Sustainability and the value of office buildings – will the market pay for green buildings?

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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 in 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.

This paper investigates the balance between sustainability and financial returns. It considers how sustainability is incorporated into the valuation of an office building, with the emphasis placed on the discounted cash flow (DCF) and capitalisation of income approach. Whilst there many varied types of sustainable and/or green buildings, it is concluded that a private sector office building is unable to place sustainability at a higher priority than profit and financial returns to shareholders.
Introduction

The rationale for green buildings and the political drivers affecting the uptake of sustainable features in the built environment is increasingly impacting the residential, commercial, and industrial and retail sectors. Whilst focusing mainly on water economy and energy efficiency, there are numerous measures that are rapidly being adopted in Australian green buildings. Surprisingly buildings are responsible for 40 – 50% of energy end use, for 40% waste to land fill, for 16% fresh water demand, for 40% raw materials consumption and 25% of global timber harvest. The environmental impact of buildings is enormous and needs to be reduced, where markets are rapidly adjusting and property analysts need to closely monitor this change.

It is essential that consideration is also given the impact of increased sustainability when undertaking the primary approaches to valuation. With the greatest single influence on risk in the form of depreciation and obsolescence, every building must be individually assessed to identify the influence of sustainability. With an increasing profile in property circles for property owners, tenants and all stakeholders, it is critical that sustainability is fully understood and included in the valuation process. Inadequate understanding of sustainability will restrict the valuation process from assessing the true market value based on a hypothetical sale, where the purchaser and vendor are fully conversant with all aspects of property, especially sustainability and green building characteristics.

Green building definitions

It is imperative to have an understanding of the definition of ‘green building’ as many terms are used to convene the meaning of buildings which reduce their impact of the environment. Some examples are Environmentally Sensitive Design (ESD), sustainable, Natural, environmentally friendly, environmentally aware, ecological and biomimetic buildings. Do these terms mean the same thing or are the buildings they give their label to different? Each term embodies different approaches and philosophies with regards to green buildings and this will influence the features that may or may not be included in the building design and the finished product can be very different in some cases. However this is not a significant issue for valuers at this point, and generally speaking any building with this type of descriptor is claiming to be different from traditional or non green buildings. Equally there are many definitions of green buildings as there are titles or descriptors. The dictionary definition is:

the practice of: increasing the efficiency with which buildings and their sites use and harvest energy, water, and materials, and reducing building impacts on human health and the environment, through better siting, design, construction, operation, maintenance, and removal the complete building life cycle (www.wikipedia.com)

Whereas the World Green Building Council definition is:

To significantly reduce or eliminate the negative impact of buildings on the environment and on the building occupants, green building design and construction practices address: sustainable site planning, safeguarding water and water efficiency, energy efficiency, conservation of materials and resources, and indoor environmental quality (www.wgbc.com)

Finally the Australian Green Building Council defines green building as one which incorporates; design, construction and operational practices that significantly reduce or eliminate its negative impact on the environment and its occupants. Building green is an opportunity to use resources efficiently while creating healthier environments for people to live and work in (www.gbcaus.org). Overall these definitions share common aspirations to reduce emissions of greenhouse gases through fossil fuel consumption, to reduce the consumption of scarce resources like water, to recycle resources and waste less, to reuse materials wherever possible, to use renewable resources, and to improve occupant comfort and well being. Therefore the intent of green buildings is to reduce environmental impact but also to provide better buildings and for this there is a market and an enhanced value; potentially.
Built environment contribution to climate change and global warming

Greenhouse gases emitted over the last 150 years have increased global mean temperatures by 0.6 degrees Celsius and climate change projections indicate that unless global greenhouse emissions are substantially reduced by 2070 Victoria’s mean temperature could increase by 5 degrees Celsius (CSIRO, 2005). Similar predictions relating to temperature changes for other countries have been discussed although the extent of the impact on individual countries and cities will vary (IPCC, 2001). In developed countries buildings offer considerable scope for meeting emission reduction targets through increased energy efficiency (BRE, 1996). For example, in Victoria, 12% of all greenhouse gas emissions are derived from commercial buildings (DSE, 2005). For many it is surprising that buildings are substantial greenhouse gas emitters; producing more greenhouse gases than all the cars on Australian roads (Australian Building Codes Board, 2001).

Many experts believe that greenhouse gases are linked to global warming and climate change via an enhanced greenhouse effect, being the process by which water vapour, carbon dioxide and other gases form a blanket around the earth and trapping heat (ABS, 2005). Projections indicate annual average temperatures in Australia could be 0.4 to 2.0 degrees Celsius (°C) higher by 2030 and 1.0 to 6.0 Celsius (°C) higher by 2070 (CSIRO, 2004). According to the Australian National Greenhouse Gas Inventory, Australia’s total net emissions of greenhouse gases increased by 23 MT of CO₂ (4.5%) between 1990 and 2002 (AGO, 2004).

