

Responsible Property Investing

An increasing number of institutions in Canada are engaging in long-term sustainable investment strategies, which incorporate environmental, social and governance factors into investment decision-making. The majority of this activity is taking place in public equities portfolios. However, an emerging body of literature seeks to extend responsible investing practices to other asset classes, including real estate. The extension to the property sector, which is referred to as 'responsible property investing' (RPI), is motivated by the recognition that property has a significant impact on environmental and social conditions.

This annotated bibliography reviews fifty articles and books, covering both the social and environmental aspects of RPI literature. The focus is on commercial property in the UK, US, Australia and Canada.

The environmental side of RPI has received significantly more attention than the social side. In particular, the business case for green buildings has been well-documented. This literature identifies the costs and benefits associated with green buildings, including savings in water and energy costs and added-value, such as an increase in worker productivity and tenancy satisfaction as reflected through rental and price premiums. Some literature is also beginning to explore the relationship between financial returns on investment and green buildings, yet this area is underdeveloped.

On the social side, literature on urban regeneration, brownfield redevelopment, affordable housing and responsible labour and contracting policies is also growing. However, this literature is still in the exploratory phase in many cases. Despite the lack of attention to social features of property, the literature that does exist on the topic demonstrates the importance of including social considerations in property ownership, management and investment in order to move beyond the concept of green buildings, to a more holistic one of sustainable buildings.

Strongly Recommended Readings:

1. Ellison, L. Sarah Sayce, and Judy Smith. (2007) "Socially Responsible Property Investment: Quantifying the Relationship between Sustainability and Investment Property Worth" Investment Property Forum, London Journal of Property Research. Available online: <http://www.informaworld.com/smpp/title~content=t713735323>

Summary

This paper explores the potential link between the sustainability of a property asset and its investment worth. The research is based on the premise that sustainability represents an additional and changing set of risks for property investors and as such needs to be examined systematically for those risks to be properly understood and mitigated. It seeks to make the bundle of issues referred to as 'sustainability' explicit within the appraisal process in order that their impact on property worth can be more effectively examined and assessed from a property investment perspective. A series of relationships between sustainability and the functional performance of a property are theorized. A set of parameters quantifying the impact of that functional performance on rental growth and depreciation are then developed. The main findings are that sustainability is pertinent to property investment and can be analysed in relation to potential impact on standard investment appraisal variables. The paper presents a model for doing this as a foundation from which further work can be developed. Two example appraisals are presented to demonstrate the approach developed.

The paper highlights the risk associated with RPI and presents a model for capturing these risks. The study focuses on commercial property investors in the UK.

To date, no technique has been developed that enables the investor to relate investment returns and risk to sustainability. As a result, this paper fills a significant gap in the literature. The authors first review qualitative literature, which has considered these issues associated with sustainability, (see, for example, Davies, 2005) and examining the potential for sustainability issues to improve the financial Socially Responsible Property Investment performance of commercial buildings (Green Building Council Australia, 2006; Robinson, 2005; Kats, 2003) or to aid decision-making at the end of building life (Sayce et al., 2004). "These produce useful case studies demonstrating how cost savings and good value has been achieved with sustainable buildings. However, they fall short of developing a systematic means of capturing the risk or return that could be attributable to the presence of specific sustainability characteristics within existing buildings".

"The methodology is presented as a starting point from which the industry could move forward in developing a means of more explicitly considering the bundle of risks that have come to be termed 'sustainability' and linking them to a standard investment appraisal process. This is not presented as the answer to the problems sustainability poses for property investors, but reviewing portfolios on a basis such as this could be a relatively straightforward means of understanding a little more about the risk sustainability represents."

The study "sets out the process by which metrics have been developed to link each sustainability criteria to investment worth. The approach taken is based on the relationship between the individual sustainability criteria, the functional performance of the property and the standard worth variables of rental growth, depreciation and cashflow. In the absence of transaction data as evidence, the

methodological approach has been to establish how each sustainability criteria might impact on the performance of the property.”

The paper provides a useful theoretical basis for linking sustainability criteria with impacts on investment worth, although the study itself does not look specifically at financial returns. Instead, it considers variables such as higher rents and longer tenancy occupancy that may result in higher financial returns. Overall the paper contributes to establishing a working basis for further investigation on the impact of sustainability on property worth. A weakness is the paper’s definition of sustainability, which excludes social factors such as responsible contracting and labour policies, urban regeneration, etc.

2. Fuerst, F. And Patrick McAllister. (2009) “New Evidence on the Green Building Rent and Price Premium”. Available online: SSRN

Abstract: This paper investigates the effect of voluntary eco-certification on the rental and sale prices of US commercial office properties. Hedonic and logistic regressions are used to test whether there are rental and sale price premiums for LEED and Energy Star certified buildings. The results of the hedonic analysis suggest that there is a rental premium of approximately 6% for LEED and Energy Star certification. A sale price premium of approximately 35% was found for 127 price observations involving LEED rated building and 31% for 662 buildings involving Energy Star rated buildings. When compared to samples of similar buildings identified by a binomial logistic regression for Energy Star-certified buildings, the existence of a rent and sales price premium is confirmed albeit with differences regarding the magnitude of the premium. Overall, the results of this study confirm that LEED and Energy Star buildings exhibit higher rental rates and sales prices per square foot controlling for a large number of location- and property-specific factors.

The authors employ a “hedonic model to measure differences in prices between certified and randomly selected non certified buildings in similar markets controlling for differences including lease contract, age, height, quality, sub-market etc”. Rental regressions for a sample of approximately 200 LEED and 800 Energy Star (the precise number varies slightly with model specification) as well as approximately 10,000 buildings in the control group are estimated.

The paper identifies rental and price premiums which are significant for LEED and Energy certification. “In terms of LEED level, although the coefficients have the expected signs, only the Certified and Platinum level have a significant premium. Based on a sample of transaction prices for 662 Energy Star and 127 LEED-certified buildings, we find price premiums of 31% and 35% respectively.”

The authors are careful in interpreting these results however, due to the fact that “there are significant methodological and data issues in controlling for the inherent heterogeneity between certified and non-certified buildings and secondly, all empirical studies provide a historic snapshot of price differentials for specific sample in a specific time period.” Also, price differentials for certified buildings are likely to vary over time and between buildings. “Attempts to profit from any current or historic price premiums are faced with the standard ‘developer’s dilemma’ – that their supply response to *current* price differentials between certified and noncertified buildings are likely to affect the *future* price differential”. Despite these limitations, this paper offers some evidence to suggest that voluntarily eco-labelled buildings are desirable investments.

**3. Kats, G. et al. (2003) "The Costs and Financial Benefits of Green Buildings, A Report to California's Sustainable Building Task Force". Available online: www.usgbc.org
<http://www.usgbc.org/Docs/News/News477.pdf>**

Summary:

Integrating "sustainable" or "green" building practices into the construction of state buildings is a solid financial investment. In the most comprehensive analysis of the financial costs and benefits of green building conducted to date, this report finds that a minimal upfront investment of about two percent of construction costs typically yields life cycle savings of over ten times the initial investment. For example, an initial upfront investment of up to \$100,000 to incorporate green building features into a \$5 million project would result in a savings of at least \$1 million over the life of the building, assumed conservatively to be 20 years. Specifically, the bulk of this report reviews and analyzes a large quantity of existing data about the costs and financial benefits of green buildings in California.

This report is frequently cited in other reports and academic literature because it covers such a broad range of issues falling under green buildings and addressing both costs and values/benefits. It does not focus however, specifically on encouraging investments in sustainable construction, but it does provide context and relevant background information to support RPI. The report begins by defining green buildings, reviews the LEED standards, life cycle model, discusses the costs of building green, and then proceeds with a review of potential benefits of green buildings, including energy-use reduction, improvements in productivity and health of workers, water conservation and waste reduction, and insurance benefits of green buildings.

Relying on data from buildings across the US for a total of 33 buildings, the study also estimates the costs of constructing green buildings in comparison with buildings that do not incorporate green characteristics, but with the same design. "The average premium for these green buildings is slightly less than 2%, or \$3-5/ft², substantially lower than is commonly perceived. The majority of this cost is due to the increased architectural and engineering (A&E) design time, modeling costs, and time necessary to integrate sustainable building practices into projects. Generally, the earlier green building features are incorporated into the design process, the lower the cost."

The report suggests that green buildings contribute to cost savings in areas such as energy and water, reduced waste, improved indoor environmental quality, greater employee comfort/productivity, reduced employee health costs and lower operations and maintenance costs. The report focuses on lower energy costs and health and productivity benefits.

4. Keeping Miles and Gyula Sebestyén. (2000) "What About the Demand? Do Investors Want 'Sustainable Buildings'? RICS Research Centre- The Cutting Edge 2000.

Abstract

The technical case for aspects of sustainable construction is well advanced, but there is little evidence that many investors in buildings (e.g. financial institutions) have a significant desire to own sustainable buildings. Initial research now indicates that such institutions (owning of the majority of commercial buildings) sometimes demand "green" features in buildings, but do not demand sustainably produced

buildings because they have a lack of knowledge of their benefits. It is vital to alter demand for sustainable construction rather than rely merely upon supply of it.

This research, which has in part been funded by the C.I.B., involves attempting to determine the reasons for low demand from institutions and others for sustainable construction. This paper will address the issues raised in the literature on the topic and will also consider primary research on the nature of investor demand for sustainable construction. This demand is analysed in both terms of what is demanded and also why it is demanded. Furthermore, an assessment is made of the reasons for a lack of demand in this area and suggestions are brought forward as to how this may be increased.

The paper highlights an important issue that is often omitted from the literature, which is the lack of demand from investors for green buildings, despite evidence showing they may be cost effective and add value. “Thus, whilst some producers of buildings have recognised awareness of issues pertaining to sustainable construction and responded to initiatives promoted by the Department of the Environment, Transport & the Regions (D.E.T.R.), there is little evidence that corporate investors in buildings (e.g. financial institutions) have a similar desire to own buildings which incorporate principles and techniques of sustainable construction.”

The authors conduct a survey of investors in order to assess their knowledge and perception of sustainable buildings. “When approached, most investors acknowledged their ignorance of the meaning of the term ‘sustainable’ and preferred to address the concept of ‘green’ buildings. Many stated that they would be prepared to consider the ‘green’ refurbishment of existing properties or procurement of new, ‘green’ buildings under a number of circumstances”.

The paper models the vicious circle of blame in an effort to explain the barriers to the production and demand for sustainable buildings from builders, contactors, occupants, and owners. The authors suggest that this vicious cycle is caused by a lack of understanding of what sustainable construction means. “It is clear from the research undertaken, both secondary and primary, that while there is relatively widespread and considerable interest in the topic of sustainability and sustainable construction, there is also a great deal of confusion over the terms that are used”. Many confuse the term sustainable development with environmental protection and many limit the scope of sustainability to consideration only of environmental issues. Within the property context, this is manifested in the apparent interchangeability of the terms ‘sustainable buildings’ and “green’ buildings’.

The authors conclude that “one of the key problems facing the promotion of sustainability and sustainable construction is the want of workable and comprehensible definitions. Underlying this is the need to enhance information and education pertaining to the important concepts of sustainable development and sustainable construction.” Education and clarification on sustainable buildings are listed as possible solutions for breaking the vicious circle of blame. This paper has reminded us that the business case is not sufficient for encouraging investment in sustainable property assets because despite the evidence that shows investors clear indications of savings and value added, demand is still low.

5. Kok, Nils. (2008) “Corporate Governance and Sustainability in Global Property Markets”.

See Chapter 5

“This chapter provides the first systematic analysis of the impact of environmentally –sustainable building practices upon economic outcomes measured in the marketplace. We concentrate upon commercial property and investigate the relationship between investments in energy efficiency in design and construction and the rents, effective rents, and selling prices commanded by these properties. We analyze a large sample of buildings, some of which have been certified as more energy efficient by independent and impartial rating services.”

The study uses a sample of 10 000 US office buildings which have been rated for energy efficiency, (LEED or Energy Star rated) and a control sample of office buildings in close proximity. The author is specifically looking for evidence of a relationship between contract rents, effective rents, and selling prices and a set of characteristics of the rated buildings.

