Energy Efficiency and Property Values: a Discussion Paper

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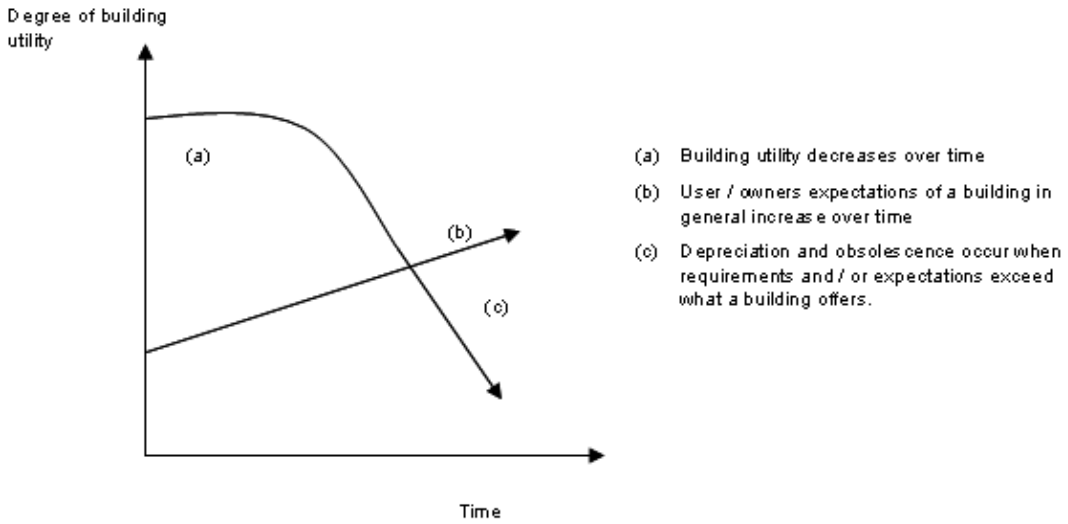
The effects of climate change and global warming receives considerable attention in society with continual reminders about the importance of energy efficiency. Whilst the focus is often placed on smaller items such as plastic bags, air-conditioners and motor vehicles, the emphasis has shifted to structures in the built environment. Retail shopping centres and office buildings have been identified as contributing substantially to global warming during their lifecycle with a substantial input to greenhouse gas emissions. In response, building design and construction techniques have evolved over time to improve energy efficiency and reduce greenhouse gas emissions. Whilst property valuers, managers and analysts must remain up-to-date regarding changes, relatively little research has been conducted into how increased energy efficiency levels affect a property's highest and best use, value and lifecycle.

This paper examines the understanding about energy efficiency in the marketplace, especially in relation to property values with the emphasis placed on a cost-benefit analysis from both an owner's and tenant's perspective. Whilst it may be argued that incorporating energy efficiency into a new office building is cost prohibitive on a financial cost-benefit basis, often minor steps can be taken to upgrade the energy efficiency of an existing building. This paper highlights the links between energy efficiency and property value over the short-term and long-term. The intent is to encourage (forward looking) discussion in these areas.

Introduction

There has been increased interest in sustainability and the built environment which has followed directly on from the higher focus on climate change and global warming in broader society (see Wilkinson et al. 2008). This trend can be observed in property-related discussions and also at conferences; for example the increasing quantity of papers at IRES conferences in recent years including the theme of this PRRES 2010 conference. However the concept of sustainability has evolved over time and still means different things to different people – to some it is a contestable concept. For example there are many types of sustainability and different 'shades of green' – at times it can appear that some have gained an interest, without a deeper conceptual understanding, in sustainability due to its higher profile and general interest factor. Property professionals have been discussing how to incorporate sustainability into property markets and the relationship with building design, construction and in-use, however this presents challenges for different land uses and locations. For example a retail shopping centre has a substantial amount of common area which must be maintained at a high level of quality (e.g. air-conditioning, large open spaces) which places enormous challenges on the demand for sustainability. Furthermore a bulky goods warehouse (e.g. 'Harbourtown' on the Gold Coast) has the challenge of heating and cooling substantial volumes of area to meet increasing customer satisfaction levels (figure 1). On a positive note there is evidence that building design and construction techniques are evolving over time to improve energy efficiency and partly reduce greenhouse gas emissions. However, evidence in the commercial property market suggests a strong focus towards cost minimisation in the guise of sustainability, indicating the perception of sustainability is at presently best practice management, rather than the more holistic understanding of sustainability (Warren-Myers 2010).

