big-box retail, laboratories, hospitals or other specialized property types, nor addresses unusual design features such as building arms, wings or projections.

6. There are design flaws in energy efficiency components that may be relatively new and/or untested. The components do not perform as expected.

7. Thermal massing causes cooling loads to be greater than anticipated.

8. The building is not built to the original design specifications: energy efficient features have been omitted or improperly installed.

9. The building is not built to the original design specifications: space design has changed, adding lunchrooms, additional copy rooms, etc.

10. The building is not operated in the same manner as the assumptions used in the design phase.

11. Sustainable O&M techniques are not employed.

12. Sufficient time was not allowed for the building to "settle down" after being put in service and before measuring energy consumption. A rule of thumb is that it takes about one year for a newly constructed building to settle down or stabilize in terms of its energy consumption.

13. Fundamental commissioning was not performed. If energy efficient systems have not been commissioned to operate as designed, expected performance levels will not be obtained.

14. Actual variations in weather: Energy models are based on assumptions about local historical weather patterns. In the first year a new building is benchmarked against modeled performance, weather may be more severe than assumed during the design phase.

15. Improper weather benchmarking: In locations that are subject to micro-climate variations (such as the Bay Area of California), weather at the site may differ from the weather at the location from which historical data was taken in the modeling process, for example, at an airport.

16. For existing buildings, prior deferred maintenance in relation to upgrades leads to increased energy use.

17. Actual energy prices may differ from those used to forecast energy cost savings. Energy models typically include forecasts of energy costs for the building as well as consumption.

Proposed Best Underwriting Practices for Energy Efficiency Forecasting

This section presents our summary of proposed best practices for underwriting energy efficiency forecasting in real estate. Keeping in mind that underwriters will approach these decisions using tried and true fundamental methodologies, it is a summary of things to look for and questions to ask that are distinctly different when considering energy efficiency investments. It starts with an overview of the impacts on the underwriting process of recognizing the “value” of energy, followed by the special considerations relating to forecasts of energy performance, qualifications of key service providers, and the issues of split incentives and capital and operating budget conflicts.

Overview of the Energy Efficiency Underwriting Process

To aid in understanding where energy forecasting fits, we provide an overview to the broader question of underwriting energy efficiency investment. A stakeholder underwriting an energy investment decision needs to go through the following comprehensive analytical process:

- What is the menu of features available? (See Appendix III-A of the expanded book.)
- What combination of features is optimal in my situation?
- What is the initial cost of the set of features?
- What are the forecast energy cost savings and offsets from the investment?
- What situations can cause such a forecast to be inaccurate? (See detailed list of questions for vetting an energy forecast below.)
- What are the non-energy savings and offsets from the investment?

- What are the risks associated with implementing the feature(s)?
- What are the risk mitigants associated with implementing the feature(s)?
- Who benefits from the feature(s)?
- Will I pay for the entire cost or will some other private party share it?
- What is the best way to finance the investment (See ESCOs.)?
- What are the tax benefits of implementing the feature(s)?
- What is the success or failure experience associated with implementing the feature(s)? (e.g. case studies)
- What problems have others encountered in implementing the feature(s) and how did they solve them?
- What is the theoretical link between the feature(s) and all possible beneficial financial outcomes (such as higher rents, lower expenses)?
- What are the financial, non-property-specific benefits of the feature(s), such as corporate reputation, recruiting benefits, access to SRI capital, etc.?
- What are the public, non-monetized benefits of the feature(s), such as cleaner air, etc.?
- What evidence supports the linkages noted above?
- What are the strengths and weaknesses of the evidence?
- How does the evidence apply to my property type?
- What must I do to ensure that integrated design concepts are incorporated into my proposed set of features?

By finding the answers to these questions, real estate stakeholders will come closer to making optimal decisions regarding energy efficiency investments in real estate.

Assessing the Reliability and Accuracy of Energy Performance Forecasts

Given the importance of assessing the reliability and accuracy of energy forecasts, we have prepared a list of questions that will assist the underwriter in this process.

Questions to Vet Forecasts of Energy Cost Savings

- What benchmark data is available from comparable conventionally designed properties?
- Have clear and aggressive energy use targets been identified?
- Which combination of energy efficiency strategies would be most effective for this project?
- Are there any design features that are outside of the range of the energy model’s capabilities?

- How reliable is energy modeling?
  - How much experience does the modeler have with this type of project?
  - Have their modeling results on other projects been reviewed to compare modeled vs. actual results?
  - What benchmarks can be utilized to track accuracy and highlight variances to the norm?
  - What data is available to support modeling results in similar projects with similar systems?
- Have different design alternatives been modeled?
  - Model and analyze energy efficiency strategies collectively, not independently. For example, a project such as upgrading an inefficient chiller that may have a 3-year payback when analyzed in isolation could instead have a 5-month payback when coupled with load-reducing strategies such as high-efficiency lighting or high-performance glazing. Combining a lighting retrofit and high-performance glazing [with a] new smaller chiller might have the same capital cost as a larger chiller. Additional benefits may [be] derived from more efficient operations and consequently lower operating costs.
- How will you ensure that the alternatives will meet the objectives?
- How will building performance be monitored over time?
  - Does the design allow for operational enhancements as needed?
  - How will adjustments be made and subsequently measured?
- Has the design team fully vetted potential negative design elements and identified appropriate mitigants? For example, daylighting can have the unintended consequence of glare and excessive heat. Mitigants may include proper glazing, or the use of outside design features to block direct sun from work surface.

Many of the risks to reliable and accurate forecasts above can be effectively mitigated with three important steps: using an experienced energy modeler, hiring a competent commissioning agent, and ensuring proper measurement and verification.

Experienced energy modelers can often tweak the modeling software packages to more accurately reflect cutting-edge features and building nuance that less-experienced modelers may miss. They will also have a track record of modeling projects and can provide the owner with a reasonable idea of the range of variation to expect from the predicted results based on experience.

Competent commissioning agents will work with the building systems to ensure that they perform as designed, thereby providing more accuracy to energy forecasts. They will also run functional tests of the buildings systems before occupancy and check how close these systems come to their expected performance. If they underperform significantly, a good commissioning agent will also be able to develop solutions to the problem.

Proper measurement and verification (M&V) will also provide the O&M staff with live data to verify that the building is performing as expected. This way, if they see actual energy use significantly higher than predicted energy use, they can diagnose the systems in order to bring actual energy use more in line with the predicted values, assuming that they are trained in how to interpret and act upon the M&V data.

Conflicts Between Capital and Operating Budgets

The discussion thus far has been predicated on the assumption that energy efficiency decisions are made at the enterprise level. That is, some decision-maker or decision-making body attempts to make a decision that will optimize enterprise value, based on all costs, benefits and risks affecting the enterprise. However, this is not always the case. In some organizations, there is a separate decision-making process, and a separate decision-maker, for operating budgets and capital budgets. While certain energy efficiency upgrades may have a worthwhile positive impact on reducing operating expenses, they may not be undertaken because funding would have to come out of a capital budget, and decision makers who control the capital budget may have different priorities. It should be noted that these conflicts could exist even when the same person is responsible for both capital and operating budgets.

A possible solution to this barrier to efficient investing is for the enterprise to restructure management and incentives to allow for an integrated approach to decision-making and optimal enterprise level decisions to be made.

8. The Evidence of Building Energy Performance

Underwriting energy/carbon reduction investment requires both a process and set of practices, but also evidence of the reliability of initial development costs estimates, energy forecasts, and longer term building energy performance. For decisions on the implementation of specific features like daylighting or lighting controls, additional evidence of performance at the feature level is also needed. Detailed energy performance evidence at the process, feature and building level is presented in Expanded Chapter IV, Sections C, D and E.

9. The Impact of ESCOs on Underwriting Energy Efficient Investment

The analysis thus far has been predicated on the assumption that all costs, benefits and risks accrue to the enterprise making the investment decision. However, financing structures exist to shift these costs, benefits and risks, in whole or in part, to a third party, thus dramatically changing the approach to the underwriting decision. For example, this shift can eliminate the initial cost of the investment and strip off only a portion of the energy cost savings to the building owner. Such arrangements are typically referred to as Energy Performance Contracting (EPC) and Energy Service Companies or (ESCOs).

One area of concern for ESCOs is dealing with the uncertainties of energy savings projects. These uncertainties can result in what appear to be high premiums for guaranteeing 100% of the projected savings, or alternatively, some companies guaranteeing only a portion, say 50%-100%, of projected savings. When guaranteed savings are lowered, many projects no longer meet the financial requirements for adoption.[88] The overriding problem is a lack of data to establish actuarial-like analysis of the risks of project performance to allow for more accurate pricing of performance contracts.

Another key issue for performance contractors is getting performance contracts for total energy use, rather than on a piecemeal basis for various features and strategies. Progress is being made on more comprehensive performance contracts, and alternative comprehensive service delivery approaches, offering the potential for an expansion of this market in the future.

F. Underwriting Space User Demand

A potential increase in demand for a sustainable property by space users is one of the most important benefits that a property can achieve.[89] Space user demand is the foundation of enhanced revenue, increased investor demand, and the reduction of potential economic obsolescence.

This section provides some insights into the process for evaluating space-user demand. The term space user demand is used because in doing valuation or market analysis, much of the detailed work talking with brokers and tenants, evaluating tenant profiles and leases, and forecasting future supply and demand conditions is done with the intent of understanding what tenants in the market demand, and how the subject property meets projected demand given its location, size, floorplate, access, and other building and/or submarket attributes.

Once demand is understood, valuers and underwriters assess the financial implications of tenant demand by evaluating a property's tenant demand relative to comparable properties. Rental rates, future rental rate increases, absorption rates, equilibrium occupancies, lease terms, tenant retention rates and capitalization and discount rates are then selected. Valuer research on tenant demand will influence their selection of each of these key financial model inputs.

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[88] See "From volatility to value: analyzing and managing financial and performance risk in energy savings projects", ENERGY POLICY, Evan Mills, Steve Kromer, Gary Weiss, Paul A. Mathew. www.elsevier.com/locate/enpol

[89] "Space user" is a term we use to describe the occupants or users of real estate. It is a term that includes corporate or non-corporate occupants, tenants, retail customers or other non-owner or tenant users of space.

The full process for underwriting space user demand, which of course varies dramatically by property type and geography, is discussed in many other books and publications and not discussed in detail here. In this section, we provide some insights and practices for evaluating space user demand for sustainable properties that complements the more complete space user demand analysis that is typically done by valuers or underwriters.

A key conclusion of the Consortium's work is that the process for evaluating space user demand does not have to fundamentally change for sustainable properties. Given the structured process the real estate industry has developed for integrating many different quantitative "sub-financial" analyses into the qualitative process of selecting rents, occupancies and other financial model inputs, it is well suited to the assessment of properties with sustainable attributes.

1. Space User Market Segmentation Analysis

The process for evaluating enhanced space user demand, and the ability of an owner to monetize these benefits through higher rents, occupancies, faster absorption, etc., starts with an assessment of the types of space users (tenants or owner occupants) expected at a property. What key issues drive these particular types of tenants? Are they influenced by their internal or external commitments to disclosure their carbon footprint? Do they care about potential health or productivity benefits? Is an environmentally or socially responsible reputation important to them, their customers or employees?

The following five space user segments serve as a starting point for assessing potential demand for sustainable property by space users:

- Those significantly influenced by enterprise value;
- Government tenants with sustainable real estate policies or mandates;
- Vendors/suppliers encouraged/required by customers to consider sustainability;
- Space users with direct ties to sustainability; and,
- "Friends" of sustainability.

Space Users Significantly Influenced by Enterprise Value

Enterprise Value Analysis is a new type of sustainability sub-financial analysis that needs to be more rigorously applied to the property markets. The focus of this type of analysis is on the value created by sustainable property investment at the enterprise level. Significant work has been done in recent years to better understand and measure the non-real estate (business unit or enterprise) value of real estate decisions. The types of benefits from sustainability investment that are analyzed in this type of analysis include employee attraction and retention, leadership value, promotional value, health and productivity benefits, and other related benefits.

One challenge to the analysis and articulation of the value of sustainable property investment to the enterprise is in transitioning from a general discussion of these benefits to a discussion about the potential magnitude of these benefits for a specific property. The influence of potential enterprise value benefits on the decision of space users will vary based on the types of space users, their business strategies, the demographics of their employees, and the nature of the customers that they serve, among other factors.

The process for evaluating potential Enterprise Value, and the ability of an owner to monetize these benefits through higher rents, occupancies, faster absorption, etc., starts with an assessment of the types of space users (tenants or owner occupants) expected at a project. What key issues drive these particular types of tenants? Are they influenced by their internal or external commitments to carbon disclosure or reduction? Do they care about potential health or productivity benefits? Is an environmentally-socially responsible reputation important to them, or their customers or employees?

Once an understanding of the key drivers of potential space users is established, the next step is to assess the likelihood of whether the subject property will generate the types of sustainable outcomes-building performance important to expected occupants.

Government Tenants with Sustainable Real Estate Mandates or Policies

Local, state and federal governments are increasingly requiring that their employees work in sustainable properties. Sustainable property requirements for new construction have been prominent in many governments for some time, and requirements for government leases are increasingly being implemented as leases turn within government organizations. With over 18% of all commercial space in the United States government owned, and significantly more in many other countries (approximately 13% of which is office space), this is a significant market that will have broader influence on leasing policies throughout the country.[90]

The potential impact for a specific property will be a function of evaluating the level of government leasing in the subject property's submarket, trends relative to government leasing, government lease rollover expectations, and the specific sustainability thresholds required by different levels of government compared to the subject property. Evaluation of this potential benefit must take into consideration not only sustainability issues, but also the suitability of the subject property relative to other minimum requirements of government tenants related to security and other issues.

Vendors/suppliers Encouraged/required by Big Customers to Consider Sustainability

Some large companies like General Electric and Wal-Mart are beginning to put sustainability requirements on their vendors and others in their supply chain to be more

[90] "Who plays and who decides; the structure and operation of the commercial building market," March 2004, Innovologie, LLC for DOE.

sustainable. These initiatives have grown over time, and while relatively small today, are likely to increase.

Evidence of this phenomenon can be ascertained for a property in a particular marketplace by studying the profile of tenants in the marketplace. Again, this is just another of the many issues influencing space user demand, but is likely to grow. For example, nearly 1,500 global businesses signed on to the United Nation’s Global Compact in 2008, signaling the growing interest of businesses that want to align their practices with the initiatives in environmental, social, and governance principles.

Approximately 7% of the 700-plus respondents in the annual survey of Global Compact participants indicated that they require Global Compact participation when selecting suppliers. About a third said they extended their commitment to the Global Compact to their subsidiaries. While these numbers are still small, they represent a significant and growing trend to extend the leadership of certain powerful companies on sustainability issues down through the supply chain.

Space users with direct ties to sustainability

There are a growing number of tenants that have a direct tie to the sustainable property business: architects, engineers, consultants, contractors, lawyers, energy firms, product companies, etc. etc.

There is increasing evidence of the growing size of the sustainable property market and companies with direct ties to the industry. For example, membership in the U.S. Green Building Council has grown dramatically to nearly 19,000, with over 81,000 LEED-accredited professionals.[91]

“Friends of Sustainability”

Demand from space users is also heightened by those individuals who want to “do the right thing,” independent of evidence of financial benefit. It is difficult to quantify the size of this marketplace, but service providers, builders, tenants and others that took on a leadership role without “proof”, initiated the green building industry.

Demographics can play a key role here with younger people and people in certain geographic locations more likely to be concerned about sustainability ideals independent of financial considerations.

[91] U.S. Green Building Council, February 2009.

2. Space User Demand Risks

An independent assessment of the affect of sustainability on space user demand and property risk must consider potential negatives of sustainability related to space user demand. These negatives include:

- Excess investment relative to market demand;
- Failure of space user demand to meet expectations;
- Building operating problems.

These issues are evaluated in detail in Expanded Chapter VI.

3. The Evidence of Space User Demand

As emphasized above and throughout *Value Beyond Cost Savings: How to Underwrite Sustainable Properties*, the evidence for space user demand must be developed through a structured analytic process at the property level. One of the ways to think about the process is that the underwriter is testing whether some of the general evidence and trends are applicable for a subject property, and determining the magnitude of potential affects. Accordingly, the general evidence of the market demand for sustainable properties is relevant and important. The market performance and building performance (occupant performance) of sustainable properties was summarized in Chapter IV, Sections E. and F of this book, and is fully presented in Expanded Chapter IV, Sections E. and F.

As a starting point, to properly interpret and apply sustainable market performance research it helps to understand the following three principles:

- **Principle One:** Different decisions require different types of market data.
- **Principle Two:** Failure to understand the different types of market research will lead to failure in interpretation and application.
- **Principle Three:** Sweat the details when applying market research to property level decisions.

A detailed discussion of these principles is presented in Expanded Chapter IV, Section F-2.

To better understand and ease the interpretation of sustainable property market and financial performance research, in Chapter IV, we report research results in four key categories:[92]

Expert-Based Financial Analyses: Conducted primarily by valuers/market analysts on a property-by-property basis following traditional market analysis practices.

[92] We combine sustainable market and financial performance research together because much of the research in the field covers both these topics in their studies.

Statistics/Modeling-Based Financial Analyses: Conducted primarily by academics applying statistical modeling techniques to large databases of properties.

Surveys and Market Research: Surveys and related market research studies addressing regulator, space user, and/or investor demand.

Foundational Background and Theory: Foundational research and theoretical studies that address key issues in sustainable property valuation and financial analysis.

Courtesy Wikimedia Commons, Demeester

G. Existing Building Underwriting Guidelines

The GBFC Sustainable Property Underwriting Checklist for existing buildings is shown below in Exhibit VI-4. This checklist and the guidelines for each checklist item that are presented in Expanded Chapter VI are generally applicable to both lenders and investors, although lenders and investors may emphasize or de-emphasize particular issues given their specific needs and requirements. In all cases, lenders will be more focused on downside risk, because they do not fully share in the potential upside that equity investors obtain by taking additional risk (they just get the mortgage payment). A key focus in existing buildings for both lenders and investors is on verification of the property operations and cash flow as well as debt service coverage and value.

The ideas and recommendations presented below and in more detail in Expanded Chapter VI are not meant to be exhaustive. This chapter focuses on underwriting modifications, which may be warranted for a particular property due to its sustainability. Accordingly, we do not provide a complete assessment of the actions that need to be undertaken under each of the checklist items, but focus on marginal changes to process and procedures. Many aspects of the underwriting process involve legal considerations including leases, contracts, mortgage documents, purchase agreements, etc. etc. The author of *Value Beyond Cost Savings: How to Underwrite sustainable Properties* is neither an attorney nor is offering legal advice, and legal questions should be reviewed with appropriate counsel.

Exhibit VI-4
Existing Building Underwriting Checklist

1. Preliminary Compliance with Investment Guidelines

Property Type/Sub-Type
Size/Value
Location
Age
Construction Type/Quality
Floor plates/Elevators/Parking, etc
Market Conditions
Loan to Value/Cost
Debt Service Coverage Ratios
Internal Rates of Return
Loan to Replacement Cost
Vacancy/Credit Loss
Income, Occupancy, and Expense Calculations
Tenant Quality/Lease Structure
Tenant Improvement/Leasing Commission Allowance

2. Owner/Operator

Credit Analysis-References
Property Type/Operations Experience
Experience with Subject Property
Financial Strength-Net Worth
Judgment, Liens, Bankruptcies, Legal search
Bank Statement Review
Ownership Form
Indemnifications, Guarantees, Carve outs
Disclosures

3. Property Management

Property Type Specific Management Experience
Employee/Tenant Training
Track Record
Management Agreement Review
Leasing Agreement Review
List of Employees and Compensation
Employee Agreements/Laws
Property Management Budget
Security Deposit Verification

4. Property Characteristics

Age and Physical Characteristics (site Inspection)
Functional Design/Obsolescence
Location
Parking Ratios
Access
Tenant Profile (primarily MF), Quality and Mix
Ground Leases
Gov. Regulations/Permits/Licenses
Brand/Franchise Agreements
Property Certifications/Performance Assessments

5. Property Operations/Cash Flow

a. Operating Cash Flow History-Verification
- Operating Statements
- Rent Roll
- Historical Occupancy/Collection Losses
- Tenant Sales Data (retail only)
- Expense Recoveries
- Other Income
- Estoppels (verification)

b. Lease Structure and Review
- Lease Abstracts/Major Lease Review
- Standard Lease Agreement
- Signed Non-standard Leases
- Objectionable Provisions Assessment

c. Operating Expenses
- Owner vs. Tenant Paid Expenses
- Utility Expenses
- Real Estate Taxes
- Personal Property Taxes
- Maintenance and Repairs
- Landscaping/Groundkeeping
- Management Fees
- Property Service Contracts
- Operating Leases

d. Capital Expenses/Escrows and Holdbacks
- Replacement Reserves
- Tenant Improvements
- Leasing Commissions
- Capital Expenditures

e. Operating Cash Flow Forecast-Verification
- Local Market Analysis/Forecast
- Comparable Property Assessment
- Lease Rollover Analysis
- Large Lease Expiration Assessment
- Re-Lease Risk Analysis
- Review of forecasted rent changes, tenant retention, rollover vacancy, future occupancy assumptions, concessions, etc.

6. Insurance

Property and Casualty
Liability
Business Interruption

7. Third Party Reports

Appraisal Report
Property Condition/Quality: Engineers Report
Pest Inspection Report
Environmental
Legal, Title and Survey
Government Regulations
Tax Consultant Report
Insurance-Risk Management Consultant
Sustainability Related Third-Party Involvement

A key value of the checklist and our select comments on underwriting changes is to reinforce the point that sustainable property investment decisions involve much more than property value and cash flows, and that many of the underwriting actions typically undertaken can significantly help decision-makers understand and appropriately consider the positive and negative risks of sustainable property investment.

Further detail and background on existing office building retrofit decisions and building operations is available in "*Retrofitting Office Buildings to be Green and Energy-Efficient*", a book published in late 2009.[93] Chapter 2 provides some insights into analyzing green retrofit opportunities. Chapter 3 provides significant detail on the elements of a green office retrofit and Chapter 4 provides information on managing the retrofit process. Chapter 6 provides a primer on green leases and building operations

H. New/Retrofit Buildings

The key underwriting issues for new construction or major retrofits are shown in GBFC's Sustainable Property Underwriting Checklist for New/Retrofit buildings in Exhibit VI-5. These issues are addressed in the more detailed guidelines presented in Expanded Chapter VI from the perspective of a lender or equity investor that is evaluating a capital investment in a new development or major retrofit project. Unlike existing buildings, new projects are subject to very different risks related to the construction process, construction completion, cost control, costs to carry construction interest prior to lease-up (or sale), and achieving the market acceptance necessary to achieve an effective take-out by a permanent lender or buyer.

Exhibit VI-5 New/Major Retrofit Building Underwriting Checklist
1. Preliminary Compliance with Investment Guidelines
Property Type/Sub-Type Size Location Construction Type/Quality Floor plates/Elevators/Parking, etc. Market Conditions Loan to Value/Cost Projected Rates of Return Loan to Replacement Cost Tenant Improvement/Leasing Commission Allowance

[93] "Retrofitting Office Buildings to be Green and Energy-Efficient," principal authors Leane Tobias and George Vavaroutsos, Urband Land Institute, 2009.

2. Owner/Developer
Ownership Form Level of Equity Investment Credit Analysis-References Property Type/Operations Experience Experience with Subject Property Financial Strength-Net Worth, Liquidity Judgment, Liens, Bankruptcies, Legal Search Bank Statement Review Indemnifications, Guarantees, Carve-outs Disclosures
3. Construction Risk
Recourse with Financially Strong Borrower Contractor-Subcontractor Experience/Capacity Contracts—Construction, Other Insurance Cost, Budget Contingencies Construction Manager/Servicer Reviews Product/Systems/Materials Performance Funding Mechanics: Inspections/Lien Waivers/Draw Mgmt Payment, Completion and Performance Bonds
4. Carry Risk
Debt Service Carry Reserves Real Estate Tax and Insurance Reserve Insurance/Letters of Credit Floating Rate Risk--Hedging and Caps Pre-leasing/Pre-Sales
5. Take-out Risk
Fundamental Project Feasibility-market, budget, timing, etc. Valuation Analysis: Pre vs. Post Completion Pre-Leasing: Volume and Tenant Quality Pro-forma Financials for As-Built Property Asset Liquidity Assessment Take-out Provider: rated or unrated? Borrower Recourse Integrated Default and Loss Severity Assessment Credit tenant/build-to-suit
6. Third Party Reports
Appraisal Report Construction Manager Reports-Monitoring Environmental Legal, Title and Survey Government Regulations Tax Consultant Report Insurance-Risk Management Consultant Sustainability Related Third-Party Involvement

A key value of the checklist and our select comments on underwriting changes is to reinforce the point that sustainable property investment decisions involve much more than property value and cash flows, and that many of the underwriting actions typically undertaken can significantly help decision-makers understand and appropriately consider the positive and negative risks of sustainable property investment.

I. Conclusions

Underwriting properties with sustainable features does not involve a fundamental change in existing methods and practices. However, underwriters need to enhance their education of sustainability and learn some new techniques, and dust-off some old ones, to effectively identify, price and mitigate sustainable property risks.

Appendix A

Annotated Index GBFC Research Library

General Underwriting/Valuation Topics

1.0 Sustainable Property Financial Analysis Alternatives

This section of the research library covers the many types of financial analysis tools, techniques, and analytic methodologies used to make and/or support sustainable property investment decisions. This section supplements Chapter V, "Sustainable Property Financial Analysis" of the *Value Beyond Cost Savings: How to Underwrite Sustainable Properties* book.

1.1 Miscellaneous

Miscellaneous documents that do not specifically fit under any of the four other sub-codes in index section 1.0.

1.2 Traditional Sustainability Financial Analyses

Models and analyses that have traditionally been used in the real estate industry to make energy efficiency/sustainability investment decisions for buildings, features, and equipment.

1.3 Traditional Real Estate Financial Analyses

Traditional real estate financial analyses are integrative models that endeavor to incorporate comprehensive cost, benefit, and risk information to generate returns/value results based on specification of financial model input such as energy costs, rents, occupancy, tenant retention, discount rates, etc.

1.4 Sustainability Sub-Financial Analyses

Sustainability sub-financial analyses are those analyses and models that provide quantitative insight/data that is typically combined with other information and analyses to aid the valuer/financial analyst in their specification of key financial assumptions in a discounted cash flow analysis or related model. The analyses covered in this section of the library are a selection of some of the specialized analyses that have been developed in recent years to aid in the financial analysis of sustainable property investment.

1.5 Public Sustainability Benefits

Financial analyses used to quantify potential public sector benefits. These analyses contribute to private value through the potential ability to negotiate payment for public value. Such "monetization" of public value is created through enhanced entitlement, permitting benefits, public grants, financing, and other incentives.

2.0 Underwriting: Risk and Compliance Analysis

This section of the research library contains the parts of the sustainable property underwriting process that are not specifically related to the pro forma or valuation. Due diligence on the borrower or sponsor of the project, legal due diligence, risk mitigation, and the types of methods, practices, and underwriting frameworks used to make decisions are covered. The term “underwriting” is used broadly to cover the due diligence and related analytic efforts undertaken by lenders, equity investors, corporations, and other property investors. This section of the research library supplements Chapter VI, “Underwriting Guidelines for Sustainable Property Investment” of the *Value Beyond Cost Savings: How to Underwrite Sustainable Properties.*

2.1 Miscellaneous

Miscellaneous documents not captured by other codes in index 2.0.

2.2 Special Reports/Studies

Special reports or studies that address issues or topics that go beyond a single type of investor or decision maker, or have broad applicability.

2.3 Space Users

Due diligence documents for space users.” “Space user” is a term used to describe the occupants or users of real estate. It is a term that includes corporate and non-corporate owner-occupants, tenants, retail customers or other non-owner or tenant users of space.

2.4 Investors/Developers

Due diligence documents for investors/developers. Investors/developers include REITs, public real estate companies, private investors, private real estate investment managers (pension investors), private equity funds, socially responsible investors, and venture capital.

2.5 Lenders

Due diligence documents for lenders. Lenders include banks (construction, permanent, bridge, or energy loans), life companies, other private lenders, energy lenders, government lenders, and commercial mortgage brokers.

2.6 CMBS Issues

Due diligence documents/publications for CMBS issues. Commercial mortgage conduit lenders and other lenders participating in the CMBS process, and other issues related to debt securitization, whether they are commercial mortgages or not.

2.7 Financing/Underwriting Packages

Examples of the output (reports/analyses, etc.) of the underwriting/due diligence process for equity and/or debt financing requests or analogous corporate capital requests. Financing packages submitted to capital sources would also be included here.

2.8 Service Provider Underwriting

Special reports and documentation of the process for underwriting service providers. Assessment or certification systems or approaches would be coded here and/or under index code 23.10.

2.9 Products/Systems Underwriting

Special reports and documentation of the process for underwriting sustainable products, systems, and materials. See also index codes 4.0: Sustainable Property Definitions/Certifications and 5.0: Sustainable Property Products/Materials Ratings/Certifications.

2.10 Third-Party Reports/Analyses

Reports/analyses and examples of third-party reports.

3.0 Cost-Benefit Analyses/Studies

This section of the research library contains documents that are specifically identified as cost-benefit analyses or studies, as well as many other documents that contribute knowledge and insight into a particular cost or benefit. More detailed evidence of building, market, and financial performance are covered in section 15 of the research library. This section of the research library supplements Chapter V, Sections E: “Assess Costs/Benefits of Sustainability” and F: “Evaluate Financial Implications of Sustainability” of the *Value Beyond Cost Savings: How to Underwrite Sustainable Properties* book.

4.0 Sustainable Property Definitions/Certifications

This section of the research library contains documents that look at issues related to sustainable property definitions or certification. Environmental assessments, occupier focused assessments, government regulations, other building performance assessments, and service provider certifications and assessments are all covered in this section. This section of the research library supplements Chapter III, “Evaluating Property Sustainability,” of the *Value Beyond Cost Savings: How to Underwrite Sustainable Properties* book.

5.0 Sustainable Products/ Materials Ratings/Certifications

This section of the research library contains documents related to sustainable products or materials, and product/materials rating and/or certifications. This section of the research library supplements Chapter III, “Evaluating Property Sustainability,” of the *Value Beyond Cost Savings: How to Underwrite Sustainable Properties* book.

6.0 Sustainable Property Features

This section of the research library contains documents that cover specific sustainable features, systems, or attributes. Energy, water, IEQ, materials, and other feature documents are covered here. This section assists in understanding the nature of sustainable options available, as well as studies or research that have looked at these options. Other related sections of the research library include 9.3: Energy/Carbon Features/Systems, 15.5—Features / System Performance and/or 28--Sustainable Property Guides/Best Practices. To locate feature performance studies, to check both sections 6.0, 9.4 and 15.5, although 15.5 is where such documents will typically be found. The most important and comprehensive best practices guides are in section 28.0. This section of the research library supplements Chapter III, “Evaluating Property Sustainability,” of the *Value Beyond Cost Savings: How to Underwrite Sustainable Properties* book. Additional detail on the performance of features can be found in Expanded Chapter IV, Section D: Feature Performance of the *Value Beyond Cost Savings: How to Underwrite Sustainable Properties* book.

7.0 Sustainable Property Valuation

This section of the research library covers documents that directly address property valuation. Because of the integrative nature of property valuation, information in many of the other research library sections has some bearing on valuation and financial performance. This section of the research library supplements Chapter IV: “Sustainable Property Performance, Section F: Market Performance, and Chapter V, Section I: Valuing Sustainable Properties of the *Value Beyond Cost Savings: How to Underwrite Sustainable Properties* book.

7.1 Miscellaneous

Miscellaneous documents not specifically covered in other sub-codes in index section 7.0.

7.2 Research Papers/Studies

This section contains the most important papers and studies looking at the relationship between sustainable property features, performance, and value. Academic studies are typically coded in this section, as well as industry and/or valuation organization studies that specifically address valuation topics. In many cases, research papers or studies that are coded in this section will also be coded in sections 15.6, 15.7, 15.8, 15.9, and/or 15.10, depending on the specific nature of the document. This section of the research library supplements Chapter IV, Section F: “Market Performance, Foundation Background and Theory” of the book *Value Beyond Cost Savings: How to Underwrite Sustainable Properties.*

7.3 Business Value and Sustainability

This section of the research library contains documents that address sustainability and its relationship to business value. This section addresses both the business component of real estate value and also issues related to sustainability and business value generally. To identify additional documents addressing the issues of business value and sustainability, check more specifically sections 8—Space User Demand for Sustainable Properties, 15.8—Market Performance: Space Users, and in some cases section 25.0—Organizational Change/Strategies and section 27.0—Sustainable Property Industry Studies/Trends. This section also supplements the discussion of Enterprise Value covered in Chapter VI, Section F:

"Underwriting Space User Demand" and in Chapter V, Section C: Select Financial Model of the book *Value Beyond Cost Savings: How to Underwrite Sustainable Properties*.

7.4 Valuation Management and Review

Valuation/appraisal management and review topics related to sustainability. This has not been an area of significant research and writing to date, but should be more so in the future.

7.5 Valuation Standards and Regulation

Valuation standards and regulation issues are covered generally, and more specifically as they relate to sustainability. Relevant documents from the Vancouver Valuation Accord, the Royal Institute of Chartered Surveyors, the Appraisal Institute, the International Valuation Standards Board, and other related organizations, are referenced here.

7.6 The Income Approach

Documents that specifically address the income approach to value and sustainability are contained in this section of the library. The income approach, which is based upon the discounted cash flow methodology, will be influenced by many of the topics in the research library index. This section is for those documents that specifically address the implementation of the income approach to value in the context of sustainability. Additional information on the discounted cash flow approach and methodology can be found in section 1.3—Traditional Real Estate Financial Analyses, 15.10—Financial Performance, and 7.10—Risk Analysis and Presentations (RAP). This section of the research library supplements Chapter V: "Sustainable Property Financial Analysis" of the book *Value Beyond Cost Savings: How to Underwrite Sustainable Properties* book.

7.7 The Cost Approach

Documents that specifically discuss the cost approach to value in relationship to sustainability are contained in this section of the library. This is a topic that has not been significantly researched, but will be more so in the future.

7.8 The Sales Comparison/Market Approach

Documents that specifically address the sales comparison/market approach to value are contained in this section of the library. This is a topic that has not been significantly researched, but should be more so in the future.

7.9 Public Value: Triple Bottom Line

Documents that address public value or triple bottom line valuation methodologies are contained in this section of the library.

7.10 Risk Analysis and Presentation (RAP)

This section of the research library contains documents that address the integration of risk in the financial analysis and valuation process. Other sections that address issues of risk--but that are less focused on analysis and presentation--

include sections 3.0—Cost-Benefit Analyses/Studies, 15.10—Financial Performance, 24.2—Integrated Design, 24.8—Insurance/Surety, 24.11—Construction/Development Risks, 24.13—Other Costs/Risks of Sustainable Development, and 24.14—Contracts/Legal Issues. This section of the research library supplements Section H: "Risk Analysis and Presentation" of Chapter V: "Sustainable Property Financial Analysis" of the *Value Beyond Cost Savings: How to Underwrite Sustainable Properties* book.