The study finds that buildings with a green rating command premiums in expected rents of 6% and selling price premiums of green buildings of 16%. Statistical methods are used to break results into several components, finding that customers may be willing to pay a premium for the socially responsible attributes of green buildings. Several control variables including spatial variation are included in the analysis, minimizing the chances of bias in the results. This research is a difficult undertaking and there is still a possibility that variables included as controls are not properly measured or adequate data do not exist to include them.

The study also offers a discussion on the ratings for green buildings, specifically LEED and Energy Star. This study provides a useful basis for more empirical research. Results are similar to those found in Fuerst and McAllister (2009).

6. Matthiessen, Lisa, Peter Morris, and Davis Langdon. (2007) “The Cost of Green Revisited: Re-examining the Feasibility and Cost Impact of Sustainable Design in the Light of Increased Market Adoption”.

Summary:

The purpose of this paper is to revisit the question of the cost of incorporating sustainable design features into projects. It builds on the work undertaken in the earlier paper “Costing Green: A Comprehensive Cost Database and Budget Methodology,” released in 2004, and looks at the developments that have occurred over the past three years, as sustainable design has become more widely accepted and used.

The paper features studies, which find savings in costs from investments in LEED standard buildings. It finds that many projects are actually achieving LEED ratings within their budgets, and in the same cost range as non-LEED buildings. Also, the authors find that despite the increases in average construction cost for both green and non-green buildings, (between 25% and 30%), there continues to be a large

number of LEED projects within budget. “This suggests that while most projects are struggling with cost issues, LEED is not being abandoned”. The study also addresses the need to deconstruct the view that green is an added feature.

The 2006 study shows essentially the same results as 2004; that there is no significant difference in average costs for green buildings compared to non-green buildings. This study compares construction costs of buildings where LEED certification was intentional to similar buildings where LEED was not considered during design phase. A total of 221 buildings were included in the study. Of these, 83 buildings were selected which were designed with a goal of meeting some level of the USGBC’s LEED certification. The other 138 projects were buildings of similar program types which did not have a goal of sustainable design.

Attitudes are also reflected in this study- data are collected through a survey of the contracting community, which finds that the community no longer views sustainable design requirements as “additional burdens to be priced in their bids.”

“As the various methods of analysis showed, there is no ‘one size fits all’ answer to the question of the cost of green. A majority of the buildings we studied were able to achieve their goals for LEED certification without any additional funding. Others required additional funding, but only for specific sustainable features, such as the installation of a photovoltaic system. Additionally, our analysis suggests that the cost per square foot for buildings seeking LEED certification falls into the existing range of costs for buildings of similar program type.”

The paper also disaggregates the LEED credits in order to assess the individual costs of each category. This is a useful tool for the design stage of construction. “The only effective way to budget for sustainable features within buildings is to identify the goals, and build an appropriate cost model for them. If they are seen as upgrades or additions, the cost of the elements will also be seen as an addition. It is possible to establish goals and budgets from the very beginning of the project.”

7. McGreal, Stanley, Webb, James R, Adair, Alastair, and Berry, Jim. (2006) “Risk and Diversification for Regeneration/Urban Renewal Properties: Evidence from the U.K”. Journal of Real Estate Portfolio Management. Available on-line:

http://findarticles.com/p/articles/mi_qa3759/is_200601/ai_n16139342/?tag=content;col1

Summary:

This study addresses the issue of investment returns and risk within urban renewal locations in major metropolitan areas in the United Kingdom. The research indicates that investment performance in regeneration areas has matched, and in the retail sector, exceeded national and local city benchmarks. Returns for regeneration property are analyzed at aggregate and disaggregated levels over a 22-year time period. Separation of the returns highlights the highly risky nature of the appreciating capital return and the low risk bond-like income returns. Optimal mean-variance portfolios are also constructed and analyzed. The results indicate that properties within urban renewal areas can potentially increase portfolio diversification in all but one instance.

This study is included in this review because it represents urban regeneration projects in the RPI literature and attempts to estimate the return on investment. This is not common in the literature on

urban renewal, which tends to focus more on the social and environmental benefits rather than estimate the financial returns. The paper also addresses risk, which is important because this is a major barrier for investors considering investment in urban renewal projects.

Methodology: “The traditional commercial property classifications of retail (includes standard retail premises and retail warehouses), office and industrial real estate are used.

The authors find that “property investment in regeneration areas can equal or outperform national and local benchmarks, contrary to the common perception that investments in regeneration real estate are associated with significant risk.” “The analysis demonstrates that over the long-term, regeneration/urban renewal properties offer significant investment opportunities. These findings challenge preconceived notions and suggest that opinions of low investment returns in these areas are incorrect. It uses investment returns, risk and diversification within urban renewal areas in eight major U.K. metropolitan areas, each of which has been the subject of varying regeneration initiatives by type, size, scale and nature of intervention.”

“On the basis of risk assessment, similar findings prevail. Indeed, both of these sectors, but notably industrials, perform better in terms of the income return component. This analysis suggests the perception that regeneration areas have significantly greater levels of risk, compared to prime real estate markets, is incorrect. Performance figures indicate that the level of risk faced in regeneration areas is not significantly different than the market as a whole, and in certain instances, may be lower.”

8. Miller, Norm Jay Spivey and Andy Florance. (2007) “Does Green Pay Off”?

Summary:

Here we reveal one of the first systematic studies that addresses questions on the benefits of investments in energy savings and environmental design. We compare all U.S.-based Energy Star office buildings as one measure of “green” building and also LEED-certified office buildings as another measure of “green” with a large sample of non-Energy Star and non-LEED rated buildings. Essentially, Energy Star buildings are those within the 25% most efficient buildings for energy conservation. LEED-certified buildings are based on the standards provided by the U.S. Green Building Council, USGBC. A parallel effort undertaken by Fuerst and McAllister (2008) finds similar results to those presented here and using the same data source, while Eicholtz, Kok, and Quigley (2008) also find modest yet positive results for controlled rent differentials.

This paper conducts a systematic study of green buildings in the US. The paper includes an attempt to assess the extra costs to go green, defined as costs extending beyond the originally estimated budget. It finds that according to surveys of those meeting LEED certification the average cost are reported to be an additional 3%. Results are disaggregated into costs per level of LEED (silver, gold, or platinum) as well as by region in the US. A strength of this study is the attempt to conduct a more comprehensive assessment of the costs associated with green buildings rather than rely on specific case studies which cannot often be generalized.

The paper finds that contrary to common perceptions, the green movement is not being driven by the public sector, and it provides evidence of private market based firms who are investing. It also identifies barriers within a society to the development of green buildings, including a lack of planning, education and culture. Overall, the authors highlight the need for market transparency and better information as well as metrics that can be agreed on if not globally, than at least nationally.

9. National Round Table on the Environment and the Economy. (2002) "A Preliminary Investigation into the Economic Impact of Brownfield Redevelopment Activities in Canada Final Report" Available on-line:

http://www.aboutremediation.com/PDFS/National_Bf_Strategy_Investigation_on_Economic_Impact_Nov_02.pdf

Summary:

In support of its mandate to develop a National Brownfield Strategy, the National Round Table on the Environment and the Economy (NRTEE) commissioned this study into the potential benefits of brownfield redevelopment activities locally, regionally and nationally. To meet the needs of the NRTEE as expressed through their terms of reference, Regional Analytics identified five core research questions, and these are addressed in turn, with a summary of findings for each.

This report offers a useful review of brownfield developments in Canada. It addresses the economic, social and environmental benefits deriving from brownfield redevelopments and provides an assessment of the barriers for investors. In particular, the report highlights barriers related to a lack of funding and liability issues. The report also presents a case study of a brownfield development in Hamilton, Ont. Noting the higher cost of brownfield redevelopment compared with greenfield, (14-34% higher) the authors stress the need for government intervention to offset these costs in order to encourage private sector investment in brownfields.

The literature review presented in this paper finds that "numerous studies of brownfield redevelopment and the case studies show that brownfield redevelopment produces significant economic benefits at all geographic scales (local, provincial, and national), regardless of size of project or type of re-use. These benefits include job creation, increased incomes and property taxes at the local level and increased income and sales taxes at the provincial and federal levels." There are a host of other benefits related to environmental and social factors that have been identified through various case studies but these relationships have been complex and few studies have incorporated them. Other possible benefits include a "reduction in urban sprawl and associated costs, such as the extension of infrastructure, traffic congestion and air pollution, as well as the revitalization of neighbourhoods, employment areas and urban cores, and an increase in community pride."

The study also discusses the important role that government investments play in leveraging private investments. "As of April 1, 2002, the total invested in rehabilitated sites (buildings, improvements, etc. was \$1.6 billion (\$953 million in Montreal, \$103 million in Quebec, and \$55 million in other municipalities). Most of this investment was made by the private sector. Therefore, \$60 million in public sector funding has leveraged \$1.6 billion in private and public sector investment in 137 projects, an average of \$11.3 million per project'- interesting result confirming the need for government intervention and investment."

Although this paper does not offer any strong evidence on positive returns on investment in brownfield development, it does identify some key issues and recommendations, as well as provide a basis for further research in the area.

10. Pivo, Gary and Jeffery Fisher. (2008) "Investment Returns from RPI: Energy Efficient, Transit-oriented and Urban Regeneration Office Properties in the US from 1998-2008".

Abstract:

Responsible property investing (RPI) includes many facets such as investing in Energy Star labeled properties, investing in properties near transit stations and investing in properties in urban regeneration areas. This paper shows that investors could have purchased a portfolio consisting solely of RPI office properties over the past 10 years and had performance that was as good if not better on a risk-adjusted basis than a portfolio of properties without RPI features. This paper breaks down the way that various RPI factors impact income, property values, capitalization rates, price appreciation and total returns. One of the interesting results is that the impact of proximity to transit differs for the CBD and the suburb. This difference can be attributed to whether or not the value of being close to transit was already reflected in prices as was the case for the CBD but not the suburbs where the value of transit appears to have increased in importance over the past ten years allowing existing investors to earn above average returns. Energy Star rated properties had higher income and income growth over the past ten years. Investors were willing to purchase these properties at lower cap rates producing a premium in value over non Energy Star properties. Although we don't know the cost to developers of making properties qualified for the Energy Star labelled, the higher income from these properties combined with investors being willing to purchase them at lower cap rates suggests that the benefits may have outweighed any additional development costs. Finally, properties in or near urban regeneration zones had higher income and value although they did not outperform other properties because their higher income and value were already reflected in the price that investors paid for them. But developers would have benefited from the higher values if development costs were not greater for these properties. All factors considered, there does not appear to be any reason why investors cannot be socially responsible and still earn an appropriate risk-adjusted return. Since RPI can produce social and environmental benefits and fulfill fiduciary duties, it would be economically irrational in social welfare terms and ethically unjustifiable to not engage in Responsible Property Investing.

The authors create a portfolio of office properties that include at least one RPI characteristic and a portfolio that does not have any RPI characteristics. Using regression analysis with different dependent variables, including market value, income, expenses, total returns, the study finds that over a ten year period, the RPI portfolio slightly out-performed the non-RPI portfolio. The results presented in this paper address the barriers associated with fiduciary duties and concerns over financial return, by systematically examining and measuring financial performance of RPI properties. The authors look at a three responsible property investment categories, including energy efficient properties (LEED and Energy Star), properties near transit, and properties in urban regeneration areas.

Although the paper does not incorporate analysis of the costs of achieving sustainable building labels, the conclusion suggests that there are significant benefits from investing in these buildings for investors and that this may outweigh costs. Clearly, there is a need for more cost-benefit analysis in order to increase confidence of investors. This paper is the first to attempt to measure financial return from investment in sustainable buildings. A significant strength of this paper is the incorporation of both environmental and social considerations in the study. This is accomplished by including not only green buildings and proximity to transit in the regression analysis, but also urban revitalization, which is more closely linked to social benefits. However there is a lack of other social variables included in this study.

11. Pivo, Gary. (2007) "Exploring Responsible Property Investing". Corporate Social Responsibility Environ. Mgmt. DOI: 10.1002/csr.