Figure 1. Relationship between Building Utility and User/Owner Expectations



(Source: Wilkinson et al. 2008)

Whilst the term 'sustainable' is commonly perceived as relative to operating expenses and certification labels within buildings, there is a wider role that sustainability plays in delivering social goals (Myers et al. 2008). The debate about sustainable obsolescence must be conducted in light of the changing nature of the property market in wider society and increasing important issues such as corporate social responsibility, the higher profile of the

environment and the increased importance of sustainability from view of stakeholders including the government and younger generations (Reed et al. 2008). Although stakeholders in the market place (e.g. property valuers, managers and analysts) must remain up-to-date regarding changes about sustainability such as mandatory disclosure, surprisingly there has been little attention placed on future change; for example how increased energy efficiency levels affect a property's changing highest and best use, changing value and changing lifecycle.

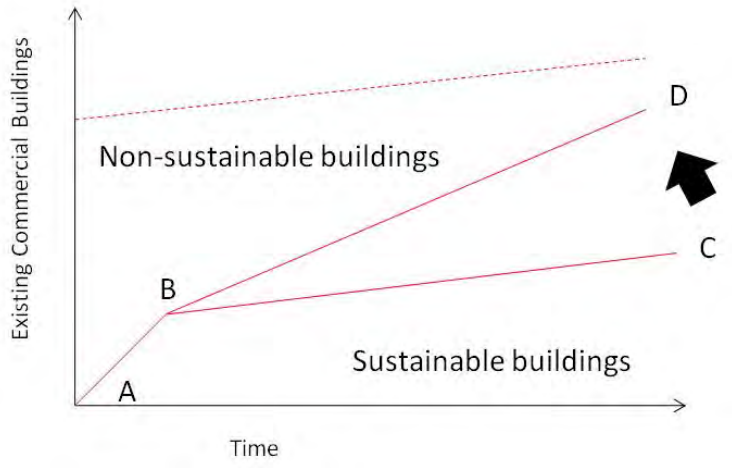
This is a discussion paper about energy efficiency and property values with the attention placed on the business case for sustainability, more so where sustainability in the built environment is moving to. Arguably the general property market's knowledge about sustainability is of limited relevance unless some action to embrace a level of sustainability is undertaken i.e. *so what?* Regardless of how important it is to embrace sustainability in the built environment and how many stakeholders are in agreement, commercial property is primarily viewed as an investment vehicle (API 2007) and it is essential that a viable business case is presented and accepted. This has implications for the value drivers with regards to sustainability including the final value of the building. Unless the tenants appreciate the additional benefits of sustainability then the investors won't spend the additional expenditure on sustainability, which in turn means that the full implementation of sustainability will not be undertaken. A study by Warren-Myers (2010) concluded investors are devaluing non-sustainable properties as a result of perceived increasing risks and obsolescence. Although traditional theory suggests sustainability adds value, this research has found investors' concerns regarding the level of sustainability in their property portfolio and possible acquisitions. The issues identified by investors relate to lack of competitiveness of assets in the market, regulatory and legislative risks and increasing obsolescence in property not demonstrating a level of sustainability.