8.0 Space User Demand for Sustainable Properties

This section of the research library contains documents that address the potential for sustainable properties to affect the demand for property by space users. "Space user" is a term used to describe the occupants or users of real estate. It is a term that includes corporate and non-corporate owner-occupants, tenants, retail customers or other non-owner or tenant users of space. The overall real estate decision methodologies that space users use are contained in this section.

The best section to find documents that address the actual market and/or financial performance related to space user demand is in section 15.7—Market Performance and the various sub-indices under this section. Additionally, key articles and research reports related to space user health and productivity are separately identified in section 10.0—Space User Productivity and Health, 10.1—Space User Productivity, and 10.2—Space User Health and under index code 15.63: Occupant Performance. Specific issues related to commercial interiors and tenant improvements are in section 16.0-- Commercial Interiors/ Tenant Improvements. This section of the research library supplements Section F, "Underwriting Space User Demand" in Chapter VI of the *Value Beyond Cost Savings: How to Underwrite Sustainable Properties* book.

9.0 Energy/Carbon Efficiency

This section of the research library includes documents specifically addressing energy/carbon efficiency and related energy issues. Most documents that have some relationship to the energy issue are coded in this section, as well as other more specific sub-codes as necessary. This section of the research library supplements Chapter VI, Section E, Underwriting Energy/Carbon Investment" and Chapter IV, Section E-3 and Building Energy Use of the *Value Beyond Cost Savings: How to Underwrite Sustainable Properties* book.

9.1 Special Reports/Research

Special reports and analyses related to energy/carbon reduction and efficiency.

9.2 Renewable Energy

Special reports and analyses related to renewable energy.

9.3 Features/Systems

Special reports and analyses related to energy features and systems. See also index codes 6.0, 28.0,and 15.5.

9.4 Measurement

Special reports and analyses related to energy/carbon measurement and monitoring. See also index codes 4.0, 15.1, and Chapter III: Evaluating Property Sustainability and Chapter IV: Sustainable Property Performance.

9.5 Performance

Special reports and analyses related to energy/carbon performance. See also index codes 15.63 and Chapter IV: Section E-4: Building Energy Use in *Value Beyond Cost Savings: How to Underwrite Sustainable Properties* book.

9.6 Regulations/Subsidies

Special reports and analyses related to energy regulations and subsidies. See also index codes 11.0: Government Regulations and Incentives and 20.5: Public Finance and 20.9: Subsidies/Incentives.

9.7 Miscellaneous

Miscellaneous special reports and analyses related to energy.

10.0 Space User Productivity and Health

This section of the research library is for those documents that address the relationship between sustainable features or attributes and space user health and/or productivity. Studies that address both these issues are coded in this section, while studies that address either productivity or health independently are coded in sections 10.1—Space User Productivity or 10.2—Space User Health. Documents in this section are further categorized and can be searched by inputting the two-character reference (H1 to P7) in the title search box. The category references are:

H1 Health Gains **-**IEQ
H2 Health Gains **-** Temp Control
H3 Health Gains **-** Lighting
H4 Health Gains – Privacy and Interaction
H5 Health Gains – Ergonomics
H6 Health Gains – Natural Environment
H7 Health Gains – Whole Building
HP1 IEQ Occupant Satisfaction
HP2 Other References
P1 Productivity Gains **-** IEQ
P2 Productivity Gains – Temp Control
P3 Productivity Gains – Lighting
P4 Productivity Gains – Privacy and Interaction
P5 Productivity Gains – Ergonomics
P6 Productivity Gains – Natural Environment
P7 Productivity Gains – Whole Building

This section of the research library supplements Section E-4, “Occupant Performance” of Chapter IV and Chapter VI, Section F: “Underwriting Space User Demand” of the *Value Beyond Cost Savings: How to Underwrite Sustainable Properties* book.

10.1 Space User Productivity

Documents or reports that specifically address the relationship between sustainable features or attributes and space user productivity. This section of the research library supplements Section E-4, “Occupant Performance” of Chapter IV and Section F: “Underwriting Space User Demand” of the *Value Beyond Cost Savings: How to Underwrite Sustainable Properties* book

10.2 Space User Health

Documents or reports that specifically address the relationship between sustainable features or attributes and space user health. This section of the research library supplements Section E-4, “Occupant Performance” of Chapter IV and Chapter VI, Section F: “Underwriting Space User Demand” of the *Value Beyond Cost Savings: How to Underwrite Sustainable Properties* book

11.0 Government Regulations and Incentives

This section of the research library contains documents that address sustainable and/or energy related government regulations and incentives. Related topics include section 15.7—Market Performance: Regulators, where most of the specific studies that talk about regulator demand for sustainable property are coded, as well as section 20.5—Public Finance, 1.5—Public Sustainability Benefits, 7.9—Public Value: Triple Bottom Line, and sometimes in sections 25.0— Organizational Change/Strategies or 28.0--Sustainable Property Guides/Best Practices.

Performance Assessment/Misc. Topics

12.0 Sustainable Sites/Land Use and Transportation

This section of the research library contains documents, which address issues related to land use, transportation, and the sustainable sites portion of LEED. Green roofs, integrated resource management, landfills, recycling, and waste reduction, and related issues are coded in this section.

13.0 Water Efficiency

Documents related to the issue of water and water efficiency are coded in this section. Sections 6.0—Sustainable Property Features, 15.5—Features/System Performance, and 28.0—Sustainable Property Guides/Best Practices are other sections of the research library where water-related documents may also be found.

14.0 Existing Buildings: Operations and Maintenance

This section covers documents and Reports specifically addressing the evaluation and analysis of sustainable existing buildings. Additionally, many of the other sections of the research library also address issues critical to existing buildings. Existing building issues are covered throughout the *Value Beyond Cost Savings: How to Underwrite Sustainable Properties"* book.

15.0 Sustainable Property Performance Assessment

This section of the research library is where most facts and information related to the specific performance of sustainable properties is maintained. As detailed in the GBFC Sustainable Property Performance Framework (Chapter IV: "Sustainable Property Performance"), performance reports and documents are separated by process performance, feature performance, building performance, market performance, and financial performance. This section of the research library supplements Chapter IV: "Sustainable Property Performance," of the *Value Beyond Cost Savings: How to Underwrite Sustainable Properties* book.

15.1 Methods-Miscellaneous

Documents that address methodological issues related to sustainable property performance assessment. Additionally, documents that do not fit in other sub-codes are contained here.

15.2 Case Studies

This section of the research library contains documents that present case studies. Case studies in this section of the research library usually address more than a single feature or attribute, although some of those types of case studies may also be coded here.

15.3 Data Collection and Analysis

Documents that address the issues of data collection and analysis in sustainable property performance assessment. Specific research and data sources and/or reports on issues related to data collection and analysis are referenced here.

15.4 Process Performance

Documents that address sustainable property process performance. Processes include integrated design, contracts, energy modeling, commissioning, occupant and staff training, etc. This section of the research library supplements Section C, "Process Performance" of Chapter IV: "Sustainable Property Performance" of the *Value Beyond Cost Savings: How to Underwrite Sustainable Properties* book.

15.5 Feature/System Performance

Documents that address performance of sustainable features or systems. For example, specific performance of a green roof, an HVAC system, under floor ventilation, daylighting, or similar features or systems are presented here. This section of the research library supplements Section D, "Feature Performance" of

Chapter IV: "Sustainable Property Performance" of the *Value Beyond Cost Savings: How to Underwrite Sustainable Properties* book.

15.6 Building Performance

Documents that report on building performance. Building performance issues include the cost of development, resource use, occupant performance, ability to achieve sustainable certification, and related issues at a building level. This section of the research library supplements Section E, "Building Performance" of Chapter IV: "Sustainable Property Performance" of the *Value Beyond Cost Savings: How to Underwrite Sustainable Properties* book.

15.61 Development Costs

Research related to sustainable development costs including differences between sustainable and traditional building. See also Chapter IV, Section E-1: Development ("First") Costs of the *Value Beyond Cost Savings: How to Underwrite Sustainable Properties* book.

15.62 Resource (Energy) Use

Research related to the performance of buildings related to resource use including energy, water, materials, landfill, etc. See also Chapter IV, Section E-3: Building Energy Use of the *Value Beyond Cost Savings: How to Underwrite Sustainable Properties* book.

15.63 Occupant Performance

Research related to building occupant performance including tenant satisfaction, health, and productivity. See also index code 10.0: Space User Productivity and Health. See also Chapter IV, Section E-4: Occupant Performance of the *Value Beyond Cost Savings: How to Underwrite Sustainable Properties* book.

15.64 Flexibility/Durability

Research related to building flexibility/durability.

15.65 Location/Access

Research related to performance of buildings from the perspective of their location and access. Transportation, land-use, and related issues covered here.

15.66 Sustainability Compliance

Research related to the performance of buildings in achieving and maintaining sustainability ratings.

15.67 Public Benefits

Research related to the public benefits generated by sustainable buildings. See also index code 11.0: Government Regulations and Incentives and 15.77: Regulator Demand Research.

15.7 Market Performance

15.71 Expert-Based Financial Analyses

Real estate valuers or market analysts typically conduct Expert-Based Financial Analyses. The basis for conclusions in these studies is typically drawn from specific analyses of buildings, following a process that is similar to a traditional market analysis process, although typically more cursory. This section supplements Chapter IV, Section F-3: Market Performance Evidence of the *Value Beyond Cost Savings: How to Underwrite Sustainable Properties* book.

15.72 Statistics/Modeling Based Research

Statistics/Modeling-Based studies typically will involve a large number of sustainable and non-sustainable properties, with statistical modeling focused on determining the incremental contribution of a sustainable certification or rating on rent levels, sales prices, occupancies, or other specific financial variables. These studies are typically completed by academics with real estate and/or finance backgrounds. This section supplements Chapter IV, Section F-3: Market Performance Evidence of the *Value Beyond Cost Savings: How to Underwrite Sustainable Properties* book.

15.73 Space User/Investor Surveys

This category includes a broad array of research including tenant/occupant surveys, investor surveys, and general surveys of corporate sustainability trends. This section supplements Chapter IV, Section F-3: Market Performance Evidence of the *Value Beyond Cost Savings: How to Underwrite Sustainable Properties* book.

15.74 Corporate Sustainability/Enterprise Value Research

This section includes a broad spectrum of research related to corporate interest in sustainability and the role of real estate in assessing the value of sustainability to an enterprise. See also index code 15.73 and 15.75. This section supplements Chapter IV, Section F-3: Market Performance Evidence of the *Value Beyond Cost Savings: How to Underwrite Sustainable Properties* book.

15.75 Space User Demographic/Market Research

This category includes a broad array of research including sustainably related market or demographic research, tenant segmentation analysis, and other research that would contribute to an understanding of space user demand and its implications on their willingness to pay more for sustainable real estate. This section supplements Chapter IV, Section F-3: Market Performance Evidence of the *Value Beyond Cost Savings: How to Underwrite Sustainable Properties* book.

15.76 Investor Demand

Documents that address the market performance of investor demand for sustainable properties. This section supplements Chapter IV, Section F-3: Market Performance Evidence of the *Value Beyond Cost Savings: How to Underwrite Sustainable Properties* book.

15.77 Regulator Demand Research

Documents that address the performance and/or reporting of the demand by regulators for sustainable properties. This section supplements Chapter IV, Section F-3: Market Performance Evidence of the *Value Beyond Cost Savings: How to Underwrite Sustainable Properties* book.

15.8 Broker/Appraiser/Lender Market Acceptance

Research and documents addressing the issue of whether brokers, appraisers, and lenders accept market or value evidence substantiated by regulator, space user and investor demand.

15.9 Market Performance: Special Reports/Studies

Documents that address the market performance of sustainable properties including documents addressing multiple of the issues segmented in the index for this section.

15.10 Financial Performance

Documents that show a direct relationship between sustainable/energy efficiency and financial performance. Financial performance is typically defined by value, rates of return, and risk, so articles and publications that deals with these issues directly as they relate to sustainable properties are presented here. This section of the research library supplements Section G, “Financial Performance” of Chapter IV: “Sustainable Property Performance” of the *Value Beyond Cost Savings: How to Underwrite Sustainable Properties* book.

16.0 Commercial Interiors/ Tenant Improvements

This section of the research library contains documents that address specific issues related to commercial interiors/tenant improvements.

17.0 General Sustainability

This section of the research library contains documents that address the general issues of sustainability that go beyond property-specific issues.

Property Specific Topics

18.0 Property Specific Analysis—Commercial

This section of the research library contains documents that specifically address and identify a particular property type.

18.1 Office

Documents specifically related to offices.

18.2 Industrial

Documents specifically related to industrial.

18.3 Retail

Documents specifically related to retail.

18.4 Hospitality

Documents specifically related to hospitality.

18.5 Large Scale Development

Documents specifically related to large-scale development.

18.6 Schools

Documents specifically related to schools.

18.7 Government

Documents specifically related to government.

18.8 Healthcare

Documents specifically related to healthcare.

18.9 Land

Documents specifically related to land.

18.10 Miscellaneous

This section of the research library contains documents on other property types not identified in sub-codes 18.1-18.9, and other miscellaneous documents that address property type issues.

19.0 Property Specific Analysis—Residential

This section of the research library identifies those documents that specifically address residential properties.

19.1 Multi-Family

Publications addressing multi-family properties.

19.2 Single-Family

Publications addressing single-family properties.

Finance and Service Sectors

20.0 Capital Sources

This section of the research library is for those documents specifically related to capital sources and key issues and trends related to such capital sources for sustainable and energy investment.

20.1 Miscellaneous

Miscellaneous documents addressing capital sources that may not fit in the categories below.

20.2 Debt

Documents specifically addressing the sources, financing vehicles, key underwriting issues, and related information for sustainability related mortgage or business loans. Construction loans, permanent loans, bridge loans, and other more specialized debt financing are covered in this section. Banks, life companies, Wall Street lenders, and other private lenders and mortgage brokerage companies are also covered in this section.

20.3 Equity

Documents specifically addressing the sources and key issues related to equity for sustainable property investment. Pension investors, REITs, private equity funds, private investors, responsible property investment, venture capital, and other sources of equity for sustainable property investment are covered in this section.

20.4 CMBS-Securities

Documents that specifically address Commercial Mortgage Backed Securities and/or other energy or sustainable securities issues are addressed in this section.

20.5 Public Finance

Documents that identify specific sources, vehicles, and strategies for the public finance of sustainable energy efficient properties. Public finance is also covered in 20.9—Subsidies/Incentives as well as in section 11.0—Government Regulations and Incentives.

20.6 Energy Finance

This section of the research library contains documents covering financing, vehicles, sources, and strategies for energy related sustainable investments. Energy finance is also covered in other sub codes of section 20. This section focuses on those sources more specifically targeted to energy.

20.7 Energy Service Companies (ESCO's)

Documents related to energy service companies, particularly in relationship to their role as a source of capital. Energy service companies are also covered in sections 24.7—Energy/Performance Service Contracting, and 9.0—Energy.

20.8 Equipment/Product Finance

Documents addressing equipment or product financing for sustainable products and equipment.

20.9 Subsidies/Incentives

Documents related to sustainable or energy efficient subsidies and incentives, and their role in the capital required for sustainable/energy efficient properties.

20.10 Single-Family

Documents addressing single-family capital sources and financing issues.

20.11 Finance Market Research

Research into the size, segmentation, growth, demographics and related market trends for real estate capital providers.

20.12 Special Reports/Studies

Special reports or research on the sustainable real estate capital markets.

21.0 Responsible Property Investing

This section of the research library presents documents related to the responsible property-investing sector. Reports on the overall responsible property investing sector as well as reports on specific types of responsible property investing are presented here.

22.0 Socially Responsible Investment

This section includes documents and reports related to socially responsible investment, with a particular focus on real estate investment. Emergence of responsible property investment began in 2006.

23.0 Sustainable Service Sector

This section of the research library contains documents about sources and key issues for sustainable service sector participants. Most specific research contacts are contained in Section 23.9.

23.1 Appraisers

Documents related to commercial real estate appraisers and their relationship to the sustainable service sector.

23.2 Commercial Brokers

Documents related to commercial brokers and their relationship to the sustainable service sector.

23.3 Consulting

Documents related to consulting and its relationship to the sustainable service sector.

23.4 Design/Engineering

Documents related to design/engineering and its relationship to the sustainable service sector.

23.5 Energy Modeling/Consulting

Documents related to energy modeling/consulting and its relationship to the sustainable service sector.

23.6 Contractors-Builders

Documents related to contractors-builders and their relationship to the sustainable service sector.

23.7 Asset/Property Management

Documents related to asst./property management and its relationship to the sustainable service sector.

23.8 Other Services

Documents related to other services and their relationship to the sustainable service sector.

23.9 Miscellaneous Research/Contacts

Documents that identify specific service providers and/or provide other miscellaneous research and/or contact information.

23.10 Service Provider Certifications/Assessments

Certifications or assessments of service providers and related reports/analyses will be included here or under index code 2.8: Underwriting Service Providers.

23.11 Services Market Research

Research into the size, segmentation, growth, demographics and related market trends for real estate/sustainable service providers.

Special Underwriting Topics

24.0 Special Underwriting Topics

This section covers a broad range of underwriting topics related to sustainable property investing. The term “underwriting” is broadly used to mean the due diligence and related analytic tasks undertaken by lenders, equity investors, or corporations in their real estate decision-making. The documents in this section supplement Sections E, F and H of Chapter V: “Sustainable Property Financial Analysis” and Chapter VI: “Sustainable

Property Underwriting Guidelines" of the *Value Beyond Cost Savings: How to Underwrite Sustainable Properties* book.

24.1 First Cost Analysis

Documents that address first cost analysis, sometimes called initial cost analysis. In addition to specific topics that address the issue of first cost, other cost-related documents and publications can also be found in this section.

24.2 Integrated Design

Documents related to integrated design.

24.3 Commissioning

Documents related to commissioning.

24.4 Tax and Accounting Issues

Documents related to tax and accounting issues.

24.5 Green Leases and Lease Analysis

Documents related to green leases and lease analysis.

24.6 Education/Communication

Documents related to education/communication.

24.7 Energy/Performance Service Contracting

Documents related to energy/performance service contracting.

24.8 Insurance/Surety

Documents related to insurance/surety.

24.9 Product Durability/Flexibility (Churn, Cap Ex.)

Documents related to product durability/flexibility.

24.10 Carbon Trading/Taxes

Publications and documents related to carbon trading/taxes.

24.11 Construction/Development Risks

Publications and documents related to construction/development risks.

24.12 New Technologies/Creative Solutions

Publications and documents related to new technologies/creative solutions.

24.13 Other Costs/Risks of Sustainable Development

Documents related to other costs/risks of sustainable development.

24.14 Contracts/Legal Issues

Documents related to contracts/legal issues.

24.15 Mold/IEQ Risk Issues

Documents related to mold/IEQ risk issues.

25.0 Organizational Change/Strategies

Documents in this section specifically address issues related to the organizational and/or societal changes and strategies that are necessary to move sustainability/energy efficiency forward, and related barriers. Documents in this section cover broader issues beyond properties, but also include property-specific organizational change.

26.0 Miscellaneous Documents

This section includes documents that have not found a home elsewhere in the research library.

27.0 Sustainable Property Industry Studies/Trends

Documents that address broader sustainable property trends are presented in this section. Many of the important and higher quality industry trend studies are identified and coded in this section of the research library.

28.0 Sustainable Property Guides/Best Practices

This section presents documents that identify guides and/or best practices for sustainable property investments.

29.0 Sustainability Adoption/Obstacles

This section presents documents that address the organizational, financial, social, technological, and other issues related to the adoption of energy efficiency/sustainability practices by consumers, property owners, managers, lenders, corporations, governments, etc. Documents identifying obstacles and mechanism to address such obstacles would be covered in this index code.

Additional Industry Links Link Index

The links indentified here do not constitute an endorsement of any individual or group and are not meant to be an exhaustive list of relevant links.

50.1 Assorted Glossaries

50.2 Green Building and Related Organizations

50.3 Research Organizations/Institutions

50.4 Trade Groups: Green/Other

50.5 Trade Groups: Real Estate

50.6 Uncategorized

Appendix B
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2. General Perspective

C. Sustainable Property Features

1. GBFC Menu of Sustainable Features
2. Sustainable Property Resources
3. Sustainable Property Features and Building Outcomes

D. Measuring a Property's Sustainability

1. Financial Analysis Requires Broad Knowledge of Alternative Approaches
2. Performance Measurement Moves to Forefront in Industry
3. Select Developments in Certification and Measurement

E. How Sustainable Property Certifications Affect Value

1. Key Findings Influencing Financial Analysis
2. Key Steps to Evaluate Environmental Sustainability Certifications
3. Key Observations About Property Sustainability Definitions Affecting Financial Analysis

F. Key Research Comparing Sustainable Rating Systems

1. Summary of Key Studies

G. Conclusions

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Appendix III-A: Sustainable Property Features List
Appendix III-B: Preliminary Analysis of Existing Case Study Databases Relevant to Green Buildings
Appendix III-C: Comprehensive Building Performance Rating Tools in North America
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Sustainable Property Performance

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1. Research Methodology
2. Applying Findings, Conclusions, and Methods
3. Organization

B. GBFC Sustainable Property Performance Framework

C. Process Performance

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2. Contracts/Legal
3. Service Provider Quality and Capacity
4. Energy Use Forecasting
5. Regulations and Code Compliance
6. Commissioning
7. Measurement Verification

D. Feature Performance

1. Feature-Based Financial Performance
2. Performances and Risk Assessment of Six Key Features/Systems

E. Building Performance

1. Development ("First") Costs
2. Whole Building Performance Studies
3. Building Energy Use
4. Occupant Performance

F. Market Performance

1. Introduction
2. Three Principles for Applying Sustainable Property Market Performance Research
3. Presentation of Market Performance Evidence

G. Financial Performance

H. Conclusions

Appendices

Appendix IV-A: GBFC Sustainable Property Performance Framework
Appendix IV-B: RICS Green Value Interview Summaries
Appendix IV-C: Studies of Productivity and Health Cited by Industry
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Chapter V
Sustainable Property Financial Analysis

3. The Importance of Energy Prices
4. Sustainable Property Energy/Carbon Reduction Features/Strategies
5. Sustainable Property Energy Features and Building Outcomes
6. Feature/Strategy Based Financial Analysis Tools
7. Underwriting Process for Energy/Carbon Reduction Investment
8. The Evidence of Building Energy Performance
9. The Impact of ESCOs on Underwriting Energy/Carbon Reduction Investment

F. Underwriting Space User Demand

1. Segmentation Analysis of the Space User Market
2. Space User Demand Risks
3. The Evidence of Space User Demand

G. Existing Building Underwriting Guidelines

1. Preliminary Compliance with Investment Guidelines
2. Owner/Operator
3. Property Management
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I. Conclusions

Appendices

Appendix VI-A: Space User Underwriting Checklist
Appendix VI-B: Existing Building Underwriting Checklist
Appendix VI-C: New/Retrofits Building Underwriting Checklist

Appendix C

GBFC Sustainable Property Performance Framework

Process Performance →

- Integrated Design
  Everyone, early, every issue
- Contracts/Legal
  Proper performance incentives, sustainability incorporated into requirements, etc.
- Services Quality & Capacity
  Financing, construction, leasing, procurement, management
- Energy Use Forecasting
  Experienced modeler, proper model, inputs
- Regulation & Code Compliance
- Commissioning
  Bring Cx agent on early, ensure all other trades buy in to Cx process
- Sustainable Certifications
  Experienced coordination and management of process, paperwork
- Measurement & Verification
  Proper metrics, systems, O&M staff buy-in
- Occupant & Staff Training
  Behavior modification required

Feature/System Performance →

- Energy/Water
  HVAC system
  Daylighting
  High efficiency lighting
  Window glazing
  Water-efficient landscaping
  Low-flow toilets & faucets
- Indoor Environmental Quality
  Low-emitting paints & flooring
  Exterior windows views
  Under-floor ventilation
  Enclosed, ventilated mechanical rooms
- Materials & Resources
  Certified or renewable materials
  Construction waste management plan
- Sustainable Sites
  Reflective roof surface/ green roof
  Stormwater management

Building Performance →

- Development Costs
  Hard/soft costs
  Timing
  Tax savings grants
  Financing costs
- Resource Use
  Energy, water, insurance, waste disposal, cap ex., etc.
- Location & Access
  Non-auto accessibility
  Accommodation of low-energy autos
  Environmental sensitivity of site
- Occupant Performance
  Satisfaction
  Health
  Productivity
- Sustainability Compliance
  Certifications
  Regulations
  Occupant policy
- Flexibility/ Adaptability
  Design
  Materials
  Systems
  Energy sources
- Public Benefits
  Infrastructure cost reduction
  Environmental benefits
  Land-use benefits
  Emissions improved
  Economic benefits

Market Performance →

- Operating Costs
  Energy, water, etc,
- Regulator/ Utility Demand
  Level of regulation
  Entitlement benefits
  Tax benefits
  Financial incentives
- Space User Demand
  Occupant type
  Internal requirements
  External requirements
  Cost-benefit allocation
  Sustainable property options
- Investor Demand
  Investor type
  Internal requirements
  External requirements
  Recognition of regulator/ space user demand

Financial Performance

- Recognition of Market Demand
  Brokers
  Appraisers
  Lenders
- Determine Key Inputs
  Rent
  Occupancy
  Absorption
  Tenant retention
  Sales price (residual)
  Discount rates
  Capitalization rates
  Capital expenditures and tenant improvements
- Calculate Results
  Net present value
  Internal rate of return
  Total occupancy cost
  Value
- Risk Assessment
  Development costs
  Development risk
  Operating costs
  Revenues
  Regulatory risk
  Liability risk
  Exit/financing risk

Appendix D
Space User/Investor Sustainability Surveys

Name/Source	Publication Date*	Date(s) Survey Taken	Respondent Description
McGraw-Hill Smart Growth Reports	Ongoing	Ongoing	Wide range of sustainable building and construction industry participants
Jones Lange LaSalle / CoreNet Sustainability Survey	Late 2009	Sept.-Oct. 2009	Corporate real estate executives
“Doubling Down on Green,” National Real Estate Investor 2009 Green Building Survey	Nov./Dec. 2009	Aug.-Sept. 2009	E-mail invitation to developers, corporate and government planners, subscribers, involved with office, retail or mixed-use properties. 337 responses: 175 government officials, 105 commercial developers, 57 corporate real estate users.
CB Richard Ellis and Burnham-Moores Center for Real Estate, University of San Diego, “Do Green Buildings Make Dollars and Sense?”	Nov. 2009	May 2009/ Summer 3009	534 responses fro tenants in 154 Class A or A-LEED office buildings. Follow-up survey obtained 221 respondents, or EnergyStar
National Association of Home Builders	Oct. 2009	Aug. 2009	Homebuilders
National University of Singapore, Journal of Sustainable Real Estate	Fall 2009	Not provided	400 occupiers of commercial buildings in Singapore; survey on importance of green building benefits and willingness to occupy
RICS/CPE Global Commercial Property Sustainability Survey	Aug. 2009	June-July 2009	Property professionals worldwide. “Leading international real estate organizations and local firms.” No further detail provided.
Kingsley Assoc. “Insight” Newsletter	June 4, 2009	N/a	Office tenants.
“Energy Efficiency Indicator Survey” (EEI), Johnson Controls	May 2009	N/a	1,400 N. American executives responsible for managing, reviewing, or monitoring energy use in their organization.
“The Economy’s Impact on Corporate Real Estate,” CoreNet Global	May 2009	April 2009	400 respondents from the occupier and service provider sides of the corporate real estate industry, many of who have global responsibilities.
“Global Compact Annual Report,” Survey by United Nations	Apr. 8, 2009	N/a	700 respondents from 1,500 global businesses signed on to UN’s “Global Compact.”
Center for Research on Environmental Decisions, Columbia and Yale Universities	Mar. 19, 2009	N/a	New Yorkers.
Allen Matkins 3rd Annual Green Building Survey	Early 2009	Dec. 2008	900 respondents including 42% design professionals, 21% contractors/subcontractors, 12% construction planning managers, 11% consultants, 10% owners/developers, 4% other
“Central London Occupier Survey,” Knight Frank	Jan. 2009	Sept. 2008	Corporate real estate directors in London, UK.
“Green Building Market Barometer,” Turner Construction Company	Jan. 2009	Aug.-Sept. 2008	754 executives in the United States real estate industry: developers; building owners; brokers; architectural, engineering, and construction firms; corporate owner-occupants; and tenants. Unclear if 754 was respondents or those surveyed.
“Sustainability in Corporate Real Estate,” CoreNet Global & Jones Lang LaSalle	Dec. 5, 2008	Oct. 2008	402 senior corporate real estate executives, global survey (75% N. America, 12% Europe, 13% other); 78% of respondents from companies with over 1,000 employees.
“The 2007 Sustainability Survey Report,” Leonardo Academy	Dec. 10, 2008 (updated)	Fall 2007	408 respondents from a variety of businesses and international locations.
“The Green Survey,” *Real Estate Forum*, GlobeSt.com, the Building Owners & Managers Assoc. Int’l., US Green Bldg. Council	Nov. 2008	2008	Over 250 respondents in the U.S. to on-line poll included property owners, property managers, developers, asset managers, REIT executives and “other” (some respondents have international reach).
“Quarterly Sustainability Tracking Study,” Panel Intelligence	Nov. 25, 2008	Early Nov. 2008	65 “sustainability executives” of Fortune 500 companies in North America.
Verizon and IR Magazine Study	Sept. 10, 2008	N/a	150 respondents -- Investor relations professionals Drawn from global readership of IR Magazine.
“From Green to Gold 2008,” GVA Grimley	Fall 2008	Summer 2008	“Leading” UK income property investors. Survey focused solely on investors.
Experience, Inc.	Aug. 6, 2008	N/a	2,500 college students and recent graduates.

Appendix D
Space User/Investor Sustainability Surveys

Name/Source	Publication Date*	Date(s) Survey Taken	Respondent Description
"Energy Efficiency Indicator," Johnson Controls	Apr. 15, 2008	N/a	Survey conducted by International Facility Management Association.
"Future of the Workplace Survey," CoreNet Global	May 2008	N/a	Global corporate real estate: consultants/academics, service providers, end-users. 85% respondents based in China/Asia/Pacific.
Carbon Disclosure Project	May 1, 2008	N/a	144 supply chain companies from around the world.
"2008 IBT Market Pulse Survey"	N/a	Apr. 2008	On-line survey: 124 financial institution executives in the U.S.
"Green Shopping Centres," GVA Grimley	Spring 2008	Oct. 7, 2007–Feb. 8, 2008	20 UK shopping centers plus interviews with their managers, investors, developers, architects and cost consultant, covering both existing and new centers.
"The State of Sustainability in Asia", Jones Land LaSalle, CoreNet Global	Mar. 4, 2008	2007	300 corporate real estate professionals at the CoreNet Global Asia Summit.
Survey on green employment, MonsterTRAK.com	Feb. 8, 2008	N/a	"Young professionals", "students and entry-level hires".
"CSR Jobs Rank High for Newly Minted MBAs," Net Impact and Ellen Weinreb Recruiting	Jan. 15, 2008	2005-2008	Job listings in major cities globally
"Global Sustainability Survey," CoreNet Global & Building Design + Construction Magazine	Jan. 2008	N/a	A wide range of industry sectors was surveyed about trends in the design-and-build side of the industry.
"Sustainability Perceptions and Trends in the Corporate Real Estate Industry," CoreNet Global & Jones Lang LaSalle	Jan. 2008	Mar.-Sept. 2007	Global Summit audiences –"corporate real estate and workplace executives"--in Singapore, Denver, London and Melbourne. 2,300 were queried; 414 responded.
Valuing Green, Australian Green Building Council, 2008	2008	2008	Detailed face-to-face interviews with representatives of five leading property advisory and valuation firms and 14 fund managers and developers (pgs. 16-19).
"Australian Sustainability Survey 2007," Jones Lang LaSalle	2008	2007	Australian real estate industry.
"Global Green Building Trends," McGraw Hill Construction	2008	April/May 2008	The global construction industry: 1,503 surveyed, with 700 respondents from construction industry professionals in 45 countries.
Survey on corporate responsibility by The Conference Board	Nov. 9, 2007	N/a	198 medium to large multinational companies.
"2007 Green Index," AIA and Autodesk, Inc.	Nov. 13, 2007	Oct. 2007	347 practicing architects in the U.S.
"2007 Green Survey: Existing Buildings," Real Estate Media, the Building Owners & Managers Assoc. Int'l. and the US Green Building Council"	Nov. 2007	2007	392 property owners, property managers, developers, asset managers, REIT executives and "other" in the U.S. (some respondents have international reach).
"European Landlord & Tenant Survey," Cushman & Wakefield	Nov. 2007	N/a	825 senior executives representing major corporations in Europe. 1/3 were property landlords; 2/3rds tenants.
"2007 Green Building Survey," National Real Estate Investor and Retail Traffic	Nov. 2007	Aug. 2007	24,943 subscribers of participating publications were e-mailed survey invitations. Subscriber categories: corporate users of real estate, developers of commercial real estate, government officials. 384 respondents.
"The Workplace Performance Survey," Tritaga	Oct. 2007	Sept. 2007	Over 100 workplace organizations primarily in government, financial services, and professional services. Medium to large organizations.
"2007 Canadian Office Tenant Survey," Colliers International	Sept. 26, 2007	July 2007	181 Canadian office tenants who lease over 10,000 sf of space.
"15th Business Leaders Survey," Grant Thornton and *Business Week*	Sept. 2007	June 2007	Online survey: 510 corporate executives from Business Week's Market Advisory Board.
"State of the Outsourcing Industry," Brown-Wilson Group	Aug. 20, 2007	N/a	Results based on a green-related sub-survey as part of its larger survey of 20,000 global outsource users for its book *State of the Outsourcing Industry."*
"Corporate Social Responsibility Survey," RSM	July 25, 2007	N/a	200 large European companies across a broad range of sectors.

Appendix D
Space User/Investor Sustainability Surveys

Name/Source	Publication Date*	Date(s) Survey Taken	Respondent Description
Erasmus University			
"From Green to Gold," GVA Grimley	Summer 2007	June 2007	UK's leading real estate investors.
Johnson Controls	June 13, 2007	Mar. 2007	"employees across a wide range of industries and locations" identified as decision makers for energy management issues.
"The Greening of Corporate America SmartMarket Report," McGraw-Hill/Siemens	May 14, 2007	N/a	190 of the largest companies in US, all with revenues over $250 million. 85% of the respondents were CEOs or CFOs or senior vice presidents in environmental or investor-relations positions.
GVA Grimley/ CBI survey	Spring 2007	June 2006	"Office occupiers".
"Australian Office Tenant Survey 2006," Colliers International	2007	Latter half of 2005	205 corporate tenants in a broad cross-section of industries occupying more than 500 sq. m. located in CBD and metropolitan markets of Sydney, Melbourne and Brisbane, Australia
"Financial Consequences of Worker Absences," Cornell U., U. of Pennsylvania, Dow Chemical & Merck	Feb. 25, 2006	N/a	800 managers in 12 industries.
"US Workplace Survey," Gensler	2006	Mar. 2006	2,013 American office workers, covering eight industries and with equal regional representation across the continental US.
"Office Tenant Needs Study," CBE and Fisher Ctr. of Real Estate & Urban Economics/ Spieker Properties	Oct. 1999	July/Aug. 1999	Focus groups of 8 to 15 from various business sectors and types of companies (small, medium, large; public/private).