CO₂ emissions can be reduced by introducing filters to power generation plants, though there is no reduction of energy consumption. On the other hand improving a building’s energy efficiency directly results in reduced consumption, costs to the user, and reduces a nation’s CO₂ emissions to help fulfil international commitments such as the ‘Kyoto Protocol’. Previous research concluded that although readily available means of reducing energy consumption in buildings currently exist and are readily available, the ‘business as usual scenario’ will not deliver sufficient reductions to meet the ‘Kyoto Protocol’ (Australian Greenhouse Office, 1999) or an acceptable level of CO₂ emissions. In other words, steps need to be taken to be done to promote wider acceptance and uptake of measures to reduce CO₂ emissions from the built environment, and there is major scope for improving Australia’s new and existing building stock (DSE, 2005). Much research has focused on the technical ways in which reductions of carbon dioxide emissions may be achieved while other studies (Fisk and Rosenfeld, 1998) set out the social and economic benefits of sustainability in buildings. The general argument is that energy efficient buildings cost less to operate and have better internal environments for occupants, leading to healthier buildings that contribute to mitigating climate change (Scrase, 2001). Despite awareness of the need for conservation, consumption is increasing particularly where CO₂ emissions are relatively high due to high electricity demand for heating, cooling and lighting (Scrase, 2001). For example current predictions are that the Australian commercial building sector is expected to increase its greenhouse gas emissions from 32Mt of carbon dioxide (CO₂) per annum to 63 MT between 1990 and 2010 under a business as usual scenario (DSE, 2005). Under this scenario Australian emissions would substantially exceed targets established in the ‘Kyoto Protocol’. The Australian position is that, although not a signatory to the ‘Kyoto Protocol’, Australia is taking some action to limit its increase of greenhouse gas emissions to 108% of their 1990 level by 2008-2012.

Energy use in buildings

Electricity in Australia accounts for the largest source of energy in the buildings sector followed by gas, petroleum products and coal. Notably the majority of Australian electricity is derived from brown coal, being the highest emitter of greenhouse gases. However because electricity results in largest CO₂ emissions it also results in 89% of the total greenhouse gas emissions. Gas on the other hand, accounts for only 7% total emissions. Clearly substantial reductions could occur if Australian buildings switched from electricity to gas as a source of energy, however current predictions do not foresee this shift in energy use before 2010 and consequently the emission levels are predicted to double.

The physical characteristics of buildings play an important part in their inherent energy efficiency. For example, building envelope performance has a substantial impact on the heating, cooling and lighting requirements for commercial buildings (AGO, 1999). For example, lightweight curtain walling with little or no thermal insulation will have very poor thermal performance. In contrast a heavyweight external envelope with insulation will have better thermal performance leaking less energy. There is agreement that improvements in the thermal, daylighting and natural ventilation
performance of commercial building envelopes will reduce greenhouse gas emissions (Moss, 2006). New construction has higher levels of thermal efficiency than any previous period and this has been achieved through improved standards in building and construction codes and regulations (BCA, 2005). These improvements will deliver a building stock with higher levels of energy efficiency, though as Boardman (1991) demonstrated in her UK study, the replacement of the existing stock of properties is so slow that it will take hundreds of years to bring all stock up to current standards. The current replacement rate for Australian office stock is less than 3% per annum (Jones Lang LaSalle, 2005).

When the proportions of energy use and greenhouse gas emissions are examined in the Australian commercial building stock, figures showed that heating was the largest single end use at 33% but is fourth largest with respect to greenhouse gas emissions. Cooling, lighting and ventilation increase in importance when greenhouse gas emissions are calculated and collectively account for 71% of total emissions. However, the actual proportion applicable to a specific building may vary considerably from the average. Australia is a large continent incorporating eight climatic zones and the breakdown of emissions related to specific operational use will vary across the climatic zones. Overall the breakdown of specific operational energy applications principally responsible for greenhouse gas emissions are cooling (28%), air handling (22%), lighting (21%) and heating (13%). Heating, ventilation, air-conditioning and lighting collectively account for 84% of commercial building sector greenhouse gas emissions - clearly it is in these areas that the opportunity to reduce emissions lay (AGO, 1999).

Within the buildings sector how is greenhouse gas emission apportioned amongst different groups? In Australia figures revealed the largest consuming sub-sector to be public administration and commercial services with 36% of total emissions. Following closely was the retail and wholesale sector accounting for 32% of emissions. The finance and business sector ranked third at 17%, followed by recreation sector at 11%, and finally communications sector at 4% of total emissions. When all building types are considered, the largest single source of greenhouse gas emissions in buildings is from offices. In order to deliver sustainability and meet the ‘Kyoto Protocol’ targets it is clear that efforts to reduce emissions of the buildings sector are required.

**Embodied energy**

Embodied energy is defined as the energy consumed by all of the processes associated with the production of a building, from the acquisition of natural resources to product delivery. Embodied energy includes the mining and manufacturing of materials and equipment, the transport of the materials and the administrative functions. It is a significant component of the lifecycle impact of a building.

Previously it was thought that embodied energy was small in comparison to operating energy use in buildings during the life cycle. However this view has changed with research demonstrating that for some buildings, those using materials with high embodied energy, can equate to many years of operational energy. When buildings are refurbished or altered additional embodied energy is introduced. The single most important factor in reducing the impact of embodied energy is to design long life, durable and adaptable buildings. Materials specification will have a substantial impact on the total amount of embodied energy in any building. For example, consider cladding panels the options might be aluminium panels or timber panels. The embodied energy content of aluminium is very high and that of timber very low. However one would also have to factor in maintenance and life cycle into the total calculation for embodied energy which would increase the embodied energy for timber but not to the level of aluminium. Clearly this is a complex issue for designers of green buildings to evaluate. Reuse of building materials is a very effective way of reducing embodied energy, for example, saves about 95% of embodied energy that would otherwise be wasted. Therefore buildings which have re-used materials in them contribute positively to reducing embodied energy. Currently green building rating tools do not include embodied energy in their assessments.