Sustainability and the built environment

The task of implementing a higher level of sustainability into the built environment has now approached mainstream buildings with completion of the first phase of sustainable building recognition. On one level these buildings are a limited number of initial 'flagship' sustainable buildings. Within the last five years there has been a small quantity of test-case sustainable buildings, both new-build and adaptive reuse conversions, which have developed primarily by government bodies (e.g. CH2 building in Melbourne developed by the Melbourne City Council, 40 Albert Road in Melbourne developed by Peter Szental from Szencorp). Such buildings have achieved a relatively high profile in the property field due to their 'cutting edge' sustainable technology where these buildings were in the minority. However if sustainability is going to be fully implemented then it is essential that sustainable buildings are viewed as standard with non-sustainable buildings being below standard. Arguably sustainability has moved towards the benchmark rather than the exception. This relationship is shown in figure 2 where most buildings were initially considered to be 'non-sustainable' at A with an initial uptake until B i.e. the first phase of landmark sustainable buildings, both new build and adaptive reuse. At this point there are two broad options depending on the drivers behind the business case for sustainable buildings. If the low series is undertaken (C) then the take-up of sustainability will be too low (i.e. too few buildings) to reach targets, where the challenge is to increase the uptake to the high series (D) via the business case argument. The two tiered market highlights the upside and downside risk associated with energy efficient/sustainable buildings and property values. From a valuation perspective it was demonstrated that the effect of sustainability in valuation methodology, or lack of sustainability, equated to devaluing of assets (Sayce et al. 2005). There may be a

larger risk and opportunity cost if a building does not incorporate sustainability at all; the downside risk associated with no action may be larger than the upside risk of adopting sustainability and associated cost.

Figure 2. Sustainability in a Two Tiered Market



Some of the challenges facing the uptake of sustainability in the built environment can be summarised as follows:

- Low churn or turnover rates;
- Different characteristics of the stock;
- Financial drivers are usually behind decisions about the building;
- Poor knowledge about sustainability and what it entails; and
- Limited data availability with little evidence.

The national benefits of sustainable buildings include:

- Meet energy targets (national and global);
- More efficient buildings equate to low energy use;
- Staff are happier – lower staff turnover;
- Lower demolition/land fill; and
- Retaining heritage while demonstrating value drivers.

New buildings and existing buildings

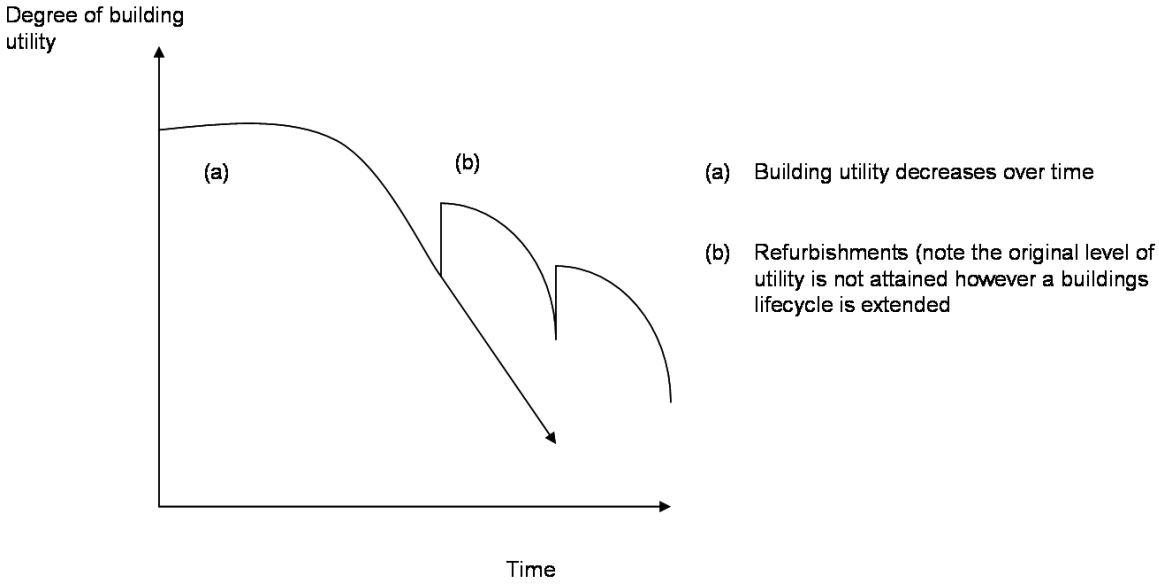
It is the case that the sustainability agenda has largely focused attention on new buildings as opposed to existing stock. However it is the existing stock that requires upgrading to reduce its total environmental impact over the whole building lifecycle and this is a conclusion many are reaching (AECOM 2008). Significant economic expenditure is directed towards adaptation and it is estimated that around half of all UK expenditure in construction is on existing stock (Ball 2002). Thus the opportunities for energy efficient upgrades are substantial. A further consideration is that a large amount of national wealth is tied up in the built environment, in Australia, 44% of the nations net worth is embodied in buildings (ABS 2006). Between 1991 and 2001 there was 17.84% of all construction work undertaken on existing buildings. Globally there are trends towards increasing the reuse of existing stock (Douglas 2006). Clearly the age and quality of the stock impacts on the amount and scope of adaptation which takes place and older stock tends to undergo more adaptation because it more likely to be affected by obsolescence to some extent. 90% of Australian commercial