* Information came from a third party source. Publication date is the date the source reported on the survey, not necessarily the date survey results were published.

Appendix E

Foundational Background and Theoretical Research Sustainable Property and Valuation Chronological List

Title	Author(s)	Publication/Publisher Name	Publication Date
Green Design and the Market for Commercial Office Space	Jonathan A. Wiley, Justin D. Benefield and Ken H. Johnson	Journal of Real Estate Finance and Economics	forthcoming (2010 or 2011)
A New Competitive Advantage: Connecting the Dots between Employee Health and Productivity	Nina Taggart	Benefits and Compensation Digest	2009
Green Buildings and Productivity	Norm Miller and Dave Pogue	Journal of Sustainable Real Estate	2009
Greening Our Built World: Costs, Benefits and Strategies	Greg Kats	Island Press	Nov. 2009
Do Green Buildings Make Dollars and Sense?	Norm Miller, David Pogue	USD-BMC Working Paper 09-11, Draft	Nov. 6, 2009
Sustainable Real Estate Development: The Dynamics of Market Penetration	John Goering	Journal of Sustainable Real Estate	Fall 2009
An Investigation of the Effect of Eco-Labeling on Office Occupancy Rates	Franz Fuerst and Patrick McAllister	Journal of Sustainable Real Estate	Fall 2009
Effect of LEED Ratings and Levels on Office Property Assessed and Market Values	Sofia V. Dermisi	Journal of Sustainable Real Estate	Fall 2009
Green Design and the Market for Commercial Office Space	Justin Benefield, Jonathan Wiley and Ken Johnson	Journal of Real Estate Finance and Economics, forthcoming	2009
Why Do Companies Rent Green? Real Property and Corporate Social Responsibility	Piet Eichholtz, Nils Kok, & John Quigley	Working Paper	July, 2009
High Performance Green Building: What's It Worth? Investigating the Market Value of High Performance Green Buildings	Chris Corps, Theddi Wright Chappell	Special Report	May 2009
Thinking About the Value of a Property From a Sustainable Perspective	Lynne Armitage	API Journal	May 2009
New Evidence on the Green Building Rent and Price Premium	Frank Fuerst & Patrick McAllister	Presentation to ARES Conference	Apr. 3, 2009
Investment Returns From Responsible Property Investments: Energy Efficient, Transit-Oriented and Urban Regeneration Office Properties in the US from 1998-2008	Gary Pivo and Jeffry Fisher	Working Paper	Oct. 11, 2008; revised March 2009
Energy Efficient Investments: Do They Pay?	Brian Ciochetti and Mark McGowan	MIT Conference for Real Estate	Feb. 2009
How Green a Recession? Sustainability Prospects in the US Real Estate Industry	Andrew J. Nelson	RREEF Research	Jan. 2009
Doing Well By Doing Good? Green Office Buildings	Piet Eichholtz, Nils Kok and John M. Quigley	Working paper, Fisher Center for Real Estate & Urban Economics, UC Berkley	Jan. 2009
Sustainability: Measurement and Valuation? Insights From Australia and New Zealand	Georgia Warren-Myers, Richard Reed	15th Annual Pacific Rim Real Estate Society (PRRES) Conference	Jan. 2009
The Impact of Sustainability on the Investment Environment: A Case Study of Australia	Deborah Levy & Anthony De Francesco	Royal Institute of Chartered Surveyors Research Report	Nov. 2008
Globalization and Global Trends in Green Real Estate Investment	Andrew Nelson	RREEF Research	Sept. 2008
Next Generation Decision Support Instruments for the Property Industry: Understanding the Financial Implications of Sustainable Building	David Lorenz & Thomas Lützendorf	Paper for World Sustainable Building Conference	Sept. 2008
Sustainable Property Investment and Management: Key Issues and Major Challenges	David Lorenz, et al.	Royal Institute of Chartered Surveyors	Sept. 2008
Valuing Green Buildings: An Australian Perspective	Philip Kimmet and Victoria	School of Urban Development,	Sept. 2008

Appendix E

Foundational Background and Theoretical Research Sustainable Property and Valuation Chronological List

Title	Author(s)	Publication/Publisher Name	Publication Date
	Popova	Queensland Univ. of Technology	
Quantifying ‘Green’ Value: Assessing the Applicability of the CoStar Studies	Scott R. Muldavin	Green Building Finance Consortium Special Report	June 2008
Does Green Pay Off?	Norm Miller, Jay Spivey & Andy Florance	Journal of Real Estate Portfolio Management	Fall 2008
Does It Pay to Be Green? Correcting Economic and Environmental Performance in Commercial Real Estate Markets	Franz Fuerst and Patrick Mcallister	Draft Paper	June 3, 2008
Breaking the Vicious Cycle of Blame—Making the Business Case for Sustainable Buildings	Royal Institute of Chartered Surveyors	Royal Institute of Chartered Surveyors	June 2008
Why Companies Rent Green: CSR and the Role of Real Estate	Piet Eichholtz, Nils Kok, John M. Quigley	Working Paper	June 2008
Does Green Pay Off?	Norm Miller, Jay Spivey and Andy Florance	Working Paper	April 2008
Doing Well By Doing Good? Green Office Buildings	Piet Eichholtz, Nils Kok and John M. Quigley	Working paper, Fisher Center for Real Estate & Urban Economics, UC Berkley	April 2008
Pricing Sustainability: An Empirical Investigation of the Value Impacts of Green Building Certification	Franz Fuerst and Patrick McAllister	Working paper presented at ARES	April 2008
Is LEED Certification Worth It?	K. McCormick	Multifamily Trends, The Urban Land Institute	April 2008
Increasing Commercial Real Estate Returns With Energy Risk Management	Jerry Jackson	Working paper presented at ARES	April 2008
Valuing Green: How Green Buildings Affect Property Values and Getting the Valuation Method Right	Richard Bowman, John Wills	Australian Green Building Council Special Report	Feb. 2008
RICS EU Advisory Group on Sustainable Property Investment and Management	RICS Advisory Group Action Plan	Royal Institute of Chartered Surveyors	Jan. 2008
An Introduction to Valuing Green	Tim Lowe & Theddi Wright Chappell	Appraisal Institute Education Seminar	2008 (updated regularly)
Climate Change: The Risks for Property in the UK	Patrick Austin	Hermes Special Report	2008
The Greening of US Investment Real Estate: Market Fundamentals, Prospects and Opportunities	Andrew Nelson	RREEF Research	Nov. 2007
Integrating Sustainability Into Property Risk Assessments for Market Transformation	Thomas Lützendorf & David Lorenz	Building Research and Information	Nov. 2007
Does Green Pay Off?	Norm Miller, Jay Spivey and Andy Florance	Working Paper	Nov. 19, 2007
Valuing Sustainability	Chris Corps	Special Report of the Commission for Environmental Cooperation	Fall 2007
Office Productivity: A Theoretical Framework	B.P. Haynes	Journal of Corporate Real Estate	Fall 2007
Valuation of Sustainable Commercial Properties	Richard Reed	Your Building Website	Aug. 30, 2007
A Strategic Response to Sustainable Property Investing	Scott Muldavin	PREA Quarterly	Summer 2007
Financing and Valuing Sustainable Property: We Need to Talk	The Royal Institute of Chartered Surveyors	Presented at the “Rethinking Sustainable Construction” Conference	April 2007
The Relationship Between Sustainability and the Value of Office Buildings	Georgia Myers	Presented at the 13th Annual Pacific Rim Real Estate (PRRES) Conference	Jan. 21-24, 2007
Socially Responsible Property Investment: Quantifying the Relationship between Sustainability and Investment Property Worth	L. Ellison, S. Sayce and J. Smith	Journal of Property Research	2007

Appendix E

Foundational Background and Theoretical Research Sustainable Property and Valuation Chronological List

Title	Author(s)	Publication/Publisher Name	Publication Date
Understanding Investment Drivers for UK Sustainable Property	Sarah Sayce, Louise Ellison and P. Parnell	Building Research & Information 35 (6)	2007
The Application of Sustainable Development Principles to the Theory and Practice of Property Valuation	David Lorenz & Thomas Lützendorf	Working Paper	Dec. 2006
The Sustainable Property Appraisal Project: Outline of Collaborative Research Programme	Sarah Sayce, et al.	School of Surveying, Kingston University	Aug. 3, 2006
Addressing Risk and Uncertainty in Property Valuations: A Viewpoint from Germany	David Lorenz, Stefan Trück & Thomas Lützendorf	Journal of Property Investment and Finance	June 2006
Exploring the Relationship Between the Sustainability of Construction and Market Value	David Lorenz, Stefan Trück & Thomas Lützendorf	Property Management, Vol. 25, No. 2	April 2006
Sustainability in Property Valuation: Theory and Practice	David Lorenz &Thomas Lützendorf	Property Management, Vol. 25, No. 2	April 2006
Assessing the Value of Sustainability	Jones Lang LaSalle	Jones Lang LaSalle	2006
Toward Sustainability Indicators for Commercial Property Occupies and Investors	Sarah Sayce & Louise Ellison	Research Paper; Kingston University	2006
Green Value: Green Buildings, Growing Assets	Chris Corps, Cushman & Wakefield LePage, Busby Perkins + Will, Build Green, DTZ (UK)	Royal Institute of Chartered Surveyors	Oct. 2005
The Value of Green Buildings: A Study for the RICS	DTZ Research	Royal Institute of Chartered Surveyors	April 2005
Property Valuation and Analysis Applied to Environmentally Sustainable Development	J. Robinson	Paper presented at the 11th Pacific Rim Real Estate Society Conference	Jan. 2005
A Note on Environmental Value Added for Real Estate	Masuto Ito	The Sumitomo Trust & Banking Co. Ltd. Real Estate Consulting Dept.	2005
The Reporting of Risk in Real Estate Appraisal Property Risk Scoring	A. Adair and N. Hutchison	Journal of Property Investment and Finance, Vol. 23, No. 3	2005
Sustainable Property Investment: Valuing Sustainable Buildings Through Property Performance Assessment	Thomas Lützendorf & David Lorenz	Building Research and Information	2005
Incorporating Sustainability in Commercial Property Appraisal: Evidence From the UK	Sarah Sayce, Louise Ellison and Judy Smith	Presented at the 11th European Real Estate Conference	June 2, 2004
How Green Is Your Building? An Appraiser's Guide to Sustainable Design	Krisandra Buidry	The Appraisal Journal (Appraisal Institute)	Winter 2004
The Costs and Benefits of Green	Greg Kats	A Report to California's Sustainable Building Task Force, Capital E Analytics	Oct. 2003 7
Integrating Sustainability Into the Appraisal of Property Worth: Identifying Appropriate Indicators of Sustainability	Sarah Sayce & Louise Ellison	Presented at the American Real Estate and Urban Economics Association Conference	Aug. 21, 2003
The Quest for Sustainable Buildings: Is Longevity the Key?	Sarah Sayce	Proceedings of the 2002 International Sustainable Development Research Conference	Apr. 8-9, 2002
An Aggregated Weighting System for Evaluating Sustainable Urban Regeneration	L. Hemphill, S. MacGreal & J. Berry	Journal of Property Research, 19 (4)	2002
Sustainability Checklist for Developments	D. Brownhill and Rao	Watford: BRE Centre for Sustainable Construction	2002
Stalking the Elusive Business Case for Corporate Sustainability	Donald J. Reed	World Resources Institute	Dec. 2001
Environmental Benchmarking for Property Portfolio Managers	D. Brownhill and A. Yates	Watford: BRE Centre for Sustainable Construction	2001

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Title	Author(s)	Publication/Publisher Name	Publication Date
What About Demand? Do Investors Want 'Sustainable Buildings?'	M. Keeping	The Cutting Edge, RICS Research Foundation	2000
Attitudes Towards Financial Incentives for Green Buildings	P. Parnell and S. Sayce	Kingston University School of Surveying and Drivers Jonas Property Consultants	1999
Sustainability Indicators: Measuring the Immeasurable	S. Bell and S. Morse	Earthscan, London	1999

Appendix F
Sustainable Property Financial Analysis Alternatives

A. Traditional Sustainability Financial Analyses[94]

1. Simple Payback
2. Simple Return on Investment (ROI)
3. Simple Change in Asset Value: Direct Capitalization (CAV-DC)
4. Simple ROI and General Cost-Benefit Analysis
5. Life Cycle Costing (LCC)
6. Value Engineering
7. ENERGY STAR Building Upgrade Value Calculator for Office Properties
8. ENERGY STAR Cash Flow Opportunity
9. Life Cycle Assessment (LCA)
10. Post Occupancy Analyses (POE)

B. Traditional Real Estate Financial Analyses[95]

1. Cost Management
2. Discounted Cash Flow Analysis (DCF)
   - Change in Asset Value
   - Net Present Value
   - Internal Rate of Return
3. After Tax Cash Flow Analyses
4. Valuation
5. Total Occupancy Cost (Cost of Ownership) Analysis
6. Economic Value Added

[94] These models and analysis are those that have traditionally been used in the real estate industry to make energy efficiency/sustainability investment decisions for buildings, features, and equipment.

[95] Traditional real estate financial analyses are integrated models that endeavor to incorporate comprehensive cost, benefit, and risk information to generate return/value results based on specification of financial model inputs such as energy costs, rents, occupancy, tenant retention, discount rates, etc.

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C.	Sustainability Sub-Financial Analyses[96]
	1. Comparative First Cost Analysis 2. DCF Lease-Based Cost-Benefit Allocation Models 3. Sustainability Options Analysis 4. Churn Cost Savings Analysis 5. Productivity Benefits Analysis 6. Health Cost Savings Analysis 7. Government/Utility Incentives and Rebates Analysis 8. Enterprise Value Analysis 9. ENERGY STAR Financial Value Calculator 10. Risk Analysis and Presentation (RAP)
D.	Public Sustainable Benefits Analyses[97]
	1. Reduced Infrastructure Costs 2. Environmental & Resource Conservation Benefits 3. Land-Use Benefits 4. Reduced Climate Change 5. Economic Benefits 6. Security Benefits

[96] Sustainability Sub-Financial Analyses are those analyses and models that provide quantitative insight/data that is typically combined with other information and analyses to aid the valuer/financial analysts in their specification of key financial assumptions in a discounted cash flow (DCF) analysis or related model. Key financial assumptions include rent, rent growth, occupancy, absorption, tenant retention, operating costs, etc. These type of analyses are done for every DCF analysis, but the analyses in this list are a selection of some of the specialized analyses that have been developed in recent years to aid in the financial analysis of sustainable property investment.

[97] Financial analyses used to quantify potential public sector benefits. These analyses contribute to private value through the potential ability to negotiate payment for public value. Such "monetization" of public value is created through enhanced entitlement/permitting benefits and related public grants, financing, or other incentives. This category is focused on those financial analyses resulting in public benefits from private sector buildings.

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Sustainable Property Financial Analysis Alternatives

Analysis/Model	Description/Commentary	Key Links/Examples
A. Traditional Sustainability Financial Analysis		
1. Simple Payback Period (SPP)	As an example, we present the Simple Payback Period method of evaluating an energy investment. In simple terms, the SSP model considers the length of time that it will take for the investor to receive benefits equal to the costs of the initial investment. SPP = ICC/S Where S = (AES x EC) – AOC + ROC SPP = Simple Payback Period (years) ICC = Initial Capital Costs (dollars) S = Net Annual Energy Savings (dollars) AES = Annual Energy Savings (kBtu) EC = Energy Costs (dollars/kBtu) AOC = Additional Operating Costs (dollars) ROC + Reduced Operating Costs (dollars) As its name implies, the SPP approach is intended to provide a simple evaluation of an investment without the need for refined data or detailed assumptions. It is easily applied and generally appropriate for investments that are relatively small in scale and that involve technologies with a track record that allows for reasonably accurate estimates of the cost to implement and reasonably accurate estimates of energy cost savings. The SPP metric does not take into account the time value of money, that is, discounting of the future benefits.[98] As presented here, the SPP does take into consideration additional or reduced operating costs that may result from the implementation of the energy efficiency upgrade. For example, a new energy-saving device may require annual maintenance costs that were not previously required, hence the energy cost savings must be offset by this additional cost, at least in the short run. Alternatively, for example, if lamps/light bulbs need to be replaced much less frequently, maintenance (operating) costs would be reduced.	**US Department of Energy**: Perhaps the most comprehensive listing of links to specialized feature or system based financial analyses using a combination of Life Cycle Costing, Simple ROI, Simple Payback and related financial models is shown on the US Department of Energy's Energy Efficiency and Renewable Energy Building Technologies Program Tools website: http://apps1.eere.energy.gov/buildings/tools_directory/subjects_sub.cfm . **Whole Building Design Guide Tools**: The Whole Building Design Guide Tool's website presents hundreds of financial analyses and models. http://www.wbdg.org/tools/tools.php **ASTM International Standards on Building Economics:** ASTM Committee EO6 on Performance of Buildings has jurisdiction over E06-81: Building Economics. They publish 25 detailed technical publications on the financial models and analyses of Building Economics including LCA calculations, net benefits, internal rate of return, and many other analyses. Each of these reports carries a price tag of $30 to $50 dollars. http://www.astm.org/COMMIT/SUBCOMMIT/E0681.htm **GreenandSave.com's Master ROI Table** provides an example of the results of simple payback and ROI models. http://www.greenandsave.com/master_roi_table.html

98 The Royal Institute of Chartered Surveyors "Energy Appraisal of Existing Buildings – a Handbook for Surveyors" makes reference to a Discounted Payback metric which is the same as the SPP but utilizes the present value of each of the Net Annual Energy Savings over the relevant period.

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Analysis/Model	Description/Commentary	Key Links/Examples
2. Simple Return on Investment (ROI)	The Return on Investment metric is another relatively simple measure that considers the energy savings in relation to the initial investment.[99] It presumes that the benefits are ongoing and permanent. ROI = (S / ICC) x 100 Where ROI = Return on Investment (percent) ICC = Initial Capital Costs (dollars) S = Net Annual Energy Savings (dollars) The ROI is the inverse of the SPP, and therefore requires the exact same inputs with the same limitations and will have similar applicability. Given its relative simplicity, it is generally appropriate for investments that are relatively small in scale and that involve technologies with a track record that allows for reasonably accurate estimates of the cost to implement and reasonably accurate estimates of energy cost savings. As generally applied, the investment decision will be accepted if the ROI exceeds an internally established threshold such as the company's cost of capital or return on other competing investments.	See links for Simple Payback Period identified above and more listed in text of Chapter.
3. Simple Change in Asset Value: Direct Capitalization (CAV-DC)	Another method of evaluating energy investment decisions is to consider the impact on property value that the investment will have by applying a direct capitalization approach. As generally applied, this approach capitalizes the change in NOI resulting from the Net Annual Energy Savings and compares it to the Initial Capital Cost as follows: Asset Valuation: Direct Capitalization = S/R0 - ICC Where S = Net Annual Energy Savings (dollars) R0 = Going In Capitalization Rate (percent) ICC = Initial Capital Costs (dollars) S = (AES x EC) – AOC + ROC AES = Annual Energy Savings (kBtu) EC = Energy Costs (dollars/kBtu) AOC = Additional Operating Costs (dollars)	

[99] This metric is referred to as the Accounting Rate of Return in the Royal Institute of Chartered Surveyors "Energy Appraisal of Existing Buildings – a Handbook for Surveyors".

Analysis/Model	Description/Commentary	Key Links/Examples
	ROC + Reduced Operating Costs (dollars) This metric presumes that the benefits are ongoing and permanent. Similar to the metrics discussed above, this metric is considered "simple" because it does not take into consideration the time value of money nor does it consider changes in future energy costs, or in most cases, as used, potential non-cost related benefits of energy/carbon reduction. An advantage is that it incorporates at least some of the elements of change in property value through changes in NOI, to the extent that the decision-maker is able to determine all of the impacts on NOI. If the increase in property value resulting from the investment exceeds the Initial Capital Cost, the metric is greater than zero, and would suggest a positive investment decision.	
4. Simple ROI and General Cost-Benefit Analyses	As discussed above, simple ROI provides an analysis of the simple return of an initial capital investment based on the cost savings, presuming the cost savings continues indefinitely. For decisions where the Simple Return on Investment is high, and accordingly the Simple Payback time period would be short, nothing else is typically necessary to support the decision. However, as payback periods get longer, and capital investments become greater, some investors have been supplementing simple ROI or Simple Pay-Back analyses with a summary of their a project's other potential benefits. As a starting point, general Cost-Benefit Analysis should include a discussion of potential productivity or health cost saving benefits, potential churn cost savings, recruiting or employee retention benefits for space users, and a general reduction in litigation risk, energy cost volatility, regulatory risk, exit risk and other issues. The effectiveness of the additional Cost-Benefit Analysis will be based on how it is articulated. For a specific property-level decision, the discussion of potential benefits needs to be property specific. An assessment of potential productivity benefits needs to address the specific evidence for productivity benefits for the types of occupants, and an assessment of how such occupants will value such potential benefits. The more detail that can be provided to give decision-makers some idea of the magnitude and direct applicability of a potential benefit for a specific property will be very beneficial. To date, this type of detailed property-specific analysis is in its	General industry cost-benefit studies can be found in the Research Library and Industry Resources links section of the Green Building Finance Consortium website (index code 3.0), Sections D. and E. in Chapter IV also provide a detailed evaluation of sustainable property costs-benefits and guidance on assessing their applicability to specific sustainable property processess and features.

Analysis/Model	Description/Commentary	Key Links/Examples
	infancy. At its best, the Simple ROI and general articulation of the Cost-Benefit Analysis can be quite powerful, even if more precise financial analysis (see Steps 4 and 5 in Chapter V, Sections F and G.) is required to truly understand the financial implications of sustainable investment. As discussed in detail in Chapter V, true understanding of potential implications of sustainability on financial performance requires specific translation of how potential costs and benefits affect DCF input assumptions like rent, vacancy, and tenant retention. Perhaps most importantly, the most successful articulation of a Cost-Benefit analysis will not just speak to benefits, but also address the specific risks and/or additional costs, and provide a discussion and articulation of potential ways the risks have been mitigated, or that the pricing has appropriately addressed the additional risks.	
5. Life Cycle Cost Analysis (LCC)	Life Cycle Cost Analysis (LCC) takes into account all of the costs of acquiring, operating/maintaining and disposing of a building or building system. LCC can be used to make decisions about whether an investment in a particular system has a positive net present value, but its primary purpose is for comparing building feature alternatives (with different initial costs and operating savings) to determine the alternative that maximizes net costs savings. LCC is considered a more rigorous analysis than either Simple Payback or Simple ROI calculations because it relies on a present value methodology, which considers variable cost savings over time and incorporates the investor's cost of capital through the choice of discount rate. Alternatively, Simple Payback and Simple ROI calculations only consider initial costs and a single year of costs savings. The following is a good description of life-cycle costing: "Life-cycle costing accounts for factors beyond initial design and construction cost of a building and includes costs that occur during the operational phase (e.g. energy, water, maintenance) as well as future costs (e.g. floor or siding replacement, final disposal/recycling of materials). For example, energy-efficient windows may cost more upfront, but reduce monthly energy bills down the road. Unlike traditional costing, life cycle costing takes into account the benefits associated with these future cost savings which offset, at least in part, the incremental purchase cost of better windows. Of course, future costs and savings must be adjusted to their equivalent value today (i.e. their 'present value'). Such discounting procedures provide for the expression of cost	See, "A Business Case for Green Buildings in Canada," Morrison Hershfield, Mark Lucuik et al, March 31, 2005, pp. 21-22. http://www.cagbc.org/resources/market_value/articles105.htm The Whole Building Design Guide (WBDG) website contains a 10 page, detailed description of how to implement a Life Cycle Cost Analysis and has a variety of helpful links on the subject. http://www.wbdg.org/resources/lcca.php "Life Cycle Costing for Facilities," (Stephen J. Kirk & Alphonse Dell'Isola – 2003), published by RS Means can be purchased for $99.95. This useful guide provides a number of examples of how LCC can work for a wide variety of projects including several types of buildings, to roads & bridges, to HVAC and electrical upgrades, to materials and equipment procurement: http://www.rsmeans.com/bookstore/detail.asp?sku=67341 "Whole-life costing: risk and risk responses" is another book that offers a thorough grounding in both the theory and practical application of WLCC. Practical frameworks

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	streams over time on a consistent basis, and allow for meaningful cost comparisons among different projects or building approaches." ["The Costs & Benefits of Green Affordable Housing," New Ecology Inc., William Bradshaw et al, 2005, pg 35].	both for assessing whole life risks and risk responses, as well as guidance on developing WLCC budget estimates are also developed. By Halim A. Boussabaine, Richard L. Kirkham, Published by Wiley-Blackwell, 2004 ISBN 1405107863, 9781405107860 http://books.google.com/books?id=HAu8HdFGfTsC **The International Initiative for a Sustainable Built Environment LCA Tools:** The iiSBE has developed a set of methods and tools for Life Cycle Assessment Analysis. http://www.iisbe.org/annex31/core_reports.htm The International Initiative for a Sustainable Built Environment (iiSBE) is an International Non-Profit Organization whose overall aim is to actively facilitate and promote the adoption of policies, methods, and tools to accelerate the movement towards a global sustainable built environment.
6. Value Engineering	"Synonymous with the terms value management and value analysis, value engineering is a professionally applied, function oriented, systematic team approach used to analyze and improve value in a product, facility design, system or service—a powerful methodology for solving problems and/or reducing costs while improving performance/quality requirements." http://www.value-eng.org/. "Value engineering (VE) is a systematic method to improve the 'value' of goods or products and services by using an examination of function. Value, as defined, is the ratio of function to cost. Value can therefore be increased by either improving the function or reducing the cost. It is a primary tenet of value engineering that basic functions be preserved and not be reduced as a consequence of pursuing value improvements." (Lawrence D. Miles Value Engineering Reference Center: Wendt Library, Wikipedia). As clearly implied by the definitions above, value engineering is a broad field of study covering much more than the real estate industry. Value engineering, or value management, has evolved to be applied in many strategic situations and at its most sophisticated level involves a process	Some examples of poorly implemented value engineering, and the implications, are shown in an article by Don Proctor in the Fall 2008 issue of the TIAC Times: http://tiactimes.com/magazine/article/_Value_engineering_means_poor_economic_return.html Additional resources and information are available at the SAVE International website. SAVE International is an international society devoted to the advancement and promotion of the value methodology (also called value engineering, value analysis, or value management). SAVE International's knowledge bank is an excellent searchable research database on the topics of value engineering and related issues. http://www.value-eng.org/ An article by Stephen J. Kirk, Ph.D., FAIA, FSAVE, CVS, LEED AP and Alphonse J. Dell'Isola, PE, HRICS, FSAVE, CVS called "Sustainability/LEED and Life Cycle Costing—Their Role in Value-based Decision Making," provides

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	that includes an orientation and diagnosis phase, a workshop phase, and an implementation phase. Regardless of the particular industry segment, well-executed value engineering follows a structured process, and perhaps is most valuable if sufficient time is spent (during the workshop phase) to fully understand and define "value" from the perspectives of the different participants in a project. In many ways, this "workshop phase" is similar to the "Charrette" that is a critical part of the integrated design process. Value engineering is meant to be a systematic process following a multi-stage Job Plan, including steps such as • preparation • information • analysis • creation • evaluation • development • presentation • follow-up. Value engineering is a financial analysis process, but relies upon simple payback, simple return on investment, and life cycle costing financial analyses to answer the questions that arise as part of the VE process. Unfortunately, in the real estate and construction sector, value engineering has become synonymous with "cost cutting." Rather than employ the more sophisticated process of value engineering, value engineers are typically brought in late in a project where budgets have been blown and short-term cost cutting is the requirement. Accordingly, particularly with developers who will not hold the project property long term, "value engineering" decisions are made based on simple payback or an initial comparative cost basis, ignoring the longer term value that can be generated through operating cost, or replacement cost savings. Fundamentally, value engineering as currently practiced does not take into consideration all the value and risk implications of sustainable property investment. Even if it is done correctly, it utilizes life cycle costing as its primary financial analysis vehicle, and thus does not take into consideration any value considerations beyond cost. That said, if sufficient time is spent up front during the workshop or Charrette phase, and a thorough	some interesting examples of the application of life cycle costing in a value framework. http://www.value-eng.org/knowledge_bank/dbsearch.php?c=view&id=67&ref=dbsearch.php%3Fc%3Dquery%26category%3D%26keywords%3Dsustainable+buildings%26match%3Dall%26pg%3D1 In "A Reappraisal of Value Methodologies In Construction," Steven Male and John Kelly provide an interesting history on the development of value management practices throughout the world since 1940 and provides some insights and examples of more sophisticated value engineering applications. http://www.value-eng.org/knowledge_bank/dbsearch.php?c=view&id=69&ref=dbsearch.php%3Fc%3Dquery%26category%3D%26keywords%3Dvalue+engineering+%26match%3Dall%26pg%3D2 In the article "It's In the Details, Engineering for Low Cost and High Efficiency," Jeff Stein and Steven Taylor provide an interesting assessment of the Electronic Arts phase 2 building in Palo Alto and the application of value engineering and detailed coordination to improve the engineering, cost and functionality of the building. http://www.taylor-engineering.com/downloads/articles/ASHRAE%20Journal%20-%20Electronic%20Arts%20Technology%20Award-Stein%20&%20Taylor.pdf Wikipedia's definition of Value Engineering is also pretty good. http://en.wikipedia.org/wiki/Value_engineering Significant additional detail from the Research Collections of Lawrence D. Miles, one of the founders of Value Engineering as a profession are available at: http://wendt.library.wisc.edu/miles/index.html

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	understanding of what "value" will mean for the occupants of the building or potential investors is undertaken, a more thorough consideration of value implications could be applied in the determination of the value standards on which cost based value engineering would be implemented.	
7. ENERGY STAR Building Upgrade Value Calculator for Office Properties	The Building Upgrade Value Calculator estimates the financial impact of proposed investments in energy efficiency in office properties. The user, representing scenarios and conditions present at their properties, bases the calculations on data input. Required inputs are limited to general characteristics of the building, plus information on the proposed investments in energy efficiency upgrades. The calculator's analysis includes the following information: • Net investment • Reduction in operating expense • Energy savings • Return on investment (ROI) • Internal rate of return (IRR) • Net present value (NPV) • Net operating income (NOI) • Impact on asset value In addition to the above outputs, the calculator also estimates the impact the proposed changes will have on a property's ENERGY STAR rating. The tool provides two ways to use its calculations: users can save and print a summary of their results, or generate a letter that highlights the financial value for use as part of a capital investment proposal.	This tool provides a combination of the metrics identified in the Description/Commentary section and can be found on the EPA's ENERGY STAR website at: http://www.energystar.gov/index.cfm?c=comm_real_estate.building_upgrade_value_calculator
8. ENERGY STAR Cash Flow Opportunity	ENERGY STAR's Cash Flow Opportunity (CFO) calculator is designed to help decision-makers address three questions when evaluating energy efficiency projects: How much new energy efficiency equipment can be purchased from the anticipated savings? In other words, how much equipment could be installed without increasing existing capital or operating budgets? CFO results are	A link to ENERGY STAR's Cash Flow Opportunity Calculator can be found under the Financial Evaluation heading on the following webpage: http://www.energystar.gov/index.cfm?c=tools_resources.bus_energy_management_tools_resources

Analysis/Model	Description/Commentary	Key Links/Examples
	based on the energy performance of existing buildings, and an estimate of energy savings. Given financing terms and an assumption about the percent of energy savings to be allocated to the energy investments, the spreadsheet works as a "reverse financial calculator" to determine the amount of equipment that could be financed with the future energy savings. Should the equipment purchase be financed now or is it better to wait and use cash from a future budget? Using a 12-year DCF model, the calculator determines which of two options results in the higher present value – Option A: installing today using financing or Option B: deferring the installation until funding becomes available in a future budget. Is money being lost by waiting for a lower interest rate? The calculator provides an analysis of the quantitative trade-off between waiting for more favorable financing terms and foregoing energy cost savings. The first tool is actually just another way of looking at either an NPV or IRR metric, relating future cash flows to current investment, except with the twist that only a portion of the energy cost savings are allocated to paying for the energy investments. ENERGY STAR makes two very important observations: 1) that an investor working with an Energy Services and Products Provider (also known as Energy Service Companies or ESCOs) may be able to obtain a guarantee that energy savings will be realized and 2) an investment grade energy audit, conducted by a qualified engineering company, will be necessary to determine the actual opportunity for energy savings.	
9. Life Cycle Assessment (LCA)	"A full building Life Cycle Assessment can be used to develop the typical production and potential reductions of greenhouse gas emissions related to buildings. LCA is a compilation and evaluation of the inputs, outputs and the potential environmental impacts of a product system throughout its life cycle. From a building perspective, LCA quantifies the environmental effects of the building materials, its operation, and its demolition (i.e. cradle to grave analysis)." LCA analysis, while inherently complicated given the long material and buildings lives, and the difficulty in data collection and quantification, is becoming more important as carbon reduction has become more important, and the high level "embodied" energy of products/materials has become better known.[Description of LCA as adapted from "A Business Case for	This site has a full range of LCA tools, case studies, software offerings etc.http://buildlca.rmit.edu.au/links.html The ATHENA Impact Estimator can be used for evaluating whole buildings and assemblies based on internationally recognized life cycle assessment (LCA) methodology: http://www.athenasmi.org/tools/impactEstimator/index.html The German Green Building Council is extending the LCA methodology. Under current plans, the "German LEED" will feature two elements unique to the current LEED

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	Green Buildings in Canada," Morrison Hershfield, Mark Lucuik et al, March 31, 2005, pg. 14.] A paper by Thomas Lutzkendorf and David Lorenz, two world leaders in thinking through, and writing about, the relationship between sustainability and value: "Sustainable property investment: valuing sustainable buildings through property performance assessment" published in Building Research & Information (2005) provides some analysis of Life Cycle Assessment and Life Cycle Costing: "L/C calculations usually consist of the following elements: • initial capital cost for design and construction or acquisition • management and operating costs • costs for maintenance and renovation • costs incurred or benefited from the building's disposal Recently, however, attempts are being made also to include the income generated by the property within the calculation. An ISO Standard Under Development currently investigates these issues (ISO DIS 15686-5, 2004d)." "But LLC techniques have several limitations that have to be understood in order to interpret the results. For example, it is very difficult to estimate future maintenance and operation costs. Observation and longitudinal evidence are also needed to determine the life of building materials and components. Furthermore, very few owners pay all the costs of the acquisition and ownership of a building and therefore regard some costs more important than others." "Usually LCA examines energy and mass flows in order to provide information on resource consumption and determine the origin of harmful environmental loads which have potential effects on global warming, acidification, ozone depletion, biodiversity, eco-toxicity, human toxicity and on occupational and living health. There are now a number of LCA-based assessment methods and tools that have emerged worldwide, e.g. BREEAM and ENVEST (UK), Eco-Quantum (the Netherlands), Okoprofil (Norway), ESCALE (France), SimaPro (the Netherlands), etc. But most of these tools assess buildings after they are designed and do not account for future life cycle costs of the building. Due to the complexity of integrating LCA and LCC methodology, only a few tools exist that allow for a combined	system: a manufacturer-supplied life-cycle assessment of all building products based on Environmental Product Declarations, EPD (ISO 14025 and ISO 21930) and a "transparency" feature that will require certified buildings to estimate all life-cycle costs for building operations, including energy, water and cleaning costs. This moves beyond the "snapshot" requirements of the LEED system, to more of a "movie" of long-term building operations. http://www.greenbuildconsult.com/blog/comments/german-green-building-council-advances-with-life-cycle-assessment-tools-for/