Abstract:

Property is an important part of modern economies with significant social and environmental consequences. As a result, practitioners and scholars have begun focusing on the social responsibility and sustainability of property investors. This paper expands that work by examining Responsible Property Investing among investment organizations in the United States. Responsible Property Investing is defined as efforts that go beyond compliance with minimum legal requirements to better manage the environmental, social, and governance issues associated with property investing. A survey of senior American executives finds that most organizations are going beyond compliance, implementing management strategies and investing in properties that are consistent with Responsible Property Investment principles. Most executives also place their organization beyond compliance in a Responsible Property Investing stage model. Business concerns are the leading drivers and impediments. Among the various types of organizations studied, pension funds, foundations and endowments lag behind others in implementing Responsible Property Investing.

This paper supports the need for more research on the business case in order to advance the RPI agenda. It is an exploratory and descriptive paper contributing to a new field of research, which is the degree of RPI activity by property organizations. It does not set out to provide in-depth analysis, but rather a basis for more detailed explanatory investigations by answering seven questions: Are US property investors and developers practicing social responsibility? How advanced are the organizations that are implementing RPI? What strategies are they using? What are the major drivers and impediments? What related information and services might they need or desire? How do the answers to these questions vary by type of organization?

US property investment organizations are surveyed on their views and practices related to RPI in order to gauge the level of activity in the area of responsible investing by this class of investors. The target population is chief executive officers.

"CEOs thought that the strongest drivers of RPI were conventional business considerations such as concern for risk and return and opportunities to outperform. Moral sensibilities, voluntary codes of behaviour and internal leadership also received relatively high scores. Over half the executives moderately or strongly agreed they would like more information on RPI investment opportunities and the merits of their current activities. Many also agreed they would probably increase their allocation to RPI if it met their investment criteria. Most were disinterested in joining a working group or paying extra for data."

Barriers to RPI that were identified in the study include concerns of poor financial performance and a lack of tenant demand. The survey also identified that there is a significant difference between the pension funds, foundations and endowments from the other types of organizations in their attitudes towards RPI. "Their lower activity levels and ratings of drivers and their higher ratings of impediments are a concern, since they are major asset owners and can be very influential." Possible explanations the author provides for this divergence include the fact that these organizations are not involved in real estate decisions, which are often left to management partners and advisors. Secondly, real estate is a smaller proportion of these organizations' portfolios, which means they may focus management

attention on other asset classes. Finally, their conception of fiduciary duties may make them more risk averse and therefore unwilling to engage in RPI. The paper provides useful basis for more research on property organizations' engagement in RPI and finds some insightful results from the survey which can be applied across all sectors of institutional property investors.

12. UNEP Finance Initiative's Property Working Group. (2009) "Responsible Property Investment: Similar Aims, Different Manifestations".

Summary

This article prepared by UNEP FI's Property Working Group, presents the essential differences between Responsible Investment (RI) in asset classes and in direct property. This practical note should help investors apprehend why and how Responsible Property Investment (RPI) is uniquely different to other "regular" assets. In particular, it explains that, whilst the same principles can be applied to property as equities with regards to RI, the unique nature of direct property as an investment type means that there are a number of practical differences in how to implement them.

The report identifies five significant differences between responsible equity investment and responsible property investment and provides corresponding implications of these differences. The first distinction made is between the investor and invested asset relationship. A property investor does not have the ability to pursue direct action in most cases because these areas are occupied by tenants. An opportunity is presented due to the nature of property as a binary asset (the building itself and the tenants). This provides a responsible property investor with a range of options for incorporating sustainability into their operations. Third, property is characterized by time limited leasing segments, so only in periods between rentals can the property be fully controlled. The fourth difference identified is the liquidity and transaction costs between equities and real estate investment. Due to "the 'lumpy' lot sizes and the heterogeneity of properties and the economic activities that occur within them," direct property investment often requires substantial due diligence and time to transact. The fifth difference identified by the report is the ability to compete in the market and the drive this creates towards meeting new sustainability challenges. "Properties are fixed in location, substantially constrained in form, and tend to obsolesce both physically and functionally over time. This relative fixity in asset characteristics can constrain what a responsible property investor is practically able to achieve with an invested asset."

Through identifying these differences between property and equity investing, this report serves a practical purpose for investors who are interested in adopting socially responsible property investment practices. The report also applies the methodologies of SRI, including engagement, screening, and best in class approach to the RPI sector in order to draw out some important considerations. Overall, some of the differences between RPI and SRI are constraints for encouraging real estate investors to engage in responsible investment practices, while others are opportunities for expanding the RI initiative to the real estate sector.

13. Cole, R., Lindsey, G. and Todd, J.A. (2000) "Assessing life cycles: Shifting from Green to Sustainable, Proceedings, Sustainable Buildings". Maastricht, The Netherlands.

Summary:

Notwithstanding the importance of social and economic needs and constraints, the health of the biosphere is *the* limiting factor for sustainability. A prerequisite for sustainability is the restoration and maintenance of the functional integrity of the ecosphere so that it can remain resilient to human induced stresses and remain biologically productive [Rees, 1991]. Unfortunately, irrespective of current efforts to curb environmental degradation, the timescale of loadings such as greenhouse gas emissions and subsequent stabilization of tolerable CO₂ levels within the atmosphere, mean that the consequences of past and current actions will persist for decades to come. The life-cycles of such processes is therefore critical. Life-Cycle Assessment (LCA) methodologies attempt to profile the performance of materials, components and buildings through time, and have successfully entrenched the notion of an extended time context for discussing buildings. Green building design is posited as incremental improvements in the environmental performance of building beyond typical practice but typically without reference to time-frames or matched to other contextual factors. By contrast, environmental sustainability implies long time frames of responsibility - well beyond those currently practiced or envisaged, and beyond the building life expectancy embodied within LCA models. Realigning societies toward sustainability may profoundly influence what we build, where we building and how we build. Assuming rational transition toward sustainability – meaningful change *can only* occur over a long time frame.

"This paper examines implications of extended view of time on green building design and assessment methodologies. The paper positions the twin requirements of technical and cultural change within the transition toward sustainability and explores whether existing building environmental assessment methods are capable of evolving incrementally within this process."

Acknowledging that green buildings have received a lot of attention in the past decade, the authors argue that we need to expand the time frame and look at broader issues if this area is going to be successful. The authors suggest that a "significant realignment toward a more holistic "sustainable" approach, both in design and its assessment, may not be possible until the links between "building" performance and larger scales are acknowledged".

"The "individual" building, is a too constraining level to define "sustainable" practice and the next significant advances in environmental assessment methods will invariably have to explicitly extend boundaries of analysis": Relating to the community or region in which a building is located – considering regional economic and social issues along with environmental issues. Suggests we need to relate this concept of sustainability to a global context and the associated environmental, economic, and social issues.

The paper concludes that "building environmental assessment methods set within the context of sustainability would require measuring the extent of progress *toward* a declared "sustainable"

condition. However whereas we can define “green” and even “greener” as well as the incremental process for improving performance, we cannot currently envision a sustainable future.”

14. Heerwagen, Judith H. (2000) “Green Buildings, Organizational Success, and Occupant Productivity”. Published in a special edition of Building Research and Information. Vol. 28 (5), 353-367.

Abstract:

This paper explores the wider context of sustainable design, integrating work from organizational effectiveness and human factors in an effort to broaden our understanding and lay the foundation for future research on the costs and values of sustainable design. At the present time, the conversation is dominated by costs because methods for calculating costs are more highly developed and more readily accepted than methods for assessing benefits and value. As a consequence of this imbalance, much of the work cited in this paper is theoretical rather than empirical. However, good research depends on good theory to guide the selection of questions and methodologies.

This paper attempts to fill a gap in the literature and research by providing a theoretical framework, which sets a basis for more work on assessing value and benefits deriving from green buildings, rather than focus on direct costs. One reason for this lack of work on measuring benefits and value is due to the difficulty in documenting them. However, the author argues that it is important to measure these benefits to help decision makers who may “want to use facilities to enhance organizational effectiveness and productivity, but often do not want to make investments in the kinds of changes needed until they have proof that it will payoff.”

The author introduces the concept of the balanced scorecard to incorporate benefits and value into the information available to the decision maker. This scorecard aims to link green buildings and organizational performance (finance, business, human resource development, and stakeholder relations). “Green buildings can provide both cost reduction benefits and value-added benefits. The emphasis to date, however, has been on costs, rather than on benefits. The need for more data on value added benefits underscores the importance of studies that focus on these human and organizational factors.”

15. Lamore, Rex L., Terry Link, and Twyla Blackmond. (2006) “Renewing People and Places: Institutional Investment Policies That Enhance Social Capital and Improve the Built Environment of Distressed Communities”. Journal of Urban Affairs. Vol. 28, 5, pp. 429-442

Abstract:

The challenges confronting distressed communities in the United States are complex and multifaceted. Communities large and small have been significantly affected by a myriad of social, environmental, and economic forces, including a continuing decline in manufacturing employment, uncontrolled sprawl, and the transition to a global economy. The traditional choice between a “placebased” theory of redevelopment strategy versus a “people-focused” theory no longer seems feasible or appropriate. This article outlines sustainable development as an alternative strategy that combines a place-based development strategy, a human development focus, and an environmentally mindful approach. It posits that there exists a direct positive relationship between the creation of social capital, the redevelopment

of the built environment utilizing sustainable development practices, and community-based organizations in distressed communities. Furthermore, the authors suggest that through community investment—a socially responsible investment strategy—institutions of higher education can facilitate the rebuilding of communities by providing financial capital while gaining a moderate yet secure financial return as well as a substantial social return.

This paper presents an argument in support of channelling financial capital from institutions of higher education into the rebuilding of communities through community investment. It is an exploratory paper which provides a theoretical basis for more research in the area. “Investors have too frequently ignored the advantages of green building and avoided investments in sustainable development. Green building in distressed communities has substantial potential to have a profound social and economic impact on residents and communities.” The paper focuses on the possibility for investment in construction and renovation efforts in distressed areas to act as a means for achieving what is referred to as a secondary rate of return, which is defined as positive social and environmental impacts, while at the same time earning a reasonable economic rate of return.

Although the paper does not engage in quantitative analysis, several examples are provided in support of this possibility. These examples however, are not in-depth case studies. The paper is specifically searching for evidence of a long term impact on social and economic conditions of these distressed communities. “Many communities are rebuilding their distressed neighborhoods utilizing both local community-based organizations and green building standards or approaches. Some, like the Green Institute in Minneapolis, have even begun start-up businesses from those areas that focus on restoring and rebuilding the community’s built environment using green building techniques.”

“When integrated with sustainable development practices, the prudent investment of higher education institutions’ financial resources in community-based development has the potential to build social capital, rehabilitate the built environment, and support environmentally sound practices in some of our most challenged communities.”

“This paper outlines sustainable development as an alternative strategy that combines a placebased development strategy, a human development focus, and an environmentally mindful approach. It argues that there exists a direct positive relationship with the creation of social capital, the redevelopment of the built environment utilizing sustainable development practices (approaches or methods), and community-based organizations in distressed communities.”

16. Mills Evan, Norman Bourassa, and Mary Ann Piette Lawrence, Hannah Friedman and Tudi Haas. (2005). “The Cost-Effectiveness of Commissioning New and Existing Commercial Buildings: Lessons from 224 Buildings”.

Summary:

Scattered case studies and anecdotal information form the "conventional wisdom" that building commissioning is highly cost-effective. Given that this belief has not been systematically or comprehensively documented, it is perhaps of no surprise that the most frequently cited barrier to widespread use of commissioning is decision-makers' lack of information pertaining to costs and associated savings.

'The Commissioning Process' defines commissioning as "a quality-oriented process for achieving, verifying, and documenting that the performance of facilities, systems, and assemblies meets defined objectives and criteria" (ASHRAE Guidelines). Commissioning covers several areas including the planning delivery, verification, and managing risks to critical functions performed in or by facilities. Commissioning is desirable because it can improve energy efficiency, environmental impacts, and the health and safety of building occupants. Although not directly focused on responsible property investment, the paper does provide a good discussion on the benefits of commissioned buildings related to social and environmental goals, as well as an assessment of whether they should be considered responsible property investments.