stock is over 10 years old and a mere 2% or so is added to the stock each year (Knott. 2007; Davis-Langdon 2008) which highlights the potential for energy efficient adaptation.

One study concluded there was a need to adapt existing Australian office buildings to meet the December 2007 Bali Road Map Agreement , which required cuts of 40% in greenhouse gas (GHG) emissions by 2020 to mitigate climate change (Davis-Langdon 2008). The report noted that existing Melbourne office buildings need retrofitting to an Australian Building Greenhouse Rating (ABGR) of 4.5 to deliver the Bali Road Map 40% reductions in GHG emissions. Furthermore emissions trading alone would not deliver sufficient reductions and that capital injection or incentives are required to induce building owners to undertake energy efficient adaptations (Davis-Langdon 2008). It was estimated that $4 billion over 12 years would be required in incentives to achieve the reductions needed in commercial office buildings (Davis Langdon 2008). The economic and environmental benefits for owners of existing buildings are lower energy costs, reduced impact of future emissions trading schemes, reduced emissions, reduced obsolescence, good risk management strategies, more competitive buildings, improved capital value and increased rental growth. Social benefits of adapting buildings lie in the improvements to indoor environment quality (IEQ) which are associated with higher user building satisfaction leading to higher productivity, lower absenteeism and lower staff turnover (Clements-Croome 2006).

Furthermore the research concluded that investment in energy efficiency of existing buildings has the potential to reduce greenhouse gas emissions by 30-35% within 20 years; faster than alternative approaches (Davis Langdon 2008). Australia is committed by the federal government to reduce emissions between 25-40% by 2020 (Department of Environment, Climate Change and Water, 2010a). It is estimated that there are 130 million square metres of existing buildings in Australia, of which offices comprise 20.5 million square metres of space and emit 6.6 million tonnes of greenhouse gas per annum (AECOM 2008.). Clearly there is potential to have a significant effect on emissions reductions through energy efficient building adaptation for offices (Boyd & Jankovic 1993; Kincaid 2002; Davis Langdon 2008; Ball 2002; Bullen 2007; DEH 2005). This argument is further supported given that the average age of Australian offices is 27 yrs and in Melbourne 31 years, adaptation of existing buildings is imperative (Jones Lang LaSalle 2008). This is further emphasised when it is appreciated that it would take 290 years to regain the embodied energy in new building through its more efficient performance (Davis Langdon 2008) the argument to adapt existing office stock gains more momentum (figure 3). A review of research into the different office building grades and energy performance showed that existing B, C and D grade offices in Melbourne reveals an environmental rating using the Australian Building Greenhouse (ABGR) tool of 2 stars or less which represents very poor performance (Davis Langdon 2008). The conclusions were there is an urgent need to act quickly if greenhouse gas emissions cuts are to be achieved within the City of Melbourne timeframe of carbon neutrality by 2020. Therefore energy performance and the potential for improvement are key environmental adaptation criteria (Davis Langdon 2008). As a testament to the mounting evidence for energy efficient adaptation of existing buildings the City of Melbourne has launched the 1200 buildings program, with the aim of adapting 1200 buildings prior to 2020 as part of the strategy to deliver a carbon neutral city (AECOM 2008; Arup 2008).