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	determination and assessment of cost, environmental and occupational health issues in the planning phase. The basic goal of these combined assessment approaches is to allow professionals to appreciate a design or building solution simultaneously form different points of view and within different life cycle scenarios. First examples of combined tools are LEGOE/LEGEP (Germany) and OGIP (Switzerland). For a detailed description of approaches for an 'integrated life-cycle analysis', see Kohler and Lützkendorf (2002). The software BEES, a building materials selection tool developed by the US Government's National Institute of Standards and Technology (NIST), allows measuring environmental and cost performance of single building products. One major problem, however, associated with combined or/and mere LCA-based assessment approaches is the lack of standardization in terms of scope, definition of performance indicators and weighting of different environmental aspects (Todd et al., 2001). While current assessment schemes take the issue of occupant health into consideration, there is less focus on occupant satisfaction, functional fit and productivity. They do not provide information on what kind of building solutions work besting practice and why. This is the goal of POE."	
10. Post Occupancy Evaluation (POE)	Post-Occupancy Evaluation (POE) is the general term for a broad range of activities aimed at understanding how buildings perform once they are built and how satisfied building users are with the environment that has been created. There is no industry-accepted definition of POE and there are many different terms in use, such as environmental design audits, building-in-use evaluations, post-occupancy assessment, facility assessment and building performance evaluations. ["A Market-Friendly Post-Occupancy Evaluation: Building Performance Report," New Buildings Institute, David Hewitt et al., March 17, 2005.] Thomas Lützkendorf and David Lorenz also discussed POEs in their paper: "Sustainable property investment: valuing sustainable buildings through property performance assessment" published in *Building Research & Information* (2005) p: "POE can be characterized (at least in theory) as follows: • design aid: as a means of improving building procurement, particularly through 'feed-forward' into briefing • management aid: as a 'geed-back' method for measuring building	For a sample POE, see "A Market-Friendly Post-Occupancy Evaluation: Building Performance Report," New Buildings Institute, David Hewitt et al. March 17, 2005: http://www.newbuildings.org/downloads/papers/FinalReport-BPR_ContractC10091_.pdf ASHRAE has been working on Performance Measurement Protocols for Commercial Buildings, which provide some structure for POEs. http://www.greenbuildingfc.com/Home/DocumentDetails.aspx?id=1101 The New Building Institute has addressed this issue with their: A Market Friendly Post Occupancy Evaluation. http://www.greenbuildingfc.com/Home/DocumentDetails.aspx?id=957

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	performance, particularly in relation to organizational efficiency and business productivity • benchmarking aid for sustainable development: for measuring progress in the transition towards sustainable production and consumption of the built environment (Cooper, 2001) Although the use of POE is widely advocated as best practice in guides to construction and facility management, POEs are far from being a 'mainstream' activity within the construction and property sector. The Probe studies are one of the first systematic and rigorous attempts to investigate the performance of buildings, modern workplace environments and their occupant's responses (Bordass et al., 1999). They gave valuable insights into the functioning and performance of buildings and led to the identification of four 'killer variables' that positively correlate with occupant's comfort, satisfaction and perceived productivity (Leaman and Bordass, 1999): • personal control: occupants' perception of control over their workplace environment (i.e. heating, cooling, lighting, ventilation and noise) • responsiveness: the building's capability to meet occupants' needs very rapidly either in anticipation or as they arise (e.g. adaptability of spaces to accommodate change, speed of response to complaints by the facilities management, etc.) • building depth: the building's depth of space (a depth of about 12m across the building seems optimal for human performance; the deeper the building gets, overall satisfaction and productivity tend to go down) • workgroups: relates to room size and workspace organization; productivity is higher in smaller (less than four people) and more integrated workgroups"	
B. Traditional Real Estate Financial Models		
1. Cost Management	Cost management is a Traditional Real Estate Financial Analyses that is not an integrated model incorporating all costs, revenues and other risks, but rather a set of analytical models focused on providing investors with the tools to identify and manage cost issues that could impair successful outcomes. Cost benchmarking, cost planning, procurement policies, and other analyses focus on assisting decision-makers to get the best possible outcomes for the least cost. Sophisticated cost management that provides proper coordination, guidance, and management of expected outcomes, can	

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	provide particular dividends for sustainable investment, with the myriad of choices and optional outcomes that can be specified at the initiation of a project.	
2. Discounted Cash Flow Analysis – Change in Asset Value	This approach considers the impact on value that the investment will have utilizing the discounted cash flow (DCF) approach to value as opposed to the direct capitalization approach. This method takes into consideration the benefits of the energy investment over a 10-year holding period, including the annual energy savings and the incremental property value that results from the energy savings at the end of the holding period (net of selling costs). Change in Asset Valuation: Discounted Cash Flow = DCF Value – ICC Where DCF Value = f (S1…S10, RT, RDISC, SCOST) S1…S10 (dollars) = present and future Net Annual Energy Savings RT = Terminal Capitalization Rate (percent) RDISC = Discount Rate (percent) SCOST = Selling Costs (percent) ICC = Initial Capital Costs (dollars) This metric takes into consideration both the time value of money and changes in future energy prices and presumes that the benefits are ongoing and permanent. Similar to the Simple Direct Cap valuation measure, the CAV-DCF has the advantage of incorporating at least some of the elements of change in property value through changes in NOI. CAV-DCF is therefore a more robust measure of the merits of the energy investment than the simple change in Asset Value discussion above in Section A.3,, applicable to higher-ICC investments or where there are data uncertainties surrounding ICC or cost savings. It is particularly appropriate in its more expanded application, where the investment has measurable	

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	impacts on other valuation components.	
3. Discounted Cash Flow Analysis – Net Present Value	The Net Present Value (NPV) metric is analogous to the DCF technique except that it focuses only on the energy savings over the expected useful life of the investment and does not take into consideration the impacts on property value. NPV = DCF Energy Savings – ICC Where DCF Energy Savings = f (S1…S10, RDISC) S1…S10 = present and future Net Annual Energy Savings (dollars) RDISC = Discount Rate (percent) ICC = Initial Capital Costs (dollars) This approach takes into consideration both the time value of money and changes in future energy prices. Since it assumes a fixed time period over which benefits are realized, it is applicable to less durable investments. For such investments, it is a robust measure and applicable to higher-ICC investments or where there are data uncertainties surrounding ICC or cost savings. As generally applied, if the NPV metric is greater than zero, the decision is accepted.	
4. Discounted Cash Flow Analysis – Internal Rate of Return	As is the case with most underwriting analysis, the NPV and IRR metrics are two sides of the same coin. If the NPV is greater than zero, then the IRR exceeds the discount rate hurdle. If the IRR exceeds the discount rate hurdle, the NPV is greater than zero. The IRR calculation is based on the same cash flow projections as the NPV analysis and determines the IRR that equates to an NPV of zero. IRR = f (S1…S10, ICC)	

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	Where IRR = Internal Rate of Return (percent) S1…S10 = present and future Net Annual Energy Savings (dollars) ICC = Initial Capital Costs (dollars) This approach takes into consideration both the time value of money and changes in future energy prices. It can be applied solely to the annual energy savings over the expected useful life of the investment, or it can also include the anticipated change in property value and net sales proceeds at the end of the holding period. When analyzing investments with limited durations, this metric will have similar applicability as the NPV metric and is a robust measure, applicable to higher-ICC investments or where there are data uncertainties surrounding ICC or cost savings. When the IRR metric is applied to investments with ongoing, permanent benefits, it becomes a robust measure of the merits of the investment, including changes in property valuation. It then becomes analogous to looking at the CAV-DCF metric and solving the same equation for a different variable – the IRR. Importantly, this model, when implemented for a real estate property investment, enables direct consideration of the impacts of sustainable investment on revenues and risk, in addition to costs, and thus is the basis of the financial methodology presented in Chapter IV. As generally applied, the decision will be accepted if the IRR exceeds an internally established threshold such as the company's cost of capital or return on other competing investments.	
5. After-Tax Cash Flow Analysis	After-tax cash flow is just an extension of the DCF analysis that incorporates tax consequences. Because of the individual and often temporary nature and complexity of tax analysis, valuation professionals and financial analysts typically evaluate properties on a before-tax basis. However, given the substantial tax advantages available to sustainable properties from many levels of government, after-tax analysis can be important considerations in making go-no go decisions on sustainable property investment, particularly for specific decisions regarding renewable energy	See discussion and sample model framework in section G of Chapter V. and in Expanded Chapter V, Appendix V-D.

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	investment or other energy efficiency investments.	
6. Total Occupancy Cost Analysis	For space users—both corporate owner occupants or tenants—real estate decisions are based on a full consideration of occupancy cost, of which the cost of the real estate, or rent, is only one component. In fact, according to Ryan Morris in his article "Occupancy Cost Managers Examine More Than Rent," rent is no longer the major component of occupancy costs. Today, most such costs are outside of the lease parameters. Current percentages of the total occupancy cost are work environment (70%), technical infrastructure (22%) and real estate (8%).[100] Some of the key considerations to include in a total occupancy cost analysis are: • Rent • Operating expenses • Taxes • Insurance • Amortization of buildout • Commissions • Telephone/electrical/data • Lights • Signage • Moving costs • Telecom equipment • Furniture and equipment • Security systems Additionally, sophisticated models need to include assessments of things like churn costs, tenant turnover and retention, infrastructure support costs, transactions costs, and other less direct costs. The IPD International Total Occupancy Cost Code has categorized	Measuring the Added Value of Corporate Real Estate Management-- Beyond Cost Minimization is a good overview article and model for the types of non-cost factors that are critical to corporate/owner occupant real estate decisions. http://www.tkk.fi/Yksikot/Kiinteisto/sivut/lisaarvo/j/Eres2005%20paper_final.pdf The IPD Occupiers International Cost Code is a well-recognized standard for measuring cost internationally. This code aims to capture the total cost of property occupation, which includes occupational, facilities, and management costs. This code can be downloaded at http://www.ipd.com/Home/GlobalEstateMeasurementStandards/HowdoImeasurecost/tabid/1381/Default.aspx A presentation by Michael Flynn provides some additional detail on Total Occupancy Cost Management: http://www.expensemanagement.com/article.cfm?id=310 A framework, glossary and definitions for An Asset Lifecycle Model for Total Cost of Ownership Management were created through an industry Consortium. The publications have many formulas and detailed definitions for measurement and analysis. http://www.ifma.org/tools/research/Asset_Lifecycle_Model.pdf This article has some interesting information on the relative importance of rent in many occupancy decisions "Occupancy Cost Managers Examine More than Rent" http://www.bizjournals.com/seattle/stories/2005/09/26/focu

[100] "Occupancy Cost Managers Examine More Than Rent," *Puget Sound Business Journal*, Ryan Morris (President and Managing Partner of Real Estate Partnerships and Alliances, Inc.), Sept. 23, 2005.

[101] *Whole Life Cycle Costing: Risk and Risk Responses*, Halim A. Boussabaine, Richard L. Kirkham, Rockwell Publishing, 2004 (insert web page)

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	occupancy costs into five broad categories (IPD 2001): 1. Real estate occupation costs 2. Adaptation and equipment costs 3. Building operation costs 4. Business support costs 5. Occupancy management costs In addition, although not always included in the total occupancy cost analysis, disruption costs can be important. Disruption can occur due to several internal and external factors. Among these is absenteeism due to sick building syndrome, and organizational changes, i.e. staff movement from one location to another within an occupied space due to promotion or movement due to a new business environment. This will result in disruption to business activities and lost productivity. These costs are estimated as a function of the rate of movement of individuals in an organization within the occupied space. This rate is particularly high during the early years of occupancy when occupants are getting accustomed to their new working environment.101 The critical point of total occupancy cost (cost of ownership) analysis is that space users make the decisions about the type of space they need on reasons well beyond real estate cost and/or sustainability or energy efficiency requirement. As discussed in more detail in Chapter VI, the specific underwriting/due diligence guidelines for space users incorporate more than total occupancy cost, focusing initially on the relationship of the space to overall strategic goal compliance including such issues as increasing the value of their assets, promoting marketing and sales, increasing innovation, increasing employee satisfaction, increasing productivity, increasing flexibility, and/or reducing costs. Other tools, such as the balance scorecard and other structured processes for incorporating nonfinancial considerations are often used in decision making.	s11.html?from_rss=1 Some introductory information on the Balanced Scorecard Approach that has been used for some time in business to address measurement of non-financial criteria and is beginning to be more widely used in the real estate industry. http://www.balancedscorecard.org/BSCResources/AbouttheBalancedScorecard/tabid/55/Default.aspx
7. Economic Value Added	Economic Value Added (EVA[102]) is a financial performance method to calculate the true economic profit of a corporation. The basic formula for EVA is: EVA = NOPAT – (Invested Capital x Cost of Capital)	Forbes' Investopedia provides a description of EVA detailing how to calculate NOPAT, Invested Capital , and how to interpret the results:

[102] EVA is a registered trademark of the consulting firm Stern Stewart & Co.

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	Where Net Operating Profit After-Taxes (NOPAT) = Net Sales – Operating Expenses – Taxes Invested Capital = ($amount of debt + $ amount of equity) Cost of Capital = Return (expressed as a %), reflecting the combination of both debt equity By including a project's Cost of Capital as an expense, EVA allows decision-makers to accept only those projects that enhance overall shareholder wealth since a positive EVA indicates an excess profit beyond a company's Cost of Capital. The EVA methodology can be used for decisions at the company level, the department-level, the store or branch-level, and/or the project level. A number of firms including Whole Foods use EVA for determining incentive compensation.	http://www.investopedia.com/university/EVA/ For a description of how the grocery store chain Whole Foods Market uses EVA, see: http://www.wholefoodsmarket.com/company/eva.php
C. Sustainability Sub-Financial Analyses		
1. Comparative First Cost Analysis	For reasons discussed below, conducing a comparative first cost analysis should either not be done, or done very carefully to avoid making bad decisions. Fundamentally, sustainability should not be viewed as something to be added, versus an integrated part of building design. Most importantly, a first cost analysis that compares initial buildings costs of a sustainable building to a "non-sustainable" building ignores potential operating cost savings or any value implications. However, despite the logic that the question does not make a lot of sense, procurement officers, CFOs, developers, and facility managers are often confronted with short-term budget constraints and the anticipated "premium" for sustainable building still gets cited as one of the most important barriers to further adoption of sustainable property investment.[103] The question of comparative cost is also very difficult to answer on a general basis. However, it is much more feasible to address the question of how much sustainability will cost on a specific project. In answering the question for a specific project, you must specify explicitly the level of green	Many of the ideas in this appendix and in the book relating to comparative first cost-analysis emanated from Peter Morris at Davis Langdon. His article in the Pension Real Estate Quarterly provides the best concise summary we have seen on some of the issues that need to be considered in thinking about this question. "What Does Green Cost", PREA Quarterly, Summer 2007. http://www.davislangdon.com/upload/images/publications/USA/Morris%20Article.pdf The best analysis of comparative cost to date is shown in: "The Cost of Green Revisited: Reexamining the Feasibility and Cost Impact of Sustainable Design in the Light of Increased Market Adoption," Lisa Matthiessen, Peter Morris, David Langdon, 2007 http://www.davislangdon.com/USA/Research/ResearchFi

[103] Much of the information in this section is derived from conversations with Peter Morris of David Langdon and a review of his article, "What Does Green Really Cost?" published in the PREA Quarterly in the summer of 2007. This article is available on the Green Building Finance Consortium website at [insert web link here].

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	or sustainability goals and consider the role of integrated design in promoting trade-offs that enable reduced costs in some areas to offset increased costs of some sustainable features. For example, improved energy efficiency due to improved insulation, window replacements, improved controls, or management changes can offset the new or replacement costs for HVAC systems. The next part of the analyses is to determine what you are going to compare sustainable costs to. One approach is to compare the cost of green to the original budget or the original anticipated cost. A limitation to this approach is that it assumes that the original budget was adequate and that no other changes or enhancements were made. Is it reasonable to assume that the building would have been designed to a minimum energy standard, or would some of the "sustainable" features have been designed in anyway? As the marketplace has become more accepting of sustainable property investing, the base for an original building budget has been moving. Equally important, investors' and space users' assessment of building quality is also changing as sustainable features and outcomes become more important than other expensive building features that used to be required for a top quality building. Another method of comparing cost is to look at the individual cost of added green features. Again, this approach fails to consider offset costs and assumes that features or outcomes can be separately priced. Perhaps most importantly, doing a comparison of initial costs for specific sustainable materials or features ignores important advantages in life cycle operating costs and value due to improved appeal to tenants and investors, as well as regulators. Perhaps the biggest cost barrier for sustainable property investment is not measured in dollars, but in implementation time and risk. For example, you can show a developer that studies have shown that a sustainable building will only cost 1% to 2% more, but from the developer's perspective, who has set up a smooth process with his contractors and subcontractors, architects, and others in the development process, the sustainable process will require new types of contracts, leases, insurance, subcontractors, contractors, and require a more integrated design and project management process, different than what the developer has been used to. What is the cost of these required changes? Sophisticated discussion of costs, and interpretation of the surveys that are done in the marketplace, will require consideration of this question.	nder/2007-The-Cost-of-Green-Revisited/ The 2007 Davis Langdon report updates a prior report in 2004 and examined a larger sampling of buildings and additional building types. The report demonstrates that costs for LEED and non-LEED projects are quite variable, and that LEED certification is not correlated with higher costs. http://www.davislangdon.com/USA/Research/ResearchFinder/2004-Costing-Green-A-Comprehensive-Cost-Database-and-Budgeting-Methodology/ Greg Katz and a group of contributing authors have recently completed a study, "Green Buildings and Communities: Costs and Benefits," that looked at 150 buildings from the U.S. and ten other countries and concluded that the additional cost for building sustainable versus conventional non-green buildings was approximately 2% (median of 1.6%, mean of 2.5%). The detail necessary to analyze the relevance and applicability of this work to specific properties is not publicly available, but may become available when the findings are published in a book in 2009. For example, given that thousands of green buildings have now been built, the specific randomness of the selection of the 150-building sample will be key to interpreting the results. (The 150 buildings were located in 33 states and 10 countries and built from the period 1998 to 2008.) http://www.goodenergies.com/news/-pdfs/Web%20site%20Presentation.pdf This recent work confirms the earlier work authored by Mr. Kats, "The Cost and Financial Benefits of Green Buildings: A Report to California's Sustainable Building Task Force," that was completed in 2003 and found that the green premium on average was about 2% of the original cost of a building. http://www.greenbuildingfc.com/Home/DocumentDetails.aspx?id=398 The GSA commissioned a Study by Stephan Winters on LEED costs which was generally supportive and

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	In answering the comparative cost question, it is important to understand the significant differences between existing buildings and new construction. Many of the most prominent studies looking at comparative costs are based on new construction, and do not fully consider existing buildings. Comparative cost analysis for existing buildings is significantly more difficult due to the wide variety of building types, the varying ways sustainability is achieved, and the significant underlying variances in the age, construction type, and other variables that will affect comparative cost.	consistent with other findings. http://www.greenbuildingfc.com/Home/DocumentDetails.aspx?id=1007 A somewhat outdated study by the David and Lucille Packard Foundation in October of 2002 provides an interesting methodological approach, looking at six different sustainability scenarios and evaluating costs and benefits. This study resulted in higher premiums for the first cost for sustainable buildings, although life cycle analysis provided a positive conclusion about sustainable investment http://www.greenbuildingfc.com/Home/DocumentDetails.aspx?id=485
2. DCF Lease-Based Cost-Benefit Allocation Models	More focused and specialized attention to the specific distribution of costs and benefits to landlords and tenants is necessary to properly evaluate the financial performance of sustainable property investments. First, for any existing building with leases, or a new building with pre-leasing agreements, the specific terms of the lease are necessary to allocate the costs and benefits of sustainable improvements, particularly related to energy. The specific allocation of costs and benefits will vary based on whether it is a gross, net or fixed base lease, or some other hybrid; the specific terms and mechanics of expense recoveries, and other lease terms. Leases have an even more central role in assessing the financial performance of sustainable properties, beyond cost and benefit allocation. In addition to the specific terms allocating the costs and benefits of sustainability improvements, leases play an important role in establishing clear environmental performance objectives, management of tenant energy use including sub-metering, building operating hours and lighting controls; clear standards for operational performance in HVAC systems and other systems; and clear guidelines for hazardous materials, green cleaning, recycling, the fit-out of tenant spaces, and other building rules and regulations. Fortunately, significant attention has been paid to developing “model” green leases and these issues are starting to be addressed. Some of the information necessary to evaluate the relative costs and benefits for landlords and tenants include: • current rent roll or lease abstracts;	Some additional information and insight into the DCF Lease-Based Cost-Benefit Allocation Models is presented in a presentation on sustainability and leasing by Mark Jewell, President of Realwinwin [insert website here]. Some examples and information on green leasing can be found on the Green Building Finance Consortium’s website, both the Research Library and Industry Resources sections under the code 24.5 for Green Leasing.http://www.greenbuildingfc.com/Home/ResearchLibrary.aspx A set of principles and provisions to address the split-incentive issue is presented in: Energy Efficiency Lease Guidance to Address the “Split Incentive”, authored by Sean Patrick Neill: http://cycle-7downloads.com/Downloads.html. Cycle-7 and HR&A Advisors developed this lease guidance under the auspices of the Natural Resources Defense Council. Financial support was provided from the New York State Energy Research and Development Authority (NYSERDA), the City University of New York (CUNY) Building Performance Lab, and the Rocky Mountain Institute (RMI). The guidance emerged from a series of three half-day seminars in New York City that included major national landlords, major tenants, attorneys,

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	• detailed history of expenses affected by upgrades; • market leasing, valuation, and vacancy assumptions; • estimated upgrade cost on a tenant-by-tenant basis; • estimated savings on a tenant-by-tenant basis; • estimated timetable for upgrade completion; • cost recovery provisions and existing leases; • debt and tax assumptions, if applicable. Whereas typical discount cash flow software can deal with the first three bullet points, additional analyses will be needed to address some of the other issues.	brokers, engineers, environmental advocates and government officials.
3. Sustainability Options Analysis (BIM, DL, EB analyses)	**Sustainability Options Analysis** has become important during the last few years, as many corporations and large investment managers have made the decision to improve energy efficiency and/or sustainability across their portfolios.[104] Sustainability Options Analysis can take many forms. Essentially such analyses should provide a series of options, typically stated as energy efficiency or sustainability outcomes or ratings, and identify costs associated with the options. This can be done on a relatively straightforward feature by feature basis or LEED point by LEED point basis, but to be most effective, an integrated modeling approach that evaluates the interactive effect of the different combinations of sustainability options, and related sustainable outcomes, preferred. However, in many cases the cost and sophistication of such approaches will not be necessary, or possible. Sustainability Options Analysis is conducted at varying degrees of sophistication based on the particular demands and sophistication of the people conducting and consuming the analysis. In practice, limitations on the measurement and monitoring of many key energy and sustainability metrics—both as to availability and accuracy—have limited the sophistication of Sustainability Options Analysis. Many companies interested in moving forward quickly with energy efficiency and sustainability investments have had to take a step backward—to determine what and how	

[104] We use the term "Sustainability Options Analysis" to reflect the dynamic choices relative to the varying combinations of sustainable features, systems and outcomes that an owner might want to achieve. LEED EB or EnergyStar audits would be examples of Sustainability Options Analyses.

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	to measure sustainability or energy use—before they can move forward. The quality of a Sustainability Options Analysis will be largely driven by the factors considered in the analysis, the process for collecting data, the flexibility of the approach to address sustainability-cost trade-offs, and most importantly to the quality and experience of the person completing the site assessment, interviews, and analysis. From a financial perspective, Sustainability Options Analyses implemented to date have done a reasonable job at assessing initial costs, and a reasonable job at assessing potential operating cost savings for specific features or sustainability processes or strategies, but are still in their infancy relative to providing a dynamic capability to assess both the development costs of varying combinations of sustainable features, and the financial benefits resulting from projected sustainable outcomes. Further work to refine existing methodologies to accommodate the revenue and risk considerations presented in this Chapter is needed.	
4. Churn Cost Savings Analysis	“Churn” costs are the costs associated with moving employees and getting them set-up and functional in a new location. This can involve moving from one part of a building to another or from one building to another. These costs can include some construction (i.e. moving walls, adding private offices, etc.), physically moving equipment and furniture, installing phone lines, and reconfiguring HVAC ducting and lighting. It has been shown that “churn” costs are significantly reduced in buildings that incorporate flexible design features. There is a variety of analyses including Simple Payback, Discounted Cash Flow analysis, etc. that can be used to calculate “churn” cost savings.	For examples of churn cost savings analysis, see “The Costs and Benefits of Green Buildings,” Greg Kats, October 2003, pp 75-77: http://www.cap-e.com/ewebeditpro/items/O59F3259.pdf An interesting article on churn was produced by Henry Miller:http://www.pacificofficefurnishings.com/pdf/11_11_11_ChurnWorkpl.pdf
5. Productivity Benefits Analysis	Employee salaries and benefits represent the largest portion of costs for most office-based and many other companies. Consequently, any increases in worker productivity can have a significant impact on a company’s financial performance. Because sustainable buildings often include features that result in better lighting, increased ventilation, reduced window glare, better thermal comfort, etc., these buildings have been shown to increase worker productivity through, among other things, reduced absenteeism, lower incidence of respiratory ailments and staff turnover. In theory, a company should be willing to pay more, when leasing, purchasing or constructing space, where its employees will be more productive.	GBFC has identified over 200 health and productivity related building studies. These studies are identified, and where possible links to actual studies are provided. http://www.greenbuildingfc.com/Home/ResearchLibrary.aspx . Carnegie Mellon’s BIDS (trademark for Building Investment Decision Support is a case-based decision support tool that generates a calculation of the economic value added of investing in high performance building systems, based on the findings of building owners and

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	The majority of these productivity calculations use an annual cost savings estimate, which is then translated into a productivity gain in dollars per square feet based on an average amount of square feet, and average space occupied per employee. Many of these analyses employ a net present value calculation that estimates future benefits, discounted back to present value dollars (see Discounted Cash Flow – Net Present Value analysis above). The logic of translating the productivity gain into a $/SF figure is that decision-makers can then assess the reasonableness of a space premium for a building that provides these benefits. Of course, to understand the real financial implications of productivity benefits, productivity sub-financial analysis must be integrated into the broader financial analysis of a property as discussed in detail in Sections E., F., and G. of Chapter V. A more detailed analyses and discussion of health and productivity related valuation considerations are presented in Chapter IV, Section E.4: Occupant Performance.	researchers around the world. It is perhaps the best example of Sustainability Sub-Financial Analysis in that the tool enables scores of sub-financial analyses on different systems and features to aid in assessing financial performance. BIDS has the most comprehensive collection of case studies organized in database in a variety of ways with key categories being Air, Thermal, Lighting Control, Network Access, Privacy and Interaction, Ergonomics, Access/Natural Environment, and Whole Building. For each of these areas, a whole range of cost-benefit factors can be analyzed including First Cost, O& M Energy, Churn, Productivity, health, attraction/retention, tax, litigation and Insurance and Salvage/Waste. One of the more complete discussions of the key purpose and value of BIDS is contained in an undated article on the AIA website by the leaders of BIDS. This article concludes that there database has become robust enough to convincingly argue for five critical improvements to buildings including: day lighting; natural ventilation and mixed mode conditioning; high performance lighting; cool roofs; and under floor air. http://www.aia.org/aiaucmp/groups/ek_public/documents/pdf/aiap080050.pdf An overview of the tool presented by Beran Gurtekin-Celik, PhD is shown at: http://www.lcacenter.org/InLCA-LCM03/Gurtekin-presentation.pdf A presentation from early 2009 provides some additional perspectives on BIDS: http://www.purdue.edu/discoverypark/energy/events/green_building_workshop_jan2009/presentations/HighPerformance%20BIDS_MingQu_Jan22_F.pdf Examples of general productivity related analysis are presented in "The Costs and Benefits of Green Buildings," Gregory Kats, October 2003, pp 59-60: http://www.cap-

Analysis/Model	Description/Commentary	Key Links/Examples
		e.com/ewebeditpro/items/O59F3259.pdf This cost-benefit study of 30 green schools in ten states provides a framework for analyzing productivity gains associated with higher lifetime earnings, asthma reduction, colds & flu reduction, and teacher retention. [“Greening America’s Schools – Costs and Benefits,” Gregory Kats, October 2006, pp 12-14] http://www.cap-e.com/ewebeditpro/items/O59F12807.pdf The University of California’s Center for the Built Environment is involved in many research activities regarding building performance, including significant research on occupant satisfaction and productivity, which is available on their website: http://www.cbe.berkeley.edu/research/research_ieq.htm.
6. Health Cost Savings Analysis	Health cost savings analyses are driven by measures of health improvement—reduced absenteeism; reduced health expenditure costs for individuals, companies, or the public; reduced severity of certain health conditions, etc. Measures of improvement are then monetized by looking at the specific population of building occupants relative to their compensation, health costs, demographics, etc. to get an estimate of potential benefits. Next, it is important to allocate the benefits to the individuals, companies, or the public appropriately, to understand how potential health cost savings will influence sustainable property investment decision-makers. (See more detailed analyses and discussion of these issues in Chapter V, Section D.4.) The key criteria for evaluating the quality of health or productivity sub-financial analyses is whether it produces information that would influence sustainable property decision-makers, or would be expected to influence potential tenants. Accordingly, information that is as specific to the subject property as possible, with realistic, unbiased interpretations of potential health or productivity outcomes, will be most persuasive and valuable. To the extent credible estimates of the potential magnitude of benefits can be assessed, that can also be important.	GBFC has identified over 200 health and productivity related building studies. These studies are identified, and where possible links to actual studies are provided. http://www.greenbuildingfc.com/Home/ResearchLibrary.aspx . A good source for independent opinion and access to research on the effects of Indoor Air Quality on health and productivity is provided at the Indoor Air Quality (IAQ) Scientific Findings Resource Bank (IAQ-SFRB). The IAQ-SFRB provides information summarizing the state of scientific knowledge about the relationships between people's health and productivity and the IAQ conditions or associated building characteristics in which the people work or reside. When possible, these relationships are expressed in quantitative terms using graphics, charts, or equations. The summaries also include brief descriptions of the actions that may be taken to improve the pertinent aspects of IAQ, including those related to building design, construction, operation, maintenance, and occupant activities. This web site also provides links for downloading published journal articles that were developed specifically for the IAQ-SFRB project. All of the information provided in the IAQ-SFRB has undergone

Analysis/Model	Description/Commentary	Key Links/Examples
		review by multiple experts other than the authors. http://www.iaqscience.lbl.gov/ Carnegie Mellon's BIDS (trademark for Building Investment Decision Support, as discussed above in the productivity benefits section, is also is a good resource for information and analytic methodologies looking at feature based health impacts. One of the key features of the BIDS tool is its life-cycle assessment of the value of features or systems. The results are calculated for each feature or system utilizing case study/research findings and BIDS "life cycle assumptions" which factor in average salaries, building size, health data, and other demographics to calculate the benefits that can be compared to cost for the feature or system.
7. Government/Utility Incentives and Rebates Analysis	Depending on the specific type of sustainable project, and the level of sustainability, it may generate substantial public benefits including reduced infrastructure costs, environmental and resource conservation, improved land use, less or more manageable climate change, economic benefits, and security benefits. If a building owner can clearly and factually articulate the public benefits that arise from their building, they are more likely to convince regulators, tenants and investors to pay for those benefits. Such "monetization" of public value is created from governments or utility companies through enhanced entitlements/permitting, public grants, favorable financing, tax benefits, and carbon credits or payments, and from private companies through their contribution to Enterprise Value and resulting increases in space user demand. Sophisticated sustainable property investors and developers will conduct their own detailed assessment of the public benefits of their projects to enable clear articulation to regulators, potential tenants, employees, and capital sources. The financial analyses of these benefits for a specific property requires a close look at the sustainable thresholds required to achieve benefits with the specific governments/regulators in the market. Benefits come in the form of	Substantial resources identifying the many types of incentives/subsidies are indentified in the Green Building Finance Consortium's website, under Research Library and Industry Resources code 11.0. Select examples are presented below. The database of State Incentives for Renewables and Efficiency is the most comprehensive State-by-State listing of incentives. State, local and utility incentives are identified. http://www.dsireusa.org/ Mark Jewell of RealWinWin presents "Best practices for finding and applying for Rebates. A bit dated—from 2005, but still some good points. http://www.realwinwin.com/White_Papers/0402_Show_Me_the_Money.pdf Rebates for 26 different types of features and systems are identified on RealWinWin website. http://www.realwinwin.com/threelinks_CorporateClients_RebateAdmin.htm The ICLEI website is a particularly good source of local

Analysis/Model	Description/Commentary	Key Links/Examples
	tax benefits, entitlement related benefits, and other financial benefits. The financial contribution of each of the potential benefits identified can be estimated by conducting sensitivity analyses with the key variables affected in the cash flow model including timing of cash flow, tax savings, increased revenue potential through entitlement bonuses, lower entitlement risk, etc.	government sustainability information. http://www.iclei.org/ The US Green Building Council also has a public policy searchable web site database that is very helpful: http://www.usgbc.org/DisplayPage.aspx?CMSPageID=1779
8. Enterprise Value Analysis	Enterprise Value Analysis is a new type of sustainability sub-financial analysis that is being applied to the property markets, based on the value created by a real estate decision at the enterprise level. Significant work has been done in recent years to better understand and measure the non-real estate (business unit or enterprise) value of real estate decisions. The types of benefits from sustainability investment that are analyzed in this type of analysis include employee attraction and retention, leadership value, promotional value, health and productivity benefits, and other related benefits. The biggest challenge in the analysis and articulation of the value of sustainable property investment to the enterprise is in transitioning from a general discussion of these benefits to a discussion about the potential magnitude of these benefits for a specific property. The influence of potential enterprise value benefits on the decision of space users will vary based on the types of space users, their business strategies, the demographics of their employees, and the nature of the customers that they serve, among other factors. The process for evaluating potential Enterprise Value, and the ability of an owner to monetize these benefits through higher rents, occupancies, faster absorption, etc., starts with an assessment of the types of space users (tenants or owner occupants) expected at a project. What key issues drive these particular types of tenants? Are they influenced by their internal or external commitments to carbon disclosure or reduction? Do they care about potential health or productivity benefits? Is an environmentally-socially responsible reputation important to them, or their customers or employees? Once an understanding of the key drivers of potential space users is established, the next step is to assess the likelihood of whether the subject property will generate the types of sustainable outcomes-building performance important to expected occupants. Some of the key sustainable	Turner Construction's 2008 Survey of Commercial Real Estate Executives: http://www.turnerconstruction.com/greenbuildings/content.asp?d=5785 2008 Study by Incisive Media's Real Estate Forum, the Building Owners and Managers Association (BOMA) International and the US Green Building Council The survey focused on the application of green methodologies and technologies in existing commercial buildings and on the financial and marketing benefits of these efforts. It was distributed to Incisive Media's national database of ownership, investment and operational entities, as well as to BOMA International's members. http://www.boma.org/AboutBOMA/pressroom/press111908-2.htm LaSalle Study released in November 2008 found that of more than 400 CRE executives surveyed, 69 percent said sustainability is a critical business issue for their real estate departments. When CoreNet and Jones Lang LaSalle asked the same question in 2007, 47 percent said it was a critical issue. http://www.joneslanglasalle-boston.com/en-US/news/PressReleases/Jones+Lang+LaSalle+-+Companies+Focus+on+Sustainability+to+Reduce+Costs.htm Panel Intelligence Study shows corporate world still moving forward on sustainability issues. http://www.panelintelligence.com/docs/PI_Sustainability_

Appendix F

Sustainable Property Financial Analysis Alternatives

<table>
<tr><th>Analysis/Model</th><th>Description/Commentary</th><th>Key Links/Examples</th></tr>
<tr><td></td><td>property outcomes that generate Enterprise Value include:

Reduction in resource use
Reduction in energy and water use
Reduction in building waste
Reduction in pollution emissions
Reduction in carbon footprint
Superior location and access
Limits auto use
Environmental sensitivity
Occupant performance
Occupant satisfaction
Improved health/absenteeism
Productivity: working environment—focus/energy level
Flexibility/adaptability of occupied space
Design
Systems
Materials
Energy sources
Sustainability compliance
Certifications
Regulations
External commitments
Internal policies
The success a subject property has in achieving the key sustainable outcomes identified above will determine the extent to which the property</td><td>Study_Q4-08_Final.pdf

A comprehensive study was pubmlished in early 2009 that addresses the integration of environental, social and governance (ESG) issues in the financial industry. http://www.ifc.org/ifcext/sustainability.nsf/AttachmentsByTitle/p_SI_WCW08_report_WEB.pdf/$FILE/p_SI_WCW08_report_WEB.pdf</td></tr>
</table>

Appendix F

Sustainable Property Financial Analysis Alternatives

Analysis/Model	Description/Commentary	Key Links/Examples
	will be able to achieve sustainable real estate-related enterprise value benefits. Key examples of the types of sustainably related enterprise value benefits are listed below: Reduction in enterprise costs • Reduction in churn costs • Reduction in employee costs: productivity • Reduction in employee health costs Improved reputation/leadership • Recruiting • Employee retention/satisfaction • Public relations/brand management • Retain "social license" to operate • Improved marketing and sales • Increase company market value • Increase company market liquidity • Address shareholder concerns Compliance with internal/external policies/initiatives • Corporate energy/sustainability requirements • Corporate social responsibility reporting • Global Reporting Initiative • Carbon Disclosure Project • Minimum requirements of socially responsible investment funds Reduced risk to future earnings • Legal risks—sick building syndrome and mold claims, business interruptions, building remediation costs, etc. • Reduced sub-leasing risk if downsizing, relocating, etc. • Reduced operating cost volatility	

Analysis/Model	Description/Commentary	Key Links/Examples
	• Reduced risk to reputation • Improved defense of competitive advantages • Reduced risk of future compliance costs The level of potential influence on key DCF model inputs like rents, occupancies, absorption, tenant retention will depend on the specific types of tenants, level and type of sustainability achieved, and sophistication of the marketing of these benefits to target audiences. Chapter VI, Section D: Underwriting Space User Demand presents the information discussed above in a more targeted discussion of underwriting.	
9. ENERGY STAR Financial Value Calculator	ENERGY STAR's Financial Value Calculator (FVC) is designed to help decision-makers determine the impact of energy savings on the market valuation of both publicly- and privately-held companies. "The FVC uses the prevailing price/earnings ratio to estimate the market value of increased earnings that can result from increased energy efficiency."[105] The calculator demonstrates potential changes to: Net Income Earnings Per Share Market Value The FVC may be an appropriate tool for the owner/user who chooses to evaluate the investment decision on an enterprise level as opposed to the property level.	A link to ENERGY STAR's Financial Value Calculator can be found under the Financial Evaluation heading on the following webpage: http://www.energystar.gov/index.cfm?c=tools_resources.bus_energy_management_tools_resources

[105] See http://www.energystar.gov/index.cfm?c=tools_resources.bus_energy_management_tools_resources under Financial Evaluation.