**Transport energy issues**

Transport issues are frequently raised when discussions occur regarding green building, but what is the issue at stake? The principal contributor to emissions to air in city and urban areas is fossil fuel combustion, particularly by motor vehicles. These account for the bulk of carbon monoxide (averaging 86%) and nitrous oxide (averaging 67%). The highest source of nitrous oxide was passenger vehicles with 204 kilo-tounes (65%) of road vehicle emissions. Whilst
there is considerable research and development into alternative methods of fuelling vehicles such as ethanol, hybrid cars, electric powered vehicles the majority are petrol fuelled. Based on 1990 data, the contribution of transport vehicles to total Australian greenhouse gas emissions (CO₂ equivalent) is just under 12% and Australia had the third highest globally measured per capita level of carbon dioxide emissions for transport. Furthermore figures compiled in the Australian National Greenhouse Gas Inventory showed road transport to emit the largest volume of greenhouse gases by the transport sector. CO₂ emissions by road transport totaled 55 million tonnes in 1994, accounting for 79% of total transport CO₂ emissions, an increase of 11% in CO₂ emissions since 1988. Air transport stood at 9 million tones an increase of 36% since 1988 whilst rail and marine figures declined.

Inevitably people need to travel to and from buildings and this where transport energy issues relate to property. Therefore it is the location of the property, the building type and access to a range of transport nodes which all impact on the associated transport energy. Some green building rating schemes like Greenstar do take some account of transport issues in their ratings tools. However the calibration of the tools are not based on actual transport energy consumed rather the award of points for having the potential to reduce transport related emissions through the provision of shower facilities for cyclists and proximity to public transport facilities. To date there is no evidence that transport energy issues are impacting on property value however with rising oil prices transport related emissions may become issues for some sectors of the property market in future.

Churn rates

Churn is a measure of customer or employee attrition, and is defined as the number of customers who discontinue a service or employees who leave a company during a specified time period divided by the average total number of customers or employees over that same time period. For example, churn rate has been an ongoing concern of telephone and cell phone services in areas where several companies compete and make it easy to transfer from one service to another. In property churn rate may refer to tenants in a building. Changes in a business' churn rate can provide feedback for a company as it may indicate tenants or customer responses to service, pricing, competition and so on, as well as the average length of time an individual remains a tenant or customer. As such, churn rate is an important business metric.

To estimate future churn rates, predictive technology is sometimes applied, in a process known as predictive churn modeling. It is possible that in future tenants will prefer to be located in green buildings leading to a higher churn rate in older non green stock. Thus the risk of depreciation and obsolescence may be increased for some property owners. Another aspect of churn is the actual replacement of the building stock itself. This is very slow and currently stands at around 2-3% for commercial buildings and is consistent with replacement rates in other industrialised countries. What this means in terms of green buildings, is that it will take hundreds of years to bring all the stock up to current best practice standards.

Regulations

There is an increased amount and range of regulations affecting property which is related to sustainability. The Government may wish to encourage more sustainability in the built environment and has two main methods of achieving this goal. The first is to implement more Regulations and Acts of Parliament which force citizens and organisations to adopt green measures. An example of this is the Building Regulations or the BCA. In 2005 and 2006 measures were introduced into the BCA concerning mandatory energy efficiency for new buildings and major refurbishments. However it will take many years for all the stock to meet the current standards and therefore focus is required on upgrading existing buildings too. Currently the BCA is restricted to energy efficiency measures only though there are discussions about extending the scope of the BCA to include water conservation measures in the near future. In the medium to long term future other green measures may also be adopted through the Building Regulation framework mandating more green building features.

With regards to water some action has been taken by state and commonwealth governments. The main legislation is the 1994 COAG (Council of Australian Governments) Water Reforms to implement a ‘strategic framework to achieve an efficient and sustainable water industry’ to halt the widespread degradation of natural resources, minimise unsustainable use of water resources and to establish integrated and consistent approaches to water resource management. The framework includes provisions for water entitlements and trading, environmental requirements, institutional reform,
public consultation and education, water pricing and research. The time frames for implementation of the framework were set at five to seven years with full implementation by the year 2001, however these were extended to 2005.

Critical environmental water issues were identified in the Water Reform Framework and include: allocation of water for the environment; ecological sustainability of new developments; institutional reform; the incorporation of environmental costs in water pricing; ecologically sustainable water trading; protection of groundwater; and implementation of the National Water Quality Management Strategy. In April 1995, COAG endorsed the National Competition Policy for Australia. Under this policy, payments are made available for states and territories that successfully implement a range of reforms. In June 1999 an assessment of the progress in implementing COAG water reforms was undertaken. In December 2002, the states and territories were informed they would receive around $740 million in competition payments in 2002-03 after an independent assessment of their progress. However progress was not adequate in all areas and a $270 000 reduction in Queensland's 2001-02 competition payments continue in 2002-03 for Townsville City Council's lack of progress in respect of two-part water pricing reform.