This paper "compiles and synthesizes published and unpublished data from real-world commissioning and retro-commissioning projects, establishing the largest available collection of standardized information on new and existing building commissioning experience in actual buildings." The authors develop a "uniform methodology for characterizing the results of projects (224 buildings) and normalizing the data to maximize inter-comparisons."

The paper finds that "building commissioning can play a major and strategically important role in attaining broader national energy savings goals—with a potential of \$18 billion or more in savings each year. As technologies and applications change and/or become more complex in the effort to capture greater energy savings, the risk of under-performance will rise and the value of building commissioning will increase. Indeed, innovation driven by the desire for increased energy efficiency may itself inadvertently create energy waste if those systems are not designed, implemented, and operated properly."

Cost of commissioning existing buildings is expressed as median: \$0.27/ft² (\$2003) [with an inter-quartile range of \$0.13 to \$0.45]. Energy savings are estimated to be 15% [7% to 29%], and payback times of 0.7 years [0.2 years to 1.7 years]. For new construction, median commissioning costs were \$1.00/ft² [\$0.49/ft² to \$1.64/ft²] (0.6% of total construction costs [0.3% to 0.9%]), and a median payback time of 4.8 years [1.2 years to 16.6 years]. The authors note the difference in commissioning costs for existing and new building construction.

Overall, the paper argues that "commissioning is underutilized in public-interest deployment programs as well as research and development activities. As technologies, controls, and their applications change and/or become more complex in an effort to capture greater energy savings, the risk of under-performance will rise and with it the value of commissioning. Indeed, innovation driven by the desire for increased energy efficiency may itself inadvertently create energy waste if those systems are not designed, implemented, and operated properly."

17. National Roundtable on the Environment and the Economy and Sustainable Development Technology Canada. (2009) "Geared for Change: Energy Efficiency in Canada's Commercial Building Sector".

Introduction:

This report provides a high-level analysis of the effectiveness of policy instruments in promoting energy efficiency in commercial buildings, and offers direction for establishing a long-term strategic plan for

emissions reductions from the sector. It does not contain a full cost-benefit analysis of all policy recommendations and does not outline the details of program design for their implementation. If adopted, the recommendations contained in this report will result in long-term policy certainty for industry, which is crucial for making investment decisions. The following information is included in this report in order to develop a realistic and achievable policy pathway:

- The current energy performance of the sector;
- The main drivers for and barriers against investment in energy efficiency;
- Best practices for monitoring and evaluating energy efficiency policies;
- International trends in energy efficiency policy development; and,
- Recommendations for the Government of Canada to increase the energy performance of commercial buildings.

The report addresses specific technology adoption barriers that prevent energy efficiency technologies from being instituted, tests the feasibility of applying specific emission reduction target sets to one sector of the Canadian economy and how they can be attained, and recommends policy instruments to achieve them.

Statistics on the impact of commercial buildings on environment: “In the absence of any policy intervention, carbon emissions from the commercial building sector in Canada are forecasted to grow to 207% above 2008 levels by 2050. There are more than 440,000 commercial buildings in Canada (approximately 672 million m² of commercial floor space). They account for 14% of end-use energy consumption and 13% of the country’s carbon emissions. Space and water heating accounts for 65% of energy used in commercial buildings in Canada. Natural gas accounts for 52% of the energy used by the sector and electricity accounts for 36%.”

18. Nelson, Andrew. (2009) “How Green a Recession? – Sustainability Prospects in the US Real Estate Industry”. RREEF Research Available on-line:

https://www.rreef.com/cps/rde/xchg/ai_en/hs.xsl/3157.html

Summary:

With all the recent distressing financial news – the declining economy, continuing credit market turmoil, and especially the rapid deterioration in property markets – real estate investors might assume that the green building craze is over, or at least on hold. Plummeting energy prices would seem to further counter the industry’s drive to greater sustainability. But assertions of green’s demise are greatly exaggerated, and certainly premature. A significant backlog of green buildings is already completed, only awaiting certification, and many other projects are nearing completion. In fact, the construction and certification of greener buildings continues to accelerate, increasing the green share of the building stock, and speeding markets to the tipping point where green buildings become the standard for quality real estate property.

This article is topical and provides a useful historical overview of the green building revolution. It begins with an account of the growth in the industry since the adoption of LEED US (2000). This is a useful illustration of progress to date in the US. “As of the end of June, almost 180 million square feet of space had been LEED certified in some 1,500 projects for perspective, more than all the office space in the Boston metropolitan area. Moreover, green building continues to grow exponentially. In fact, the amount of green building area has been growing at about a 50% compounded growth rate since 2000 –

about 25 times the growth rate for commercial real estate overall in this country, which averages a bit under 2% annually”.

A conclusion the paper draws from these trends, in the context of the current economic conditions: that the recession will “undercut the viability of real estate construction, which will reduce construction starts in the short term, and thereby limit the medium-term supply of new sustainable buildings”. However the paper also points out that there are a “significant number of green projects still under construction, and an even greater backlog of completed green buildings awaiting certification.” This suggests that the near-term supply of green buildings will continue to increase through the recession. In addition, market forces and regulatory incentives and mandates will “continue to pressure real estate owners and managers to enhance the sustainability of their portfolios, though the focus will shift to more affordable repositioning and efficient property operations instead of costly building renovations. Green buildings will continue to outperform conventional buildings due to their scarcity relative to demand, particularly in the nation’s major commercial centers.” The paper suggests that there will be immediate opportunities for investors to “purchase new-leased corporate facilities, sale-leasebacks, and selective acquiring and upgrading of well-located Class B buildings, as much for defensive positioning as for market gains”.

“In summary, the current recession will only slow, but not fundamentally alter, the market-shift to sustainable real estate.”

19. Newell G, Acheampong P.(2002) “The role of property in ethical managed funds”. In Proceedings from the Pacific Rim Real Estate Society (PRRES) Eighth Annual Conference, Available online at: www.prres.net/Proceedings/2002proceedings.htm

Summary:

Given the significance of property as an asset class and the development of a sustainable development agenda for the commercial property industry by the Property Council of Australia (PCA, 2001), it is important to assess the role of property (via listed property trusts etc) in Australian ethical managed funds. As such, the purpose of this paper is to analyse the development and performance of ethical managed funds in Australia in recent years, particularly highlighting the role of property in these socially responsible investment vehicles. With an increasing international focus on the environment and sustainability, many investors are seeking investment vehicles which are ethically responsible and financially sound.

The paper begins with a discussion of SRI, followed by a review of the total returns of property asset classes for eleven ethical funds for the three year period of October 1998-September 2001. “Ethical fund portfolios were also constructed for both an equal-weighted portfolio and a market-cap weighted portfolio, with the ASX300 used as the performance benchmark. Performance measures calculated for these ethical funds were average annual returns, annual risk and the Sharpe index”. The paper also provides details of the property-related companies in ethical managed funds. The twelve ethical managed funds reviewed accounted for \$468 million, representing 52% of the ethical managed fund sector.

The authors identify some of the characteristics associated with these levels of property-related companies in ethical managed funds. While ethical investing is well-established in the USA and UK, it is still an expanding investment market in Australia. The paper may be useful for comparing barriers that Australia faces to RPI with Canada as it is also lagging behind UK and US.

20. Pivo, Gary. (2008). "What the Leaders are Doing". in Journal of Property Investment & Finance (26) 6. pp: 562-576 Available on-line:

<http://www.emeraldinsight.com/Insight/ViewContentServlet?contentType=Article&Filename=Published/EmeraldFullTextArticle/Articles/1120260606.html>

Purpose – “This paper seeks to help those making investment decisions on existing commercial real estate portfolios to understand how environmental, social, and governance (ESG) issues impact the current value and prospective investment performance of the assets they own and manage. Design/methodology/approach – The issues and literature related to ESG issues in property investing are reviewed and examples of what industry leaders are doing to address these issues are collected and reported.”

Findings – “Property investors can realize greater returns on their investments through considering and acting on a range of social and environmental issues. Lenders, owners, fund managers, asset and property managers, and developers can all incorporate RPI strategies into their own activities. RPI strategies can be categorized into ten elements covering environmental, social and community issues. There are two types of financially sound RPI strategies: no cost and value added approaches. More research needs to be carried out to understand the economic impacts of some strategies”.

Originality/value – Sustainability and corporate social responsibility are major and growing issues for property investors. The study demonstrates a successful example of how fund and asset managers are responding to these issues which can be considered by other managers in their own strategic planning.

Pivo makes reminds us that although there is now a significant literature base on new green buildings, there is a need to focus on the buildings that already exist, since new buildings replace old ones only by 2-3%- per annum. The paper also provides a useful summary of progress made to date on responsible property investing, divided into investment categories.

21. Pivo, Gary. (2007). Exploring Responsible Property Investing: a Survey of American Executives. USA Corporate Social Responsibility and Environmental Management Corp. Soc. Responsib. Environ. Mgmt. Published online in Wiley InterScience (www.interscience.wiley.com) DOI: 10.1002/csr.165

ABSTRACT

Property is an important part of modern economies with significant social and environmental consequences. As a result, practitioners and scholars have begun focusing on the social responsibility and sustainability of property investors. This paper expands that work by examining Responsible Property Investing among investment organizations in the United States. Responsible Property Investing is defined as efforts that go beyond compliance with minimum legal requirements to better manage the environmental, social, and governance issues associated with property investing. A survey of senior American executives finds that most organizations are going beyond compliance, implementing

management strategies and investing in properties that are consistent with Responsible Property Investment principles. Most executives also place their organization beyond compliance in a Responsible Property Investing stage model. Business concerns are the leading drivers and impediments. Among the various types of organizations studied, pension funds, foundations and endowments lag behind others in implementing Responsible Property Investing. But no one has examined the firms that finance them. That is the purpose of this paper.

22. Pivo, Gary. (2005). "Is There a Future for Socially Responsible Property Investments"? Real Estate Issues.

Summary:

"The purpose of this paper is to explore the potential for a new niche in real estate investing, focused on "socially responsible" property investments. Despite the attention that SRI has been receiving, there is no system for evaluating social and environmental responsibility of real estate investments and there are virtually no real estate investment funds that are either designed for or marketed to the SRI community". The author finds through interviews that SRI leaders are unaware of "even a single real estate investment product that meets their needs". There are 300 real estate investment trusts in the U.S. yet the author has yet to find a single one that makes social responsibility or sustainability an explicit goal."

Acknowledging the lack of socially responsible property investment opportunities, the author sets out to identify possible types of investments that real estate investing could pursue. "These include publicly traded REITs that seek to own, develop and operate a portfolio of properties that fit certain criteria, such as Energy Star labelled office buildings, publicly traded real estate companies that make conservation, urban revitalization and sustainability a key part of their corporate strategy, private funds that are not traded on the public securities markets, but that buy, develop and sell SRPIs, SRPI funds of funds that would acquire interests in multiple private funds (minimum investments to invest in fund of funds is smaller making them more accessible to individual investors), and socially screened real estate mutual funds, which would buy and sell publicly traded REIT or real estate related stocks that the fund has determined pass certain social and environmental screening criteria."

The paper addresses the possibility for screening SRPI – Currently, LEED and Energy star do not have a portfolio tool yet. They only have the capacity for rating individual buildings.

The paper also discusses the difficulties with developing rating systems, best in class, dimensions of property which make it different from RI, and how rigorous to make the screens. "It may well be time for innovation and leadership in the field of socially responsible real estate. With the current level of interest in socially responsible investing and the rapid growth in real estate investment funds, it is remarkable that there is no mechanism that gives investors the opportunity to own real estate that's been certified as suitable for SRI investors".

Pivo lists five key actions that should be pursued: "Leaders from the SRI and real estate industries should sit down together to explore what's needed and can be done. Second, work should commence on means of evaluating and certifying new and existing investment products. Third, data on the financial, social and environmental performance of properties should be pooled in order to determine the relationships between these outcomes and expand our knowledge of how to maximize all three at the same time. Fourth, companies and funds that are achieving social, environmental and financial

success should be identified and rewarded. And fifth, companies and funds should explore how they can make social and environmental goals more central to their strategic planning and how they can report on their performance in these areas.”