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Sustainable Property Financial Analysis Alternatives

Analysis/Model	Description/Commentary	Key Links/Examples
10. Risk Analysis and Presentation (RAP) • Energy Cost Volatility • Litigation Risk (mold, SBS, contracts, etc.) • Regulatory Risk • Reduced sub-leasing risk • Cash flow risks • Development-Construction risk analysis • Exit-risk analysis	Risk Analysis and Presentation (RAP) becomes particularly important in sustainable property investment. Sustainable properties generate powerful positive and negative risks that need to be specifically analyzed in the context of the property. Some of these key risks include energy cost volatility, litigation risk due to mold or sick building syndrome, regulatory risk, sub-leasing risk, exit risk, and development and construction risk. More sophisticated and property-specific analyses need to be conducted and clearly and independently communicated to aid decision-makers. Risks are addressed throughout *Value Beyond Cost Savings: How to Underwrite Sustainable Properties*. They are presented in detail in the GBFC Sustainable Property Cost-Benefit Checklist, and in the discussion of process and feture performance in Chapter IV, Sections C and D. The RAP process is presented fully in Section H of Chapter V.	Climate Change Economics has an interesting section clarifying the distinction between risk and uncertainty. While focused on public benefits issues, this section, and other parts of the website provide important points in thinking through the economics of sustainability. http://www.climatechangeecon.net/index.php?option=com_content&task=view&id=8&Itemid=22 The American Association of Architects Chapter 12 of their Best Practices publication contains over a dozen different publications addressing risk management issues. http://www.aia.org/practicing/bestpractices/AIAS077005 Energy Budgets at Risk is a book that presents a financial management tool for assessing energy related risk at a company level: http://www.jjacksonconsulting.com/eriskm.htm
D. Public Benefits Analyses		
1. Reduced Infrastructure Costs • Water collection, storage, treatment and distribution • Energy production and distribution • Road & bridge construction/maintenance • More efficient use of existing infrastructure	Infrastructure cost benefit analyses seek to quantify cost savings that accrue to the public from buildings that incorporate various "green" features, which reduce or eliminate the need for public infrastructure investment. By quantifying these benefits, the public sector can more accurately assess the appropriate level of expenditure to make or incentives to provide in order to achieve the desired outcome. Buildings that use less water and/or incorporate features that minimize storm runoff can help reduce infrastructure costs related to water collection, storage, treatment and distribution. Buildings that are more energy efficient or generate a portion of their energy needs on-site can help reduce the need for additional energy generation plants and expansion of the distribution system. Buildings that promote the use of public transportation by workers or that have locations that can rely on existing transportation infrastructure can reduce or eliminate costs associated with additional construction and maintenance of these improvements.	Towards a Green Building & Infrastructure Investment Fund is a report commissioned by The City of Vancouver, the Vancouver Organizing Committee for the 2010 Olympic and Paralympic Winter Games (VANOC), Vancity, BC Hydro and Tides Foundation who were interested in the possibility of using the 2010 Olympic and Paralympic Winter Games in Vancouver to launch a Green Building & Infrastructure Investment Fund as a legacy of the Games. The overall structure for the analysis and specific sub-analysis provide a perspective on assessing the financial impacts of sustainable investment. http://www.greenbuildingfc.com/Home/DocumentDetails.aspx?id=386 **Climate Change Economics** has an interesting section

Analysis/Model	Description/Commentary	Key Links/Examples
	Another cost consideration has to do with the duplication or under-utilization of infrastructure improvements as a result of urban sprawl. When new communities are developed outside existing urban areas the effect on infrastructure is twofold: 1) There must be a duplication of existing infrastructure already in the urban area; and 2) Out-migration to the suburbs can leave the existing infrastructure under-utilized and reduce the number of taxpayers available to support these improvements. Several of the infrastructure cost benefit analyses use a present value calculation to estimate the value of these public benefits. We believe this is a logical approach since buildings that incorporate these features will produce the benefits over many years. Given the small impact of any particular building, presenting the total public benefits, and the relative contribution of the subject building to costs is a good idea. Since infrastructure costs are not typically incremental, but require substantial expenditures to ensure excess capacity, often to meet peak demand, the marginal benefits to reducing peak demand, a goal of many sustainable systems, can be significantly higher than average costs.	laying out the Basic Economics of evaluating sustainability. This section, and the other key sections on issues in applying economic analysis are important for infrastructure and all public, and many private benefits of sustainability. http://www.climatechangeecon.net/index.php?option=com_content&task=category&sectionid=4&id=10&Itemid=22 Water Collection, Storage, Treatment and Distribution**:** Cost-benefit study of 30 green schools in ten states calculates an average water-use reduction of 32%. The author translates this reduction in water-use and wastewater treatment into a net present value estimate (over 20 years) of $0.84/SF. ["Greening America's Schools – Costs and Benefits," Gregory Kats, October 2006, pg. 7] http://www.cap-e.com/ewebeditpro/items/O59F12807.pdf Water Supply & Wastewater Treatment**:** This report presents a net present value analysis (over 20 years) of avoided marginal water supply costs and delayed expenditures from the construction of new wastewater facilities by the public sector. The study calculates an average "avoided" marginal water supply cost savings of $5,075 per acre foot, a wastewater facilities "avoided" cost savings of $953 per acre foot and a wastewater O&M "avoided" cost savings of $201 per acre foot. See, "The Costs and Benefits of Green Buildings," Gregory Kats, October 2003, pp 42-43: http://www.cap-e.com/ewebeditpro/items/O59F3259.pdf
2. Environmental and Resource Conservation Benefits • Conservation of natural environment • Landfill reduction	Environmental & natural resource conservation benefits analyses seek to quantify public benefits associated with those green building features that minimize the detrimental effects of water treatment and use, promote landfill reduction, cleaner air, cleaner water, and reduce drought risk.	Resources from Waste: Integrated Resource Management is a very detailed analytic study, which presents many creative quantitative techniques to assess the costs and benefits of an integrated waste management system. The study is an independent report on integrated resource management that examines approaches for local governments across British Columbia to use solid and liquid waste to create energy, reduce greenhouse gas emissions, conserve water, and

Analysis/Model	Description/Commentary	Key Links/Examples
• Reduce air pollution • Reduce water pollution • Increase biodiversity • Reduce soil erosion • Reduce deforestation • Reduce desertification • Preserve ozone layer • Reduce drought risk		recover nutrients. Benefits cited include: Reduce greenhouse gas emissions by 25% Power the equivalent of 10% of homes Heat the equivalent of 30% of homes Run the equivalent of 10% of cars Recover clean, usable water Limit tax increases http://www.cd.gov.bc.ca/ministry/whatsnew/IRM.htm The Organization for Economic Co-operation and Development (OECD) has published a 2005 reference manual entitled "Strategic Waste Prevention." As part of its on-going efforts towards assisting governments with actions that support increased resource efficiency and sustainable development: http://www.olis.oecd.org/olis/2000doc.nsf/LinkTo/NT00001066/$FILE/00081387.PDF Construction & Demolition (C&D) Waste Diversion: This report presents a calculation of the economic impacts of C&D waste diversion for both new construction and for renovations of existing buildings requiring demolition. The report includes a calculation of public (environmental and tax) benefits associated with an additional 25% in C&D diversion equating to a $0.03/SF benefit for construction only and a $0.14/SF benefit for construction preceded by demolition. This is not a present value calculation. See, "The Costs and Benefits of Green Buildings," Gregory Kats, October 2003, pp 47-53 and Appendix H: http://www.cap-e.com/ewebeditpro/items/O59F3259.pdf Many of the sources cited in the text and covered in other parts of Public Benefits provide additional detail on analyzing Environmental and Resources Conservation Benefits.
3. Land-Use Benefits • Preserve open	Land-use benefits analyses attempt to quantify public benefits associated with reduced traffic congestion & air pollution, and preserving open-space & natural habitat, protecting agricultural lands and keeping urban areas	The Green Communities Criteria Checklist and Manual provide a detailed listing of criteria for sustainable housing developments with a particularly good assessment of site

Analysis/Model	Description/Commentary	Key Links/Examples
space and natural habitat • Protect agricultural land and economic diversity • Maintain vibrant urban areas • Reduce traffic congestion and air pollution	vibrant. Examples of the types of issues that a land-use benefits financial analysis might consider include increased worker productivity due to shorter commute distances, reduction on quality of life as a result of the loss of open-space, tax revenue loss as a result of a decrease in the amount of productive agricultural land.	location and related issues. http://www.greenbuildingfc.com/Home/DocumentDetails.aspx?id=1072 The Holland Barrs Planning Group authored "Playbook for Green Buildings and Neighborhoods - Strategic Local Climate Solutions". The Playbook presents tools that cities and counties can use to take immediate action on climate change through: Green building, green neighborhoods, and sustainable infrastructure. http://www.greenbuildingfc.com/Home/DocumentDetails.aspx?id=978 Brownfield's Capital: Unlocking the Value of Environmental Redevelopment by Glenn Mueller provides some insights into an important sustainable land-use issue. http://findarticles.com/p/articles/mi_qa3759/is_200501/ai_n9484608 The Urban Land Institute has long been a leader in "Smart Growth" and all the issues related to real estate and related intelligent use of land. At the 2007 ULI Fall Meeting in Las Vegas, the Trustees directed Chairman Todd Mansfield to form an Advisory Group to study and advise on the issues of climate change and energy and how ULI as an organization might best engage in these issues. The Climate, Land Use and Energy (CLUE) Advisory Group is made up of a diverse body of ULI members who span the fields of finance, investment, development, design and the insurance industries. The study can be found at: http://www.uli.org/sitecore/content/ULI2Home/ResearchAndPublications/Reports.aspx Resources on Smart Growth can be found at: http://www.uli.org/ResearchAndPublications/Reports/Smart Growth.aspx
4. Reduced Climate	Reduced emissions benefits analyses consider the value of improved public health resulting from cleaner air and water, and from reductions in carbon	The IPCC has extensive publications and analysis of the costs of Climate Change across a wide range of areas.

Analysis/Model	Description/Commentary	Key Links/Examples
Change • Reduce vulnerability to climate • Reduce costs to respond to change • Reduce spread of infectious respiratory disease • Reduce acidification • Contribute to many environmental conservation benefits • Improve public health	emissions that cause global warming. In the improved indoor air quality example, the analysis looks at the costs saved based on a reduction in the number of asthma cases. In the reduced pollutants example, the analysis assigns dollar amounts to the various pollutants and then calculates an overall value based on a reduced level of emissions. Both analyses calculate a present value that is appropriate since buildings that incorporate these features will realize these benefits over many years.	http://www.ipcc.ch/about/index.htm The IPCC was established to provide the decision-makers and others interested in climate change with an objective source of information about climate change. The IPCC does not conduct any research nor does it monitor climate related data or parameters. Its role is to assess on a comprehensive, objective, open and transparent basis the latest scientific, technical and socio-economic literature produced worldwide relevant to the understanding of the risk of human-induced climate change, its observed and projected impacts and options for adaptation and mitigation. Climate Changes Futures - Health, Ecological and Economic Dimensions by Paul Epstein and Evan Mills is the result of The Center for Health and the Global Environment, Swiss Re and the United Nations Development Programme three-year effort to examine the physical and health risks of climate instability. http://www.greenbuildingfc.com/Home/DocumentDetails.aspx?id=91 Ceres (pronounced "series") is a national network of investors, environmental organizations and other public interest groups working with companies and investors to address sustainability challenges such as global climate change. They have many publications dealing with climate change and their impacts. http://www.ceres.org/Page.aspx?pid=415 Climate Change Economics provides a significant listing of sustainable sources—with an index and their commentary about the site which ties into resources to describe the public benefits of sustainability and climate change. http://www.climatechangeecon.net/index.php?option=com_mtree&task=listcats&cat_id=42&Itemid=20 Reduced Pollutants: This report presents a net present value analysis (over 20 years) that concludes a $1.18/SF emissions benefit due to a reduction in electricity

Analysis/Model	Description/Commentary	Key Links/Examples
		generation. The analysis is based on a 36% reduction in Carbon Dioxide, Sulfur Dioxide, Nitrogen Oxides and Particulates. "The Costs and Benefits of Green Buildings," Gregory Kats, October 2003, pp 38-39: http://www.cap-e.com/ewebeditpro/items/O59F3259.pdf Improved Indoor Air Quality–Asthma Reduction**:** Cost-benefit study of 30 green schools calculates a present value of $3.00/SF as a result of a 25% reduction in asthma cases (over 20 years) associated with children attending a green school with better indoor air quality compared to a conventional school. See, "Greening America's Schools – Costs and Benefits," Gregory Kats, October 2006, pg. 13: http://www.cap-e.com/ewebeditpro/items/O59F12807.pdf Improved Public Health from Cool Roofs**:** This report estimates health benefits for the state of California, principally due to reduced smog creation as a result of the installation of "cool roofs." The report estimates the health benefit to be $0.70/SF based on a report produced by PG&E in 2000 and other findings of a Lawrence Berkeley Labs (LBL) senior scientist. See, "The Costs and Benefits of Green Buildings," Gregory Kats, October 2003, pp 77-80: http://www.cap-e.com/ewebeditpro/items/O59F3259.pdf Consider using another example here (not much detail): Cost-benefit study of 30 green schools in ten states calculates a present value (over 20 years) of emissions reduction of $0.53/SF from a green school. See, "Greening America's Schools – Costs and Benefits," Gregory Kats, October 2006, pg. 6: http://www.cap-e.com/ewebeditpro/items/O59F12807.pdf
5. Economic Benefits • Job creation • Improve public health and well-	Economic benefits analyses seek to quantify public benefits associated with job creation, recycling, reduced public health costs, increased tax revenues associated with greater educational achievement, and community competitiveness. Examples of this include investments in "green" schools that have been shown to have a positive impact on academic performance that in turn has a positive impact on lifetime earnings and tax revenues.	This is a vast area analyses that is based on the historic foundation used by governments in Cost-Benefit analysis that is adapted for the purposes of addressing sustainability related benefits. Two examples from Mr. Kats are presented below.

Analysis/Model	Description/Commentary	Key Links/Examples
being • Reduce insurance costs • Reduce public health costs—Medicare • Government worker productivity: reduce government costs • Worker productivity: increase earnings and tax revenues • Community competitiveness—quality of life	Benefits such as these, which are realized over many years, are most accurately valued using some type of present value calculation.	Worker Productivity-Increased Earnings & Tax Revenue**:** Cost-benefit study of 30 green schools in ten states calculates a public financial benefit of $2,700 per student or $20.00/SF over a 20 year period from increased federal, state and local tax benefits associated with higher earnings from students attending green schools. See, "Greening America's Schools – Costs and Benefits," Gregory Kats, October 2006, pg. 13] http://www.cap-e.com/ewebeditpro/items/O59F12807.pdf Employee Retention**:** Cost-benefit study of 30 green schools calculates a financial savings of $4.00/SF over a 20 year period from increased teacher retention. See, "Greening America's Schools – Costs and Benefits," Gregory Kats, October 2006, pg. 14] http://www.cap-e.com/ewebeditpro/items/O59F12807.pdf
6. Security Benefits • Reduce reliance on foreign energy sources	Security benefits analyses are an attempt to quantify the value of reduced reliance on foreign energy sources. Our dependence on certain foreign energy sources contains a number of hidden costs including increased risk of energy cost volatility due to supply shock, significant wealth transfer to hostile regimes, and increased risk of a costly US military intervention.	See, "The Hidden Cost of Oil: An Update," The National Defense Council Foundation, Milton Copulos, January 2007: http://www.ndcf.org/ Energy Insecurity; testimony of J. Robinson West Chairman PFC Energy on September 21, 2005 concerning the increasing security implications of our reliance on foreign energy supplies. http://www.greenbuildingfc.com/Home/DocumentDetails.aspx?id=286

Appendix G
Sustainable Property Cost-Benefit Checklist

Potential Property Benefits	Description of Benefit	Applicability Analysis[106]
A. Reduced Development Costs		
1. Government incentives	Significant benefits are available from local, regional, state or provincial, and federal governments as well as utilities and other organizations. These benefits can be quite substantial and include: • Increased Floor Area Ratio and zoning/density bonuses • Expedited permitting and approvals • Design and code flexibility • Rebates; construction cost off-sets; grants • Financing assistance, subsidies • Tax benefits: Federal, State, and Local—credits, favorable accounting treatment (Tenant Improvements, etc), tax reductions, etc. • Government mandated carbon trade value	The specific sustainability or energy efficiency thresholds required by each governmental level in order to obtain incentives must be identified and evaluated. These thresholds should then be compared to the project's actual or projected sustainable outcomes/performance to enable an assessment of the magnitude of potential benefits. Expanded Chapter III, Appendix III-D provides a listing of many certification and assessment systems. Assessment of the likelihood of achieving benefits will be enhanced by a clear understanding and articulation of the property's Public Benefits (see section V-C2 a) Public Sustainability Property Analysis in Expanded Chapter V.)
2. Better private financing	Sustainable properties have the potential for better private equity and debt financing due to their generally lower risk profile, the growth in specialized energy or sustainable financing sources, including Socially Responsible Investment funds and other private financing, and other factors. Better private financing can be achieved in a number of ways: • Improved access • Lower cost: rates, closing costs • Better terms: LTV, DSCR, reserves, hold-backs	This benefit has been elusive since debt and equity sources have not been able to effectively integrate "non-cost" benefits into their decisions. Accordingly, only a few smaller debt and equity sources have offered very limited rate discounts or other benefits. The ability of a project to achieve better private financing will largely be determined by the quality of their Investment Request Package[107] and their ability to articulate, at a very property specific level, the net benefits of sustainable investments and their impacts on risks and returns.

[106] This column provides select guidance on assessing the applicability of a general cost-benefit to a specific property.

[107] An Investment Request Package refers to any collection of documents submitted to a lender, equity investor, corporate CFO, or other real estate decision-maker responsible for a capital investment decision.

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Sustainable Property Cost-Benefit Checklist

Potential Property Benefits	Description of Benefit	Applicability Analysis[106]
		Given the deterioration of the debt financing market, which accelerated in the fourth quarter of 2008, (interest rates up 2% or more, loan to value limits closer to 50% than 70%, and more severe debt service coverage ratio, reserves, holdbacks, and guarantees against rollover risk), the marginal benefits of sustainable property investment will continue to be dwarfed by broader capital markets changes. However, certified sustainable properties, or at least properties with some combination of sustainable features, have a good chance of becoming a minimum standard or strategic imperative that could significantly increase access and provide some pricing/terms advantage to financing. While rates and terms may be slow to be revised, it is also likely that private "sustainable" property financing will be available from most conventional sources, rather than relegated to specialist "green" lenders or investors.
3. Downsizing of some systems (HVAC, etc.)	Developing sustainable properties, particularly certified properties, requires additional expenditures not required for conventional properties. Offsetting these additional costs are reductions in costs due to the down or right sizing of some systems, like HVAC systems. For example, a smaller, less expensive HVAC system may be possible when energy costs are significantly reduced. Additionally, as more space users start to view sustainability as a prerequisite for a Class A building, more cost-effective sustainable products/features may replace more expensive products previously considered essential to a Class A property.	The key issue here is in reviewing cost estimates underwriters/valuers should understand that both higher costs in some areas, and lower costs other areas is the norm for sustainable property developments. Properties with no such trade-offs may be exposed to excessive costs.
4. Reduce number and magnitude of change orders	Sustainable properties can experience fewer and less significant change orders due to more forward-thinking development processes. Depending on the magnitude and number of change orders, costs can be substantial.	Properly run sustainable property investments will involve more significant upfront planning involving key stakeholders, including the owner, architects, engineers, building operators, and others, enabling better communication and a more clear understanding of the

Appendix G
Sustainable Property Cost-Benefit Checklist

Potential Property Benefits	Description of Benefit	Applicability Analysis[106]
		"values" that are being sought in a building. This more holistic approach is formalized in the sustainability process through integrated design and related requirements in most certification programs. Commissioning, particularly if started early in the project, is also a key indicator of reduced change orders. (More detail in Chapter IV, Section C: Process Performance and Section D: Feature Performance) Studies of construction projects have found that risks are typically determined in the initial phases of a project, while the impacts are not experienced until the construction phases, supporting the value that the enhanced upfront coordination typical of sustainable projects can deliver.[108] The design-build model, where the design and construction phases are overlapped and the contractor takes on more risk, can be a good choice for sustainable property projects. As a design-builder, the general contractor can redesign a facility if cost overruns are anticipated to still meet the goals of the owner. This process has risk and responsibility issues that must be addressed up front, but can add flexibility to significantly reduce budget risk that is inherent in the design-bid-build delivery model where multiple contractors bid on construction drawings, which can reduce flexibility and increase the frequency and cost of change orders.
5. Reduce operational start-up costs	Sustainable properties can experience fewer problems during their initial operations, enabling space users to move in more quickly and requiring less management time. These benefits, while not typically of large magnitude, are primarily the results of a more holistic building design approach implemented through integrated design and commissioning, which ensures that systems and products operate as designed.	Key evidence of potential benefits for a specific property are based on an assessment of the quality of the integrated design process and the quality and thoroughness of commissioning and the commissioner. Potential benefits could be offset by the use of products, materials or systems that are too pioneering that take significant time and money to calibrate and get operating efficiently.

[108] Mbachu, J. and Vinasithamby, K. (2004), "Sources of Risk in Construction Project Development: An Exploratory Study."

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Potential Property Benefits	Description of Benefit	Applicability Analysis[106]
B. Reduced Development Risks		
1. Reduce construction risk	Sustainable projects can reduce construction risk through: • Reduced cost volatility • Commissioning • Integrated design • Local materials • Improved/earlier goal setting; “values clarification” • Better communications among key participants in process • Reduce entitlement risk • Improved timing and content of neighborhood/public appearances • Improved timing and content of regulatory approvals • Reduce legal risks • More explicit service provider contracts • Better, earlier communication	Construction risk is the risk that a project will not be completed to the planned quality level on time or within the allocated budget. Construction risk can result from delays, financial problems, contractual issues, legal problems, design issues, operational problems or environmental issues. Construction risk is also unique to each project. Each project has its own stakeholders, regulatory issues, and other factors that are unknown or unknowable at the start of a project. The primary way that construction risk is mitigated is through higher equity requirements, fixed price construction contracts, retainage, budget contingencies, and payment, completion, and performance bonds. Based on a survey by Marsh published in early 2009, the surety markets (that provide payment, completion and performance bonds) have not specifically responded to the green industry. They noted the specific concerns revolving around onerous contract provisions and the risk of inadvertently guaranteeing a specific performance or efficacy for energy usage, water consumption, and/or LEED certification. These markets are looking at green contracts more closely, and it is possible, as more positive experiences are achieved, that new products will be available in this area.[109] To assess potential benefits due to reduced construction risk, as a result of sustainability, it is important to evaluate the specific sustainability experience of the contractor, subcontractors, design team and other project participants. Given the added potential communication problems from having additional participants, team experience working together, or a plan to mitigate lack of prior team experience can be important.

[109] “The Green Built Environment in the United States, 2008 Year-end Update of the State of the Insurance Market,” Marsh, February 2009.

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Potential Property Benefits	Description of Benefit	Applicability Analysis[106]
		A specific assessment of the key factors that can reduce cost volatility, entitlement risk, and legal risk should be made for the subject property.
2. Reduce carry risk	• Reduce time to construct • Reduce time to lease-up • Reduce "carry" risk insurance cost • Increase pre-leasing • Reduced entitlement risk	Carry risk addresses the possibility that a construction loan will default in the payment of interest during the construction lease-up period. This risk is most acute in the later years of the term of a construction or mini-perm loan. Interest reserves are established to cover the expected time to build and lease up the project, together with a small contingency. Insurance policies can also be obtained that backstop loan payments until establishment of an adequate stabilized debt service coverage ratio (typically 1.0 or better). A letter of credit or an advancing mechanism may also be used, and hedges and caps are also important in mitigating carry risk. The primary additional attributes of a sustainable project that will reduce carry risk are those that support a compelling favorable lease-up story relative to the specific space users expected to occupy the property. While reducing the cost of carry insurance is one potential benefit, this is not yet possible in the marketplace as of early 2009.[110]
3. Reduce exit/take-out risk	The risk that the construction loan's balloon payment will not be executed as planned is referred to as take-out risk.[111] If a construction loan does not have a highly rated take-out lender, then the risk of executing the take-out is a function of the economics of the completed real estate project. Accordingly, sustainable properties with proven demand by regulators, space users, and investors, and the resulting increase in value and financial performance will	A loan's potential for reduced take-out risk is directly related to the clear articulation of the subject property's superior economics as a result of increased regulator demand, space user demand, and investor demand. A property's exit risk (for equity investors/developers) is also significantly reduced by anything that increases the demand from investors or buyers for their final product. This benefit should be common in many sustainable

[110] Ibid.

[111] "US CMBS: Moody's Approach to Rating Commercial Real Estate Construction Loans," January 20, 2006. This section discussed loan-related take-out risk as well as exit-risk, a similar concept for equity investors/developers, who must eventually sell their property to capitalize on its value.

Potential Property Benefits	Description of Benefit	Applicability Analysis[106]
	have significantly lower take-out risk.	projects, but it is important not to overestimate the magnitude of this benefit, given the many other factors that affect investor and space user demand on any particular project. The best evidence of these benefits will be information that is supportive of the key economic arguments given the subject property's specific attributes.
C. Increased Space User Demand	A potential increase in demand for a sustainable property by space users is one of the most important benefits that a property can achieve.[112] Space User demand will be enhanced from at least the following segments of potential space users: 1. Those significantly influenced by Enterprise Value; 2. Government tenants with sustainability mandates; 3. Vendors/suppliers encouraged/required by customers to consider sustainability; 4. Space Users with direct ties to sustainability 5. Friends of sustainability.	The process for evaluating enhanced Space User Demand, and the ability of an owner to monetize these benefits through higher rents, occupancies, faster absorption, etc., starts with an assessment of the types of space users (tenants or owner occupants) expected at a project. What key issues drive these particular types of tenants? Are they influenced by their internal or external commitments to carbon disclosure or reduction? Do they care about potential health or productivity benefits? Is an environmentally-socially responsible reputation important to them, or their customers or employees? Once an understanding of the key drivers of potential space users is established, the next step is to assess the likelihood of whether the subject property will generate the types of sustainable outcomes-building performance important to expected occupants. Some of the key sustainable property outcomes that generate enterprise value include: **Reduction in resource use** • Reduction in energy and water use • Reduction in building waste • Reduction in pollution emissions • Reduction in carbon footprint **Reduction in enterprise costs** • Reduction in churn costs

[112] "Space user" is a term we use to describe the occupants or users of real estate. It is a term that includes corporate or non-corporate occupants, tenants, retail customers or other non-owner or tenant users of space.

