PROPERTY VALUATION AND ANALYSIS APPLIED TO ENVIRONMENTALLY SUSTAINABLE DEVELOPMENT

Jon Robinson
Professor of Property and Construction
The University of Melbourne

INTRODUCTION

The principle of environmental sustainability "implies using natural resources in a way which does not eliminate or degrade them or otherwise decrease their usefulness to future generations, and implies using non-renewable natural resources at a rate slow enough as to ensure a high probability of an orderly societal transition to new alternatives" (Pearce *et al,* 1989, p176). The World Bank has used the phrase "development that lasts" in this context (World Bank, 1992, p34).

The process of sustainable built asset management is continuous throughout the life cycle of the property. The life cycle comprises "consecutive and interlinked stages of a product system, from raw material acquisition or generation of natural resources to the final disposal" (Standards Australia, 1998). In the context of property and construction, it is a time horizon which commences with the acquisition of land, includes the design and construction of buildings, and continues with the ongoing operation of the property and ceases with the ultimate demolition or deconstruction and recycling of the property.

In Australia, buildings are responsible for 30% of all raw materials used by society and they consume more than 40% of all energy produced causing more than 40% of all air emissions (AGO 1999). Development will not be sustainable if the economic constraints under which the property development process operates are not considered. There is a common perception that there is no demand or support for sustainable development. However, the impact of buildings on the environment requires that the property and construction industry contributes to the ESD culture.

The relationship between benefits and costs is commonly assumed to be a major obstacle to the uptake of sustainable development. The property and construction industry and its clients tend to focus on short-term gains rather than long-term savings or investment opportunities. Perceived higher initial construction costs and maintenance costs are major obstacles, as they reduce profitability. The anticipated additional cost of ESD features is a reason for the perceived indifference of clients to environmental issues.

In Australia, concern for initial costs is reinforced by the involvement of a number of actors in different phases of building delivery, from development, ownership to occupation of structure. Energy efficiency, for example, is not considered a high priority for potential tenants and the emphasis industry puts on initial costs versus life cycle costs militates against ESD considerations.

Inappropriate financing models or lack of access to capital discourages investment in sustainable buildings. There is also no incentive to act, when often the investor is not the ultimate user who is responsible for energy bills. In addition, energy, like other business related expenses, is tax deductible and the plant and equipment that uses

energy is can be depreciated against taxable income. Lenders of capital neglect environmental costs in their assessment frameworks.
The property market continues to be unsure about the benefits of environmentally sustainable development (ESD) and accordingly ESD is not usually reflected in the property valuation and analysis process. Using the concepts of price and worth, an outline valuation process is developed to assist the valuer to take ESD into account through rent, capital growth and psychic income. Research has shown that lessees are prepared to pay 5% to 10% higher rent for improved comfort and control of the environment (Maguire & Robinson, 2000). Analysis of market evidence has shown that a psychic element of income can increase prices paid for properties by reducing the initial yield (Baum & Crosby, 1995). Taking all of these elements of return together, a property exhibiting the highest environmental design and management principles can achieve a substantially improved property investment worth. These remain to be reflected in the general approach to estimates of market price.

It is common for investment valuations to be prepared in association with market valuations the former by DCF and the latter by capitalisation. It has been common to adjust the investment variables in the DCF so that both methodologies provide the same result. This tends to suggest that price and worth are identical (which would be so in a fully informed market in equilibrium and is certainly so for a buyer in that market). But reference to any of the financial markets dispels this notion; transactions occur as a result of differing opinions about price and worth and this is of significant relevance to property.

Sales evidence may be analysed and its results used to value a comparable property in the normal way. But this reflects what the market has been paying for comparable properties; it does not necessarily reflect the normative solution, i.e., what it should have been paying.

First, the paper briefly reviews the findings of a sample of the empirical research in which the costs and benefits of ESD are detailed. Second, the residual analysis methodology adopted for the purposes of this paper is briefly described. Third, the data used in this paper are recorded including current market data. Fourth, the calculations are illustrated using the conventional residual model. Finally, some concluding comments are offered together with some suggestions for further research.