23. Pivo, Gary. (2009) “Social and Environmental Metrics for US Real Estate Portfolios: Sources of Data and Aggregation Methods”. Planning Degree Program and School of Natural Resources, University of Arizona Forthcoming, in Journal of Property Investment & Finance.

Purpose:

To assess the availability of information in the US for measuring the social and environmental performance of real estate portfolios. Design/methodology/approach: A search was conducted for relevant indicator data sources using internet, library and government resources. Priority was placed on information that could be accessed on line, by any user, free of charge, from reputable sources, using available search parameters, for all types of properties and for any properties anywhere in the USA. Useful sources were identified and assessed using data quality indicators. Information gaps were also identified. A previously published method was adapted for comparing the social and environmental performance of properties and portfolios and data collected from identified sources were used to illustrate the construction of indices useful for making comparisons. Findings: Nationwide data sources are available for most important dimensions with greater availability for the most important ones. There are, however, important data gaps related to such issues as water use, day light and ventilation, aesthetics, and others. Most sources only require a property address for queries but do not support batch processing.

“This paper addresses this problem of data supply by identifying public and proprietary data sources that are available and can be used by firms or third parties.” The paper also demonstrates how this information can be aggregated into indices, which is useful for comparing properties and portfolios. In addition, the paper addresses demand side issues, aimed at helping fund managers who want to compile extra-financial information on sustainability and corporate social responsibility and socially responsible investors and researchers who want to evaluate the social and environmental merits of property investment opportunities.

The paper contributes to a previous study by Pivo (2008) which employs the Delphi method to rank possible criteria for assessing responsibility in the property sector. In particular, this study “shows where useful data can be found to measure properties according to the recommended criteria and how those data can be combined into an RPI index suitable for property- and portfolio-level comparisons.” This paper however focuses more on the supply of data rather than discussing which processes should be used to select indicators. It includes consideration for data sources which measure both environmental and social performance of US real estate portfolios and discusses how this data can be aggregated into RPI indices.

“The results of this paper are important because they give a roadmap to RPI analysts and executives who wish to assess the extra-financial performance of properties and portfolios. Asset owners can ask their asset managers to compile this information, fund managers can use it to improve reporting and management of corporate sustainability and responsibility, and socially responsible investors can use it to independently screen and rate REITs and private equity funds as long as they can obtain the addresses of the properties that comprise the investments. Further progress with RPI metrics can now

proceed along several lines. First, fund managers can begin using these datasets on an experimental basis to further assess their usability.”

24. Reed, Richard G and Wilkinson. (2004) “What are the Costs and Financial Benefits of Green Buildings? Sustainability and the Value of Office Buildings – Will the Market Pay for Green Buildings”? Presented at 12th annual Asian Real Estate Society (AsRES) Conference - 9th-12th July 2007, Macau, China.

Abstract:

Recently the profile of sustainable office buildings has increased substantially with many stakeholders in the property market consistently being reminded about green buildings. Whilst sustainable buildings have advanced in many aspects including design and construction, there remains a strong argument that the financial viability of a building will determine to what degree a building is allowed to be sustainable. The majority of office buildings are owned by enterprises that are profit-seeking as their first priority, rather than sustainability as their first priority, and consequently the financial drivers relating to sustainability must be fully incorporated into any decisions about a sustainable building. It can be argued that no viable competitive business would rather be green than make a profit for its shareholders. Overlooking these financial considerations may ensure the building is not viable and competitive in the open property market, which in turn will limit the amount of debt available for the project with associated higher levels of risk.

The paper reviews several different costs associated with green buildings and discusses implications for valuation approaches- such as Discounted cashflow (DCF) approach and Cost approach. “Of particular concern is the energy consumed through the increasing reliance on mechanical heating and cooling, although different property types in a range of climatic regions will have large variations in energy consumption. When designed effectively, all building types can reduce substantial current energy use. It appears certain that green buildings are here for the long term and the valuation industry must be at the forefront of this change.”

25. Ries , Melissa M. Bilec, Nuri Mehmet Gokhan, Kim LaScola Needy. (2006) “The Economic Benefits of Green Buildings: A Comprehensive Case Study”. Engineering Economist, Fall.

Abstract:

Several studies suggest green construction can result in significant economic savings by improving employee productivity, increasing benefits from improvements in health and safety, and providing savings from energy, maintenance, and operational costs. This article quantifies these benefits by establishing a set of measurable performance and building attribute variables, collecting longitudinal data, statistically analyzing the results, and performing sensitivity analyses for a precast concrete manufacturing facility located near Pittsburgh, Pennsylvania. Productivity, absenteeism, energy, and financial data are presented and an engineering economic analysis is reported. Results show that in the new facility manufacturing productivity increased by about 25%; statistically significant absenteeism results varied; and energy usage decreased by about 30% on a square foot basis. Considering all aspects, the economic analysis showed that the company made the correct decision to build a new green facility.

This paper is useful because it identifies several possible areas where green construction can add value. The paper employs quantitative analysis and a case study of Castcon Stone, a green facility located is located on a brownfield site designated by the state as a Keystone Opportunity Zone (KOZ). In addition to value, cost issues are also considered. The paper also contributes to green building metrics.

The paper makes an important distinction between green building attributes and normal changes to business operations in a non-controlled environment. This can pose a significant challenge if the difference is not identified when attempting to measure the costs and value of green buildings. “The research in this article collects quantitative data and validates the data by conducting a self-reporting survey along with interviewing management in order to analyze the hypothesized relationship”.

Values from green buildings which are discussed in the paper include productivity, health and safety including absenteeism, energy, and IEQ. “A framework for evaluating the benefits of green building design and construction was developed for and used on a manufacturing facility. One important drawback for this research was the lack of data, especially for the pre-move period. For the statistical analyses and to reduce the variance of data, longer periods of data collection are very important for similar uncontrolled studies. More data points also help with understanding impacts of other factors on the studied areas since the impacts are expected to stabilize in longer periods and some factors, such as Hawthorne effects, may diminish”.

26. Romm, J. and W. Browning. (1998) “Greening the Building and the Bottom Line - Increasing Productivity Through Energy-Efficient Design”. Rocky Mountain Institute: Colorado.

Summary:

Energy-efficient building and office design offers the possibility of significantly increased worker productivity. By improving lighting, heating, and cooling, workers can be made more comfortable and productive. An increase of 1 percent in productivity can provide savings to a company that exceed its entire energy bill. Efficient design practices are cost-effective just from their energy savings; the resulting productivity gains make them indispensable. This paper documents eight cases in which efficient lighting, heating, and cooling have measurably increased worker productivity, decreased absenteeism, and/or improved the quality of work performed. They also show that efficient lighting can measurably increase work quality by reducing errors and manufacturing defects. The case studies presented here include retrofits of existing buildings and the design of new facilities, and cover a variety of commercial and industrial settings.

The case studies also show that efficient lighting can measurably increase work quality by reducing errors and manufacturing defects. The paper finds that the most cost effective way for a business to improve the productivity of their workers and quality of product is through adopting energy efficient designs. The findings from this study have encouraged several subsequent studies on the relationship between productivity and features of buildings.

“The cost of employees... is greater than the total energy and operating costs of a building. Based on a 1990 national survey of large office buildings, electricity typically costs \$1.53 per square foot and accounts for 85 percent of the total energy bill, while repairs and maintenance typically add another \$1.37 per square foot; both contribute to the gross office-space rent of \$21 per square foot. In

comparison, office workers cost \$130 per square foot—72 times as much as the energy costs. Thus an increase of 1 percent in productivity can nearly offset a company's entire annual energy cost."

"The results of these case studies are compelling, for two reasons. First, the measurements of productivity in most of the cases came from records that were already kept, not from a new study. Second, the gains in productivity were sustained and not just a temporary effect".

27. Sayce , Sarah; Louise Ellison; Philip Parnell. (2007) "Understanding Investment Drivers for UK Sustainable Property". Kingston University, Kingston upon Thames, UK Drivers Jonas Chartered Surveyors, London, UK

Summary:

What progress has occurred in terms of developing the culture of sustainability in which UK property investors, occupiers, and developers are both informed and accepting of the sustainability principles? Although the rise in concern for 'triple bottom line' sustainability is now embedded in many government and corporate policies, it is still not integrated into UK property investment practice. Whilst the last decade has seen progress towards 'green buildings', there has not yet been a 'sea change' in market behaviour. In developing this premise, it draws on the third of three surveys undertaken by the authors spanning a decade and tracking investor attitudes towards 'green' and sustainable buildings. Stakeholders' attitudes towards a potential range of fiscal measures that might incentivize market movement towards the adaptation of more sustainable behaviour. The business case for investment in sustainable property currently rests on risk reduction, not proven return advantage. There is support among respondents for a range of fiscal incentives. Although challenges to implementation undoubtedly exist, they are, in the authors' view, worthy of further research and investigation. There is potential to stimulate, via the fiscal system, measures to reward sustainable practices in property investment and management which can be facilitated through a more open dialogue with government bodies.

The paper addresses the lack of a business case for the development of sustainable buildings and makes reference to the vicious circle of blame, which is a model used in several of the papers reviewed here, used to explain the barriers to green buildings. The author notes that despite optimistic views (Davies, 2004), there has been "no systematic study with hard evidence on the green value case". The paper considers "the progress made in the UK to date in terms of developing the culture of sustainability in which property investors, occupiers, and developers are both informed and accepting of the principles. It does this by exploring three dimensions. First, it considers legislation and policy drivers which provide a top-down imperative. Second, it explores market drivers, which provide an upward push. The paper then reviews the findings of a survey of professional opinion aimed at gaining a better understanding of barriers and drivers and the potential role of fiscal incentives. In the light of these analyses, the authors assess "whether sufficient change has occurred to argue that a 'tipping point' has been reached where sustainable or responsible property investment will shift from being the concern of the minority to a mainstream activity taking place through market activity."

Each survey targets a similar population set. The first is distributed to a random sample of 240 institutional investors, valuation surveyors, property developers and property-investing. From the sample organizations, questionnaires were sent to named individuals. The four sectors chosen were selected on the basis that they represent the major decision-makers within the occupier– developer– investor triumvirate that effectively drives property decision-making.

Questions addressed: Do environmental (sustainability) factors affect rents and yields now? Will such factors affect rents and yields in five years' time? Do they – or will they – affect investment strategy? Disaggregating the data across the four different respondent groups shows some disparity in views. “Whilst those considering environmental factors to be having an effect in the current market are in the minority, the highest positive response came from the property advisors. The research also demonstrated that respondents, whilst they recognized the growing strategic importance of sustainability factors, considered that sustainability is having little impact in terms of rents yet the analysis of research outlined above points less to a ‘sea change’ than to a slowly rising tide of changing behaviour.”

“The review of the current positioning of sustainable or responsible property investment in the UK points to significant progress over the last five years. The vicious circle has been broken, at least in part, although progress towards a virtuous wheel as envisaged by Parnell (2005) remains tenuous and focused on a small number of investors and developers. Survey evidence of stakeholder groups also points to triple bottom line sustainability being increasingly important in the future; what it does not do is support the presence of a current convincing business case”.