Figure 3. Building Utility over Time



(Source: Wilkinson et al. 2008)

Within the retail sector, property varies in size and age from large new department stores and big box retail with large floor to ceiling heights to small strip shops converted from previous use as residential buildings. Consequently the selection of energy saving measures is determined by the building to some extent. However where the retail sector is concerned the greatest energy saving opportunities are considered to be:

- Installation of Building Management Systems (BMS) which control lighting and ventilation systems by computer;
- Installation of energy efficiency T8 and T5 lighting which produces higher lux levels with less energy;
- Installation of devices to save energy such as passive infrared sensors, timers and energy save units;
- Installation of energy efficient devices to air conditioning systems such as variable speed drivers (VSD) which can reduce consumption by 27% through a 10% reduction in motor speed;
- Installation of high efficiency motors typically has a pay back of 2 – 5 years yielding around 2 to 8 per cent in energy savings;
- Shutting down electronic displays which are often left on over night ;
- HVAC rationalisation and effective maintenance can lead to savings between 20 to 70 per cent; and
- Adoption of a planned maintenance program can achieve savings of 20% in boilers operating costs and reduce running costs by 10 – 25%.

To-date the larger retail operations are more likely to implement such initiatives; for example in Australia the retailer Big W has implemented energy saving measures in a number of stores in NSW where savings of 24% were achieved in lighting energy consumption alone. BMS have been a popular measure for retailers such as Target, Coles, David Jones and Bi-Lo

where 20% savings in operational energy use is recorded. With retail sales in decline globally, energy saving measures will contribute positively to company liquidity. Hotel properties range in quality from the top of the range luxury hotels which feature high rise construction, high levels of services including air conditioning and fast lifts to the budget backpacker hostels with low levels of building services typically in low rise buildings. Most energy is used in heating and cooling, lighting, followed by water heating. Energy savings are possible and quick fixes (which is actually good housekeeping) have been identified as follows:

- Hallway lighting – where some natural day-lighting is provided dim light by 30% during daytime hours;
- Peripheral and backrooms – ensure HVAC settings are at minimum levels during hours of low usage;
- Kitchen equipment and laundries are high consumption areas, staggering start-up times for meal preparation reduces peak demand charges for energy;
- Laundry – set hot water temperature to 120 degrees Fahrenheit;
- Pools and hot tubs should be covered after hours to reduce heat loss;
- Installation of water saving shower roses leads to less hot water energy use;
- Housekeeping – ensure lights are turned off, reduce room temperatures after cleaning, close curtains to reduce heat loss in winter and heat gain in summer; and
- Fill north facing rooms first which require less energy.

Longer term measures include:

- Recommissioning plant enables a tune up to be undertaken and reduction in usage of 10 to 15% are possible;
- Upgrade to more efficient lighting and reductions of 35% are possible;
- Installation of occupancy sensors in rooms and hallways reduce energy use in HVAC and lighting;
- Upgrading chillers can improve consumption levels – new equipment being 25 to 50% more efficient than equipment that is 10 years old or more;
- Use efficient water heating systems;
- Use cold water in laundries;
- Install heat recovery systems which can recover 60% of water heat energy;
- Control vending machines – continuous operation of machines leads to high consumption;
- Make the most of the BMS to ensure optimum savings; and
- Adoption of a planned maintenance program and auditing of energy usage annually.