BACKGROUND

Conventional business case decision making tools can be used to evaluate ESD buildings, but they have generally not been used, or used inappropriately. ESD buildings by their nature must be considered over the entire life span of the development, not simply the design and construction stage. Therefore, a whole of life or life cycle cost approach to the evaluation of ESD buildings is appropriate. In simple terms, this is because increased investment in sustainability features of building design can be offset by reduced running costs and potential productivity gains during the occupation of the building. Concentration predominantly on increased capital costs of development for ESD buildings, and use of static business case analysis tools which support this view, leads to inappropriate or inadequate consideration of the total development.

The presumption that ESD buildings "cost more" needs to be considered further. The perception that sustainable design and construction inherently contains a substantial cost premium is considered one of the main barriers to ESD (Flynn, 2003). Due to the fact that the construction industry and its clients generally tend to concentrate on short-term gains rather than long-term savings or investment opportunities, this perception that ESD buildings require higher initial construction costs and maintenance costs, is a major obstacle as this reduces the profitability of the project. Indeed, six Californian property developers interviewed in 2001 estimated that green buildings cost 10 to 15% more than conventional buildings (Berman, 2001). In terms of capital development cost, there is a dearth of published information as regards the cost premium of ESD buildings. Information currently available tends to support the contention that ESD buildings require additional capital expenditure. Exactly how much extra depends upon the level of sustainability measures introduced, although there are some broad guidelines that can be deduced from the little information available.

The International Netherlands Group (ING) Bank in Amsterdam completed in 1987 is perhaps a pioneer in this field, with passive solar heating and ventilation, cogeneration and waste heat capture, day lit office space and interior cores, rainwater usage etc. The additional cost of these features is estimated at approximately 2% of the development cost (Rocky Mountains Institute, 2004) The more recently completed 60L building in Melbourne, touted as "the premier green building in Australia" (The Green Building Partnership, 2004), is believed to have carried a capital cost premium in the order of 5%. An analysis of 33 projects certified as "green" by the United States Green Building Council (USGBC) found on average the capital cost premium is about 2%, although this premium varied from 0.66% level 1 certified buildings, up to 6.5% for level 4 (highest) certified buildings (Capital E, 2003) . A further study conducted in the United States by Davis Langdon compared the cost of 45 USGBC certified green buildings with 93 conventional buildings. This study found that that there was no significant difference in the construction costs between the two categories of buildings (Davis Langdon, 2004). This is not to say that ESD buildings will not cost more. The Colorado Court energy and resource efficient affordable housing project in California, estimated that the projects special energy measures cost in the order of 12% of the total construction cost (Global Green USA, 2004). The proposed Council House 2 building in Melbourne includes $11.3million of ESD features in a total building cost of $51.045 million, a premium of around 20% (Melbourne City Council, 2005).

Yet there is a large body of evidence which suggests that ESD buildings, whilst having an initial capital investment surcharge, will repay this investment many time over in terms of lower energy and operational costs. The ING bank cost premium payback period was just three months and the annual savings of US $2.9M continue. The building uses a tenth of the energy of it predecessor, and a fifth of that of a conventional new office building in Amsterdam. (Rocky Mountains Institute, 2004) The Four Times Square development in New York was completed in 2000 and considered *"the first skyscraper to embrace standards of energy efficiency, indoor air quality, and sustainable materials use.."* is expected to have operational costs of 10-15% lower than a comparable project. The energy efficiency measures are estimated to have a payback period of three years (US Department of Energy, 2004). A report to California's sustainable Building Task Force, touted as "the most definitive cost benefit analysis of green building ever conducted" concluded that that minimal increase of capital investment of approximately 2% to support green technologies in buildings would, on average over a 20 year period, result in life cycle savings of 20% of total construction costs. Of these savings, approximately 30% (6% of total saving) emanated from reduced energy and resource usage, and 70% (14%) from increased production productivity and health values (Capital E, 2003).