28. UN PRI Building Responsible Property Portfolios – Also see Pivo and McNamara, INTERNATIONAL REAL ESTATE REVIEW 2005 Vol. 8 No. 1: pp. 128 - 143 Responsible Property Investing

Summary:

The Principles for Responsible Investment (PRI) are voluntary and aspirational guidelines for incorporating environmental, social, and governance (ESG) issues into mainstream investment decision-making and ownership practices. This report helps PRI signatories understand how they can apply the Principles to property assets through what some call responsible property investing (RPI). It does so by highlighting the work of leading practitioners. It is not intended to prescribe new requirements for signatories, but rather to aid those wishing to apply the PRI to property. This report was produced by the PRI Secretariat and the UN Environment Programme Finance Initiative Property Working Group (PWG). Its content was provided by members of these organizations, who together manage over \$300 billion in property assets. For more information about the PRI or PWG, please visit www.unpri.org and www.unepfi.org

This report provides a useful overview of the business case for RPI, drawing on several previous studies. It also identifies challenges to RPI, which are not faced by responsible investors in other asset classes. First is the indirect nature of relationships between investors and ESG performance in the property sector. When investing in public companies, investors may be able to more easily influence outcomes through direct dialogue. In the property sector however, this agency chain is weakened by the indirect nature of the most relevant relationships (such as fund managers, independent property managers, and tenants who are independent). Also, investors may not be the sole or major owner of a property or property portfolio. Finally, there is the “eco-efficiency principal-agent, or split-incentives problem common to rented properties.” “When landlords pay for conservation measures and tenants pay for utilities, there are few incentives for owners to take actions that yield savings for tenants or for tenants to make capital efficiency improvements that revert to landlords when they vacate the premises. Without some form of shared-savings contracts that benefit both parties, progress toward eco-efficiency in property will not achieve its full potential.”

The report also identifies opportunities for responsible property investors “because investors are in an influential position to help overcome these problems by virtue of the direct relationships they may have with property fund managers, property managers, service providers and tenants. For example, investors can help property fund managers who want their service providers and tenants to address ESG issues by engaging directly, alongside the fund manager, with the service and tenant corporations that are operating within the portfolio to emphasize the importance of these issues. Other opportunities exist for coordinated action among investors in pooled investment vehicles to encourage those vehicles to improve. Ultimately, responsible investors can play a critical role in breaking down what has been termed the “circle of blame” that characterizes the property industry”.

The report concludes with a review of the six principles of responsible investment and applies them to property investment. This section also provides a good overview of what the leaders are doing to apply these principles to the property sector.

Note- this report is based on work by Pivo and McNamara(2005), who recommend some strategies for dealing with these challenges: 1) establishing an RPI working group, 2) summarizing prior reports on urban issues, 3) identifying investment strategies that are profitable and responsive to the issues, 4) clarifying the financial effects of different responses and improving our means of measuring them, 5) identifying best practices, 6) adopting a rating system, 7) supporting RPI investment funds, and 8) recognizing leaders in the field.

29. Wolff, G. (2006) “Beyond Payback: A Comparison of Financial Methods for Investments in Green Building”. in Journal of Green Building, Vol. 1, No. 1

“The green building movement is growing rapidly. Economic analysis of financial, other tangible, and intangible costs and benefits can help to sustain the movement over time. The purpose of this paper is to compare and contrast four methods of economic analysis to support green building decisions, and to identify the strengths, weaknesses, data requirements, and research needs associated with each. Five green features from a project in California are used to illustrate the methods and issues. The features are representative of the types of challenges building developers and designers face. The specific data used is illustrative, and the pattern of results across methods and examples is generally applicable. The more advanced financial calculations provide essential information for overcoming financial obstacles such as split incentives or excessively high hurdle rates for green investments”.

30. Wyon, D.P. (2000) “Enhancing Productivity While Reducing Energy Use in Buildings”. Available online at: <http://www.rand.org/scitech/stpi/Evision/Supplement/wyon.pdf>

The problem addressed in this paper is the conflict between the undoubted need to reduce energy use in buildings and the reasonable economic requirement that energy conservation initiatives should not impact indoor environmental quality in offices and schools in such a way as to cause negative effects on productivity. The paper also explores solutions to improve the benefits of sustainable buildings. In this paper, a range of potentially very effective solutions to the conflict between energy conservation and productivity are proposed.

This paper serves a practical purpose, which is to provide building owners/managers, with information they need to strike a balance between reducing energy use and increasing productivity. First, the paper focuses on ventilation and thermal conditioning since this is the most heavily used source of energy in offices and schools. It begins by documenting whether productivity is affected by air quality and temperature, and to what extent. "Indoor air quality (IAQ) and air temperature (T) have powerful effects on the efficiency with which work can be performed in schools and offices."

" Huge amounts of energy are used to keep these parameters constant at levels which represent a compromise between group average requirements for subjective comfort and energy conservation. Human requirements change with task requirements and from hour to hour, so the levels at which T & IAQ are maintained are at best a crude approximation to what would be the most efficient use of energy in buildings. Different individuals have very different requirements for health, comfort and efficient performance—the three ascending levels of the human criteria hierarchy. Symptoms of ill health and discomfort have powerful effects on the efficiency with which work can be performed in schools and offices, so even a narrow economic focus requires that indoor environmental effects at all three levels be considered".

The paper then proposes and assesses a series of solutions to improve such as technology, in order to address the conflict between energy conservation and productivity. Solutions include leveraging funding for research on energy sources- closed loop building operations- where feedback is gathered from occupants, natural ventilation, openable windows, design issues, user empowerment, and energy storage in the building.

31. Yudelson, Jerry (2007) " The Green Building Revolution". Island Press, Washington D.C.

Yudelson argues that there is a paradigm shift towards sustainability in building and that it is not only in the interest of the environment and workers, but it is also profitable and cost-saving in the long run. See Chapter 3- Business Case for green buildings: "if you're next project is not a green building, one that's certified by a national third party rating system, it will be functionally outdated the day its completed and very likely to underperform the market as time passes." Throughout the book Yudelson reviews incentives and barriers to green development- Benefits include tax rebates, building value, productivity benefits, reduced maintenance costs, reduced operating costs, risk management benefits, health benefits, public relations and marketing benefits, environmental stewardship, recruitment and retention benefits.

Chapter 4 reviews costs of green buildings and presents a theoretical approach to this issue. Yudelson also cites the Davis Langdon law firm, which offered evidence from a study based on 94 different building projects that the most important determinant of project cost is not the level of LEED certification sought, but rather more conventional issues, such as the building program goals, type of construction, etc.

Chapter 5 discusses the future of green buildings and identifies possible green building market drivers. The book proceeds with discussing specific sectors of property, including commercial development, residential, academic and neighbourhood design. It identifies progress to date, barriers, special considerations, and recommendations. The conclusion discusses individual actions that can be pursued

in an effort to join the green building revolution, including a section encouraging readers to invest in responsible property. No other mention is made of investment returns in property throughout the book.

Additional Readings:

32. Adair, A., Hutchison, N. (2005), "The Reporting of Risk in Real Estate Appraisal Property Risk Scoring", Journal of Property Investment & Finance, Vol. 23 No.3, pp.254-68.

Summary:

This paper aims to examine financial risk management. The UK valuation profession has been criticised for inconsistencies and failures to reflect risk and uncertainty in certain valuation assignments such as the pricing of urban regeneration land. Also the Investment Property Forum/Investment Property Databank specifically concluded that a new approach is needed which combines conventional analysis of returns uncertainty with a more comprehensive survey of business risks. This debate has been brought into sharper focus by the publication of the Carsberg Report, which emphasised the need for more acceptable methods of expressing uncertainty, particularly when pricing in thin markets. The aim of this paper is to present an alternative paradigm for the reporting of risk based on techniques utilised within business applications. In particular it applies a standard credit-rating technique, based on the D&B model, to report the level of risk within property pricing – property risk scoring (PRS).

“The paper commences with an examination of risk analysis within investment decision making and the property industry, drawing on the findings of the most recent literature that assesses the utilisation of risk management approaches. It covers risk factors related to market transparency, investment quality, depreciation and obsolescence and covenant risk”.

The paper is useful because it offers an account of the decision-making framework within which the property risk score is applied and examples are advanced across each of the principal commercial sectors. Although there is some mention of environmental consideration in risk, it is not the focus. However, it does provide a good model for incorporating environmental considerations in the future for assessing risk, which is a need expressed by several authors on RPI. The authors explore “financial risk management and the workings of the D&B credit rating model is illustrated.”

33. Castro-Lacouture, Daniel Jorge A. Sefair, Laura Flórez' and Andrés L. Medagli (2009) “Optimization Model for the Selection of Materials Using a LEED-based Green Building Rating System in Colombia”.

Abstract:

Buildings have a significant and continuously increasing impact on the environment because they are responsible for a large portion of carbon emissions and use a considerable number of resources and energy. The green building movement emerged to mitigate these effects and to improve the building construction process. This paradigm shift should bring significant environmental, economic, financial, and social benefits. However, to realize such benefits, efforts are required not only in the selection of

appropriate technologies but also in the choice of proper materials. Selecting inappropriate materials can be expensive, but more importantly, it may preclude the achievement of the desired environmental goals. In order to help decision-makers with the selection of the right materials, this study proposes a mixed integer optimization model that incorporates design and budget constraints while maximizing the number of credits reached under the Leadership in Energy and Environmental Design (LEED) rating system. To illustrate this model, this paper presents a case study of a building in Colombia in which a modified version of LEED is proposed.

This article begins with a detailed description of the LEED credit system. An optimization model is then presented. The authors review the impact that buildings have on environment- “This article proposes a mixed integer linear program (MILP) that improves green construction decision-making through the selection of materials”. The model “considers both design and budget constraints to address realistic scenarios experienced by the decision- maker. In addition, the model includes soft constraints that describe the LEED requirements pertaining to the selection of materials, which may or may not be satisfied”.

Although not specific to the Canadian context, the paper does suggest some ideas for global LEED standards, as well as some interesting considerations for developing countries. In the case of the Colombian market, “the LEED-based system is highly dependent on the use of materials with a low content or emission factor of volatile organic composites (VOC) and a high content of recycled constituents. Materials with these characteristics are scarce and expensive. Similarly, other materials, such as certified wood, are not widely available, nor do they come with information about their origin and properties. As no regulations currently require manufacturers to report data, the lack of information about materials – some characteristics are unknown even to the manufacturers – will continue to challenge LEED-based systems.”

Overall, the paper highlights a problem which is often omitted from metrics discussion, which is “the success of a green building depends on the quality and efficiency of the installed green systems. If the building lacks these essential features, it will neither accomplish the environmental goals nor generate the estimated benefits. Thus, the market requires a common way to differentiate green buildings from traditional buildings through the use of standard, transparent, objective, and verifiable measures of green, which assure that the minimum green requirements have been reached.”

34. Fuerst, Franz and Patrick M. McAllister. (2008) “Green Noise or Green Value? Measuring the Price Effects of Environmental Certification in Commercial Buildings.”

Evaluating the environmental performance of a building is rapidly gaining importance as a metric in real estate investments. Since interpretation of the technical measurements is difficult and requires high expertise, investors tend to rely on markers as provided by environmental certification standards instead of evaluating environmental performance directly. It is argued that there are likely to be three main drivers of price differences between certified and non-certified buildings. Drawing upon the CoStar database of US commercial real estate assets, hedonic regression analysis is used to measure the effect of certification on both rent and price. We first estimate the rental regression for a sample of 110 LEED and 433 Energy Star as well as several thousand benchmark buildings to compare the sample to. The results suggest that certified buildings have a rental premium. Furthermore, based on a sample of

transaction prices for 292 Energy Star and 30 LEED-certified buildings, we find a price premium of 10% and 31% respectively.

“This paper investigates the price differentials between LEED/Energy Star certified buildings and non-certified commercial buildings in the US. Given that the literature suggests that certified buildings may offer a bundle of benefits linked to lower operating costs, improved employee productivity and image benefits relative to non-certified buildings, we model the short and long-run occupational price effects of certification using a static partial equilibrium framework.”

“Empirical analysis compares certified buildings to non-certified buildings on the basis of price differentials, and theoretical analysis is used to estimate price effects of environmental certification for commercial real estate assets in both occupier and investment markets.”

“Results suggest that certified green buildings obtain higher rents, have lower vacancy rates and sell for more than non-certified buildings. When we control for potential differences between certified buildings and non-certified buildings, the finding of price premium relative to buildings in the same metropolitan area is confirmed. In addition, there is evidence to suggest that the more highly rated that buildings are, the greater the premium.”

35. Green Building Council Australia. (2006) “The Dollars and Sense of Green Buildings: Building the Business Case for Green Commercial Buildings in Australia”. Available online: <http://www.gbcaus.org/>.

Only Chapter 1 through 4 are available on-line (Introduction) The report offers analysis of both international and Australian data. It finds that green buildings result in lower annual operating costs and more efficient asset management. These findings are based on case studies drawn from local sources which attempt to quantify/provide cost reduction figures for various tangible and non-tangible benefits.