In 2004 the National Water Initiative (NWI) was established this as a strategy driven by the government to improve water management. The NWI encompasses a wide range of water management issues and encourages the adoption of best-practice approaches to the management of water and is intended to drive a number of issues, but of relevance for the property profession is better and more efficient management of water in urban environments - for example through the increased use of recycled water and storm water. The NWI Agreement was signed by the commonwealth and all states and territories, with the exception of Western Australia and Tasmania which declined to sign at the time. From this, state governments have set targets for water recycling. The planning system also provides a framework which enables greener buildings to be developed. For example planners may attach certain stipulations to planning consents regarding public transport facilities for example. Where large developments occur there is scope for the planner to exert influence on issues such habitat destruction and transport issues which lead to greener buildings. Increasingly planners are taking green issues into account when considering development proposals. The other option available to government and their agencies is incentives. There have been numerous schemes established in the UK and some in Australia to incentivise the market for green buildings. Some schemes have been more successful than others (Wilkinson & Goodacre, 2001), though in reality it requires a combination of incentives and regulation to increase the uptake of green buildings in the market.

Green building rating tools

There are an increasing number of voluntary rating tools available in Australia, some of which are whole building assessments like Green Star, others focus on a single issue only like ABGR and energy use. In addition some tools focus on a specific period in the building life cycle such as ‘design’ where others cover the operational phase and design. The aim of the tools is to reduce environmental impact of buildings and to promote a market for green buildings. There is a danger that if too many different schemes or tools are launched consumers will become confused and the opportunity to develop a market in green buildings will be slowed. It is in the interests of all if the states and territories work together to provide uniform tools which operate on an Australia wide scale. Currently, there is a suite of Green Star rating tools for commercial offices at all phases of development - design, construction, and operations promoted by the Green Building Council of Australia (www.gbcaus.com.au). By the end of 2006, there will be Green Star tools for Retail, Health, Education, Convention, and Residential buildings. Projects are evaluated against eight environmental impact categories, plus innovation. Within each category, points are awarded for initiatives that demonstrate that a project has met the overall objectives of Green Star and the specific criteria of the relevant rating tool credits. Points are weighted and an overall score is calculated determining the Green Star rating. 4 Star Green Star Certified Rating (score 45-59) signifies 'Best Practice', 5 Star Green Star Certified Rating (score 60-74) signifies 'Australian Excellence' and 6 Star Green Star Certified Rating (score 75-100) signifies 'World Leadership' (Green Building Council of Australia, 2006).

The Australian Building Greenhouse Rating (ABGR) Scheme is an initiative to help building owners and tenants benchmark their greenhouse performance. ABGR encourages best practice in the design, operation and maintenance of commercial buildings to minimise greenhouse emissions. It is administered by the New South Wales Department of Energy, Utilities and Sustainability (DEUS) and locally by leading state greenhouse agencies. The ABGR scheme rates buildings from one to five stars with five stars representing exceptional greenhouse performance. Current market best
practice in Australia is three stars. ABGR is voluntary, a rating can be initiated by a building owner, manager or tenant. It rates a building according to its actual performance, using 12 months’ energy data and can be used for the base building (central services), whole building or individual tenancies. It is available for all Australian office buildings (ABGR, 2006).

NABERS (the National Australian Built Environment Rating System) is a performance-based rating system that measures an existing building’s overall environmental performance during operation. NABERS will rate a building on the basis of its measured operational impacts - including energy, refrigerants (greenhouse and ozone depletion potential), water, stormwater runoff and pollution, sewage, landscape diversity, transport, indoor air quality, occupant satisfaction, waste and toxic materials. This range of environmental indicators and the associated measurement techniques have been the subject of extensive research and deliberation, drawing on international and local expertise. NABERS is an environmental rating for existing commercial office buildings and homes. It complements and builds on other environmental rating schemes available for buildings. NABERS OFFICE incorporates the ABGR scheme for energy and greenhouse efficiency, and the new NABERS OFFICE Water rating. The new water rating system is designed to complement ABGR with an additional environmental impact measurement for environmentally responsible businesses. Other components of NABERS OFFICE will be designed with a similar purpose. NABERS is intended to work alongside other rating tools for example the Energy Smart Home Rating (ESHR) scheme will provide the basis of NABERS HOME Energy in the future. As regards Green Star – Office ratings the actual operational performance data established by NABERS ratings will complement Green Star ratings, establishing a valuable feedback loop to building designers, developers, tenants and owners. It is apparent that increasing numbers of buildings are becoming accredited under these and other schemes currently in the marketplace. There are plans to use such schemes as a means of demonstrating compliance with part of the BCA energy efficiency for example in future. The perception could be that building with very good ratings will have a higher value and be less vulnerable to depreciation and obsolescence in the property market.

Office Accommodation

The Property Council of Australia represents the interests of owners of Australian office buildings. A National Office Quality Matrix has been developed by PCA that classifies stock according to a differential grading system. For example, Premium is the highest quality grade of office building followed by A Grade, B Grade, C Grade and D Grade. In summary, Premium is considered a ‘landmark office building located in major CBD markets’, A Grade is a ‘high quality space’, B Grade is classified as ‘good quality space’, C Grade space is ‘older style with lower quality finish’ and D Grade is space of ‘poor quality’. Significantly in 2006 the matrix was amended to include the Greenstar and AGBR ratings as a benchmark of quality; another factor which may influence a property’s value in the marketplace.

Office buildings require a major refurbishment every 20 -25 years although many owners have opted for a series of minor refurbishments to lower the capital expenditure outlay and avoid access problems (Jones Lang LaSalle, 2005). The drivers of refurbishment are reducing vacancy rates, improving rental levels, upgrading assets (such as from Grade B to Grade A), and mitigating against obsolescence; in essence the drivers are financial (Burton, 2001). Significantly two recent refurbishment projects have demonstrated in Victoria that older buildings can be refurbished to 5 star GreenStar standards (40 Albert Road and 500 Collins St, Melbourne). Therefore is real potential for existing stock to be upgraded to high and current standards of environmental quality. Many CBDs comprise a varied stock of property. Furthermore, each building presents different challenges in respect of green improvements - for example, an owner may seek to refurbish single floors only or to refurbish for a short term life of say 5 – 10 years although another owner may be considering 25 year refurbishments or seek to strip a property completely down to the original structural frame.