The issue of productivity and ESD buildings is an interesting one. Whilst the original thrust of ESD buildings focused predominantly around greenhouse gas emission reduction and associated energy cost savings, more recently the relationship between the internal building environment and production productivity has commanded attention. Clearly there are difficulties in relation to measuring the value of productivity as a function of building environment, due to the complexity of the many factors which contribute to the way human beings function. Whilst energy efficiencies can be measured fairly precisely, productivity of building inhabitants tends to be less certain (Capital E, 2003). Nevertheless, there is a strong band of case-study evidence to suggest that improved building environments support increased productivity.

The renovation of the Reno Post Office in Nevada, undertaken with objective of reducing energy costs, also heralded a 6% increase in worker productivity (Smith, 1999). The Pennsylvania Power and Light Company incorporated task lighting for their drafting staff. The effect was to reduce energy bills by 73% which in itself produced a return on investment of 24%. But quicker drawing production times, coupled with increased quality and accuracy of work, reduced sick leave and improved worker morale, combined to produce a return on investment of over 1000%. (Smith 1999). After PNC Realty Services operated from a new "green" certified building in Pittsburgh, one of the Directors described the benefit of the new facility in terms of productivity and staff – *"people want to work here, even to the point of seeking employment just to work in our building. Absenteeism has decreased, productivity has increased, recruitment is better and turnover less".* (Green Building Alliance, 2002). Closer to home, the new administration building for Melbourne City Council is expected to save $1.12 million pa (approximately $120 per m^2 pa) as a result of an increase in staff effectiveness estimated at 4.9% (Melbourne City Council, 2005). These benefits are considerable. Unpublished research conducted by Advanced Environmental Concepts found that the cost of sick leave remuneration in Australia in 2000 (excluding cost of replacement staff, disruption of production etc) was estimated to be $1550 per employee, whilst the cost of replacing employees, or staff churn, is estimated to be anywhere from 29 to 130 percent on an employee's annual salary.

But these benefits do not necessarily end with increased productivity and a happier workforce. The ING Bank credits its rise from No.4 to No.2 bank in the Netherlands with the new image the building has presented to the public. (Rocky Mountains Institute, 2004) thereby giving rise to an opportunity to include psychic income. This gives rise to the concept of psychic income mentioned above. This is an element of return brought about by the benefits of owning and operating a socially desirable asset. This is similar to the benefit of owning a "trophy" property, a sentiment that is recognised by the market usually by the medium of a firmer capitalisation rate. It follows that the benefits of ESD should be recognized by the market and reflected in appraisal methodologies as the ESD culture becomes more widely adopted.

So the issue of productivity and performance in ESD buildings can include many dimensions including reduced staff absenteeism and turnover, increased production output and quality through employee comfort and enthusiasm, to improved organizational branding and public perception. Whilst these clearly have a financial benefit which, although perhaps difficult to measure precisely, is nevertheless very significant, it is becoming clearer that these benefits represent a watershed for ESD buildings. Suddenly a building becomes an organizational benefit, and the people within them are considered to matter, rather than simply a way of housing an organization (Heerwagen, 2004). ESD buildings are no longer just about reduced emissions or increased productivity, but the people who live and work within them are identified and acknowledged as a fundamental and worthy resource in their own right. And this has another financial benefit – reduced risk to occupiers of the building due to the adverse affects of poor indoor air quality. Clearly this has beneficial implications for the insurance of occupants within ESD buildings and the designers of such buildings. In one notable example, designers of ESD buildings who undertook appropriate training were offered a 10% insurance premium rebate as a reflection of the relationship between design and physical ailments, predominantly due to poor indoor air quality (Mills, 2001).

And thus ESD buildings take on a social dimension, in addition to the financial and environmental perspectives. Such an approach is in line with current trends toward "triple bottom line" reporting procedures. Indeed, such a model serves as apt business case decision making model, and a project deemed feasible under such criteria would no doubt embody the ethos of environmentally sustainable development.