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Potential Property Benefits	Description of Benefit	Applicability Analysis[106]
		• Reduction in employee costs: productivity • Reduction in employee health costs • Reduced selling costs **Superior location and access** • Limits auto use • Environmental sensitivity **Occupant performance** • Occupant satisfaction • Improved health/absenteeism • Productivity: working environment—focus/energy level **Flexibility/adaptability of occupied space** • Design • Systems • Materials • Energy sources **Sustainability compliance** • Certifications • Regulations • External commitments • Internal policies The success a subject property has in achieving the key sustainable outcomes identified above will determine the extent to which the property will be able to achieve sustainable real estate-related enterprise value benefits. Key examples of the types of sustainably related enterprise value benefits are listed below: **Improved reputation/leadership** • Recruiting • Employee retention/satisfaction

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Potential Property Benefits	Description of Benefit	Applicability Analysis[106]
		• Public relations/brand management • Retain “social license” to operate • Improved marketing and sales • Increase company market value • Increase company market liquidity • Address shareholder concerns **Compliance with internal/external policies/initiatives** • Corporate energy/sustainability requirements • Corporate social responsibility reporting • Global Reporting Initiative • Carbon Disclosure Project • Minimum requirements of socially responsible investment funds **Reduced risk to future earnings** • Legal risks—sick building syndrome and mold claims, business interruptions, building remediation costs, etc. • Reduced sub-leasing risk if downsizing, relocating, etc. • Reduced operating cost volatility • Reduced risk to reputation • Improved defense of competitive advantages • Reduced risk of future compliance costs • • Finally, the above analysis is combined with a specific assessment of the subject property’s space-user market and importance of segments expected to have a higher demand for sustainable properties: 1. Those significantly influenced by Enterprise Value; 2. Government tenants with sustainability

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		mandates; 3. Vendors/suppliers encouraged/required by customers to consider sustainability; 4. Space Users with direct ties to sustainability 5. Friends of sustainability. More detail on the process for Underwriting Space User Demand is available in Expanded Chapter VI: Section D: Underwriting Space User Demand.
1. Increased demand from space users concerned about enterprise value	Space user demand will be partially driven by the value of the sustainable property investment to the overall enterprise. The incremental value of sustainable property investment to an enterprise will be driven by the key issues identified below: **Reduction in resource use** • Reduced energy & water use • Reduction in building waste • Reduction in carbon footprint • Reduction in pollution emissions **Enterprise cost reduction** • Reduced "churn" costs • Reduced employee costs: productivity • Reduced health costs	The process for assessing potential demand enhancement from this segment is discussed above. Logically, most space users have an interest in increasing enterprise value, but different companies and industry segments will view the importance of this topic quite differently, as well as their views of the Importance of their real estate decision to create this value.
	Superior Location and Access • Limits auto use • Environmental sensitivity	
	Occupant Performance • Occupant Satisfaction • Improved health • Improved productivity	Occupant performance from sustainable properties can create value in ways as articulated below and as fully evaluated in a separate section on occupant performance in Expanded Chapter IV, Section E-4. **Improved occupant satisfaction** • Reduce turnover and/or defection to competing firms

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Potential Property Benefits	Description of Benefit	Applicability Analysis[106]
		- Interruption in responsibilities - Lost clients - Lost ideas / institutional knowledge - Lost intellectual property - Downtime until new hire picks up responsibilities - Recruiting costs – direct / indirect - Training costs - Overall employee morale • Reduce HVAC noise and pitch distractions • Reduce “too hot / too cold” complaints given the implementation of specific HVAC systems • Increase access to daylight and overall facility quality **Improved occupant health** • Reduce absenteeism • Increase employee retention • Reduce spread of colds, flu, etc among co-workers given greater outdoor air circulation, better MIRV air filtration • Possible reduction in health care premiums given corporate-wide facility standardization and pushing of health care providers to acknowledge benefits
		Improved occupant productivity • Reduce employee salary cost/unit output • Improved profitability
	Improved reputation/leadership • Improve cost/quality of recruiting • Improve employee retention/satisfaction • Improve public relations/brand management • Retain “social license” to operate	The importance of improved reputation/leadership to potential space users can be deduced by evaluating the specific space users and the level of sustainability contemplated for a project. Companies with an emphasis on brand promotion and external marketing, larger companies, companies with potentially controversial

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Potential Property Benefits	Description of Benefit	Applicability Analysis[106]
	• Improved marketing and sales • Increase company market value • Increase company market liquidity • Address shareholder concerns	products or practices, companies that public and promote corporate social responsibility reports, and others are good candidates to be positively influenced by sustainable property investment. Sustainable properties that make a leadership position in sustainability or energy efficiency will be more likely to influence potential space users in this regard.
	Compliance with internal/external policies/initiatives • Corporate energy/sustainability requirements • Corporate social responsibility reporting • Global Reporting Initiative • Carbon Disclosure Project • Minimum requirements of socially responsible investment funds	Properties whose potential space users, either individually or as a sector, have made it a policy to comply with external policies and initiatives such as the Global Reporting Initiative or Carbon Disclosure Project will be more likely to be influenced by sustainable property investment. These external policies have in many cases led to more detailed and important internal corporate real estate or related occupancy policies that can place a high priority on sustainable property occupancy.
	Reduced risk to future earnings • Legal risks—sick building syndrome and mold claims, business interruptions, building remediation costs, etc. • Reduced sub-leasing risk if downsizing, relocating, etc • Reduced operating cost volatility • Reduced risk to reputation • Improved defense of competitive advantages • Reduced risk of future compliance costs	Evaluating potential space user understanding of how sustainable properties can reduce risk to future earnings is a bit less direct. While the risk benefits are quite clear and compelling, it is likely that the overall influence of reduced risk to future earnings and its influence on space user demand will be best reflected in surveys of tenant or space user interest, or other anecdotal information and trends regarding space user understanding of the value of sustainable property investment. Research on the risk-reducing attributes of sustainable investment generally has become well publicized, with substantial financial benefits accruing to companies that incorporate sustainability concerns into their overall business.
2. Increased demand from government tenants with mandated sustainability	Local, state and federal governments are increasingly requiring that their employees work in sustainable properties. Sustainable property requirements for new construction have been prominent in many governments for some time, and requirements for government leases are increasingly being implemented as leases turn within government organizations. With over 18% of all	The potential impact for a specific property will be a function of evaluating the level of government leasing in the subject property's submarket, trends relative to government leasing, government lease rollover expectations, and the specific sustainability thresholds required by different levels of government compared to the subject property. Evaluation of this potential benefit

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Potential Property Benefits	Description of Benefit	Applicability Analysis[106]
	commercial space in the United States government owned, and significantly more in many other countries (approximately 13% of which is office space), this is a significant market that will have broader influence on leasing policies throughout the country.[113]	must take into consideration not only sustainability issues, but also the suitability of the subject property relative to other minimum requirements of government tenants related to security and other issues.
3. Increased demand from vendors/supply chain required by big customers (GE, Wal-Mart, etc.) to be more sustainable	Many large companies like General Electric and Wal-Mart are beginning to put sustainability requirements on their vendors and others in their supply chain to be more sustainable. These initiatives have grown over time, and while relatively small today, are likely to increase.	Evidence of this phenomenon can be ascertained for a property in a particular marketplace by studying the profile of tenants in the marketplace. Again, this is just another of the many issues influencing space user demand, but is likely to grow. For example, nearly 1,500 global businesses signed on to the United Nation's Global Compact in 2008, signaling the growing interest of businesses that want to align their practices with the initiatives in environmental, social, and governance principles. Approximately 7% of the 700-plus respondents in the annual survey of Global Compact participants indicated that they require Global Compact participation when selecting suppliers. About a third said they extended their commitment to the Global Compact to their subsidiaries. While these numbers are still small, they represent a significant and growing trend to extend the leadership of certain powerful companies on sustainability issues down through the supply chain.
4. Increased demand from tenants with direct tie to sustainability business—architects, engineers, consultants, contractors, lawyers, energy firms, product companies, etc. etc.	There are a growing number of tenants that have a direct tie to the sustainable property business: architects, engineers, consultants, contractors, lawyers, energy firms, product companies, etc. etc.	There is increasing evidence of the growing size of the sustainable property market and companies with direct ties to the industry. For example, membership in the U.S. Green Building Council has grown dramatically to nearly 19,000, with over 81,000 LEED-accredited professionals.[114]
5. Increased demand from	Demand from space users is also heightened by those	Demographics can play a key role here with younger

[113] "Who plays and who decides; the structure and operation of the commercial building market," March 2004, Innovologie, LLC for DOE.

[114] U.S. Green Building Council, February 2009.

Potential Property Benefits	Description of Benefit	Applicability Analysis[106]
"Friends of Sustainability"	individuals who want to "do the right thing," independent of evidence of financial benefit. It is difficult to quantify the size of this marketplace, but service providers, builders, tenants and others that took on a leadership role without "proof", initiated the green building industry.	people and people in certain geographic locations more likely to be concerned about sustainability ideals independent of financial considerations.
D. Reduced Resource Use / Operating Costs		
1. Lower energy use 2. Lower water use 3. Reduction in sewage/stormwater run-off 4. Reduction in building waste 5. Reduction in construction / demolition waste 6. Reduction in carbon footprint 7. Lower emissions 8. Lower property/casualty insurance costs 9. Lower maintenance costs	In this section, the key benefits are a reduction in operating costs due to the reduction in resource use. For example, for energy, the operating cost benefit is a function of the amount of energy reduction and the price of energy, and its expected price change over time. Each of the reductions in resource use are sustainable property outcomes, which should be the foundational requirements of measurement and verification programs and policies. In addition to the direct operating cost savings, strong building performance in each of the nine categories of reduced resource use are the primary contributors to sustainable certification compliance and meeting the demands by regulators, space users, and investors. The indirect benefits of reduced resource use as a result of their impacts on regulators; space users and investors are identified and described as benefits in other parts of the GBFC Sustainable Property Cost-Benefit Checklist.	The first step in analyzing the applicability of this benefit is to evaluate actual or projected resource use and cost, and assess the reasonableness of measurements and reporting. Are the measurement metrics correct? Are appropriate historic time periods used? Are projected benefits based on a combination of sustainable features and strategies logically estimated? Reduced resource use, particularly reductions in energy and water use, and resulting cost savings, have typically been perceived as the easiest to analyze and assess quantitatively, and thus have been emphasized by real estate decision makers. This perception is largely accurate, particularly for existing sustainable properties with seasoning, but there are still key issues to consider when evaluating the financial performance of a property as a result of reduced resource use. Key issues include the reliability and accuracy of forecasts, the durability of reduced resource use over time, the influence of changing resource prices, the effect of lease structure and allocation of benefits over time, and the quality/reliability of measurement and verification practices. The specific challenges and methodology to assess the reliability and accuracy of energy forecasts is presented in Chapter VI, Section E: Underwriting Energy-Carbon Reduction. Energy is by far the most important issue in understanding the value and financial performance of sustainable properties, and thus should be focused on in the underwriting or due diligence analysis. Energy costs

[115] "The Green Built Environment in the United States, 2008 Year-end Update of the State of the Insurance Market," Marsh, February 2009.

[116] Ibid.

Potential Property Benefits	Description of Benefit	Applicability Analysis[106]
		are significant in the operating cost budget and reduced energy use is also the most integrally tied to regulator, space user and investor demand. Many of the other non-energy related resource use benefits are of less magnitude, and it is more reasonable to rely upon forecasted savings based on design intent and an analysis of sustainable property process and feature risks. There is direct evidence of lower property/casualty insurance costs for sustainable properties, based on policies offered by Fireman's Fund Insurance, Lexington, ACE, Traveler's, Liberty Mutual Property, and others.[115] In evaluating the cost savings from insurance policies it is important to assess both the actual cost savings as well as benefits due to coverage enhancements and other changes. [116] Lower maintenance costs can be achieved through reduced expenditures to clean carpets, less frequent light bulb replacement, and changes in the schedule and nature and cleaning, among other factors.
E. Improved Building Operations	Improved building operations can contribute to increased space user demand due to: • Reduced cost of changing space • Fewer tenant/occupant complaints • Reduced frequency of capital expenditures • Reduced tenant turnover/re-leasing • More reliable functioning of systems	Improved building operations are primarily a result of a more thorough planning process and integrated design; commissioning which improves the functioning and reliability of systems; and more flexible and adaptable workspaces due to under-floor air ventilation and other attributes. As a result of these sustainable attributes, specific building performance relative to tenant/occupant complaints, the speed and cost of tenant improvements, and the frequency of capital expenditures can be improved. Given the rapid change in many organizations, both in

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		building owners and tenants, space that is built to be very flexible has significant advantages in its ability to adapt to changing needs at the smallest possible cost. Flexibility is not only a sustainable issue, but sustainable attributes can contribute to flexibility. Further, a building that is flexible and durable enough to meet changing needs over a longer period of time is more sustainable.
1. Reduced cost of changing space	The Institute of Facility Management (IFMA) defines "churn" rate as the number of moves in a year expressed as a percentage of the total number of offices occupied. Churn rates averaged 36% in a 2007 IFMA survey, down from 44% in 1997 and 41% in 2002. "More than 85% of the moves are 're-stacking' moves, which take place within the same building. Those re-stacking moves take different forms. Box moves, in which employees move to existing workspaces, involve relocating files and supplies, not furniture, wiring, or telecommunications systems. Furniture moves are more complex and involve reconfiguring existing furniture or adding new furnishings, although changes to telecommunications are usually minimal. Construction moves are the most complex and include new walls and telecommunications systems and additional wiring for power and data. Costs associated with the three major elements involved in these moves—furniture, cabling, and walls—vary depending on a number of factors. These include prevailing labor rates, materials used (Category 5e cable versus Category 6), and technology support required. A facility designed for wireless access can reduce costs considerably because no wiring is required.	The potential benefits of reducing churn costs will be a function of the level of churn for the types of space users that will be occupying the space, and the specific types of sustainable features (under floor air ventilation, carpet tiles, etc.). According to IFMA research, the primary drivers of churn are • Reorganization (70%) • Routine churn (53%), which includes collocating groups to improve collaboration and maximize efficiencies within and between departments • Expansion (46%) • Consolidation (33%) Downsizing (11%) and mergers (9%) are the weakest drivers of churn. [118]

[117] Churn Reconsidered, Herman Miller 2008; "Project Management Benchmarks," IFMA, Research Report #28, 2007, p. 41.

[118] Ibid.

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	IFMA-member companies reported that box moves average $152, whereas furniture moves cost $679 per move, excluding power and cabling changes. Moves that include changes to power and cabling range from $200 for simple changes to $600 for extra circuits and receptacles. Typically, costs per drop (bringing two or three cables into a workstation) are an additional $300 to $450, and that's only for data cabling; electrical is additional. Thanks to wireless networks that allow people to work from anywhere in the building, "soft costs," associated with downtime (lost productivity) are less of a problem than they used to be.[117]	
2. Fewer tenant/occupant complaints	Well-designed sustainable properties can result in fewer tenant/occupant complaints. This can be as a result of greater control (windows that open, individual office environmental controls), improved thermal comfort, improved functioning of equipment (commissioning and recommissioning), increasing the amount of daylight, and other factors.	The primary evidence supporting this potential benefit would be tenant/occupant satisfaction studies that cover the type of building and/or potentially the types of tenants in the subject property. Similar information obtained from local brokers, the subject property building manager, and/or interviews or discussions with tenants could also supplement this analysis. It is not important to precisely quantify the magnitude of this potential benefit, but incorporate findings into the overall discussion and understanding of improved building operations, and potential implications on operating costs and space user demand.
3. Reduced frequency of capital expenditures	Sustainable properties can benefit from more durable products and materials and longer life due to more frequent recommissioning. More flexibly designed interior improvements and core and shell designs can improve the longer-term durability/adaptability of a property.	Hard evidence of the reduced frequency of capital expenditures is not yet available in the U.S. due to the longer-term nature of such data, and the relatively recent growth of the sustainable property market. Those seeking capital should provide strong articulation of potential benefits, and the potential for reduced capital expenditures should probably be treated as a risk benefit, rather than a specific adjustment in potential capital expenses, unless it can be convincingly demonstrated.
4. Reduced tenant turnover/re-leasing	Reduced tenant turnover due to higher tenant retention rates due to improved space user demand for the property will reduce the costs of tenant turnover as well as releasing expenses. Tenant improvement and leasing expenditures for new versus returning tenants are substantially greater.	The best evidence for potential reduced tenant turnover is the overall determination of the potential for increased space user demand, discussed fully in Chapter VI: Section F: Underwriting Space User Demand.

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5. More reliable functioning of systems	Sustainable properties have the potential for more reliable functioning of systems due to the improved communication among participants in the development process due to integrated design, commissioning, and recommissioning.	The potential for more reliable functioning of systems needs to be offset by potential difficulties of systems if they are too pioneering in nature. Additionally, this is just one of many points that support improved building operations, which is part of what will attract both space users and investors. It is not necessary to precisely quantify the incremental contribution of more reliable functioning of systems, just include it in the articulation of potential benefits if warranted by the subject property.
F. Reduced Cash Flow/Building Ownership Risk		
1. Improve ability/cost to meet future regulatory compliance	Sustainable properties are well positioned to significantly reduce cash flow/building ownership risk. Lower risk will increase value by lowering discount and capitalization rates, and lower the required return necessary for investors/corporations to make a positive decision about sustainable property investment. (More detail in Chapter V: Section E: Assess Costs/Benefits of Sustainability) For investors or lenders, the most important risk benefit is the protection against future increases in demand for sustainable properties by regulators, space users, and investors. Given the dramatic increase in demand and the fact that lenders or investors will be evaluating cash flow streams well into the future, protection against future change will be a critical risk benefit. Space users (tenants and corporate owner-occupants) will also be interested in the risk benefits from regulatory and investor demand change, but will have even more direct concern about the ability to limit liability due to building health-related issues, limiting the risk of future energy or water cost volatility, and other factors.	The measurement and assessment of potential reduced cash flow/building ownership risk is based on a compilation of the underwriting of the subject property's attractiveness to regulators, space users, and investors, as well as an assessment of reduced resource use projections, and other factors. The traditional way discount and capitalization rates have been generated is through market research. Capitalization rates are calculated based on evaluating comparable sales of commercial properties, and discount rates are typically determined through an analysis of the most likely buyer of a project, and their rates of return requirements, through surveys or other means. Market derived discount and capitalization rates are then adjusted for the specific concerns and considerations of the particular property, given its risk attributes. When market transactions are limited, and capitalization and discount rates are difficult to determine based on market evidence, or the number of property sales for a particular specialized property type is too low (as is the case with sustainable properties), the derivation of capitalization and discount rates relies more upon a detailed articulation and reconciliation of the risk-increasing and risk-decreasing factors of a particular property.
2. Ability to capitalize on future government incentives		
3. Improved ability to meet changing space users demand		
4. Improved ability to meet changing investor demand		
5. Prevent risk of loss of "social license" to operate building		
6. Limit liability due to building related health issues—sick bldg, mold claims		
7. Limit exposure to future compelling health and/or productivity research		
8. Reduced risk of reliance on grid (terrorism)		
9. Increased flexibility/adaptability		
10. Reduce risk of building not operating as designed		
11. Limit exposure to		

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energy/water cost volatility		
12. Reduced exit/take-out risk • Improve financing—terms, price, availability, etc. • Increase flow of capital from SRI/RPI Funds 13. Overall reduced potential loss of value due to functional, economic and physical obsolescence		While anecdotal (based on many interviews and discussions, but not based on a random or statistically significant survey), our research shows that for most institutional investors, new development projects achieve a relatively high level of sustainability, and institutions are moving rapidly to assess their existing portfolio's sustainability related potential for functional or economic obsolescence due to sustainability. Many of the largest real estate owners are developing specific acquisition screens to eliminate potential risks from properties that are unsustainable, or where the cost to cure potential obsolescence from sustainability is not financially feasible. Additional surveys, anecdotal evidence, and actual valuation evidence will increase in the future, improving the capability to analyze this issue. One important caution in trying to determine the incremental effect of sustainability on property value is the tremendous increases in value between 2005 and 2007 and the subsequent substantial decreases in value after that time. Given these substantial changes, with values changing as much as 2% a month during certain time periods, any statistical efforts to isolate sustainability will be very difficult.
G. Public Benefits[119]		
1. Infrastructure Cost Benefits	Water collection, storage, treatment and distribution • Energy production and distribution • Road & bridge construction/maintenance • More efficient use of existing infrastructure	See Public Benefits discussion in Expanded Chapter V-C2-a.
2. Environmental & Resource Conservation Benefits	Conservation of natural resources • Landfill reduction • Reduce air pollution	See Public Benefits discussion in Expanded Chapter V-C2-a

[119] Public benefits become private investor/landlord benefits when the investor/landlord can monetize the benefits through government regulatory relief, incentives, tax benefits, etc.

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	• Reduce water pollution • Reduce soil erosion • Reduce deforestation • Reduce desertification • Preserve ozone layer • Reduced drought risk	
3. Land-Use Benefits	Preserve open space and natural habitat • Protect agricultural land • Maintain vibrant urban areas • Reduced traffic congestion	S See Public Benefits discussion in Expanded Chapter V-C2-a.
4. Reduced Climate Change	Reduce vulnerability to climate change • Reduce costs to respond to change • Reduce spread of infectious respiratory disease • Reduce acidification • Contribute to many other environmental benefits • Improve public health	See Public Benefits discussion in Expanded Chapter V-C2-a
5. Economic Benefits	• Job creation • Improve public health and well-being • Reduce insurance costs • Reduced public health costs—Medicare • Reduced government employee costs • Increased worker earnings and tax revenues • Community competitiveness – quality of life	See Public Benefits discussion in Expanded Chapter V-C2-a.
6. Security Benefits	Reduce reliance on foreign energy sources	See Public Benefits discussion in Expanded Chapter V-C2-a
H. Increased Investor Demand		
1. Reduced capitalization and discount rates	The primary benefit of increased investor demand is to reduce capitalization and discount rates, which result in higher property values. Increased investor demand is	As discussed briefly in the reduced cash flow/building ownership risk section above, the evidence for increased investor demand is difficult to quantitatively determine,

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	largely tied to: • Increased space user demand • Lower operating costs • Reduced cash flow risk • Favorable depreciation/other tax benefits • Reduced risk of functional obsolescence	and will continue to be difficult to incrementally assess for sustainability. However, as is commonly done with conventional real estate, underwriters and valuers develop a detailed understanding of the most likely buyers of a potential property and assess the property attributes that are important to these groups. This research is based on surveys of investors by third parties, surveys by underwriters and valuers, analysis of qualitative and quantitative work evaluating investor demand for property, and other information. Understanding an investor's interest in sustainability is no more difficult than ascertaining their interest in particular building designs, locations, floorplate sizes, lobby or landscape quality, or other factors that are conventionally considered in a real estate analysis. New sources of third-party research concerning investor demand are beginning to appear and will grow in their scope and sophistication.
2. Reduced exit/take-out risk	Another key benefit of increased investor demand is reduced exit risk for developers, who sell their finished products, and reduced take-out risk for construction lenders, who must rely upon permanent take-out financing to exit their commitments.	See argument above.
3. Increased FAR—zoning--density bonuses	One of the potential benefits of sustainable properties is increased floor area ratio, density bonuses, or other zoning benefits that can increase the volume of space that can be built on a particular piece of land, increasing the value of the land, and the value of the project to investors and developers.	Looking at local government regulations for the subject property, and determining if the subject property's sustainable performance meets threshold requirements can help determine a property's potential FAR/zoning density bonuses.
4. Improved access to debt financing	Improved access to debt financing will increase the demand for a property by investors. Favorable financing, particularly relative to access, even if costs are not significantly lower, would be a substantial benefit in today's property debt financing marketplace.	This needs to be assessed through understanding of most likely capital sources and their position towards sustainable properties.

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Sustainable Property Cost-Benefit Checklist

Potential Property Costs	Description of Cost	Applicability Analysis[120]
A. Increased Development Costs		
1. Certification, energy modeling, legal and commissioning costs 2. Higher cost specialized service providers 3. Higher cost products and systems 4. Higher tenant improvement costs for green improvements 5. Higher finance costs—more high cost equity; increased construction interest 6. Project delays	One of the most hotly debated issues in the sustainable property sector is whether sustainable properties or retrofits cost more than conventional properties. This "first cost" analysis is discussed at some length in Section F-3 of Chapter V and in more depth in Chapter IV, Section E-1 on Development Costs. As fully discussed in those sections, the clarification of the cost question, as well as a full consideration of cost-increasing and cost-decreasing attributes of a sustainable project are critical to addressing this issue. Sustainable properties do have additional costs compared to conventional properties. Sustainable certifications, more sophisticated energy modeling, and higher legal and commissioning costs increase development costs over conventional projects. Higher costs for products, materials, systems, and specialized service providers are possible, and to be expected in some cases, but this will vary dramatically by project and geography, as well as the particular market conditions relative to the contractor bidding climate and other factors. There have been dramatic improvements in the cost and availability of sustainable products, systems and materials in recent years, and growing sophistication and capacity of service providers. However, projects seeking a leadership position as to their sustainability rating, or in the use of pioneering products or systems, will experience both higher costs, and greater uncertainty than conventional properties. We have not seen specific evidence of higher tenant	Potential increased development costs can be evaluated through assessing development budgets, sustainable process and feature issues, and other mitigation strategies. The potential for increased development costs can be mitigated through an evaluation of the integrated design process, contracts, service provider capacity, and a review of the nature of the sustainable features and systems to check for any pioneering or higher risk design and construction elements. Another key issue in thinking about the incremental cost of sustainable construction is to be careful to not attribute too much of any construction cost increase, or volatility, to sustainability alone. For example, in the four years prior to the economic collapse in 2008, the Producer Price Index (prices of materials and components for the construction industry) went up 40%, compared to just 18% for the consumer price index.[121] Some of the key inputs into the construction process increased at a much faster rate during this time period: Crude oil: 301% Diesel: 252% Asphalt: 190% Gasoline: 167% Copper and brass: 146% Iron and steel: 114% Concrete: 36% Consumer Price Index: 18% The rapid increase in the cost of fuel during this time

[120] This column provides select guidance on assessing the applicability of a general cost-benefit to a specific property.

[121] Smart Construction: Economical Building Solutions to Offset Soaring Materials Prices, Leo Pardo Construction, Bureau of Labor Statistics, Jan. 04 to Jan. 08 Time Period, 2008.

Potential Property Costs	Description of Cost	Applicability Analysis[120]
	improvement costs or higher financing costs, but both are possible. Higher tenant improvement costs could result from the use of relatively expensive glass or lighting systems in internal spaces, or from product or service provider capacity and experience issues. Financing costs could be higher if lenders do not recognize the value of some sustainable improvements, increasing the amount of high cost equity that is needed. Additionally, with greater up front expenditures for planning and other activities, construction interest may also increase due to earlier and larger loan draws. Development costs can also increase through project delays due to the complexity of sustainable construction, delayed product or system deliveries, or capacity issues relative to contractors and subcontractors. Such delays can increase construction cost due to timing and management problems and an increase in construction period interest.	period influenced most costs. It affects petroleum-based materials such as asphalt, plastic, rubber, PVC, insulation and roofing shingles, and every single construction material requires manufacturing and transportation, sometimes across thousands of miles, which consumes fuel. Accordingly, while fuel prices are significantly down in 2009, sustainable products and practices (emphasis on local materials) can both mitigate construction costs and construction cost volatility. It is also important to remember when evaluating potential incremental increases in development costs for sustainability, that it is often difficult to get a statistically significant answer, given the relatively high variance in bids by contractors for the same construction plan. While estimates of bid variance of 5% to 10% for construction contracts is a reasonable rule of thumb, a recent study of commercial interiors projects found that average bid swings for many components, such as ceiling tile and carpets, had an average bid swing of 5%, while electrical bid swings pushed as high as 20%. This was important in that approximately 25% of the interior construction costs was spent on electrical, based on the study's results.[122] While this type of analysis is important for any project, it should be noted that the key issue in making a sustainable property investment decision is not whether the initial costs are more than a conventional project, but whether the additional costs, if any, are supported by sufficient benefits to justify potentially higher initial costs.
B. Increased Development Risk		
Construction risk	Sustainable property investment can increase construction risk, which is defined as the risk that a project will not be completed on time or within the allocated budget. Some of the key issues that can increase construction risk include: • Pioneering design and construction • Contractor bidding climate and uncertainty:	An evaluation of construction risk is similar to the evaluation of the potential for increased development costs above. While much of the risk can be mitigated through using experienced contractors and service providers; limiting untested or pioneering design, construction and features; and engaging an experienced

[122] Ibid.

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Sustainable Property Cost-Benefit Checklist

Potential Property Costs	Description of Cost	Applicability Analysis[120]

	contractors demand payment for uncertainty in the bidding process
	• Pioneering products/systems
	  o Untested performance and reliability
	  o Availability
	  o Combining new systems/technology
	  o Potential for rapid functional obsolescence
	• Systems interoperability
	• Increased new/retrofit construction complexity
	• Potentially underestimated contingency reserves
	• Building codes and regulation complexities/limitations
	• Service provider capacity and experience
	• Specialized subcontractors / equipment
	• LEED / Certification compliance
	• Regulatory compliance
	• Credit capacity of subcontractors
	• Capacity of sureties to handle green projects
		sustainable certification consultant to lead you through the process, paperwork, and other required tasks, many sustainable properties will still experience significant additional construction risk.
		
		One example of increased risk can occur with building codes and related regulations. With over a hundred years of building codes based primarily on life and safety factors, even well-intentioned municipal and state governments cannot eliminate the conflicts that exist with some aspects of sustainable properties. Waterless urinals have been a particular issue as many local governments, due to union and other pressures, either do not allow waterless urinals, require dual sets of plumbing, or do not allow waterless urinals for an individual tenant build-out. With governments, building owners, and tenants starting to come together on these issues, it is hoped that these kinds of risks can be further mitigated in the future.
		
		Performance bonds, payment bonds, completion bonds, and other types of surety are also used to mitigate construction risk. Performance bonds protect lenders in the event the contractor fails to complete the project as agreed. Payment bonds are an undertaking by the surety that all persons supplying labor and materials to the project will be paid. Completion bonds involve the surety agreeing to complete the project, regardless of cost.[123]
		
		Sustainable projects, like conventional projects, can mitigate risk through these types of surety. Based on a survey by Marsh in early 2009, sureties have not developed any new products or services for the green building marketplace, and have made no specific adjustments to their underwriting criteria to deal with this sector. Some sureties surveyed did have specific concerns revolving around onerous contract provisions and the risk of inadvertently guaranteeing a specific

[123] US CMBS: Moody's Approach to Rating Commercial Real Estate Construction Loans, January 20, 2006.

[124] Extracted from "The Green Built Environment in the United States, 2008 Year-End Update of the State of the Insurance Market," Marsh, early 2009.

Potential Property Costs	Description of Cost	Applicability Analysis[120]
		performance or efficacy for energy usage, water consumption, and/or LEED certification. Green contracts are being closely monitored. Marsh also reports that some jurisdictions have implemented regulations that require bonds to guarantee LEED certification and specific performance standards. Such regulations have generated scrutiny from surety companies both individually and on the part of the industry association. However, green building ordinances that contain surety requirements have not yet been pushed down to the contractor level. There have been no known issues of green related contractor defaults.[124] Standard construction loan risk management techniques will also reduce potential risks. Reputable and experienced borrowers, construction managers, or a guarantor of debt by a credit-worthy borrower guarantor is one method. Construction loan draws should be linked to construction performance, based on inspections and lender approvals. Delay cost reserves covering any potential expenses that could be incurred (such as might be payable to a key tenant due to delay) can also be put in place. Budget contingencies, typically at 5% to 10% of the total project budget, are also usually required.
2. Legal/contractual risks	Sustainable properties introduce a number of important legal and related contractual risks that increase development risk if not appropriately mitigated through improved contracts, training, and behavior. Some of these risks include: • Design firm professional liability • Construction contracts • LEED/Certification Liability • Misrepresentation and fraud risk: marketing and leasing protocols • Warranties • ESCO contracts • Entitlements • Insurance contracts	**Design firm professional liability.** Design firm professional liability is primarily an issue for architects and design firms who want to limit the potential for litigation, but improved and more clearly specified contracts will also help investors. For any owner or investor who has gone through litigation, they know that even the winners often do not "win." From the owner perspective, design and construction is already complex, and additional sustainability requirements and issues can make it even more so. Given the leadership of architects and designers in sustainability, it is natural and appropriate for owners to look to architects for education and guidance in this new

Potential Property Costs	Description of Cost	Applicability Analysis[120]
		field. However, it is important that the owner understand that their job is to communicate the importance of the economics, and the values that they are seeking in a project, and it is to their benefit to have contracts that clearly lay out the relative risks and responsibilities between architects and designers and owners. The architectural community has stepped up their responsibilities to sustainable design in recent years: "Looking at AIA B101-2007, the standard form of contract between architect and owner, sustainable duties are immediately apparent. That document provides, in pertinent part: 3.2.5.2 The architect *shall* consider environmentally responsible design alternatives such as material choices and building orientation, together with other considerations based on program and aesthetics that are consistent with the Owner's program, schedule and budget for Cost of the Work. (Emphasis added) Thus under the AIA contract, for the very *first* time, the architect is actually required to consider and evaluate green or sustainable design alternatives as part of the base services. The AIA Canons of Ethics create and impose similar duties, taken one step further. Under the modern Canons, the architect now actually has duties running to the environment. In that regard, Canon IV – Obligations to the Environment, specifically provides.: Members should *promote* sustainable design… E.S.6.1 Sustainable Design: In performing design work, members should be environmentally responsible and ***advocate*** the design, construction

Potential Property Costs	Description of Cost	Applicability Analysis[120]
		and operation of sustainable buildings and communities. E.S.6.3 Sustainable Practices: Members should use sustainable practices within their firms and professional organizations, and they should ***encourage*** their clients to do the same. (Emphasis added.)"[125] Architects and owners need to be careful and understand the role of an "advocate" for sustainable design, and appropriately recognize their relative responsibilities and roles. Frederick Butters, in his article[126], provides an example of this issue: "For example, the architect who takes the AIA documents' admonishment to "advocate" for sustainable design and sustainable products to heart and recommends to the owner an HVAC system based on a heat pump package that draws on a geothermal or water source. Unfortunately, the projections regarding the temperatures at which the geothermal or water source run are erroneous and the actual temperatures are warmer than projected. As a consequence, the system is less efficient and unable to maintain comfort on 10 percent of the warmest days in the summer. Tenants are angry and withholding rent. Vacant space remains vacant. The owner is faced with a complete retrofit of the HVAC system in order to resolve the problem at substantial expense. The owner looks to the design professional to correct the problem. While it may seem like a good idea, geothermal-based energy sources are unpredictable. If the architect does not clearly and sufficiently indicate the positives and negatives of the HVAC options, the client will be

125 Frederick F. Butters, "Greening the Standard of Care: Evolving Legal Standards of Practice for the Architect in a Sustainable World," *Real Estate Issues*, Counselors of Real Estate, Vol. 33, No. 3, 2008.

126 Ibid.

Potential Property Costs	Description of Cost	Applicability Analysis[120]
		looking to the architect to make him or her whole. Becoming an advocate for many types of sustainable approaches may cause the design professional to overlook the messy reality for the sake of being a good advocate." The American Institute of Architects understands the importance of risk issues and has a series of 14 different memoranda in the risk management best practices strategies section on their website. Other potential design risks include: "Liability for the increased cost of certain types of damages, such as lost profits, lost business opportunities, increased tax burdens, and energy costs. Liability for warranting an outcome without having complete control over things such as construction means and methods and operation and maintenance. Liability for structural problems and leaks associated with green roofs. Lack of proper green experience and qualifications on the part of the design team. Lack of control over material specifications and substitutions on the p art of the contractors."

[127] Extracted from "The Green Built Environment in the United States, 2008 Year-end Update of the State of the Insurance Market," Marsh, February 2009.

[128] Paul Arelli, "Selling and Governing the Green Project: Owner Risks in Marketing, Entitlement and Project Governance," *Real Estate Issues*, Counselors of Real Estate, Vol. 33, No. 3, 2008.

[129] Cathy Turner and Mark Frankel, "Energy Performance of LEED® for New Construction Buildings," New Buildings Institute Final Report, March 2008, pp. 1-4.

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		The 2009 Marsh Report made the following observations: “As of May 2008, all markets surveyed acknowledged that it is premature to draw any conclusions or to offer new coverage. Much will likely depend on the claim activity or lack thereof. Insurers already have experienced claim activity. Below are several examples: • Claim by developer against architect because building did not achieve LEED Gold Certification. • Claim against architect and structural engineer due to water infiltration from green roof. • Claim against design team because the cork flooring they specified resulted in water retention and mold. • Claim against architect because lack of green product availability caused project delays. • Claim against architect because health problems of tenants’ employees increased despite warranties that the indoor air quality would improve. Most markets believe that traditional design professional liability policies provide a significant amount of coverage for the negligent performance of professional design services. However, the general consensus is that a key difference between traditional design and green design involves enhanced performance expectations (i.e., energy savings, employee productivity, etc.) and an evolving standard of care, which may not be covered by traditional architects and engineers professional liability insurance policies.