Most Australian CBDs include a range of Victorian commercial buildings constructed of traditional load-bearing construction that are several stories high. Some of these properties are heritage listed, which in turn places certain restrictions on alterations to the structure and fabric of the buildings. CBD stock is nested in a variety of 20th century stock that ranges from low rise to skyrise. The skyscraper stock has a variety of cladding and external wall materials consistent with architectural preferences prevailing at the time of construction. These materials have varying thermal
properties that render some buildings more energy efficient than others - for example glass curtain walling is less energy efficient than natural stone panels. In addition, office buildings vary in size on the floor plate ranging from deep plan to narrow plan, with both types enjoying different energy efficiency characteristics. When considering the available options with regards to water conservation, there is a water source hierarchy in which reducing consumption is highest, followed by re-use of water (known as ‘greywater’), then recycling on a large scale and finally the last resort of desalination. Note that it is possible to re-use and recycle water in most building types; new and existing and the measures that be adopted include:

- Low usage taps and showers;
- Rainwater harvesting and storage tanks;
- Low flush water closets (wcs);
- Sensor activated urinals;
- Greywater recycling;
- Sewer mining (black water recycling); and
- Chilled beams (to replace air conditioning using cooled air).

Dual water supply is possible where there is a water supply of potable (drinking quality) water provided to each house or building, with a second supply of non-potable water. Dual water supply systems have been successfully implemented in Australia at Mawson Lakes in Adelaide, South Australia and overseas in Singapore and California. These are all measures that valuers may find included on property details and specifications relating to water use in buildings. Given the scarcity of water those buildings which have reduced consumption rates may prove attractive to tenants and owners in the near future.

Implications for the valuation process

Whilst the green building sector has substantially raised its profile, there has been a perceived lag with other stakeholders in the property market. Even though substantial advancements have occurred with sustainable technology and building processes, consideration must be given as to how the ‘value’ of a property is affected by its level of sustainability, and how this affects the business case for green buildings. For example, is a green building less or more risky? Furthermore, how is this reflected in the actual value of the building? Also, how is sustainability incorporated into the valuation process? To fully understand the relationship between green (or sustainable) buildings and value, consideration must be given to their influence on value. 90% of the Australian commercial property market was designed prior to the introduction of accepted rating systems (JLL, 2006). Conventional valuation analysis focuses on three primary forms of obsolescence: physical, functional and economic. Although there other forms of obsolescence also exist (e.g. legal), it can be argued that a fourth primary type of obsolescence has been added – sustainable obsolescence. Thus a building can have increased obsolescence (causing a loss in value or depreciation) if it fails to meet the market’s expectations of incorporating a level of sustainability. This can be in many forms including the design phase, the construction materials or the operational phase. Accurately identifying, fully understanding and then being able to quantify the level of sustainability, in a similar manner to understanding other forms of obsolescence, is rapidly becoming an essential part of the valuation process.

The relationship between sustainability or green buildings and capital value has remained in large part untested because, although the number of green buildings has increased in recent years, many are owner-occupied by private organisations or government led projects (Madow, 2005). In addition few green buildings have been sold and it is difficult to identify the premium, if any, as well as the effect on depreciation and obsolescence. Even though increasing attention has been placed on green buildings, research in the area between asset value and green building is largely anecdotal or theoretical (Sayce et al., 2004). The raised awareness in the investment and financial sector of the property industry has not yet engaged fully with the sustainability agenda, and there is seemingly limited attention focused on this area by property professionals (Lutzkendorf & Lorenz, 2005). Collectively these factors have contributed to the limited knowledge about the relationship between value and green buildings, including the perception of tenants, owners, developers and other stakeholders. Above all, little is known about long-term influences which in turn will affect property values. Lutzkendorf and Lorenz (2005) argued sustainability embraced two strong principles: (1) satisfy human needs and requirements (quality of life)
and (2) intra and intergenerational ethics. Thus to fully consider the financial applications of buildings towards sustainability, consideration should be given to the interaction between social, economic and physical factors. This triple factor approach is referred to as the ‘triple bottom line’ approach as shown in figure 1.

**Figure 1. Triple Bottom Line Approach**

![Image of the triple bottom line approach](https://source.unsplash.com/random/300x200)

(Source: Lutzkendorf & Lorenz 2005.)

At a starting point the degree to which an individual building is sustainable can vary substantially depending on a myriad of factors including:

- the location of the building and the proximity of alternative buildings, as well as transport and surrounding services and facilities;
- the architectural design and age of the building;
- the perception of building owners (and tenants) towards sustainability;
- the perception of the marketplace towards the environment and corporate social responsibility;
- the prevailing cost of energy, construction and transport;
- other factors that influence the financial decision.