METHODOLOGY

Residual analysis

Residual valuation is adopted to illustrate the effect of considering ESD components of return to establish their worth. Owner-occupiers should see immediate benefits provided by this methodology in promoting their accommodation requirements to shareholders and the community. It is obviously less apparent to investors for the reasons outlined above and market recognition is required in these circumstances. Residual analysis is dependent upon a rearrangement of the developer's equation. The developer's equation may be more fully stated as follows:

Value = (Gross Income – Outgoings) / Capitalisation Rate

Costs = Land + Building + Finance + Marketing + Profit

The developer's equation is often rearranged in order to calculate land value. This is known as residual analysis or residual valuation as the case may be. It ties in with the concept that the return to land, economic rent, is a surplus return. In practice, economic rent cannot be separated from the worth of the land in unimproved terms. Thus the residual value is found as follows:

$$L = V-(B+F+M+P).$$

A hypothetical study using residual analysis is used to compare a conventional office property with an ESD property (see below).

Value
Income occurs in many forms, the major classifications in the property context being:

- rental income e.g. rents for offices, retail space in shopping centres and industrial buildings
- sales income e.g. sales of residential lots or units (flats, apartments, detached homes), subdivided floors in office buildings or units on industrial estates.
- business income where the building is the business e.g. hotels in which income is derived from 'room-nights', food and beverage, dining and conference facilities and so on.

In the context of this paper, value may also be generated by increased productivity and the improved well-being of building occupants.

The establishment of net income for evaluation purposes is stressed. All costs of owning and operating buildings must be deducted to achieve net income and this should include allowances for repairs, preventive and corrective maintenance and programmed replacement of building components. Given that building occupants make accommodation decisions based on total accommodation costs (gross rentals), reduced outgoings should lead to increased net operating income.

Land
The price of land is very much a function of market supply and demand. The residual study also allows for land purchase expenses as well as legal fees for conveyancing and for other associated fees and charges. Land holding costs are also included such as State Land Tax and municipal and water rates.

Building
Feasibility studies are usually prepared in the first instance prior to any building documentation being prepared and it is at this stage that decisions are made about whether or not to pursue particular proposals. Accordingly building cost estimates must be "right" early on despite the lack of detail. All building costs must be allocated here including professional fees (usually around 8% to 12% of building cost).

Finance
Whether debt or equity, capital required for building development is all treated as a factor input accruing interest for the time that it is involved in the project. In the early stages of feasibility analysis, capital is considered in two tranches:

- Capital expended on the development from the outset, e.g., land costs and expenses. Interest is charged on the amount for the full development period.
- Capital expended during the development process, e.g., progress payments for building. Here, interest is charged on the amount for half the development period (assuming constant expenditure). Thus the whole of the required capital is not set aside at the commencement of the development process.

Marketing
Sundry allowances, for either or both sales and leasing, often referred to as ripening costs, are also usually included in feasibility studies. Allowances for agents' commissions will be required (10% to 15% of the first years' rent for a leasing

commission and 1% to 2% of the sale price for a sale commission) in addition the costs of advertising and promotion.

An allowance may also be made under this heading for the letting up process. It is rare that a building is fully precommitted so that the full rental is paid from the date of completion. Usually an allowance is made for vacancies or the business starting up process. Any leasing inducement required could also be accounted for here.

Profit
The profit motive is of course the main driver to building project development. Profit constitutes the developers allowance for risk and return and it is treated as a development costs in residual analysis. Feasibility studies are often computed in order to establish potential profitability.

DATA

A comparative study of two hypothetical properties, one a conventional office building and the other having ESD features, is provided to illustrate the point of this paper. It is accepted in this paper that the ESD building provides an improved internal environment leading to the benefits reviewed above. The data used in the study are described below.