Potential Property Costs	Description of Cost	Applicability Analysis[120]
		As of the date of creating this report, no insurance companies surveyed have made changes to their underwriting criteria, pricing and/or coverage with respect to the design of green buildings. Several insurers do provide risk and contract management advice for their design firm clients. Focus is placed on the avoidance of performance guarantees, the appropriate standard of care, and a well-defined scope of services."[127] **Marketing risk** Owners could also be subject to significant legal risk in the marketing of their projects. Sustainable property investors and developers are subject to claims of misrepresentation and fraud resulting from property marketing. These risks arise largely because the marketing process begins well before a project is certified, a lack of knowledge about the studies and data they cite, insufficient consideration of the specific application of studies and data to their project, and the actual variability in sustainability outcomes achieved by properties to date. As a result, sales and leasing brokers or principals marketing their projects have the potential to make claims that are untrue at the time that they make them. Many in the market are confused about the difference between pre-certification, registration, certification, and other varying levels of sustainability. It is also important to be careful in making "first in market" claims or other claims that are not carefully researched. Given the long time frame in which marketing documentation often exists, these kinds of claims can also become untrue over the life of a document.[128] It is particularly important not to cite industry studies without appropriate caveats and/or limitations. Many studies show that actual energy performance is quite volatile with a wide scatter among the individual results

Potential Property Costs	Description of Cost	Applicability Analysis[120]
		that make up an average energy savings. Consequently, if an owner cites averages in marketing their project, there is a high likelihood that they will be wrong. [129] There is also a substantial risk in presenting or promoting a project with unsupported claims in that capital providers, as part of their due diligence, often will uncover poorly supported or misleading facts and statistics, thus undermining the credibility of all of the appropriately argued and supported information in a funding request. These risks can be mitigated through training of staff and the development of protocols for reviewing marketing and promotion materials. A good discussion of these and other issues can be found in "Selling and Governing the Green Project: Owner Risks in Marketing, Entitlement and Project Governance," Paul D. Arelli, *Real Estate Issues,"* Counselors of Real Estate, Vol. 33, No. 3, 2008. On a similar note, unsubstantiated or over-stated claims made during the entitlement process can also lead to problems, and potentially be turned around on a developer by becoming part of the requirement(s) of the development agreement. The Federal Trade Commission has published a brochure, "Complying with the Environmental Marketing Guides" that provides the FTC staff's view of the law's requirements. The FTC Act gives the Commission the power to bring law enforcement actions against false or misleading marketing claims, including environmental or "green" marketing claims. The FTC issued its Environmental Guides, often referred to as the "Green Guides," in 1992, and revised them most recently in 1998. The Guides indicate how the Commission will apply Section 5 of the FTC Act, which prohibits unfair or deceptive acts or practices, to environmental marketing claims. Like other industry guides issued by the FTC, the Environmental Guides "are administrative interpretations of laws administered by the

Potential Property Costs	Description of Cost	Applicability Analysis[120]
		Commission for the guidance of the public in conducting its affairs in conformity with legal requirements." Conduct that is inconsistent with the positions in the Environmental Guides may result in corrective action by the Commission, if after investigation, the Commission has reason to believe that the conduct violates prohibitions against unfair or deceptive acts or practices. The Environmental Guides apply to all forms of marketing for products and services: advertisements, labels, package inserts, promotional materials, words, symbols, logos, product brand names, and marketing through digital or electronic media, such as the Internet or email. They apply to any claim, express or implied, about the environmental attributes of a product, package or service in connection with the sale, offering for sale or marketing of the product, package or service for personal, family or household use, or for commercial, institutional or industrial use. See the complete text of the Environmental Guides. http://www.ftc.gov/bcp/edu/pubs/business/energy/bus42.shtm Construction contracts, warranties, escrow contracts, insurance documents, and other specialized legal documents also add risk, simply because they are new and may be untested by owners and developers. Appropriate legal representation and/or other specialized services should be retained to mitigate these types of risks.
3. Exit/take-out risk	Sustainable property developments, like all developments, are subject to exit or take-out risk. Take-out risk is the risk that a construction loan's balloon will not execute as planned. Exit risk relates to the sufficiency of the price an owner would be able to achieve at the time of sale. Failure to execute a take-out could be due to rising interest rates, capital market distress, and/or sustainable property underperformance in areas like those shown below: • Building envelope performance	The key issues in assessing the implications of sustainability on exit or take-out risk for a specific property include those issues addressed above in the construction and legal risk sections, but are even more heavily focused on real estate market risk. The financial performance and value of a property is key to exit/take-out risk. Permanent take-out loans will typically have specific requirements relative to pre-leasing, pre-sales, or other specific targets that must be

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	• Product / system performance: combining new systems and technologies • Energy cost volatility • Contractor experience / performance • Service provider performance • Building underperformance • Market underperformance	met. Sufficient value is key to equity investors, particularly developers; whose profitability is driven by sales prices once the project is complete. Unlike conventional properties, not only does the market have to be strong for the property, but there is also a more significant issue relative to commercial broker and appraiser recognition of that value. While both the commercial brokerage and appraisal industries are ramping up their training and education efforts in the sustainability area, it will take a number of years for these service providers to increase their understanding and acceptance of sustainability benefits. One of the key market risks that need to be assessed is whether the level of sustainable property investment matches the demand by tenants and investors in the marketplace. For example, while a high level platinum or gold LEED building is a very desirable outcome, depending on the types of space users and most likely buyers in the marketplace, it is possible that the level of expenditures required to reach the highest levels of sustainability might be viewed as an over-investment relative to the market. This type of risk is similar to that experienced by all developers, who must match their building design and quality successfully with market demand, or risk the consequences. Another interesting area of risk that needs to be considered is that of the building enclosure. Daniel Lemieux, AIA, in a recent article, stated it this way: “Energy efficiency is not the only goal of a sustainable building. Other goals include indoor environmental quality and durability. Simply put: uncontrolled rainwater penetration, condensation and moisture ingress are three of the most common threats to the long-term durability, structural integrity and performance of the building enclosure. In the past, statistical data has suggested that collectively they represent up to 80% of all construction

Potential Property Costs	Description of Cost	Applicability Analysis[120]
		related claims in the United States."[130] Mr. Lemieux goes on further to say that "since 2004, a new pipeline of litigation has begun to form, partially stimulated by the growing demands of sustainability for improved energy and related resource use. He suggests that the primary problems in the context of building enclosure failure originate from errors and omissions arising from the frequently short-circuited design process, one that reflects the compartmentalization of design and, in many instances, the attempt to relocate design responsibility downstream to the subcontractors and trades responsible for the work."[131] Mr. Lemieux suggests that specialized building enclosure commissioning can assist in reducing potential problems with the building enclosure.
C. Decreased/Unchanged Space-User Demand		
1. Excess investment cost relative to market demand	• Invested more than market willing to pay • Selected incorrect combination/mix of sustainable features	Every real estate project faces risk from over-investment—spending more on a building or project than the market is willing to pay for it. For sustainable properties, which are often difficult to clearly define, and certainly the marketplace have an unclear understanding of the differences in levels of sustainability, this issue can be even more important. To assess the applicability of this particular risk, you need to compare the level of sustainability planned for a project, and the related costs, with the particular profile of the space users expected in the building. This analysis of space users, which is described in more detail in Chapter VI: Section F. will provide perspective on space user needs. Tenant surveys and an initiative like the Sustainable Leasing Initiative, which provides a minimum

[130] Daniel J. Lemieux, "Trust, But Verify: Building Enclosure Commissioning in Sustainable Design," AIA, *Real Estate Issues*, Counselors of Real Estate, Vol. 33, No. 3, 2008; Bomberg, M. T., and Brown, W.C. (1993), "Building Envelope and Environmental Control: Part I – Heat, Air and Moisture Interactions," Construction Canada 35 (1), 15-18.

[131] Ibid.

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		checklist of the types of sustainability requirements multinational corporations want, can provide some indications of the minimum standards required by the space user market. While the evidence is anecdotal, the Consortium's research suggests that achieving the highest levels of sustainability (a gold or platinum level for a LEED certification) is probably not needed to capture much of the space user demand. This may change over time as the market matures and higher levels of sustainability become the norm, and will certainly not be true for the LEED headquarters buildings of most major space users, where a high level of certification is typically desired.
2. Space-user demand does not meet expectations	• Price/non-sustainable factors dominate specific target occupiers • Tenants not educated enough • Less demand from smaller tenants in smaller buildings • Gross-lease market does not encourage tenant focus on cost savings • Liability limits marketing benefits • Incorrect assessment of likely space users	To assess the applicability of this particular risk, the valuer/underwriter needs to consider the sophistication and education of likely space users, market conditions, which could make rent a dominant factor for some types of users, potential limitations in marketing benefits, and consideration of the specific terms of leases (particularly if it is an existing building).
3. Building operating problems	• Products underperform • Service providers underperform • New systems learning curve for engineering staff/maintenance staff/etc. • New/different systems can reduce economies of scale for engineering staff for a concentrated portfolio of similar assets • Capacity/seasoning of service providers/contractors • Tenants do not cooperate	This potential risk is particularly applicable for existing buildings, which sometimes experience underperformance problems in the initial ramp-up after a sustainability retrofit as tenants, management, and maintenance staff learn about operations of the newly retrofitted building.

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Potential Property Costs	Description of Cost	Applicability Analysis[120]
D. Increased Operating Costs		
1. Higher maintenance costs--training, manuals 2. Vendor availability and pricing 3. Product or system failure/underperformance 4. More costly lease analysis and implementation 5. Higher real estate taxes 6. Costs of required additional monitoring/measurement	In most cases, sustainable property investment will not result in increased operating costs, but perhaps operating costs that are higher than initially projected. For example, while the original projections could be for a 40% reduction in energy use, insufficient training of engineers, maintenance staff, and tenants, as well as systems or service providers that do not meet performance expectations, could limit the reduction in energy use to a lower number, say 25%. Additionally, energy costs could have gone down significantly, like they did in 2008, reducing operating cost reductions, while resource use reduction may have met original projections. Additionally, sustainable properties require additional monitoring and measurement of sustainability outcomes, and, in addition to the capital cost to put in such systems, there are additional operating costs which will be required, including, at least initially, additional time and expense to administer and address lease issues. If values go up due to the sustainable property investment, higher real estate taxes could result, increasing operating costs beyond historical norms.	(See Section I-D of this Appendix)
E. Building Operating Problems		
1. Products underperform 2. Service providers underperform 3. New systems learning curve for engineering staff/maintenance staff/etc. 4. New/different systems can reduce economies of scale for engineering staff for a concentrated portfolio of similar assets 5. Capacity/seasoning of service providers/contractors 6. Tenants do not cooperate	Building operating problems can occur on sustainable properties primarily due to products, systems, service providers, maintenance staff, and other factors in the production and operation of a sustainable building that are more pioneering, or untested relative to their reliability. These learning curve issues are more likely to occur in the early operations of a building, but can also occur later due to untested durability and functioning over time of some systems.	The primary way to address the applicability of this potential risk is through evaluating the process and features of a sustainable property. Much of the risk of potential building operations problems can be mitigated through proper planning, modeling, contracts, and the selection of features and systems with more proven track records.

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Potential Property Costs	Description of Cost	Applicability Analysis[120]
F. Increased Cash Flow Risk	The most significant cash flow risk is to underperform pro-forma projections, rather than underperform compared to a property with no or limited sustainability attributes	The best way to assess potential sustainability related underperformance risk is to carefully consider the influence of incremental sustainability investment on key assumptions in the financial analysis or valuation. If the incremental contributions appear overstated, or are not clearly articulated, the risk of underperforming the pro-forma projections will increase.
1. Risk of rapid functional obsolescence	New technologies in sectors of the industry with substantial ongoing research and development investment, like the sustainable property industry, are subject to heightened levels of functional obsolescence, which has a direct impact on value, but can also impact space user demand and cash flows. For example, if an owner paid one million dollars for a new HVAC system, and two years later you could buy an HVAC system that was 15% more efficient for 10% less money, the value of the original investment has gone down due to functional obsolescence due to the introduction of leapfrog technology. 13.	Major expenditures on new products, systems, or strategies should be evaluated for this risk and mitigated through supplier contracts, phasing of implementation, further research, and other means.
2. Process Underperformance	One of the biggest risks to cash flow is poorly executed sustainable property processes such as those identified below: • Poor integrated design process • Legal/contractual risks o Design firm professional liability o Green leases o Warranties o ESCO contracts o Misrepresentation and fraud: marketing an leasing o Regulatory compliance o Securities fraud • Insurance o Environmental	To assess the influence of process performance on cash flow risk, the valuer/underwriter must assess each of the key processes, particularly those that have led historically to underperformance like: • Integrated design process • Contracts • Service provider capacity • Energy modeling • Commissioning • Sustainable certification • Measurement and verification • Occupant and building management training

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	o Property coverage o Casualty coverage o Business interruption • Inadequate commissioning • Insufficient measurement and monitoring • Insufficient training of property management	See Chapter IV, Section C: Process Performance for more detail on this topic.
3. Operating cost underperformance	Failure on these processes has been found to lead directly to building underperformance and poor financial performance. (See Chapter IV of "Sustainable Property Performance" for more detail) • Product or system failures/underperformance • Excessive lease analysis / administrative costs • Insufficient training / cooperation of property managers / occupants • Reliability / accuracy of energy forecasts • Sensitivity to potential declines in energy prices • Reliability of water use forecasts	Each of these issues needs to be evaluated in the context of the specific circumstances with the subject property being analyzed.
4. Revenue underperformance	Revenues are the most significant cost component of net cash flow, so risks must be assessed. Key risks include: • Delays due to regulator problems • Space user demand underperformance o Risk of overimprovement o Prioritizing the wrong systems upfront such that the assets competitive position is diminished relative to peer group. o Incomplete assessment of building uses o Market change o Insufficient consideration of lease impacts (separate meters, etc.) o Insufficient value recognition by commercial broker o Insufficient value recognition by appraisers • Loss of utility mark-up revenues	The potential for risk in revenue performance is a function of the aggressiveness of assumptions in the pro-forma regarding sustainability premiums. While historically revenue enhancement has not been an important part of sustainable property decisions, it will, and should be more important going forward, so more attention will have to be paid to this issue.
5. Value / Sales Price	• Inaccurate / overassessment of investor demand	Value/sales price underperformance can be assessed by evaluating the aggressiveness of sales price/value

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Underperformance	• Insufficient commercial sales broker recognition of value • Insufficient appraiser recognition of value	assumptions, the level and quality of analysis of most likely buyers, and a consideration of broker and appraiser recognition of value. For projects with projected sales more than a year or two in the future, and certainly for ten-year projection periods, the rapidly changing investor attitudes towards sustainable property investment need to be considered in selecting residual capitalization rates.
G. Limited/No Increase in Investor Demand		
1. Increase/no change in capitalization and discount rates	• Investors in subject market not educated enough/don't care • Non-sustainable factors dominate pricing/investor demand • Less sophisticated/smaller property owners • Liability limits ability to market advantages • Property improvements built to wrong standard: changing investor "sustainability" requirements	Investors are significantly influenced by space-user demand and the priority that sustainability issues are being given by the providers of capital. Capitalization and discount rates are market derived based on a detailed understanding of many of the issues identified in this Appendix.
2. Energy cost declines increase pay-back periods, reduce value of sustainable investment	Resource use could meet expectations but if energy or other resource costs go down, revenues and investor interest could suffer.	Evaluate sources and cost history of resources for the subject property.
3. Existing leases limit ability to pass costs to tenants--capture sufficient benefits to justify costs	• Existing leases in place limit cost pass-throughs on green retrofits • Net leases constrict ability to pass-through higher first cost investments in a competitive market	Evaluate lease structure and potential for lease changes at rollover dates.
4. Failure of appraisers/brokers to accept value/enhanced performance	Negative effect on value and financing	Market research and interviews with local community will help address these concerns.

Appendix H

Discounted Cash Flow Analysis

Revenue Inputs

Contract rental rates and other lease terms

Market rental rates:

- Ground floor retail — $1.50/SF NNN
- Office: floors 2-5 — $2.50/SF FSG
- Office: floors 6-10 — $2.60/SF FSG
- Office: floors 11-15 — $2.85/SF FSG
- Office: floors 16-19 — $3.00/SF FSG
- Office: floors 20-23 — $3.20/SF FSG

Annual rent growth

- Year 1 — 3.0%
- Year 2 — 6.0%
- Year 3 — 5.5%
- Year 4 — 5.0%
- Year 5 — 4.5%
- Years 6-10 — 4.0%

Vacancy and collection loss - 5.0%

Office lease terms and other assumptions - new and renewing tenants

- Lease term - 5 years
- Free rent - 0 months
- Annual rent escalations - 3.5%
- Downtime between tenants - 9 mos.
- Renewal probability - 65.0%

Parking revenues

- Reserved parking - $225/space
- Unreserved parking - $190/spacae
- Annual parking revenue growth - 5.0%

Expense Inputs

	Year 1
Janitorial	$ 222,572
Porter	72,816
Window cleaning	44,625
Supplies	42,483
Trash removal	28,150
Fire & life safety supplies	31,760
Repairs & maintenance	505,807
Tools & equipment	13,500
Utilities	
– Electricity	647,633
– Gas	43,883
– Chilled water	588,000
– Water & sewer	21,797
Security	209,200
Landscape contract	23,200
Administrative	259,890
Advertising & promotion	25,900
Real estate taxes	2,376,310
Non-reimbursable expenses	37,670
Insurance	188,000

Management fee - 2.0% of Effective Gross Income

Growth factor for real estate taxes - 2.0%

Growth factor for other expenses - 3.0%

Financing Inputs

Loan amount	$73.0 million
Loan-to-value	65.0%
Interest rate	7.5%
Loan term	10 years
Amortization schedule	25 years
Loan points	1.0%
Annual debt service	$6.5 million

Investor Tax Inputs

Ordinary income marginal tax rate	35.0%
Capital gains tax rate	15.0%
Cost recovery recapture tax rate	25.0%
Allocation of cost basis to improvements	80.0%
Depreciation schedule for improvements	39 years

Leasing Expenses & Capital Reserve Inputs

Office tenant improvements

- New tenants/2nd gen. space — $ 15/SF
- Renewing tenants — $ 10/SF
- Shell space — $ 55/SF
- New tenants/2nd gen. space — $ 15/SF

Leasing commissions

- New leases — 4.0%
- Renewing leases — 2.0%

Capital reserves — $ 0.35/SF

Property Acquisition & Disposition

Property acquisition inputs

- Purchase price — $110.0 million
- Closing costs — 1.75% of purchase price
- Loan fee — 0.75% of loan amount
- Total acquisitions costs — $112.5 million

Property disposition inputs

- Residual capitalization rate — 8.5%
- Broker's fee and closing costs — 2.0% of sales price

Appendix H

Discounted Cash Flow Analysis

Revenue Inputs

Contract rental rates and other lease terms

Market rental rates:

– Ground floor retail	$1.50/SF NNN
– Office: floors 2-5	$2.50/SF FSG
– Office: floors 6-10	$2.60/SF FSG
– Office: floors 11-15	$2.85/SF FSG
– Office: floors 16-19	$3.00/SF FSG
– Office: floors 20-23	$3.20/SF FSG

Annual rent growth

– Year 1	3.0%
– Year 2	6.0%
– Year 3	5.5%
– Year 4	5.0%
– Year 5	4.5%
– Years 6-10	4.0%

Vacancy and collection loss - 5.0%

Office lease terms and other assumptions - new and renewing tenants

- Lease term - 5 years
- Free rent - 0 months
- Annual rent escalations - 3.5%
- Downtime between tenants - 9 mos.
- Renewal probability - 65.0%

Parking revenues

- Reserved parking - $225/space
- Unreserved parking - $190/spacae
- Annual parking revenue growth - 5.0%

Expense Inputs

	Year 1
Janitorial	$ 222,572
Porter	72,816
Window cleaning	44,625
Supplies	42,483
Trash removal	28,150
Fire & life safety supplies	31,760
Repairs & maintenance	505,807
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Utilities	
– Electricity	647,633
– Gas	43,883
– Chilled water	588,000
– Water & sewer	21,797
Security	209,200
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Administrative	259,890
Advertising & promotion	25,900
Real estate taxes	2,376,310
Non-reimbursable expenses	37,670
Insurance	188,000

Management fee - 2.0% of Effective Gross Income

Growth factor for real estate taxes - 2.0%

Growth factor for other expenses - 3.0%

Financing Inputs

Loan amount	$73.0 million
Loan-to-value	65.0%
Interest rate	7.5%
Loan term	10 years
Amortization schedule	25 years
Loan points	1.0%
Annual debt service	$6.5 million

Investor Tax Inputs

Ordinary income marginal tax rate	35.0%
Capital gains tax rate	15.0%
Cost recovery recapture tax rate	25.0%
Allocation of cost basis to improvements	80.0%
Depreciation schedule for improvements	39 years

Leasing Expenses & Capital Reserve Inputs

Office tenant improvements

– New tenants/2nd gen. space	$ 15/SF
– Renewing tenants	$ 10/SF
– Shell space	$ 55/SF
– New tenants/2nd gen. space	$ 15/SF

Leasing commissions

– New leases	4.0%
– Renewing leases	2.0%

Capital reserves $ 0.35/SF

Property Acquisition & Disposition

Property acquisition inputs

– Purchase price	$110.0 million
– Closing costs	1.75% of purchase price
– Loan fee	0.75% of loan amount
– Total acquisitions costs	$112.5 million

Property disposition inputs

– Residual capitalization rate	8.5%
– Broker's fee and closing costs	2.0% of sales price

Appendix H

Discounted Cash Flow Analysis

		Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10	Year 11
Revenues												
Contract & Market Rents		$14,535,362	$14,681,099	$14,891,176	$15,413,827	$16,038,704	$16,341,311	$16,931,934	$17,308,906	$18,161,525	$19,357,235	$19,989,350
Less: Absorption & Turnover Vacancy		(1,939,548)	(234,360)	(35,459)	(208,510)	(153,671)	(318,318)	(501,959)	(14,579)	(2,414,068)	(449,023)	(1,147,250)
Scheduled Base Rental Revenue		$12,595,814	$14,446,739	$14,855,717	$15,205,317	$15,885,033	$16,022,993	$16,429,975	$17,294,327	$15,747,457	$18,908,212	$18,842,100
Add: Expense Reimbursement Revenue		150,928	336,333	482,641	619,902	745,691	819,584	905,880	1,057,583	950,642	668,362	634,719
Add: Parking Other Income		2,273,518	2,661,759	2,772,061	2,887,698	3,008,978	3,143,035	3,280,040	3,426,672	3,585,445	3,749,516	3,921,436
Total Potential Gross Revenue		$15,020,260	$17,444,831	$18,110,419	$18,712,917	$19,639,702	$19,985,612	$20,615,895	$21,778,582	$20,283,544	$23,326,090	$23,398,255
Less: Vacancy & Collection Loss			(649,600)	(871,835)	(737,561)	(835,998)	(696,879)	(553,934)	(1,075,079)		(739,733)	(80,025)
Effective Gross Revenue		$15,020,260	$16,795,231	$17,238,584	$17,975,356	$18,803,704	$19,288,733	$20,061,961	$20,703,503	$20,283,544	$22,586,357	$23,318,230
Operating Expenses												
Janitorial		222,572	269,116	281,665	287,024	296,553	301,445	307,831	327,095	297,086	339,226	335,269
Porter		72,816	75,000	77,250	79,568	81,955	84,414	86,946	89,554	92,241	95,008	97,859
Window Cleaning		44,625	45,964	47,343	48,763	50,226	51,733	53,285	54,883	56,530	58,226	59,972
Supplies		42,483	51,367	53,762	54,785	56,604	57,537	58,756	62,433	56,705	64,749	63,993
Trash Removal		28,150	34,037	35,624	36,302	37,507	38,126	38,934	41,370	37,575	42,904	42,404
Fire & Life Safety Supplies		31,760	32,713	33,694	34,705	35,746	36,819	37,923	39,061	40,233	41,440	42,683
Repairs & Maintenance		505,807	526,019	542,366	558,246	575,110	591,857	609,276	628,822	642,654	666,132	684,332
Tools & Equipment		13,500	13,905	14,322	14,752	15,194	15,650	16,120	16,603	17,101	17,614	18,143
Utilities												
- Electricity		647,633	715,651	742,576	761,086	785,037	803,708	824,580	861,541	838,853	904,515	914,425
- Gas		43,883	49,093	51,003	52,231	53,888	55,114	56,507	59,182	57,068	62,026	62,506
- Chilled Water		588,000	605,640	623,809	642,523	661,799	681,653	702,103	723,166	744,861	767,207	790,223
- Water & Sewer		21,797	24,385	25,334	25,944	26,767	27,375	28,068	29,396	28,346	30,809	31,047
Security		209,200	215,476	221,940	228,598	235,457	242,520	249,796	257,290	265,008	272,959	281,148
Landscaping Contract		23,200	23,896	24,613	25,351	26,112	26,895	27,702	28,533	29,389	30,271	31,179
Administrative		259,890	267,686	275,718	283,989	292,508	301,284	310,322	319,632	329,221	339,097	349,270
Advertising & Promotion		25,900	26,677	27,478	28,302	29,151	30,025	30,926	31,854	32,810	33,794	34,808
Real Estate Taxes		2,376,310	2,423,836	2,472,313	2,521,759	2,572,195	2,623,638	2,676,111	2,729,633	2,784,226	2,839,910	2,896,708
Non-Reimburseable Expense		37,670	38,800	39,964	41,163	42,398	43,670	44,980	46,330	47,720	49,151	50,626
Insurance		188,000	193,640	199,449	205,433	211,596	217,944	224,482	231,216	238,153	245,297	252,656
Management Fee		$300,405	$335,905	$344,772	$359,507	$376,074	$385,775	$401,239	$414,070	$405,671	$451,727	$466,365
Total Operating Expenses		$5,683,601	$5,968,806	$6,134,995	$6,290,031	$6,461,877	$6,617,182	$6,785,887	$6,991,664	$7,041,451	$7,352,062	$7,505,616
Net Operating Income		$9,336,659	$10,826,425	$11,103,589	$11,685,325	$12,341,827	$12,671,551	$13,276,074	$13,711,839	$13,242,093	$15,234,295	$15,812,614
Calculation of Net Sales Price:												
Sales Price (Based on Year 11 NOI)												$186,030,758
Less: Selling Costs												($3,720,615)
Net Sales Proceeds												$182,310,142
Leasing & Capital Items												
Tenant Improvements		$2,393,710	$1,746,344	$48,853	$255,930	$70,237	$505,521	$774,869		$2,540,912	$689,209	$649,595
Leasing Commissions		$263,606	$217,857	$20,703	$121,646	$30,022	$198,432	$339,303		$1,341,019	$336,496	$282,295
Capital Reserve		$131,250	$135,188	$139,243	$143,420	$147,723	$152,155	$156,719	$161,421	$166,264	$171,251	$176,389
Total Leasing & Capital Items		$2,788,566	$2,099,389	$208,799	$520,996	$247,982	$856,108	$1,270,891	$161,421	$4,048,195	$1,196,956	$1,108,279
Cash Flow Before Debt Service & Taxes		$6,548,093	$8,727,037	$10,894,790	$11,164,328	$12,093,845	$11,815,444	$12,005,182	$13,550,418	$9,193,899	$14,037,338	$14,704,335
Less: Debt Service		($6,473,563)	($6,473,563)	($6,473,563)	($6,473,563)	($6,473,563)	($6,473,563)	($6,473,563)	($6,473,563)	($6,473,563)	($6,473,563)	($6,473,563)
Cash Flow after Debt Service		$74,530	$2,253,474	$4,421,227	$4,690,766	$5,620,282	$5,341,881	$5,531,620	$7,076,855	$2,720,336	$7,563,776	$8,230,773
Internal Rate of Return Calculation (Before-Tax/Unleveraged)												
Original Purchase Price	($112,472,500)											
Cash Flow Before Debt Service & Taxes		$6,548,093	$8,727,037	$10,894,790	$11,164,328	$12,093,845	$11,815,444	$12,005,182	$13,550,418	$9,193,899	$14,037,338	$14,704,335
Net Sales Proceeds												$182,310,142
Total	($112,472,500)	$6,548,093	$8,727,037	$10,894,790	$11,164,328	$12,093,845	$11,815,444	$12,005,182	$13,550,418	$9,193,899	$14,037,338	$197,014,478
Internal Rate of Return	12.4%											

Appendix H

Discounted Cash Flow Analysis

Revenue Inputs

Contract rental rates and other lease terms

Market rental rates:

– Ground floor retail	$1.50/SF NNN
– Office: floors 2-5	$2.50/SF FSG
– Office: floors 6-10	$2.60/SF FSG
– Office: floors 11-15	$2.85/SF FSG
– Office: floors 16-19	$3.00/SF FSG
– Office: floors 20-23	$3.20/SF FSG

Annual rent growth

– Year 1	3.0%
– Year 2	6.0%
– Year 3	5.5%
– Year 4	5.0%
– Year 5	4.5%
– Years 6-10	4.0%

Vacancy and collection loss - 5.0%

Office lease terms and other assumptions - new and renewing tenants

- Lease term - 5 years
- Free rent - 0 months
- Annual rent escalations - 3.5%
- Downtime between tenants - 9 mos.
- Renewal probability - 65.0%

Parking revenues

- Reserved parking - $225/space
- Unreserved parking - $190/spacae
- Annual parking revenue growth - 5.0%

Expense Inputs

	Year 1
Janitorial	$ 222,572
Porter	72,816
Window cleaning	44,625
Supplies	42,483
Trash removal	28,150
Fire & life safety supplies	31,760
Repairs & maintenance	505,807
Tools & equipment	13,500
Utilities	
– Electricity	647,633
– Gas	43,883
– Chilled water	588,000
– Water & sewer	21,797
Security	209,200
Landscape contract	23,200
Administrative	259,890
Advertising & promotion	25,900
Real estate taxes	2,376,310
Non-reimbursable expenses	37,670
Insurance	188,000

Management fee - 2.0% of Effective Gross Income

Growth factor for real estate taxes - 2.0%

Growth factor for other expenses - 3.0%

Financing Inputs

Loan amount	$73.0 million
Loan-to-value	65.0%
Interest rate	7.5%
Loan term	10 years
Amortization schedule	25 years
Loan points	1.0%
Annual debt service	$6.5 million

Investor Tax Inputs

Ordinary income marginal tax rate	35.0%
Capital gains tax rate	15.0%
Cost recovery recapture tax rate	25.0%
Allocation of cost basis to improvements	80.0%
Depreciation schedule for improvements	39 years

Leasing Expenses & Capital Reserve Inputs

Office tenant improvements

– New tenants/2nd gen. space	$ 15/SF
– Renewing tenants	$ 10/SF
– Shell space	$ 55/SF
– New tenants/2nd gen. space	$ 15/SF

Leasing commissions

– New leases	4.0%
– Renewing leases	2.0%

Capital reserves $ 0.35/SF

Property Acquisition & Disposition

Property acquisition inputs

– Purchase price	$110.0 million
– Closing costs	1.75% of purchase price
– Loan fee	0.75% of loan amount
– Total acquisitions costs	$112.5 million

Property disposition inputs

– Residual capitalization rate	8.5%
– Broker's fee and closing costs	2.0% of sales price

Property Type: CBD Office
Square Feet: 375,000
Stories: 25

Appendix H

Discounted Cash Flow Analysis

		Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10	Year 11
Revenues												
Contract & Market Rents		$14,535,362	$14,681,099	$14,891,176	$15,413,827	$16,038,704	$16,341,311	$16,931,934	$17,308,906	$18,161,525	$19,357,235	$19,989,350
Less: Absorption & Turnover Vacancy		(1,939,548)	(234,360)	(35,459)	(208,510)	(153,671)	(318,318)	(501,959)	(14,579)	(2,414,068)	(449,023)	(1,147,250)
Scheduled Base Rental Revenue		$12,595,814	$14,446,739	$14,855,717	$15,205,317	$15,885,033	$16,022,993	$16,429,975	$17,294,327	$15,747,457	$18,908,212	$18,842,100
Add: Expense Reimbursement Revenue		150,928	336,333	482,641	619,902	745,691	819,584	905,880	1,057,583	950,642	668,362	634,719
Add: Parking Other Income		2,273,518	2,661,759	2,772,061	2,887,698	3,008,978	3,143,035	3,280,040	3,426,672	3,585,445	3,749,516	3,921,436
Total Potential Gross Revenue		$15,020,260	$17,444,831	$18,110,419	$18,712,917	$19,639,702	$19,985,612	$20,615,895	$21,778,582	$20,283,544	$23,326,090	$23,398,255
Less: Vacancy & Collection Loss			(649,600)	(871,835)	(737,561)	(835,998)	(696,879)	(553,934)	(1,075,079)		(739,733)	(80,025)
Effective Gross Revenue		$15,020,260	$16,795,231	$17,238,584	$17,975,356	$18,803,704	$19,288,733	$20,061,961	$20,703,503	$20,283,544	$22,586,357	$23,318,230
Operating Expenses												
Janitorial		222,572	269,116	281,665	287,024	296,553	301,445	307,831	327,095	297,086	339,226	335,269
Porter		72,816	75,000	77,250	79,568	81,955	84,414	86,946	89,554	92,241	95,008	97,859
Window Cleaning		44,625	45,964	47,343	48,763	50,226	51,733	53,285	54,883	56,530	58,226	59,972
Supplies		42,483	51,367	53,762	54,785	56,604	57,537	58,756	62,433	56,705	64,749	63,993
Trash Removal		28,150	34,037	35,624	36,302	37,507	38,126	38,934	41,370	37,575	42,904	42,404
Fire & Life Safety Supplies		31,760	32,713	33,694	34,705	35,746	36,819	37,923	39,061	40,233	41,440	42,683
Repairs & Maintenance		505,807	526,019	542,366	558,246	575,110	591,857	609,276	628,822	642,654	666,132	684,332
Tools & Equipment		13,500	13,905	14,322	14,752	15,194	15,650	16,120	16,603	17,101	17,614	18,143
Utilities												
- Electricity		647,633	715,651	742,576	761,086	785,037	803,708	824,580	861,541	838,853	904,515	914,425
- Gas		43,883	49,093	51,003	52,231	53,888	55,114	56,507	59,182	57,068	62,026	62,506
- Chilled Water		588,000	605,640	623,809	642,523	661,799	681,653	702,103	723,166	744,861	767,207	790,223
- Water & Sewer		21,797	24,385	25,334	25,944	26,767	27,375	28,068	29,396	28,346	30,809	31,047
Security		209,200	215,476	221,940	228,598	235,457	242,520	249,796	257,290	265,008	272,959	281,148
Landscaping Contract		23,200	23,896	24,613	25,351	26,112	26,895	27,702	28,533	29,389	30,271	31,179
Administrative		259,890	267,686	275,718	283,989	292,508	301,284	310,322	319,632	329,221	339,097	349,270
Advertising & Promotion		25,900	26,677	27,478	28,302	29,151	30,025	30,926	31,854	32,810	33,794	34,808
Real Estate Taxes		2,376,310	2,423,836	2,472,313	2,521,759	2,572,195	2,623,638	2,676,111	2,729,633	2,784,226	2,839,910	2,896,708
Non-Reimburseable Expense		37,670	38,800	39,964	41,163	42,398	43,670	44,980	46,330	47,720	49,151	50,626
Insurance		188,000	193,640	199,449	205,433	211,596	217,944	224,482	231,216	238,153	245,297	252,656
Management Fee		$300,405	$335,905	$344,772	$359,507	$376,074	$385,775	$401,239	$414,070	$405,671	$451,727	$466,365
Total Operating Expenses		$5,683,601	$5,968,806	$6,134,995	$6,290,031	$6,461,877	$6,617,182	$6,785,887	$6,991,664	$7,041,451	$7,352,062	$7,505,616
Net Operating Income		$9,336,659	$10,826,425	$11,103,589	$11,685,325	$12,341,827	$12,671,551	$13,276,074	$13,711,839	$13,242,093	$15,234,295	$15,812,614
Calculation of Net Sales Price:												
Sales Price (Based on Year 11 NOI)												$186,030,758
Less: Selling Costs												($3,720,615)
Net Sales Proceeds												$182,310,142
Leasing & Capital Items												
Tenant Improvements		$2,393,710	$1,746,344	$48,853	$255,930	$70,237	$505,521	$774,869		$2,540,912	$689,209	$649,595
Leasing Commissions		$263,606	$217,857	$20,703	$121,646	$30,022	$198,432	$339,303		$1,341,019	$336,496	$282,295
Capital Reserve		$131,250	$135,188	$139,243	$143,420	$147,723	$152,155	$156,719	$161,421	$166,264	$171,251	$176,389
Total Leasing & Capital Items		$2,788,566	$2,099,389	$208,799	$520,996	$247,982	$856,108	$1,270,891	$161,421	$4,048,195	$1,196,956	$1,108,279
Cash Flow Before Debt Service & Taxes		$6,548,093	$8,727,037	$10,894,790	$11,164,328	$12,093,845	$11,815,444	$12,005,182	$13,550,418	$9,193,899	$14,037,338	$14,704,335
Less: Debt Service		($6,473,563)	($6,473,563)	($6,473,563)	($6,473,563)	($6,473,563)	($6,473,563)	($6,473,563)	($6,473,563)	($6,473,563)	($6,473,563)	($6,473,563)
Cash Flow after Debt Service		$74,530	$2,253,474	$4,421,227	$4,690,766	$5,620,282	$5,341,881	$5,531,620	$7,076,855	$2,720,336	$7,563,776	$8,230,773
Internal Rate of Return Calculation (Before-Tax/Unleveraged)												
Original Purchase Price	($112,472,500)											
Cash Flow Before Debt Service & Taxes		$6,548,093	$8,727,037	$10,894,790	$11,164,328	$12,093,845	$11,815,444	$12,005,182	$13,550,418	$9,193,899	$14,037,338	$14,704,335
Net Sales Proceeds												$182,310,142
Total	($112,472,500)	$6,548,093	$8,727,037	$10,894,790	$11,164,328	$12,093,845	$11,815,444	$12,005,182	$13,550,418	$9,193,899	$14,037,338	$197,014,478
Internal Rate of Return	12.4%											