The 2008 edition of the report tracks the changes from a previous report released in 2006 and discusses the evolution of the understanding of 'green'. It also includes a review of other case studies, new metrics that have been developed, industry practices and knowledge, and the new cost benchmarks that have been set and new evidence in support of the business case for green buildings. Section 5 provides a useful overview of the benefits of green buildings, from the perspective of owners/managers, developers, investors, and tenants. It relies on case studies and other studies conducted in Australia, finding that there are benefits to all groups in the form of cost savings and soft values (particularly for tenants). Another interesting factor the report considers, which is often left out of Green building literature focusing on benefits is the role of insurance companies. The report suggests that they may offer lower premiums for green buildings. Section 6 considers some of the barriers to promoting the development and investment in green buildings, with corresponding solutions. Some barriers include lack of supply chain of green building materials, lack of cooperation on metrics, and vicious circle of blame.

Overall, this is a useful and comprehensive report, which identifies several trends and developments over the past few years. It lacks any in-depth analysis of its own however, and does not give adequate attention to the concept of sustainability and a more holistic approach, rather focusing specifically on the design, construction, and operation of new green buildings. In addition, not enough attention is

given to the relationship between buildings and the environment in which they exist and operate, preventing advancement of sustainability in the property sector.

36. Haxton B. and Beckstead G. "Crunching the Numbers: A Conceptual Cost Estimating System for LEED Facilities". Available on-line:

<http://www.rdmag.com/ShowPR.aspx?PUBCODE=014&ACCT=1400000100&ISSUE=0802&RELTYPE=LD&PRODCODE=00000000&PRODETT=ID&CommonCount=0>

Summary:

After designing a number of LEED sustainable buildings, the authors sought a systematic way to estimate costs early in the design process to enable the design team to identify the most cost-effective and sustainable LEED credits for any given project. However, LEED credits vary significantly in relative costs, and the challenge is compounded by both the sheer numbers—and possible combinations—of LEED credit/options, building types, sites and client budgets.

This paper is useful for understanding the relative cost between Certified, Silver, Gold, and Platinum accreditation levels of LEED. The lowest-cost credits with the fastest payback were used to generate cost figures. The author finds that "the cost of LEED-certifiable construction have focused on retrospective studies of completed buildings or comparative modeling of hypothetical buildings rather than on prospective conceptual cost estimating of an actual project."

"In response to this shortage the author develops a database using different versions of excel spreadsheets for different building types. The process for using the system could then be further quickly customized for each site. The firm's proprietary software estimating system, eSpec, was used to develop a base building conceptual cost model for a non-LEED building from 25 attributes. A second system, EarlyEco, was then developed to analyze the cost of LEED line items. Finally, an output spreadsheet was developed that collects and analyzes the data from the first two systems and provides the report for the design team."

37. Kumar, S. and W.J. Fisk. (2002) "The Role of Emerging Energy-Efficient Technology in Promoting Workplace Productivity and Health."

Abstract:

Research into indoor environmental quality (IEQ) and its effects on health, comfort, and performance of occupants is becoming an increasing priority as interest in high performance buildings and organizational productivity advances. Facility managers are interested in IEQ's close relationship to energy use in facilities and employers want to enhance employee comfort and productivity, reduce absenteeism and health costs, and reduce or even eliminate litigation by providing excellent indoor environments to employees. The increasing interest in this field as architects, engineers, facility managers, building investors, health officials, jurists, and the public seek simple and general guidelines on creating safe, healthy, and comfortable indoor environment, has put additional pressure on the research community. In the last twenty years, IEQ researchers have advanced our understanding of the

influence of IEQ on health and productivity, but many uncertainties remain. Consequently, there is a critical need to expand research in this field, particularly research that is highly multidisciplinary.

38. Larsson Nils K. and Raymond J. Cole. (2001) “Green Building Challenge: the development of an idea”. Natural Resources Canada, University of British Columbia, School of Architecture, Building Research & Information 29(5), 336–345

Green Building Challenge (GBC) is a unique international research, development and dissemination collaborative effort to further understanding of building environmental performance assessment. The unique features of the GBC process are that it is ad-hoc with no host organization; it is based on national teams; it is self-funding; it depends on consensus amongst the participating countries; and it uses conferences as a focusing device. Other significant features include the roles and motivations of participants; working in subgroups; and the importance of networking and personal contacts. The future of GBC will depend on the success of many of these past operating methods. GBC has provided an important model for innovation strategies with high impact. It indicates that rapid and visionary work can be achieved through a consensus basis of researchers and practitioners, without layers of management or bureaucratic strictures. Its notable success lies in linking the research and practicing design communities’ interests through the development of national case studies.

39. Lucuik, M. (2005) “A Business Case for Green Buildings in Canada”. Presented to Industry Canada by Morrison Hershfield. Canada Green Building Council.

This report presents the business case for Green Buildings, highlighting the benefits of Green Building, as well as the challenges and barriers specific to the green building industry in Canada- Not available on-line.

40. Moores, John, Chongqing Jiaotong Sukulpat Khumpaisal. (2009) “An Analytic Network Process for Risks Assessment in Commercial Real Estate Development”. Journal of Property Investment and Finance, Vol. 27(3), pp 238-258.

Abstract:

The purpose of this paper is to introduce a novel decision-making approach to risks assessment in commercial real estate development against social, economic, environmental, and technological (SEET) criteria. It therefore aims to describe a multiple criteria decision-making model based on analytic network process (ANP) theory, and to use an experimental case study on an urban regeneration project in Liverpool to demonstrate the effectiveness of the ANP model. Design/methodology/approach – The paper commences with a description about risks related to commercial real estate development, and provides a list of risk assessment criteria based on a literature review and experience in related areas. The ANP is then introduced as a powerful multicriteria decision-making method. An experimental case study is finally conducted with scenarios and assumptions based on a real urban regeneration project in Liverpool.

Findings – The paper defines a group of risks assessment criteria against SEET requirements directly related to commercial real estate development. An ANP model is set up with 29 risks assessment criteria, and results from an experimental case study reveal that the ANP method is effective to support decision-making based on risks assessment to select the most appropriate development plan; and therefore it is applicable in commercial area. Originality/value – This paper defines SEET criteria for risks assessment in regard to SEET requirements to emphasise sustainable development; while the ANP is introduced to assess risks in commercial real estate development. The ANP model provides a platform for decision makers in commercial real estate development to evaluate different plans based on the degree of interactions among risk assessment criteria.

41. Myers, Georgia and Richard Reed. (2008) “A Business Case for Sustainable Office Buildings Faculty of Architecture”. Building and Planning University of Melbourne Australia

Abstract:

The market for sustainable buildings has rapidly gained momentum in the design and construction phases however it appears that development and investment in these buildings by the private sector is limited. This is further complicated by the limited information available confirming the financial viability of sustainable buildings, with relatively little research conducted into the relationship between sustainability and the market value of commercial buildings. Currently the demand for sustainable buildings in Australia and New Zealand is being encouraged through government legislation and policy, where investment by the private sector has been relatively slow to develop due to the lack of evidential proof of the economic viability of sustainable buildings. Clearly if the progress and uptake of sustainable buildings is to develop within the property market, it is essential that the relationship between market value and sustainability should be understood in order to fully inform the investment industry.

42. Pearce, B. (2003) “The Social and Economic Value of Construction – the Construction Industry’s Contribution to Sustainable Development”. Available online: <http://www.ccinw.com/images/publications/NCrisp%20The%20Social%20and%20Economic%20Value%20of%20Construction.pdf>

Summary:

The aim of the report is to answer the question: just what is construction’s contribution to sustainable development and the delivery of long-term quality of life improvement? The report defines sustainable development and conditions for achieving it, it discusses both natural and social environmental considerations in construction and is quantitative in nature and qualitative material has been treated as secondary resources in constructing this report.

Topics it covers include human capital, social and environmental considerations, technology, and the research agenda for the future. The main themes of the report are centered around sustainability and added value, as they apply to construction of buildings in the UK. This is a useful report for summarizing areas of sustainability and it covers both social and environmental issues.

Of particular interest are the following chapters:

Chapter 4 (Capital structure) focuses on manmade or manufactured construction. The section identifies a “special feature of some parts of the built environment that distinguishes it from most other forms of capital: its longevity. The focus on longevity arises because of the potential gains and losses to the economy at large, to the environment, and to social conditions from having a built stock with a high

average age". It also identifies the role that the construction industry plays in contributing to greenhouse gas emissions and CO2 emissions- All buildings –commercial/ public, industrial and residential account for half of energy use in the UK and half of carbon dioxide emissions". Clearly, energy use in existing buildings is a significant contributor to environmental problems, suggesting mitigation efforts could have very positive results if successful in this area. The section also offers a description of how environmental impacts of the construction industry are assessed- "A materials balance analysis reveals that the (narrow) construction sector receives around 360 million tonnes of raw materials of which 90 million tonnes reappears as construction and demolition waste, implying a conversion efficiency of 75%. Of the 90 million tonnes construction and demolition waste, half is recycled."

Chapter 5 explores the interaction of human capital in the construction sector – its labour force, its embodied skills and knowledge, and the health of the labour force. "The construction industry suffers from an image problem. There is a need to show its positive and negative contributions to value and sustainability in a transparent manner. Overall- Despite this reasonable record on existing technological progress, the construction industry faces massive challenges in the next few decades."

"When well designed, the built environment generates significant but, as yet, largely unquantified benefits in terms of human wellbeing. Good design contributes to physical and mental health, to a sense of identity and wellbeing, to good social relationships, reduced crime, and higher productivity. Bad design and dilapidated capital stock has the opposite effect."

43. Pivo, Gary. (2008) "Responsible property investment criteria developed using the Delphi Method". *Building Research & Information*, 36(1), 20–36

This paper helps define responsible property investing (RPI) by using the Delphi Method to prioritize criteria for the evaluation of property investments. An international panel from the real estate and social investing sectors evaluated 66 criteria in terms of materiality to investors and importance to the public interest. A moderate to strong level of consensus was achieved. Criteria were ranked in terms of their materiality for financial performance and their importance to the public interest. Top ranked criteria were energy efficiency and conservation, high level of public transport services, transit-oriented development, daylight and natural ventilation, and contributes to higher density, mixed-use walkable places. There were few to no significant differences among the panellists by industry, gender or nationality. Factor analysis uncovered ten dimensions underlying the criteria. Based on this analysis, the panel would emphasize the creation of less automobile-dependent and more energy-efficient cities where worker well-being and urban revitalization are priorities. Leadership in Energy and Environmental Design (LEED) green building rating tools were compared with the results and found to be much stronger on environmental criteria than social concerns. The results can guide RPI portfolio audits, database development, third-party assessments of property companies, strategic consulting, the development of corporate reporting standards, RPI certification procedures, updated green building assessment tools, and cost–benefit studies to help guide asset managers.

44. Rapson, Daniel David Shiers, Claire Roberts and Miles Keeping. (2007) "Socially responsible property investment (SRPI) An analysis of the relationship between equities SRI and UK property investment activities". *Journal of Property Investment and Finance*. Vol. 25,4

Summary:

Socially responsible investment (SRI) is now a well established part of equities investment. Questions are now being raised over property investment and whether similar attempts to be “socially responsible” should be incorporated into investment practice. This paper aims to examine the investment practices of large fund managers for both equities and property in order to identify products and activities which are contributing to the progress of SRPI.

Design/methodology/approach – Analysis was conducted of equities SRI, and potential SRPI activities, for the top ten UK property fund management using publicly available company literature. This was analysed using simple matrices to understand common activities, industry application, and market-leading innovations. Relationships between progress in SRI and SRPI, are also explored, along with the consideration of SRPI actions in the context of SRI concepts.

Findings – Market leaders were established in terms of their equities SRI products and services, though this did not necessarily equate to progress in the field of SRPI. Only one potentially SPRI product was identified. However this does not represent the overall consideration of sustainability issues in relation to property investment practices. Half of the companies studied were found to be taking actions which demonstrate attempts to consider the impacts associated with property investment. Originality/value – This paper reflects a call from key SRPI thinkers to assess the current extent of SRPI practices, which will be a useful starting point for further analysis/debate of the most appropriate SRPI methods. It should therefore be of interest to both SRI and general property investors alike.