However there is a difference between the actual cost of different levels of sustainability and the perceived added value. Research for the United States Green Building Council demonstrated that a green commercial building (LEED certified) costed on average only 0.66% higher than a conventional building – the researchers concluded that many projects ‘achieve sustainable design within or close to their initial budget (Kats et al., 2003). Even so, there is a widely held perception that green buildings are substantially more expensive than conventional buildings. Robinson et al (2005) argued that the Australian commercial property market is generally risk-averse, which hinders acceptance of green buildings because of an understandable reluctance to accept new methods without proof that they work. The experience of the cost of green buildings in Australia is also less positive than the United States, with reported premiums ranging from 2 per cent to as high as 22 per cent for ‘iconic’ buildings (Matthiessen et al., 2004). It is increasingly likely that investors may consider paying a premium for assets with demonstrated sustainability potential which can be realised via cost-effective management or modification; on the other hand, owners who do not implement sustainable practices may find their buildings subject to a ‘non-sustainability discount’ by tenants over the next three to five years (JLL, 2006).

Whilst it is not possible to accurately measure the effect of every sustainable aspect, consideration must be given as to how sustainability will influence the primary valuation approaches as discussed below.

Careful attention must be paid to the initial cost of the improvement e.g. a sustainable office building. With regards to sustainability, an important consideration is the relationship between the construction cost and the value of the building - see figure 1. Commonly over-capitalisation occurs when marginal
cost (MC) exceeds marginal revenue (MR) – in other words, more money is being spent than can be recovered e.g. by selling on the open market (Trigilia, 2002). In figure 1, for example, MC equals MR at point (a); however, over-capitalisation (i.e. initial cost exceeds market value) has occurred at (b) since every extra dollar spent on construction cost will not increase value at the same rate. From a market value perspective it is important not to spend more than (a) which is the highest and best use of the site.

![Figure 2. Law of Diminishing Returns](image)

**Comparison (or market) approach**

Based on the premise of comparing ‘like with like’ and making the appropriate adjustments, there are challenges when seeking to compare a sustainable building with a non-sustainable building. Consideration must be given to the level of sustainability incorporated in the subject property – does it have a small degree of sustainability or it a radical green building? For example, prior to the introduction of water meters the existence of a rainwater tank for a suburban residential house was considered to be of little interest by a prospective purchaser (from a willingness to pay more), although this has changed substantially in recent times. Other examples include the perception towards photovoltaic solar panels as well as the conventional solar hot water systems, which previously may have been perceived as having a minor or negligible contribution to the value of the property (in comparison to the analysed recent sales). On the other hand if the subject property does not have a solar hot water system and all of the analysed sales do, consideration must be given to the effect, if any, that the lack of a sustainable attribute has as a potentially negative influence on the value of the subject property.

As with all valuations, the emphasis should be placed on the added value of each component. Whilst hedonic modelling (via regression analysis) is commonly used to identify how certain characteristics (e.g. number of bedrooms) affects the value of a house, this in turn will incorporate sustainable aspects of the property. At present there is little evidence to quantify exactly how much each sustainable aspect contributes to the overall value, although attention should be placed on the marketing programs by real estate agents where the emphasis is placed on sustainable aspects of a property. In areas where this is occurring, the valuation process should note the increased demand by purchasers for sustainability in the subject property and pay increased attention in the assessment of value.

According to the International Valuation Standards Committee (IVSC, 2006), ‘market value’ is defined as “the estimated amount for which a property should exchange on the date of valuation between a willing buyer and a willing seller in an arm’s-length transaction after proper marketing wherein the parties had each acted knowledgeably, prudently and without compulsion”. With the concept of sustainability being increasingly incorporated into property markets, the valuer must assess the concept of ‘willing’ with respect to the ‘willing buyer’. In other words, how ‘willing’ is a prudent purchaser with respects of their demand for sustainable attributes in a building? On the other hand, if a property is considered to be a ‘full’ green building (i.e.
completely different to neighbouring properties), will a prudent purchaser be unwilling pay the full market price for the property? This is subject to conventional supply and demand theories where a building with a lower level of demand (due to a perception that the property is unconventional or too ‘different’) will realise a lower sale value.

Capitalisation of income approach

The two components of the capitalisation of income approach, namely (a) the net operating income (NOI) and (b) the capitalisation rate can both potentially be affected by the level of sustainability in the property. (a) The net operating income reflects the amount the building (based on net lettable area) will realise after operating costs are deducted. There is increasing evidence to argue that tenants will pay a higher rate per m² for a sustainable building, although the actual amount would vary substantially depending on the perception of the tenants and the benefits to them. At present some of these benefits are intangible and difficult to quantify, such as lower staff absenteeism due to a healthier work environment. However, if a building is perhaps ‘too sustainable’ as perceived by certain tenants (i.e. with no airconditioning, waterless urinals) it would have a limited market and therefore may not attract a premium rent. Once again, the level of sustainability incorporated into competing properties, as well as the level of sustainability sought by tenants (e.g. if government tenants have a mandatory star rating that must be achieved such as ABGR 4.5 stars for the Victorian state government). From the level of perspective of outgoings, another important consideration is whether the leases are net or gross leases, which in turn affects who reaps the benefits from a sustainable building (with lower operating costs). If the leases are gross, the tenant may have little interest in accommodation in a sustainable building – inversely, a tenant with a net lease would prefer lower outgoings if possible although the owner may not be so willing to outlay additional capital expenditure for enhanced sustainability features.