Value
Market rental; values for office buildings are currently around \$300 per m^2 gross effective after allowing for lease incentives. Property economists currently predict a substantial rise in rents (50% or more) over the next year or two (Australian Financial Review, 2005). This will be brought about by the removal of the lease incentives to achieve the levels of current face rentals. A gross rental value of \$400 per m^2 has been adopted for the conventional building in this study. A 5% rental premium is allocated for the ESD building to reflect the improved internal environment.

An allowance is also made for improved productivity. Referring to the CH2 building in Melbourne, salary savings of \$1.12 million pa are estimated and this amounts to \$120 per m^2. A saving of \$100 per m^2 is allowed for the hypothetical ESD building in this study.

The outgoings for the ESD building have been reduced from \$80 per m^2 to \$70 per m^2 in line with the findings discussed above.

The net operating income is capitalized at 8% for the conventional building. An indicative allowance for psychic income is made by firming the capitalisation rate to 7.75%. It is assumed that both buildings are fully precommitted.

Costs
The building costs are estimated at \$30 million for the conventional building and \$35 million for the ESD building to allow for the additional costs of ESD features as outlined above. The same development period is used for both buildings.

An interest rate of 8% is adopted for both buildings.

Developer's profit is included at 10% for the conventional building and 15% for the ESD building. This reflects an additional risk for the latter despite the improved returns listed above.

RESULTS
The residual studies are illustrated in table 1 (conventional building) and table 2 (ESD building).

Table 1: Conventional building

DEVELOPMENT RETURNS					
		Floor area	Rent/sqm	Net Rental	
Gross rental value			$400		
Staff saving			$0		
			$400		
Outgoings			$80		
Net rental value		10,000	$320	$3,200,000	
Net Income					$3,200,000
Capitalisation Rate					8.00%
					$40,000,000
Less sales commissions and costs			1.50%		$600,000
					$39,400,000
Less vacancies					
	prelet		100.00%		
	letting up period		0		
Rent lost					$0
					$39,400,000
Less letting commissions and costs			15.00%		$480,000
NET RETURNS					$38,920,000
DEVELOPMENT COSTS					
Developer's Allowance for Profit and Risk				10.00%	$3,538,182
					$35,381,818
Building costs				$30,000,000	
Consultants' Fees			0.00%	$0	
				$30,000,000	
Construction Finance					
	interest		8.00%		
	construction period		24		
				$2,400,000	
Total construction costs					$32,400,000
GROSS RESIDUAL LAND VALUE					$2,981,818
Less rates and taxes					$100,000
					$2,881,818
Less holding costs					
	interest		8.00%		
	preconstruction period		6		
					$480,303
					$2,401,515
Less land purchase expenses			6.00%		$135,935
NET RESIDUAL LAND VALUE					$2,265,580

Table 2: ESD building

		Floor area	Rent/sqm	Net Rental	
DEVELOPMENT RETURNS					
Gross rental value			$420		
Staff saving			$100		
			$520		
Outgoings			$70		
Net rental value		10,000	$450	$4,500,000	
Net Income					$4,500,000
Capitalisation Rate					7.75%
					$58,064,516
Less sales commissions and costs			1.50%		$870,968
					$57,193,548
Less vacancies					
	prelet		100.00%		
	letting up period		0		
Rent lost					$0
					$57,193,548
Less letting commissions and costs			15.00%		$675,000
NET RETURNS					$56,518,548
DEVELOPMENT COSTS					
Developer's Allowance for Profit and Risk				15.00%	$7,371,985
					$49,146,564
Building costs				$35,000,000	
Consultants' Fees			0.00%	$0	
				$35,000,000	
Construction Finance					
	interest		8.00%		
	construction period		24		
				$2,800,000	
Total construction costs					$37,800,000
GROSS RESIDUAL LAND VALUE					$11,346,564
Less rates and taxes					$100,000
					$11,246,564
Less holding costs					
	interest		8.00%		
	preconstruction period		6		
					$1,874,427
					$9,372,137
Less land purchase expenses			6.00%		$530,498
NET RESIDUAL LAND VALUE					$8,841,638

As can be seen, the land value for the conventional building is $2.2 million and that for the ESD building is $8.8 million. This hypothetical study indicates that the worth of the ESD building ($58 million) is substantially greater than its estimate of price ($40 million) as suggested by the conventional building.