Provides definition: Work by Pivo and McNamara (2005) suggests that SRPI may be thought of as “maximising the positive effects and minimizing the negative effects of property ownership, management and development, on society and the natural environment in a way that is consistent with investor goals and fiduciary responsibilities”.

“This paper therefore aims to contribute to understanding in this field by examining the policies, practices and products, of the ten largest UK property investment organisations (by value managed), in order to identify examples which fit with Pivo and McNamara’s SRPI definition”.

The paper is exploratory, looks at the presence of SRPI investment opportunities, the market leading examples of consideration of sustainability issues in the selection development and management of commercial property. “It should be noted that this study forms part of the early stages of investigations into SRPI methods and is ultimately dealing with policy indicators representing a variety of corporate practices”. The sample for this study was selected based on the size (total property assets under management).

The paper compares the progress of SRI with SRPI and finds that there is a significant lack of SRPI funds on offer compared to equities SRI. “At present none of the ten companies offer property investment products or services which are directly marketed as SRPI”. This lack of SRPI funds, however, does not indicate a general lack of consideration of the SEE impacts associated with property investment. Although some companies make no attempt to publicly state considerations of SEE issues, several others were found to have a range of relevant policies and targets relating to all their investment property under management”.

“Further work is now needed to assess the relative contributions to sustainability of the actions identified in this study”. Despite the fact that this paper focuses on the supply side of SRPI, it acknowledges the need for more demand side studies- specifically looking at the views and requirements of large SRI investors. “This would help establish the kinds of SRPI methods they actually want, i.e. would they prefer SRPI funds, or if they are happier with actions which can be applied across investment strategies, as has been the case with engagement approaches in equities SRI?”

45. Reed Richard G. and Sara J. Wilkinson. (2005) “The Increasing Importance of Sustainability for Building Ownership”. *Journal of Corporate Real Estate*, Vol. 7(4), pp 339-350.

This study seeks to investigate the degree to which energy efficiency is incorporated into office building refurbishment and capital expenditure with the emphasis placed on a cost-benefit analysis from the owner’s perspective. Design/methodology/approach — In order to develop a research framework, a thorough literature review was conducted of three disciplines being construction technology, building refurbishment and property management. The study identifies differences between varying levels of capital expenditure to ensure an existing building is more energy efficient, with the emphasis placed on the cost of implementation and the potential for tenants to acknowledge the increased energy efficiency via higher rents. Findings — Office buildings have been identified as a contributor to global warming during the construction phase, however during the building lifecycle there is a greater contribution to CO2 omissions. Whilst various building designs and construction techniques have evolved to improve energy efficiency, the focus has largely been placed on new buildings where it is easier to incorporate change and innovative approaches. However, the proportion of new buildings constructed each year is relatively small in comparison to existing building stock, which requires regular capital expenditure to maintain and attract new tenants within a competitive marketplace.

The paper identifies some important linkages between the natural and built environment, and the implications of the relationship for owners of office buildings. This is a useful study because “a significant proportion of the stock is owned by institutional investors who are unconvinced by the need to improve their stock and pass on running costs to tenants. Thus, a substantial gap in research currently exists in the area of office buildings and the means of persuading owners to increase the uptake of energy efficiency”.

The paper highlights the contribution of office buildings to CO2 emissions and climate change. “Whilst this area is emerging research area, it falls between environmental studies and research into the built environment. Professional bodies need to provide members with best practice information to enable those members to offer strategic professional advice with confidence, and this research encourages professional bodies to provide such best practice guidance regarding the refurbishment of existing office stock to members.”

46. Sayce, S. and Ellison, L. (2003) “Integrating Sustainability into the Appraisal of Property Worth: Identifying Appropriate Indicators of Sustainability”. *The American Real Estate and Urban Economics Association Conference, RICS Foundation Sustainable Development Session, 21–23 August, Skye, Scotland.*

Abstract:

Research project which investigating ways in which sustainability factors can be factored into the property appraisal process. The ambition of the project is that by providing an appropriate analytical

tool, the property investment community can better implement their Corporate Social Responsibility policies and develop a greater knowledge of their building stock in sustainability terms. This paper relates to the first stages of the project: namely the development of a literature review to provide a theoretical underpinning to the work and the early stages of the identification of a set of indicators that can be used to assess a commercial building's sustainability. The paper argues that the development of sustainability policies has, within the property field, arisen from early roots in environmentalism and subsequent regulation. However, it has stepped beyond this and market forces are increasingly accommodating regulatory frameworks to exploit competitive advantage. And this means that there is perceived value to the investor in developing knowledge as to the sustainability credentials of their portfolios. But in order that investors and occupiers can so assess their stock, they require the appropriate assessment tools with which to measure sustainability and this in turn creates a need for an appropriate set of indicators.

This paper aims to develop indicator tools to monitor sustainability within the operation of the commercial building stock- the paper describes in detail part of the process of identifying indicators that could take on this role. First it provides an overview drawn from literature to outline the theoretical stance on which the project is founded and second, it discusses some of the key considerations revealed to date in the development of the indicators set. "The key, of course, is making businesses aware of the inefficiency". It also provides analyses of some of the indicators that might be adopted. The market-based theoretical approach is justified as the best option because it does not require regulation, and it is useful in the short term as a tool for increasing sustainability indicators.

The research conducted for this paper does not add to the literature on evidence that property markets should be sustainable. Instead, it aims to "provide a system of property appraisal that, if used, will make *transparent* the element of worth attributable to a property's sustainability profile".

47. Todd, Joel Ann, Drury Crawley, Susanne Geissler, and Gail Lindsey. (2001) "Comparative Assessment of Environmental Performance Tools and the Role of the Green Building Challenge". *Building Research & Information* 29(5), 324–335

Green Building Challenge (GBC) was intended to advance the state-of-the-art of building performance assessment, through the development, testing, and discussion of an assessment framework, criteria and tool. The contributions of GBC to building performance assessment are considered through comparing similarities and differences with a selection of available assessment tools. Unlike national or proprietary assessment systems, GBC was not designed for application to specific commercial markets. Instead, it emphasized research and involved researchers and practitioners from many countries. Consequently, GBC has been in a unique position to test and adopt new ideas and implement step changes. GBC's roles over the past five years have been to provide a reference framework, method and tools that can be used to develop new systems or improve existing systems; provide a forum for discussion among researchers and practitioners worldwide; and raise awareness and credibility of assessment systems. GBC's role has evolved as the context in which it operates has changed. Based on the analysis on GBC's specific characteristics and strengths, its potential future roles are found to reside in a unique position. Its role as a reference system has become less important to many participants as they implement their own national assessment systems. However, GBC's role as a forum and catalyst for change has taken on greater importance as researchers and practitioners continue to wrestle with the most dif. cult issues in building performance assessment.

This paper explores the contributions of the GBC to the discussion of building performance assessment, and considers its potential role in the future of the green building revolution. “First, the paper describes similarities and differences between GBC and a selection of available assessment tools, since some of these differences are crucial in enabling GBC to play potential future roles. The paper then discusses several important roles that GBC is in a unique position to address based on its specific characteristics and strengths”.

The paper provides a useful comparison of the available assessment tools, which examines scale and scope, end use, inclusion of sustainability concepts, structure, type of criteria, and specific elements (the definitions of these terms will be discussed below). The GBC “has contributed to the elaboration of other concepts, including the performance criteria themselves, the use of benchmarks, and suggested weighting of criteria: Perceptions of the importance and role of the Green Building Challenge have evolved over the past five years, as has the context in which it operates. Initially, GBC was viewed primarily as an international assessment system that could serve as a master reference list of criteria and framework for assessment that could be adapted for use in various countries and also provide for international comparisons of buildings”.

As a research project, GBC developed and tested assessment criteria as well as approaches for measuring and scoring these criteria. For example, GBC pioneered in the use of regionally relevant benchmarks. “In summary, GBC has played an important role in the continuing discussion of building performance assessment and could continue to play an important role in the future”.

48. Wanga Weimin, Radu Zmeureanua, and Hugues Rivard. (2004) “Applying Multi-Objective Genetic Algorithms in Green Building Design Optimization.”

Abstract:

It is a difficult task to find better design alternatives satisfying several conflicting criteria, especially, economical and environmental performance. This paper presents a multi-objective optimization model that could assist designers in green building design. Variables in the model include those parameters that are usually determined at the conceptual design stage and that have critical influence on building performance. Life cycle analysis methodology is employed to evaluate design alternatives for both economical and environmental criteria. Life cycle environmental impacts are evaluated in terms of expanded cumulative exergy consumption, which is the sum of exergy consumption due to resource inputs and abatement exergy required to recover the negative impacts due to waste emissions. A multi-objective genetic algorithm is employed to find optimal solutions. A case study is presented and the effectiveness of the approach is demonstrated for identifying a number of Pareto optimal solutions for green building design.

This paper is quantitative in nature and offers a theoretical framework which is useful for illustrating the “conflicting goals of environmental and economical performance in cases where they do not compliment each other.” It defines a green building as a building “designed with strategies that conserve resources, reduce waste, minimize the life cycle costs, and create healthy environment for people to live and work”. It also employs a case study which looks at the design of a single-story office building located in Montreal, Canada.

The paper demonstrates the utility of an optimization and energy simulation program, which “allows the design space to be explored in the search for an optimal or near optimal solution(s) for a predefined problem.” A literature review finds that designers often do not consider only one criterion in the decision-making process, and therefore, multi-objective optimization models are proposed. Acknowledging that optimization studies are useful for exploring innovative and effective ways of building design, the authors also note several limitations may undermine their application in practice.”

Problems with optimization models which are identified include difficulty in making cost-effective decisions, accounting for environmental performance, and incomplete environmental performance criterion. The authors propose that other impact categories such as natural resource depletion and global warming should also be incorporated into the objective function. A disconnect exists between optimization models and design practice in terms of variables. In response to shortcomings, this paper proposes a new optimization model. The environmental performance is evaluated through a life cycle assessment methodology. “Life cycle assessment (LCA) is a system analysis method that is useful in understanding and evaluating the resource consumption and waste emissions associated with products, processes and activities, across all phases of their life cycle from materials acquisition to final disposition.”

49. Weinstein Bernard L. and Terry L. Clower (2005) “The Estimated Value of New Investment Adjacent to Dart Lrt Stations: 1999-2005”. Available on-line:

http://www.community-wealth.org/_pdfs/articles-publications/tod/paper-weinstein-clower.pdf

Evidence to date suggests that a significant amount of new and rehabilitated property development has, in fact, occurred in close proximity to DART LRT stations. In 1999, we found that the increase in property valuations around DART stations was about 25 percent greater than in control neighborhoods, the total value of new investment completed, underway, or planned near DART LRT stations since 1999 is more than \$3.3 billion. But our earlier research found that access to public transportation looms larger than ever in urban real estate investment decisions. Drawing on announcements of new investments and reinvestment adjacent to or near DART LRT stations—as reported in local newspapers—we have estimated the dollar value associated with these projects. As the bibliography points out, in many instances proximity to DART rail was one of the critical factors guiding the site location decision. The articles also indicate that access to DART service was instrumental in driving many real estate leasing and purchasing decisions.

Full article not available on-line.

50. Wilhelm, M.D. (2005) “Green Building Specifics: Costs, Benefits and Case Studies”. Pollution Prevention Workshop for Healthcare.

This study is a review of both costs and benefits of sustainable buildings. It identifies strategies to keep track of green building statistics. It also reviews several different types of construction practices that can help reduce impact of buildings on the environment. The study focuses mostly on the environmental impact of green buildings, although there is some reference made to the health of the occupants of these buildings. The author attempts to estimate the financial benefits of productivity increases, although this is based on the work of others rather than an independent study. The study suggests that

gains from productivity are 1-1.5% improvement. Overall, this resource provides a good overview of the various research based on cost and benefits associated with green buildings, although it does not contribute to the findings.