In a typical restaurant approximately 80% of energy use is derived from cooking, refrigeration, cooling and lighting and these areas are the best targets for savings. Operation and management of the building is the key to energy efficiency and in the short term quick fix measures include turning things off and or turning thing down. Too often the lights, fans and other equipment is left running when not in use; the use of occupancy sensors in walk in coolers and storage areas can help. The use of checklists can help staff to ensure energy savings policies are adhered to. In terms of regular maintenance checks, ensuring refrigerator and freezer doors are well sealed and properly aligned avoids leaking energy. The biggest savings are made when HVAC equipment is regularly maintained, regular inspection avoid costly repairs accruing unnoticed over time (CEA 2006). Maintenance related energy savings can be summarised as:

- Keep lights clean;

- Inspect refrigerator and freezer doors;
- Check HVAC;
- Check air conditioning temperatures;
- Change filters;
- Clean condenser coils; and
- Check for air flow to air registers for adequate flow.

On a long-term basis approximately 10-15% of energy bills can be saved by ensuring building services are tuned up and properly commissioned. For a typical 14,000 m² restaurant the savings can equate to over AU$13,000. Areas for energy savings include the kitchen area where measures should be targeted at energy guzzling equipment such as cooking equipment, coolers and dishwashers. Installation of smart vent hoods to cooking equipment (with a payback of 1 to 2 years) and evaporator fan controllers in coolers are good steps to take. Switching to compact fluorescent lamps (CFL) and T8 lamps will reduce lighting energy consumption by up to 35% (CEA 2006). This section has identified the energy consumption patterns and potential efficiency measures associated with retail, hotel and restaurant land uses.

Stakeholder perspectives

Much of the focus in property and real estate markets is consistently placed on normative research to inform stakeholders of the benefits of sustainability - financially, socially and environmentally. This has to some extent encouraged stakeholders to embrace sustainability by generating a theory of how sustainability should affect value. This has intrigued market innovators to adopt sustainability based on their interpretation and rationalisation of the risks and benefits (Warren-Myers 2010). Stakeholders including occupiers, owners, investors, developers, construction, valuers and government among others all have a fundamental role in the evolution of the property market and the adoption of sustainability. The rapid evolution of sustainability in commercial property has been accompanied by a plethora of research advocating the benefits of sustainability to stakeholders (Warren-Myers 2010). Stakeholders, namely investors (owners) and occupiers, have often been encouraged to buy into sustainability primarily based on the value they would attain either through investment or occupation. There have been other incentives in terms of social and environmental benefits, however, in the world of business and profits, these factors have not been as powerful as the economic argument. Normative research has attempted to convince the industry of the benefits of sustainability using a variety of techniques, from cost-benefit analysis, net present value calculations, and even different valuation techniques. However, this is still limited by the lack of empirical evidence to justify normative statements and theories regarding the financial relationship between sustainability and property. The removal of normative studies and anecdotal evidence from the field of research significantly reduces the amount of research connecting sustainability and value (Sayce and Sundberg 2009).

To develop the argument for sustainability and its justification of normative theories on the value of sustainability, research from both academic and industry have investigated perceptions and willingness-to-pay of investors and occupiers, and other stakeholders who play key roles in the property market (noted in the circle of blame – see Cadman 2000). However, the diverse findings in perception studies indicate prevalent uncertainty in the industry, in addition to the issue of saying is one thing but doing is another. The majority of this research has published positive perspectives for investors and occupiers, some rationalising the position of the stakeholders and other actually surveying participants for