CONCLUSIONS

The study shows that in the current market where ESD buildings are valued as though they are conventional buildings, the application of the concept of worth demonstrates that ESD buildings can generate higher values/benefits. As stated above, this concept can be readily accepted by owner-occupiers, but acceptance in the investment market requires further research and analysis including:

- Psychic income
- Improved rental values
- Better technical performance of ESD buildings
- Improvements in productivity and other building occupant advantages.

Acknowledgment

For the purposes of this discussion paper, the author has drawn heavily from unpublished research by the author, Peter Lawther of RMIT University and Sowfun Low, as well as work by Margaret Kam, both postgraduate students at the University of Melbourne. The author acknowledges with thanks the contribution of his co-researchers. However, any and all shortcomings are the sole responsibility of the author.

References

Australian Financial Review (2005). 19 January.
Australian Greenhouse Office (AGO). 1999. *Scoping Study for Minimum Energy Performance Regulations for Incorporation into the Building Code of Australia*. Canberra.
Baum A & Crosby N (1995): *Property Investment Appraisal*. London: Routledge. 2nd edition.
Berman, A. (2001) *Green Buildings: sustainable Profits from Sustainable Development*. unpublished report, Tilden Consulting.
Capital E, (2003). *The Cost and Financial Benefits of Green Buildings* – A report to California's sustainable Building Task Force.
Davis Langdon, (2004). *Examining the Cost of Green*. Available at http://www.usgbc.org/Docs/Resources/Cost_of_Green_Short.pdf
Flynn, L. (2003), Driven to be green. *Building Design & Construction*, Nov. 2003, Vol. 44, Issue 11, p. 24.
Global Green USA, (2004). *Colorado Court*. Available at http://www.globalgreen.org/pdf/casestudy_colorado.pdf
Green Building Alliance (2002). *Shades of Green: 2002 Report of the Pittsburgh Green Building Alliance*. Available at http://www.gbapgh.org
Heerwagen, J. (2004). Do Green Buildings Enhance the Well Being of Workers? *Environmental Design and Construction*. Available at http://www.edcmag.com
Maguire P & Robinson J (2000): Building evaluation by prospective lessees. *CIB W70 2000 Conference Proceedings.* Brisbane: Queensland University of Technology.
Melbourne City Council (2005): Facts and figures. *CH2 Green Building Design*. http://www.melbourne.vic.gov.au/info.cfm?top=171&pg=1941
Mills, E. (2001). *The Insurance and Risk management Industries: New Players in the Delivery of Energy Efficient and Renewable Energy Products and Services*. Available at http://eetd:lbl.gov/emills/PUBS/Insurance_Case_Studies. html
Pearce D. W., Markandya, A. and Barbier, E. B. (1989) *Blueprint for a Green Economy*. Earthscan, London.
Rocky Mountains Institute (2004), International Netherlands Group (ING) Bank Amsterdam, Netherlands. available at http://www.rmi.org/sitepages/pid208.php
Smith, P. (1999). *"Occupancy Cost Analysis"*. Building in Value – Pre-Design Issues. Arnold. London.
Standards Australia & Standards New Zealand (1998). *Environmental Management – Life Cycle Assessment – Principles and Framework*, AS ISO 14040:2, Standards Australia, Sydney.
The Green Building Partnership, (2004) available at http://www.60lgreenbuilding.com
US Department of Energy (2004). Four Times Square New York, NY. (http://www.eere.energy.gov/buildings/highperformance/case_studies/overview.cfm?ProjectID=32
World Bank (1992) *World Development Report 1992 Development and the Environment.* Oxford University Press, Oxford.