The capitalisation rate (or ‘all risk yield’) reflects all future risk in the property – the added element of sustainability will clearly affect this risk and should be incorporated within the capitalisation rate. This may be undertaken via the following examples of adjustments to the capitalisation rate:

- lower level of (sustainable) obsolescence -> lower risk (capitalisation rate);
- higher perceived maintenance costs -> higher risk (capitalisation rate);
- lower operating costs -> lower risk (capitalisation rate); or
- potentially having a perception of being ‘too green’ -> higher risk (capitalisation rate).

Adjustments in the capitalisation rate need to incorporate all the aspects of sustainability, which will also be affected by wider changes in society towards the environment (via corporate social responsibility or CSR) and energy use (i.e. higher energy costs equate to perceived demand for sustainable buildings which will appear to be partly future-proof).

Discounted cashflow (DCF) approach

Due to the explicit nature of discounted cashflows, there are numerous variables that must be adjusted in a discounted cashflow to indicate how the level of sustainability affects the property – see figure 3. In addition to considerations discussed with regards to the capitalisation of income approach, other factors that may be affected DCF include:

- retention of existing tenants throughout the DCF (perhaps increased renewals in a sustainable building);
- attracting new tenants to a perceived sustainable building;
- lower discount rate to reflect less risk;
- lower reversionary yield to reflect less risk;
- lower operating costs with regards to energy;
- possibly higher maintenance costs for specialised sustainable equipment (e.g. cleaning);
- higher capital costs e.g. photovoltaic cells;
- potentially a higher level of obsolescence after a 10 year period (i.e. if the building does not have the latest technology or if the sustainable technology is out-of-date).
Figure 3. Conceptual Overview of a Discounted Cashflow (DCF)

There are arguments both for and against the use of discounted cashflows with assessing the value of a building. A DCF is explicit and includes all financial details for a building over the next 11 years starting on the date of valuation. In other words, there must be forecasts and assumptions about many variables over the next 11 years including the state of the market (e.g. vacancy rate, level of rents, interest rates), the costs associated with maintaining the building, the effect of depreciation and obsolescence (e.g. functional, physical and economic), as well as the perception of the market towards the building. For example: are the level of sustainable features adequate?

Due to the inherent number of assumptions in a DCF, the issue of sustainability can further complicate the matter unless there is clear direction about the effect on the influencing value drivers. For example, although lower staff absenteeism is linked to sustainable buildings this may not be readily transferred into the calculations in the spreadsheet due to the lack of available evidence – the challenge for the valuer is to quantify the effect into a financial amount. Thus, the different levels of ‘sustainability’ must be reflected in the DCF – this refers to the environment, the ability of the property to ‘sustain’ income levels and the likelihood that that building will ‘sustain’ (or retain) its long term value.
Cost approach

Commonly used as a check method where appropriate, the cost approach relies heavily on the original replacement or reproduction cost with a allowance for depreciation – this is also commonly referred to as depreciated replacement cost (DRC). The cost approach can be defined as: “a set of procedures through which a value indication is derived for the fee simple interest in a property by estimating the current cost to construct a reproduction of, or replacement for, the existing structure plus any profit or incentive; deducting depreciation from the total cost; and adding the estimated land value” (API, 2007). Clearly the determining factor with the approach is the level of depreciation or loss in value from the original cost, where sustainability has a varied impact of value. For example, it may be possible to validate the original cost of a sustainable improvement by referring to the payback period e.g. 5 or 10 years. However, some improvements have payback periods that far exceed the anticipated life of the buildings.

As the majority of savings are made over the long term, some homeowners may not keep their house long enough to fully recover the initial costs of complying with energy efficiency. On the other hand, energy efficient homes may produce immediate positive cash flows for owners as the savings in energy bills more than offset the higher monthly mortgage payments needed to finance the additional investment (Nevin and Watson, 1998).

Research into the relationship between house values and energy costs in the USA concluded that properties with higher energy efficiencies had higher values, suggesting the housing market in the USA identified and valued improved energy efficiency. When referring to investment grade properties, the length of the payback becomes crucial. Thus, if the sustainable improvement can not be amortised over a reasonable period then it is not viable.

Another complication with using the cost approach is to use the initial cost as a starting point. It can be argued that many ‘green’ buildings that have been developed by government or public bodies (e.g. universities, city councils) have incorporated a degree of over-capitalisation. In other words, there are other external drivers that influenced the initial outlay for construction of the building – for example, a status symbol or flagship property. In reality the initial construction costs would not be commensurate with the market value of other neighbouring (or competing) properties and care must be exercised when relying on the capital value as a starting point. Overall when incorporating sustainability into the cost approach then a high degree of care must be applied. It should be remembered that the starting point (replacement or replacement cost) may be inflated due to over-capitalisation (the valuer should check the current market cost of construction) and the exact rate of depreciation may be hard to accurately identify.

Considerations for valuers

The increasing need for the built environment to be sustainable has adversely affected design and construction approaches, where valuers must now become fluent with additional jargon such as ‘purging’, ‘orbs’ and ‘chilled beams’. Until recently a ‘green building’ was extremely rare and considered vastly different, where many cities now boast a variety of newly constructed and refurbished or converted green buildings. In addition, the concept of a green building has been broadened to include buildings that incorporate different levels of sustainability. How these varying levels of sustainability are reflected in the final valuation figure are current challenges for valuers, although it is simply not possible to ignore their effect on risk and subsequently on value. A starting point for the valuation process is to consider how sustainability affects depreciation and obsolescence – see table 1.
Table 1. Comparison of varying property types – refurbishment, obsolescence and sustainability