their opinions of the subject, for example, Goodman (1994), Lockwood and Deloitte (2008), and Mays (2003). Longitudinal studies on property stakeholders perceptions in the UK over 10 years, found ambitious positive perceptions and responses from respondents. However, there was little indication these stakeholders were seeing any impact on the rents or values in the property market (Parnell and Sayce 2007). Myers (2008) found investors generally were interested in sustainability, stating it has an important role in the property market and for long term property investment. However, the level of action taken by investors in terms of implementing sustainability was limited to increasing efficiency of operating costs (Warren-Myers 2010). Studies conducted over longer periods of time examining stakeholders anticipation found observations of sustainability's impact on the market moved further and further out (Parnell and Sayce 2007) and is mirrored in other studies; see for example investors/owners surveys conducted by Jones Lang LaSalle from 2006 - 2008 (2008). *This begs the question, with the anticipation of the impacts of sustainability on a market, why are these impacts not being realised?* This is also reflected in occupier surveys in the commercial property market, where strong occupier sentiments that sustainability is a prevalent issue now, and increasing levels of occupiers' willingness-to-pay over the period between 2005 to 2007 (Jones Lang LaSalle 2007). However, recent survey results indicate a reduction in occupiers' willingness-to-pay, as a result of the global financial crisis (Jones Lang LaSalle 2008). The conversion of willingness-to-pay has not been evident within the market which has tactical implications for investors as the cash flows are yet to be derived and uncertainty remains with the underlying rationale of rents and prices remaining unanswered (Pfrang and Wittig 2008). There is a significant disconnect between willingness-to-pay and actually paying for sustainability from both investors and occupiers. Stakeholders, occupiers or investors, in the property market it seems are not willing to sacrifice profit for the environment (Merrill Lynch 2005). The elusive impact sustainability has on value continues and time does not seem to have provided the answers to the question (Parnell and Sayce 2007). This may have a relationship with the characterisation of stakeholders within the property market.

Energy efficiency and sustainability – defining the relationship

When discussing sustainability with reference to the built environment it appears the broad perception is placed on improving energy efficiency, limited mainly to the operating expenses linked to HVAC and/or electricity for lighting. This is a relatively narrow use of the term 'energy efficiency' which should include three (3) main types of energy directly related to aspects of the building:

(a) Operating energy. This relates to 'in use' energy consumed in the course of operating the building. From a lease perspective it may be recoverable or non-recoverable, however the usage of operating energy depends on factors such as the design of the building (e.g. more natural light equates to less artificial light required), operation of the building including facilities management and also the occupants' knowledge about how to efficiently use energy to operate the building. Operating energy is often viewed as a direct cost and is easily measured.

(b) Embodied energy. Although increasingly being included in discussions about energy efficiency, embodied energy relates to the captured energy (e.g. concrete, steel) which was part of the original building when it was constructed and possibly also later refurbished. The amount of embodied energy is not readily easy to quantify but nevertheless is measureable.

(c) Transport energy. Referring to the location of the building and where the occupants must travel to and from, transport energy is not readily included in most discussions

about operating energy. This is an indirect cost which is often difficult to quantify, however it forms and important component in an analysis of energy efficiency and sustainability.

For a building to be truly sustainable it is important to somewhat address all three types of sustainability. It appears too much emphasis is placed on energy efficiency relating to operating expenses with little consideration given to the other two at present. For example there are new cutting edge sustainable buildings in Dubai although seemingly little consideration given to transport energy (or building materials) and embodied energy.

Energy efficiency and property values – identifying the links

Arguably it has become increasingly evident that sustainability in the built environment is multi-faceted and the concept is constantly changing. Due to the relatively low emergence of sustainable buildings in the open market (i.e. not developed/owned by government or sustainability-related organisations) when considering the advances in sustainable technology and the desire for increased uptake by certain stakeholders (e.g. government), it can be postulated that the business case for sustainability in the built environment is not fully transparent. In other words, the links between energy efficiency (at all three levels) and property values has not yet been fully established. This may be due to the uncertainty by building investors about the long term 'value' benefits of sustainability which are over and above the operating costs, as well as the real 'value' of the intangible benefits to tenants. For example a tenant in a sustainable building will prosper from tangible benefits (e.g. lower operating costs) and also intangible benefits (e.g. lower staff absenteeism, higher employee productivity, higher staff retention) (Clements-Croome 2006). Collectively these tangible and intangible benefits for tenants will equate to higher demand for sustainable accommodation if the returns are higher than the outgoings. The challenge at hand is to accurately quantify the intangible benefits of sustainable accommodation and disaggregate each element. For example, *to what extent is employee productivity enhanced if the tenants are working in a sustainable building?* Furthermore, *what is the optimal cost-benefit analysis for a sustainable building i.e. what shade of green will a tenant consider to be the minimum sustainable level of accommodation?*

From a property value perspective the debate hinges largely on who is determining the value. For example, *is the marketplace itself or a valuer assessing the marketplace?* Also, *how do investors/developers determine what level of sustainability should be incorporated in a new or existing sustainable building?* There is evidence that some property investors assess sustainability levels in their property portfolios in order to identify assets deficient in required sustainability levels, based on portfolio or regulatory requirements (Warren-Myers 2010).