Appendix H
Discounted Cash Flow Analysis

Revenue Inputs

Contract rental rates and other lease terms

Market rental rates:

– Ground floor retail	$1.50/SF NNN
– Office: floors 2-5	$2.50/SF FSG
– Office: floors 6-10	$2.60/SF FSG
– Office: floors 11-15	$2.85/SF FSG
– Office: floors 16-19	$3.00/SF FSG
– Office: floors 20-23	$3.20/SF FSG

Annual rent growth

– Year 1	3.0%
– Year 2	6.0%
– Year 3	5.5%
– Year 4	5.0%
– Year 5	4.5%
– Years 6-10	4.0%

Vacancy and collection loss - 5.0%

Office lease terms and other assumptions - new and renewing tenants

- Lease term - 5 years
- Free rent - 0 months
- Annual rent escalations - 3.5%
- Downtime between tenants - 9 mos.
- Renewal probability - 65.0%

Parking revenues

- Reserved parking - $225/space
- Unreserved parking - $190/spacae
- Annual parking revenue growth - 5.0%

Expense Inputs

	Year 1
Janitorial	$ 222,572
Porter	72,816
Window cleaning	44,625
Supplies	42,483
Trash removal	28,150
Fire & life safety supplies	31,760
Repairs & maintenance	505,807
Tools & equipment	13,500
Utilities	
– Electricity	647,633
– Gas	43,883
– Chilled water	588,000
– Water & sewer	21,797
Security	209,200
Landscape contract	23,200
Administrative	259,890
Advertising & promotion	25,900
Real estate taxes	2,376,310
Non-reimbursable expenses	37,670
Insurance	188,000

Management fee - 2.0% of Effective Gross Income

Growth factor for real estate taxes - 2.0%

Growth factor for other expenses - 3.0%

Financing Inputs

Loan amount	$73.0 million
Loan-to-value	65.0%
Interest rate	7.5%
Loan term	10 years
Amortization schedule	25 years
Loan points	1.0%
Annual debt service	$6.5 million

Investor Tax Inputs

Ordinary income marginal tax rate	35.0%
Capital gains tax rate	15.0%
Cost recovery recapture tax rate	25.0%
Allocation of cost basis to improvements	80.0%
Depreciation schedule for improvements	39 years

Leasing Expenses & Capital Reserve Inputs

Office tenant improvements

– New tenants/2nd gen. space	$ 15/SF
– Renewing tenants	$ 10/SF
– Shell space	$ 55/SF
– New tenants/2nd gen. space	$ 15/SF

Leasing commissions

– New leases	4.0%
– Renewing leases	2.0%

Capital reserves $ 0.35/SF

Property Acquisition & Disposition

Property acquisition inputs

– Purchase price	$110.0 million
– Closing costs	1.75% of purchase price
– Loan fee	0.75% of loan amount
– Total acquisitions costs	$112.5 million

Property disposition inputs

– Residual capitalization rate	8.5%
– Broker's fee and closing costs	2.0% of sales price

Appendix H

Discounted Cash Flow Analysis

Property Type: CBD Office
Square Feet: 375,000
Stories: 25

		Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10	Year 11
Revenues												
Contract & Market Rents		$14,535,362	$14,681,099	$14,891,176	$15,413,827	$16,038,704	$16,341,311	$16,931,934	$17,308,906	$18,161,525	$19,357,235	$19,989,350
Less: Absorption & Turnover Vacancy		(1,939,548)	(234,360)	(35,459)	(208,510)	(153,671)	(318,318)	(501,959)	(14,579)	(2,414,068)	(449,023)	(1,147,250)
Scheduled Base Rental Revenue		$12,595,814	$14,446,739	$14,855,717	$15,205,317	$15,885,033	$16,022,993	$16,429,975	$17,294,327	$15,747,457	$18,908,212	$18,842,100
Add: Expense Reimbursement Revenue		150,928	336,333	482,641	619,902	745,691	819,584	905,880	1,057,583	950,642	668,362	634,719
Add: Parking Other Income		2,273,518	2,661,759	2,772,061	2,887,698	3,008,978	3,143,035	3,280,040	3,426,672	3,585,445	3,749,516	3,921,436
Total Potential Gross Revenue		$15,020,260	$17,444,831	$18,110,419	$18,712,917	$19,639,702	$19,985,612	$20,615,895	$21,778,582	$20,283,544	$23,326,090	$23,398,255
Less: Vacancy & Collection Loss			(649,600)	(871,835)	(737,561)	(835,998)	(696,879)	(553,934)	(1,075,079)		(739,733)	(80,025)
Effective Gross Revenue		$15,020,260	$16,795,231	$17,238,584	$17,975,356	$18,803,704	$19,288,733	$20,061,961	$20,703,503	$20,283,544	$22,586,357	$23,318,230
Operating Expenses												
Janitorial		222,572	269,116	281,665	287,024	296,553	301,445	307,831	327,095	297,086	339,226	335,269
Porter		72,816	75,000	77,250	79,568	81,955	84,414	86,946	89,554	92,241	95,008	97,859
Window Cleaning		44,625	45,964	47,343	48,763	50,226	51,733	53,285	54,883	56,530	58,226	59,972
Supplies		42,483	51,367	53,762	54,785	56,604	57,537	58,756	62,433	56,705	64,749	63,993
Trash Removal		28,150	34,037	35,624	36,302	37,507	38,126	38,934	41,370	37,575	42,904	42,404
Fire & Life Safety Supplies		31,760	32,713	33,694	34,705	35,746	36,819	37,923	39,061	40,233	41,440	42,683
Repairs & Maintenance		505,807	526,019	542,366	558,246	575,110	591,857	609,276	628,822	642,654	666,132	684,332
Tools & Equipment		13,500	13,905	14,322	14,752	15,194	15,650	16,120	16,603	17,101	17,614	18,143
Utilities												
- Electricity		647,633	715,651	742,576	761,086	785,037	803,708	824,580	861,541	838,853	904,515	914,425
- Gas		43,883	49,093	51,003	52,231	53,888	55,114	56,507	59,182	57,068	62,026	62,506
- Chilled Water		588,000	605,640	623,809	642,523	661,799	681,653	702,103	723,166	744,861	767,207	790,223
- Water & Sewer		21,797	24,385	25,334	25,944	26,767	27,375	28,068	29,396	28,346	30,809	31,047
Security		209,200	215,476	221,940	228,598	235,457	242,520	249,796	257,290	265,008	272,959	281,148
Landscaping Contract		23,200	23,896	24,613	25,351	26,112	26,895	27,702	28,533	29,389	30,271	31,179
Administrative		259,890	267,686	275,718	283,989	292,508	301,284	310,322	319,632	329,221	339,097	349,270
Advertising & Promotion		25,900	26,677	27,478	28,302	29,151	30,025	30,926	31,854	32,810	33,794	34,808
Real Estate Taxes		2,376,310	2,423,836	2,472,313	2,521,759	2,572,195	2,623,638	2,676,111	2,729,633	2,784,226	2,839,910	2,896,708
Non-Reimburseable Expense		37,670	38,800	39,964	41,163	42,398	43,670	44,980	46,330	47,720	49,151	50,626
Insurance		188,000	193,640	199,449	205,433	211,596	217,944	224,482	231,216	238,153	245,297	252,656
Management Fee		$300,405	$335,905	$344,772	$359,507	$376,074	$385,775	$401,239	$414,070	$405,671	$451,727	$466,365
Total Operating Expenses		$5,683,601	$5,968,806	$6,134,995	$6,290,031	$6,461,877	$6,617,182	$6,785,887	$6,991,664	$7,041,451	$7,352,062	$7,505,616
Net Operating Income		$9,336,659	$10,826,425	$11,103,589	$11,685,325	$12,341,827	$12,671,551	$13,276,074	$13,711,839	$13,242,093	$15,234,295	$15,812,614
Calculation of Net Sales Price:												
Sales Price (Based on Year 11 NOI)												$186,030,758
Less: Selling Costs												($3,720,615)
Net Sales Proceeds												$182,310,142
Leasing & Capital Items												
Tenant Improvements		$2,393,710	$1,746,344	$48,853	$255,930	$70,237	$505,521	$774,869		$2,540,912	$689,209	$649,595
Leasing Commissions		$263,606	$217,857	$20,703	$121,646	$30,022	$198,432	$339,303		$1,341,019	$336,496	$282,295
Capital Reserve		$131,250	$135,188	$139,243	$143,420	$147,723	$152,155	$156,719	$161,421	$166,264	$171,251	$176,389
Total Leasing & Capital Items		$2,788,566	$2,099,389	$208,799	$520,996	$247,982	$856,108	$1,270,891	$161,421	$4,048,195	$1,196,956	$1,108,279
Cash Flow Before Debt Service & Taxes		$6,548,093	$8,727,037	$10,894,790	$11,164,328	$12,093,845	$11,815,444	$12,005,182	$13,550,418	$9,193,899	$14,037,338	$14,704,335
Less: Debt Service		($6,473,563)	($6,473,563)	($6,473,563)	($6,473,563)	($6,473,563)	($6,473,563)	($6,473,563)	($6,473,563)	($6,473,563)	($6,473,563)	($6,473,563)
Cash Flow after Debt Service		$74,530	$2,253,474	$4,421,227	$4,690,766	$5,620,282	$5,341,881	$5,531,620	$7,076,855	$2,720,336	$7,563,776	$8,230,773
Internal Rate of Return Calculation (Before-Tax/Unleveraged)												
Original Purchase Price	($112,472,500)											
Cash Flow Before Debt Service & Taxes		$6,548,093	$8,727,037	$10,894,790	$11,164,328	$12,093,845	$11,815,444	$12,005,182	$13,550,418	$9,193,899	$14,037,338	$14,704,335
Net Sales Proceeds												$182,310,142
Total	($112,472,500)	$6,548,093	$8,727,037	$10,894,790	$11,164,328	$12,093,845	$11,815,444	$12,005,182	$13,550,418	$9,193,899	$14,037,338	$197,014,478
Internal Rate of Return	12.4%											

Appendix H

Discounted Cash Flow Analysis

Revenue Inputs

Contract rental rates and other lease terms

Market rental rates:

– Ground floor retail	$1.50/SF NNN
– Office: floors 2-5	$2.50/SF FSG
– Office: floors 6-10	$2.60/SF FSG
– Office: floors 11-15	$2.85/SF FSG
– Office: floors 16-19	$3.00/SF FSG
– Office: floors 20-23	$3.20/SF FSG

Annual rent growth

– Year 1	3.0%
– Year 2	6.0%
– Year 3	5.5%
– Year 4	5.0%
– Year 5	4.5%
– Years 6-10	4.0%

Vacancy and collection loss - 5.0%

Office lease terms and other assumptions - new and renewing tenants

- Lease term - 5 years
- Free rent - 0 months
- Annual rent escalations - 3.5%
- Downtime between tenants - 9 mos.
- Renewal probability - 65.0%

Parking revenues

- Reserved parking - $225/space
- Unreserved parking - $190/spacae
- Annual parking revenue growth - 5.0%

Expense Inputs

	Year 1
Janitorial	$ 222,572
Porter	72,816
Window cleaning	44,625
Supplies	42,483
Trash removal	28,150
Fire & life safety supplies	31,760
Repairs & maintenance	505,807
Tools & equipment	13,500
Utilities	
– Electricity	647,633
– Gas	43,883
– Chilled water	588,000
– Water & sewer	21,797
Security	209,200
Landscape contract	23,200
Administrative	259,890
Advertising & promotion	25,900
Real estate taxes	2,376,310
Non-reimbursable expenses	37,670
Insurance	188,000

Management fee - 2.0% of Effective Gross Income

Growth factor for real estate taxes - 2.0%

Growth factor for other expenses - 3.0%

Financing Inputs

Loan amount	$73.0 million
Loan-to-value	65.0%
Interest rate	7.5%
Loan term	10 years
Amortization schedule	25 years
Loan points	1.0%
Annual debt service	$6.5 million

Investor Tax Inputs

Ordinary income marginal tax rate	35.0%
Capital gains tax rate	15.0%
Cost recovery recapture tax rate	25.0%
Allocation of cost basis to improvements	80.0%
Depreciation schedule for improvements	39 years

Leasing Expenses & Capital Reserve Inputs

Office tenant improvements

– New tenants/2nd gen. space	$ 15/SF
– Renewing tenants	$ 10/SF
– Shell space	$ 55/SF
– New tenants/2nd gen. space	$ 15/SF

Leasing commissions

– New leases	4.0%
– Renewing leases	2.0%

Capital reserves $ 0.35/SF

Property Acquisition & Disposition

Property acquisition inputs

– Purchase price	$110.0 million
– Closing costs	1.75% of purchase price
– Loan fee	0.75% of loan amount
– Total acquisitions costs	$112.5 million

Property disposition inputs

– Residual capitalization rate	8.5%
– Broker's fee and closing costs	2.0% of sales price

Appendix H

Discounted Cash Flow Analysis

Property Type: CBD Office
Square Feet: 375,000
Stories: 25

		Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10	Year 11
Revenues												
Contract & Market Rents		$14,535,362	$14,681,099	$14,891,176	$15,413,827	$16,038,704	$16,341,311	$16,931,934	$17,308,906	$18,161,525	$19,357,235	$19,989,350
Less: Absorption & Turnover Vacancy		(1,939,548)	(234,360)	(35,459)	(208,510)	(153,671)	(318,318)	(501,959)	(14,579)	(2,414,068)	(449,023)	(1,147,250)
Scheduled Base Rental Revenue		$12,595,814	$14,446,739	$14,855,717	$15,205,317	$15,885,033	$16,022,993	$16,429,975	$17,294,327	$15,747,457	$18,908,212	$18,842,100
Add: Expense Reimbursement Revenue		150,928	336,333	482,641	619,902	745,691	819,584	905,880	1,057,583	950,642	668,362	634,719
Add: Parking Other Income		2,273,518	2,661,759	2,772,061	2,887,698	3,008,978	3,143,035	3,280,040	3,426,672	3,585,445	3,749,516	3,921,436
Total Potential Gross Revenue		$15,020,260	$17,444,831	$18,110,419	$18,712,917	$19,639,702	$19,985,612	$20,615,895	$21,778,582	$20,283,544	$23,326,090	$23,398,255
Less: Vacancy & Collection Loss			(649,600)	(871,835)	(737,561)	(835,998)	(696,879)	(553,934)	(1,075,079)		(739,733)	(80,025)
Effective Gross Revenue		$15,020,260	$16,795,231	$17,238,584	$17,975,356	$18,803,704	$19,288,733	$20,061,961	$20,703,503	$20,283,544	$22,586,357	$23,318,230
Operating Expenses												
Janitorial		222,572	269,116	281,665	287,024	296,553	301,445	307,831	327,095	297,086	339,226	335,269
Porter		72,816	75,000	77,250	79,568	81,955	84,414	86,946	89,554	92,241	95,008	97,859
Window Cleaning		44,625	45,964	47,343	48,763	50,226	51,733	53,285	54,883	56,530	58,226	59,972
Supplies		42,483	51,367	53,762	54,785	56,604	57,537	58,756	62,433	56,705	64,749	63,993
Trash Removal		28,150	34,037	35,624	36,302	37,507	38,126	38,934	41,370	37,575	42,904	42,404
Fire & Life Safety Supplies		31,760	32,713	33,694	34,705	35,746	36,819	37,923	39,061	40,233	41,440	42,683
Repairs & Maintenance		505,807	526,019	542,366	558,246	575,110	591,857	609,276	628,822	642,654	666,132	684,332
Tools & Equipment		13,500	13,905	14,322	14,752	15,194	15,650	16,120	16,603	17,101	17,614	18,143
Utilities												
- Electricity		647,633	715,651	742,576	761,086	785,037	803,708	824,580	861,541	838,853	904,515	914,425
- Gas		43,883	49,093	51,003	52,231	53,888	55,114	56,507	59,182	57,068	62,026	62,506
- Chilled Water		588,000	605,640	623,809	642,523	661,799	681,653	702,103	723,166	744,861	767,207	790,223
- Water & Sewer		21,797	24,385	25,334	25,944	26,767	27,375	28,068	29,396	28,346	30,809	31,047
Security		209,200	215,476	221,940	228,598	235,457	242,520	249,796	257,290	265,008	272,959	281,148
Landscaping Contract		23,200	23,896	24,613	25,351	26,112	26,895	27,702	28,533	29,389	30,271	31,179
Administrative		259,890	267,686	275,718	283,989	292,508	301,284	310,322	319,632	329,221	339,097	349,270
Advertising & Promotion		25,900	26,677	27,478	28,302	29,151	30,025	30,926	31,854	32,810	33,794	34,808
Real Estate Taxes		2,376,310	2,423,836	2,472,313	2,521,759	2,572,195	2,623,638	2,676,111	2,729,633	2,784,226	2,839,910	2,896,708
Non-Reimburseable Expense		37,670	38,800	39,964	41,163	42,398	43,670	44,980	46,330	47,720	49,151	50,626
Insurance		188,000	193,640	199,449	205,433	211,596	217,944	224,482	231,216	238,153	245,297	252,656
Management Fee		$300,405	$335,905	$344,772	$359,507	$376,074	$385,775	$401,239	$414,070	$405,671	$451,727	$466,365
Total Operating Expenses		$5,683,601	$5,968,806	$6,134,995	$6,290,031	$6,461,877	$6,617,182	$6,785,887	$6,991,664	$7,041,451	$7,352,062	$7,505,616
Net Operating Income		$9,336,659	$10,826,425	$11,103,589	$11,685,325	$12,341,827	$12,671,551	$13,276,074	$13,711,839	$13,242,093	$15,234,295	$15,812,614
Calculation of Net Sales Price:												
Sales Price (Based on Year 11 NOI)												$186,030,758
Less: Selling Costs												($3,720,615)
Net Sales Proceeds												$182,310,142
Leasing & Capital Items												
Tenant Improvements		$2,393,710	$1,746,344	$48,853	$255,930	$70,237	$505,521	$774,869		$2,540,912	$689,209	$649,595
Leasing Commissions		$263,606	$217,857	$20,703	$121,646	$30,022	$198,432	$339,303		$1,341,019	$336,496	$282,295
Capital Reserve		$131,250	$135,188	$139,243	$143,420	$147,723	$152,155	$156,719	$161,421	$166,264	$171,251	$176,389
Total Leasing & Capital Items		$2,788,566	$2,099,389	$208,799	$520,996	$247,982	$856,108	$1,270,891	$161,421	$4,048,195	$1,196,956	$1,108,279
Cash Flow Before Debt Service & Taxes		$6,548,093	$8,727,037	$10,894,790	$11,164,328	$12,093,845	$11,815,444	$12,005,182	$13,550,418	$9,193,899	$14,037,338	$14,704,335
Less: Debt Service		($6,473,563)	($6,473,563)	($6,473,563)	($6,473,563)	($6,473,563)	($6,473,563)	($6,473,563)	($6,473,563)	($6,473,563)	($6,473,563)	($6,473,563)
Cash Flow after Debt Service		$74,530	$2,253,474	$4,421,227	$4,690,766	$5,620,282	$5,341,881	$5,531,620	$7,076,855	$2,720,336	$7,563,776	$8,230,773
Internal Rate of Return Calculation (Before-Tax/Unleveraged)												
Original Purchase Price	($112,472,500)											
Cash Flow Before Debt Service & Taxes		$6,548,093	$8,727,037	$10,894,790	$11,164,328	$12,093,845	$11,815,444	$12,005,182	$13,550,418	$9,193,899	$14,037,338	$14,704,335
Net Sales Proceeds												($6,473,563)
Total	($112,472,500)	$6,548,093	$8,727,037	$10,894,790	$11,164,328	$12,093,845	$11,815,444	$12,005,182	$13,550,418	$9,193,899	$14,037,338	$8,230,773
Internal Rate of Return	12.4%											

Appendix H
Discounted Cash Flow Analysis

Revenue Inputs

Contract rental rates and other lease terms

Market rental rates:

– Ground floor retail	$1.50/SF NNN
– Office: floors 2-5	$2.50/SF FSG
– Office: floors 6-10	$2.60/SF FSG
– Office: floors 11-15	$2.85/SF FSG
– Office: floors 16-19	$3.00/SF FSG
– Office: floors 20-23	$3.20/SF FSG

Annual rent growth

– Year 1	3.0%
– Year 2	6.0%
– Year 3	5.5%
– Year 4	5.0%
– Year 5	4.5%
– Years 6-10	4.0%

Vacancy and collection loss - 5.0%

Office lease terms and other assumptions - new and renewing tenants

- Lease term - 5 years
- Free rent - 0 months
- Annual rent escalations - 3.5%
- Downtime between tenants - 9 mos.
- Renewal probability - 65.0%

Parking revenues

- Reserved parking - $225/space
- Unreserved parking - $190/spacae
- Annual parking revenue growth - 5.0%

Expense Inputs

	Year 1
Janitorial	$ 222,572
Porter	72,816
Window cleaning	44,625
Supplies	42,483
Trash removal	28,150
Fire & life safety supplies	31,760
Repairs & maintenance	505,807
Tools & equipment	13,500
Utilities	
– Electricity	647,633
– Gas	43,883
– Chilled water	588,000
– Water & sewer	21,797
Security	209,200
Landscape contract	23,200
Administrative	259,890
Advertising & promotion	25,900
Real estate taxes	2,376,310
Non-reimbursable expenses	37,670
Insurance	188,000

Management fee - 2.0% of Effective Gross Income

Growth factor for real estate taxes - 2.0%

Growth factor for other expenses - 3.0%

Financing Inputs

Loan amount	$73.0 million
Loan-to-value	65.0%
Interest rate	7.5%
Loan term	10 years
Amortization schedule	25 years
Loan points	1.0%
Annual debt service	$6.5 million

Investor Tax Inputs

Ordinary income marginal tax rate	35.0%
Capital gains tax rate	15.0%
Cost recovery recapture tax rate	25.0%
Allocation of cost basis to improvements	80.0%
Depreciation schedule for improvements	39 years

Leasing Expenses & Capital Reserve Inputs

Office tenant improvements

– New tenants/2nd gen. space	$ 15/SF
– Renewing tenants	$ 10/SF
– Shell space	$ 55/SF
– New tenants/2nd gen. space	$ 15/SF

Leasing commissions

– New leases	4.0%
– Renewing leases	2.0%

Capital reserves $ 0.35/SF

Property Acquisition & Disposition

Property acquisition inputs

– Purchase price	$110.0 million
– Closing costs	1.75% of purchase price
– Loan fee	0.75% of loan amount
– Total acquisitions costs	$112.5 million

Property disposition inputs

– Residual capitalization rate	8.5%
– Broker's fee and closing costs	2.0% of sales price

Appendix H

Discounted Cash Flow Analysis

Property Type: CBD Office
Square Feet: 375,000
Stories: 25

		Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10	Year 11
Revenues												
Contract & Market Rents		$14,535,362	$14,681,099	$14,891,176	$15,413,827	$16,038,704	$16,341,311	$16,931,934	$17,308,906	$18,161,525	$19,357,235	$19,989,350
Less: Absorption & Turnover Vacancy		(1,939,548)	(234,360)	(35,459)	(208,510)	(153,671)	(318,318)	(501,959)	(14,579)	(2,414,068)	(449,023)	(1,147,250)
Scheduled Base Rental Revenue		$12,595,814	$14,446,739	$14,855,717	$15,205,317	$15,885,033	$16,022,993	$16,429,975	$17,294,327	$15,747,457	$18,908,212	$18,842,100
Add: Expense Reimbursement Revenue		150,928	336,333	482,641	619,902	745,691	819,584	905,880	1,057,583	950,642	668,362	634,719
Add: Parking Other Income		2,273,518	2,661,759	2,772,061	2,887,698	3,008,978	3,143,035	3,280,040	3,426,672	3,585,445	3,749,516	3,921,436
Total Potential Gross Revenue		$15,020,260	$17,444,831	$18,110,419	$18,712,917	$19,639,702	$19,985,612	$20,615,895	$21,778,582	$20,283,544	$23,326,090	$23,398,255
Less: Vacancy & Collection Loss			(649,600)	(871,835)	(737,561)	(835,998)	(696,879)	(553,934)	(1,075,079)		(739,733)	(80,025)
Effective Gross Revenue		$15,020,260	$16,795,231	$17,238,584	$17,975,356	$18,803,704	$19,288,733	$20,061,961	$20,703,503	$20,283,544	$22,586,357	$23,318,230
Operating Expenses												
Janitorial		222,572	269,116	281,665	287,024	296,553	301,445	307,831	327,095	297,086	339,226	335,269
Porter		72,816	75,000	77,250	79,568	81,955	84,414	86,946	89,554	92,241	95,008	97,859
Window Cleaning		44,625	45,964	47,343	48,763	50,226	51,733	53,285	54,883	56,530	58,226	59,972
Supplies		42,483	51,367	53,762	54,785	56,604	57,537	58,756	62,433	56,705	64,749	63,993
Trash Removal		28,150	34,037	35,624	36,302	37,507	38,126	38,934	41,370	37,575	42,904	42,404
Fire & Life Safety Supplies		31,760	32,713	33,694	34,705	35,746	36,819	37,923	39,061	40,233	41,440	42,683
Repairs & Maintenance		505,807	526,019	542,366	558,246	575,110	591,857	609,276	628,822	642,654	666,132	684,332
Tools & Equipment		13,500	13,905	14,322	14,752	15,194	15,650	16,120	16,603	17,101	17,614	18,143
Utilities												
- Electricity		647,633	715,651	742,576	761,086	785,037	803,708	824,580	861,541	838,853	904,515	914,425
- Gas		43,883	49,093	51,003	52,231	53,888	55,114	56,507	59,182	57,068	62,026	62,506
- Chilled Water		588,000	605,640	623,809	642,523	661,799	681,653	702,103	723,166	744,861	767,207	790,223
- Water & Sewer		21,797	24,385	25,334	25,944	26,767	27,375	28,068	29,396	28,346	30,809	31,047
Security		209,200	215,476	221,940	228,598	235,457	242,520	249,796	257,290	265,008	272,959	281,148
Landscaping Contract		23,200	23,896	24,613	25,351	26,112	26,895	27,702	28,533	29,389	30,271	31,179
Administrative		259,890	267,686	275,718	283,989	292,508	301,284	310,322	319,632	329,221	339,097	349,270
Advertising & Promotion		25,900	26,677	27,478	28,302	29,151	30,025	30,926	31,854	32,810	33,794	34,808
Real Estate Taxes		2,376,310	2,423,836	2,472,313	2,521,759	2,572,195	2,623,638	2,676,111	2,729,633	2,784,226	2,839,910	2,896,708
Non-Reimburseable Expense		37,670	38,800	39,964	41,163	42,398	43,670	44,980	46,330	47,720	49,151	50,626
Insurance		188,000	193,640	199,449	205,433	211,596	217,944	224,482	231,216	238,153	245,297	252,656
Management Fee		$300,405	$335,905	$344,772	$359,507	$376,074	$385,775	$401,239	$414,070	$405,671	$451,727	$466,365
Total Operating Expenses		$5,683,601	$5,968,806	$6,134,995	$6,290,031	$6,461,877	$6,617,182	$6,785,887	$6,991,664	$7,041,451	$7,352,062	$7,505,616
Net Operating Income		$9,336,659	$10,826,425	$11,103,589	$11,685,325	$12,341,827	$12,671,551	$13,276,074	$13,711,839	$13,242,093	$15,234,295	$15,812,614
Calculation of Net Sales Price:												
Sales Price (Based on Year 11 NOI)												$186,030,758
Less: Selling Costs												($3,720,615)
Net Sales Proceeds												$182,310,142
Leasing & Capital Items												
Tenant Improvements		$2,393,710	$1,746,344	$48,853	$255,930	$70,237	$505,521	$774,869		$2,540,912	$689,209	$649,595
Leasing Commissions		$263,606	$217,857	$20,703	$121,646	$30,022	$198,432	$339,303		$1,341,019	$336,496	$282,295
Capital Reserve		$131,250	$135,188	$139,243	$143,420	$147,723	$152,155	$156,719	$161,421	$166,264	$171,251	$176,389
Total Leasing & Capital Items		$2,788,566	$2,099,389	$208,799	$520,996	$247,982	$856,108	$1,270,891	$161,421	$4,048,195	$1,196,956	$1,108,279
Cash Flow Before Debt Service & Taxes		$6,548,093	$8,727,037	$10,894,790	$11,164,328	$12,093,845	$11,815,444	$12,005,182	$13,550,418	$9,193,899	$14,037,338	$14,704,335
Less: Debt Service		($6,473,563)	($6,473,563)	($6,473,563)	($6,473,563)	($6,473,563)	($6,473,563)	($6,473,563)	($6,473,563)	($6,473,563)	($6,473,563)	($6,473,563)
Cash Flow after Debt Service		$74,530	$2,253,474	$4,421,227	$4,690,766	$5,620,282	$5,341,881	$5,531,620	$7,076,855	$2,720,336	$7,563,776	$8,230,773
Internal Rate of Return Calculation (Before-Tax/Unleveraged)												
Original Purchase Price	($112,472,500)											
Cash Flow Before Debt Service & Taxes		$6,548,093	$8,727,037	$10,894,790	$11,164,328	$12,093,845	$11,815,444	$12,005,182	$13,550,418	$9,193,899	$14,037,338	$14,704,335
Net Sales Proceeds												$182,310,142
Total	($112,472,500)	$6,548,093	$8,727,037	$10,894,790	$11,164,328	$12,093,845	$11,815,444	$12,005,182	$13,550,418	$9,193,899	$14,037,338	$197,014,478
Internal Rate of Return	12.4%											

Appendix H

Discounted Cash Flow Analysis

Revenue Inputs

Contract rental rates and other lease terms

Market rental rates:

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Annual rent growth

– Year 1	3.0%
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Vacancy and collection loss - 5.0%

Office lease terms and other assumptions - new and renewing tenants

- Lease term - 5 years
- Free rent - 0 months
- Annual rent escalations - 3.5%
- Downtime between tenants - 9 mos.
- Renewal probability - 65.0%

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- Reserved parking - $225/space
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- Annual parking revenue growth - 5.0%

Expense Inputs

	Year 1
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Real estate taxes	2,376,310
Non-reimbursable expenses	37,670
Insurance	188,000

Management fee - 2.0% of Effective Gross Income

Growth factor for real estate taxes - 2.0%

Growth factor for other expenses - 3.0%

Financing Inputs

Loan amount	$73.0 million
Loan-to-value	65.0%
Interest rate	7.5%
Loan term	10 years
Amortization schedule	25 years
Loan points	1.0%
Annual debt service	$6.5 million

Investor Tax Inputs

Ordinary income marginal tax rate	35.0%
Capital gains tax rate	15.0%
Cost recovery recapture tax rate	25.0%
Allocation of cost basis to improvements	80.0%
Depreciation schedule for improvements	39 years

Property Acquisition & Disposition

Property acquisition inputs

– Purchase price	$110.0 million
– Closing costs	1.75% of purchase price
– Loan fee	0.75% of loan amount
– Total acquisitions costs	$112.5 million

Property disposition inputs

– Residual capitalization rate	8.5%
– Broker's fee and closing costs	2.0% of sales price

Appendix H

Discounted Cash Flow Analysis

Property Type: CBD Office
Square Feet: 375,000
Stories: 25

	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10	Year 11
Calculation of After-Tax Cash Flow:											
Cash Flow after Debt Service	$74,530	$2,253,474	$4,421,227	$4,690,766	$5,620,282	$5,341,881	$5,531,620	$7,076,855	$2,720,336	$7,563,776	$8,230,773
Add: Loan Principal Paid											
Less: Depreciation											
Taxable Income											
Less: Federal & State Taxes (Taxable Income X Marginal Tax Rate)											
After-Tax Cash Flow											
Calculation of After:Tax Gain on Sale:											
Net Sales Price											$182,310,142
Add: Depreciation Recapture											
Less: Original Property Cost Basis											
Taxable Gain on Sale											
Less: Capital Gains Tax											
After-Tax Gain on Sale											

Appendix I
Space User Property Underwriting Checklist

1. Strategic Goal Compliance

Support Social License to Operate

Promote Marketing and Sales
Increase Innovation
Improve Employee Recruiting and Retention

Increase Productivity
- Meet Logistics Requirements: Vendors and Customers
- Integration of Business Units

Increase Flexibility
- Assets Off Balance Sheet
- Match Occupancy Durations

Reduce Costs
- Assets off Balance Sheet
- Match Occupancy Durations
- Reduce Capital Costs
- Reduce Operating Costs
- Energy Efficiency/Cost Goals/Standards

Meet Energy and Sustainability Goals
- Prescriptive Standards
- Performance Standards

2. Property Specific Requirements

Security

Technology

Life and Safety

Parking

Quality-Image

Mission Driven Occupant Requirements

Design and Engineering Standards

Human Resource Standards

Maintenance and Operations Requirements

Etc.

* This underwriting checklist identifies some of the key tasks and analytic practices used by space users. Based on the type of investment the space user is making, the tasks on this checklist need to be combined with either Appendix I-B, the Existing Building Underwriting Checklist, or Appendix VI-C, the New/Major Retrofit Building Underwriting Checklist.

Appendix I
Space User Property Underwriting Checklist

3. Financial Analysis

Corporate Return on Investment Hurdle
Economic Value-Added
Total Occupancy Cost Analysis
Company Capital Investment “Hurdle” Rate
Low-Bid/Cost Assessment
Simple Return on Investment
Simple Payback
Life Cycle Cost Assessment
Value Engineering
Sale-Leaseback Analysis
Asset Valuation
Risk/Options Analysis

4. Pre-Purchase/Lease Due Diligence**

Compliance with Lease Request for Proposal Requirements
Utility Bill Analysis
Benchmark Energy Costs
Energy Audit
Evaluate Lease Structure and Terms
Interview Prior Users of Space
Identify and Test Systems-Commissioning
Review Prior Energy Modeling

** These are some of the key energy-related due diligence activities undertaken by corporate real estate executives as reported in CoreNet Global’s April 2007 study: “The Energy Challenge: A New Agenda for Corporate Real Estate.”

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