<table>
<thead>
<tr>
<th>Property Type</th>
<th>Lease length</th>
<th>Refurbishment Frequency</th>
<th>Current Exposure to Obsolescence</th>
<th>Anticipated Effect of Changing Perception of Sustainability**</th>
</tr>
</thead>
<tbody>
<tr>
<td>Office</td>
<td>Medium</td>
<td>Medium</td>
<td>High</td>
<td>Medium*</td>
</tr>
<tr>
<td>Retail</td>
<td>Short</td>
<td>High</td>
<td>High</td>
<td>Low*</td>
</tr>
<tr>
<td>Industrial</td>
<td>Long</td>
<td>Low</td>
<td>Low</td>
<td>Low</td>
</tr>
<tr>
<td>Residential</td>
<td>Short</td>
<td>Varying</td>
<td>Low</td>
<td>Low-medium</td>
</tr>
<tr>
<td>Misc.</td>
<td>Varying</td>
<td>Low</td>
<td>Low</td>
<td>Low-medium</td>
</tr>
</tbody>
</table>

(* would vary in other sectors) (** would vary according to net or gross leases, and which stakeholder e.g. tenant, owner)

The role of the valuer needs to be clearly understood with regards to relationship between sustainability and the value an office building. With regards to increasing the level of sustainability, it has been argued a ‘vicious circle of blame’ exists between tenants, investors, developers and contractors (Keeping, 2000). A modified version of this diagram is presented in figure 4, where the valuation profession is located in middle of this circle and conveys varying levels of information to four stakeholder groups, namely tenants, investors, developers and contractors. Note: this is a conceptual diagram only and the circumstances would vary substantially depending on the various stakeholders and the individual subject building. However it should be acknowledged that all four stakeholder groups are generally profit-seeking and can benefit from valuation advice. This interpretation would relate to the incorporation of sustainability into the building, and the effect on the overall capital value and/or the operating cost.

Figure 4. Circle of Blame

![Figure 4. Circle of Blame](Source: Modified from Myers et al., 2007)

There is an immediate requirement for the valuation industry to become conversant and aware of the relevance of sustainability in the built environment and factor it into the valuation considerations. A parallel can be drawn here with the past need for valuers to become fluent with the negative impact of asbestos when it rapidly emerged - any ignorance about understanding the effect of asbestos on value was clearly inexcusable. Sustainability is certainly progressing rapidly and reaching a higher profile. While the amount of material in the valuation industry has increasingly been incorporating sustainability issues such as in the Australian Property
Journal (published by the API), it is important for valuers to gain exposure to wider sustainability issues. For example, many seminars are presented by local government and environmental organisations concerning energy use in buildings – this is also an opportunity to increase knowledge about technological advances in sustainability and green buildings. On many occasions a newly constructed (or refurbished) building developer (or owner) will encourage stakeholders in the property market to attend a release of such a building. Valuers should accept this opportunity to become familiar with the building’s characteristics, as well as discussing the catalyst for adopting a relatively high level of sustainability.

**Difference between market value and construction cost**

Most commercial buildings are developed and sold with the aid of a financier who is funding the majority of the transaction. In order to accurately measure the financier’s exposure to risk, a property valuer is usually engaged to assess the market value of the property and therefore the level of financier’s risk. Referring to figure 5, the financier will rely heavily on the market value range identified by the valuer (a), primarily because the valuer has assumed the risk (and therefore can then usually be sued if the building is not sold for this amount). Generally the financier will take relatively little notice of the actual construction cost (c), and will only advance funds based on the current market value (a). The difference between the two amounts (b) will be ignored by the financier but must be funded by other sources e.g. equity or private funds. For example, if the actual construction cost of a sustainable building was equal to (c), this exceeds the current market value (a) substantially. In other words, the valuer has the final say on the business case for a sustainable building and determines the market’s perception of when (a) (current market value) equals (c) the (actual cost of a sustainable building). Unless the valuer (who is reflecting current market value) considers that sustainability is reflected in current market value (a), the construction or sale of the sustainable office building will not proceed in its current form.

**Figure 5. Market value versus Construction Cost**

![Figure 5. Market value versus Construction Cost](image-url)
Conclusions

Green buildings incorporate a number of features, energy conservation, water economy, materials selection and recycling amongst other things. Energy use within buildings is responsible for large amounts of CO₂ emissions in Australia. 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. Micro generation using wind turbines and the use of innovative design and technologies such as passive solar design through effective building orientation and material selection can reduce the amount of power required to heat and cool buildings. The need for water economy is becoming increasingly important. Valuers must become conversant with this new technology and factor the effect (or added value, if any) into their valuation calculations.

Commonwealth and state governments are beginning to tackle issues related to water and energy consumption; albeit slowly through the BCA and National Water Initiative for example. While energy and water consumption may decline, reliance on legislative tools is insufficient to make the greenhouse reductions required to mitigate climate change. Wider society has embraced climate change as a significant and immediate problem. Consequently we are reliant on the market adopting green building measures and there is evidence that some sectors are beginning to adopt green building features to offset obsolescence and have more efficient stock in their portfolios. An increasing number of case studies are available which demonstrate current best practice in green buildings. At this point in time most are offices or residential and it is imperative that examples of retail and industrial buildings are added. Whilst many stakeholders in the property market are factoring sustainability into their decisions, valuers must interpret the effect this has on value over both the short and long term, which in turn is affected by factors such as depreciation and obsolescence. It appears certain that green buildings are here for the long term and the valuation industry must be at the forefront of this change.
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