An investor's concept of value in a sustainable building is linked to the business case for sustainability where the value of the asset reflects future profit/risk (API 2007). Although investors did not demonstrate sophisticated modelling or theory (e.g. see Sayce et al. 2005), they focused on energy and other resource cost minimisation initiatives. Investors are very focused on sustainability as a result of potential risks and obsolescence in their property portfolios although valuers were not very adept at identifying this aspect and concern of investors (Warren-Myers 2010). In the same study valuers indicated regardless of sustainability that obsolescence had the least effect, out of a range of variables, on market value. However, the concept of obsolescence is important to the discussion of sustainability as obsolescence occurs when there is impairment to the desirability and usefulness of a property; this is brought about by technological changes or improvements in asset performance which makes properties not incorporating these evolutionary changes to become less desirable and valuable (Whipple 1995; API 2007). Investors are already motivated to

'future proof' assets to minimise obsolescence, however at present this is restricted to efficiencies attained through operational costs (Warren-Myers 2010). Sustainability is considered a technological change affecting commercial property; therefore the potential risks relating to demand, competition, and regulatory and legislatives issues may engender properties obsolete if action is not implemented to mitigate these issues.

Concluding comments and observations

The objective of this discussion paper was to raise current issues about sustainability in the built environment (especially office buildings) with the focus placed on energy efficiency and property values. It was written to encourage debate and 'discussion' about where sustainability is heading from a research and stakeholder perspective. There are lots of people 'talking the talk' about sustainability as it is now fashionable. Whilst there has been increased interest in sustainability and buildings as measured by conference papers and discussions, it is uncertain what is a contribution to knowledge and if the uptake of sustainability is actually taking place at the same pace as the level of interest in broader society and with other energy users e.g. uptake in sustainable motor vehicles. It has been discussed here that sustainability means different things to different people, where one shade of dark green is another's shade of light green. It is becoming evident that the word 'sustainability' may be too broad to encompass what it used to mean – *for example it could be argued that every building is sustainable in one form or another?* At the same time, the concept of sustainability has quickly become mainstream and is increasingly less perceived as different, much in the same way that other changes in buildings (e.g. elevators, reduced columns) have become mainstream. Identifying a building without a lift now is quite difficult; it would also be an unviable obsolete building. Perhaps the word 'sustainability' needs to be divided into different shades of green which may reflect future proofing. This paper has raised issues surrounding sustainability in the broader built environment, new buildings versus existing buildings, stakeholder perspectives and the links between energy efficiency and property values. The authors have drawn on their research experience in the area of sustainability and the built environment; for example one author produced a Masters thesis on 'green buildings' when the term was relatively new although now argues it is possibly dated and overused.

Where to from here? If research is to truly be at the 'cutting edge' of investigating the links between energy efficiency and property values there needs to be some agreed facts. The starting point is to accurately define what energy efficiency/sustainability is (note: it means different things to different people) and what property values are (i.e. once again, this varies in perception). Moving forward there needs to be more data availability and sharing of information between all stakeholders. Few disciplines have such low (poor?) transparency of data between all stakeholders although these structural barriers are hard to change. But due to the imminent push to increase the uptake of sustainability in the built environment, can we afford to wait until sustainability measures that work are identified. *Why not pool our resources and everyone benefits from a sustainable built environment?* The challenge now is to increase our discourse and discussion about sustainability and the built environment and really challenge our thinking. For example many property professionals are criticised for being backward looking – what will a sustainable building look like in 20 years (also is 20 years the appropriate shelf life for a building?). Should buildings be constructed out of adaptable materials so they can adjust to changing circumstances e.g. Lego. Let's think outside the square.

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