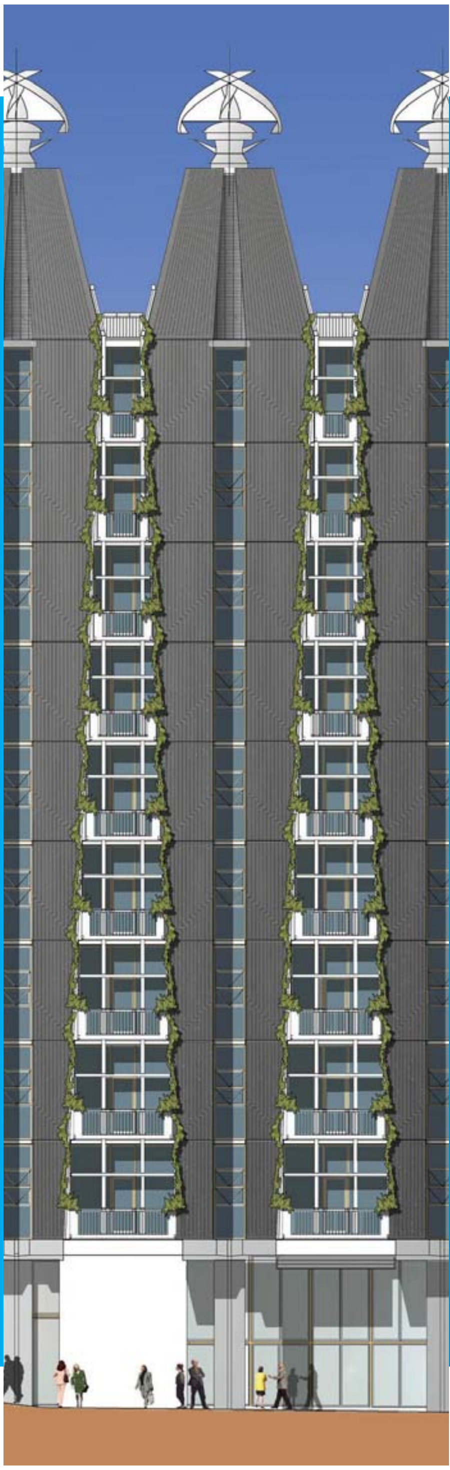
Technical Research Paper 10

# The Business Case for Sustainable Design

city of Melbourne



## Contents



## Disclaimer



An Australian Government Initiative
AusIndustry

6 star rating
green star Office Design v1
This rating represents World Leadership

$CH_2$

# Preface

Council House 2 ($CH_2$) is a visionary new building that is changing forever the way Australia – indeed the world – approaches ecologically sustainable design.

With its Six Star Design Rating granted by the Green Building Council of Australia, $CH_2$ is one of the cleanest and greenest buildings on earth.

This paper, one in a series of 10 technical papers, investigates the design and systems of $CH_2$ prior to occupancy and availability of operational performance data. The papers have been written by independent authors from Australian universities, as part of the $CH_2$ Study and Outreach Program – a coordinated effort to consolidate the various opportunities for study, research, documentation and promotion generated by $CH_2$.

The aim of the $CH_2$ Study and Outreach Program is to raise awareness of sustainable design and technology throughout the commercial property sector and related industries.

While the pre-occupancy research papers are a valuable resource, they do have some limitations. For instance, these studies have been written before operational experience. This means the authors' views are based on existing knowledge, which can be difficult to apply when significant innovation exists.

Many of the innovations in $CH_2$ have been subject to limited, if any, rigorous or directly relevant research in the academic field, which is reflected in the lack of literature cited for systems such as the shower towers and phase change materials used in the cooling system.

Another major limitation is the exclusion, by academics generally, of industry experience of new technologies. The extensive knowledge gained by industry is often not well documented and can be difficult to access through traditional academic channels.

One example, where industry expertise exists, is the use of phase change materials for reducing peak cooling loads and energy use in commercial and institutional settings, such as offices, hospitals, prisons and factories.

In addition, to enable the authors to complete their task, they have based their study on $CH_2$ project reports prior to the design being finalised. This means some of the descriptions of systems and findings in the papers are to some extent out dated. In particular, findings related to the wind turbines and the heating, cooling and ventilation systems have changed somewhat as a result of final design decisions.

To reduce the impact of these limitations for readers, the Council has provided additional comment as footnotes in some papers.

It is important to inform readers the target audience for these papers is professionals and academics involved in the research, design, engineering, construction and delivery of high performance buildings. This helps to explain the technical detail, length and complexity of the studies.

Although these papers may be of interest to a range of audiences it's important that readers, who possess a limited knowledge of the subjects covered, obtain further information to ensure they understand the context, relevance and limitations of what they are reading.

For more information or to make comment and provide feedback, readers are invited to contact the Council. The details are available at the end of this document.

We hope you enjoy reading these technical studies and find they are a useful resource for progressing your own organisation's adoption of sustainable building principles and encouraging the development of a more sustainable built environment.

# Foreword

In 2000 the City of Melbourne made the decision to embark on a revolutionary new project called Council House 2 ($CH_2$). The decision was due to a pressing need for office space for its administration and the desire to breathe life into an under-used section of the city.

The project gave the Council the opportunity to exercise its environmental credentials by creating a building that was at once innovative, technologically advanced, environmentally sustainable and financially responsible.

This approach allowed the Council to insulate itself against exposure to rising energy and water prices, the diminishing availability of resources and the uncertain long-term availability, while providing a healthy workplace attracting the best workforce in a labour-constrained market.

$CH_2$ has been designed to reflect the planet's ecology, which is an immensely complex system of interrelated components.

From the revolutionary cooling storage system in the basement to vertical gardens and wind turbines on the roof, the building has sustainable technologies integrated throughout its 10 storeys.

Although the majority of the technologies and principles adopted in the building are not new, never before in Australia have they been used in an office building in such a comprehensive and interrelated fashion.

This includes innovations such as: using thermal mass for improving comfort; phase change material to reduce peak energy demands and energy use; generating electricity onsite from natural gas; and using waste heat for cooling and heating.

Through $CH_2$, the Council plans to trigger a lifestyle and workstyle revolution. The building will be used as a living, breathing example, demonstrating the potential for sustainable design principles and technologies to transform the way industries approach the design, construction and philosophy of our built environment.

As with many revolutions, there are sceptics. The Council's response has been to patiently press ahead with the construction of $CH_2$ while actively and energetically encouraging lively debate.

Some of the papers in this pre-occupancy study and outreach series make compelling points in favour of the case for sustainable development. Others reflect a more subtle or sometimes overt scepticism that may be encountered throughout the community.

The City of Melbourne welcomes all of this debate but in the long term intends to demonstrate the effective performance of $CH_2$ and prove the doubters wrong. Collectively, the studies demonstrate the enormous value to be gained by researching the case for sustainable development and the scope for much more study and documentation in this field in the future.

The City of Melbourne wants $CH_2$ to be copied, improved on and enthusiastically taken up throughout Melbourne and far beyond.



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Technical Research Paper 10

# The Business Case for Sustainable Design

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## Abstract

The City of Melbourne's new landmark building, known as Council House 2 ($CH_2$), will be completed during 2006. A world leading, six Green Star – Office Design rated environmental building, $CH_2$ will incorporate sustainable technologies and provide a wide range of financial, environmental and social benefits. This paper examines the business case for sustainable design within the context of $CH_2$. A review is carried out of traditional business case decision making tools used in the context of property development, and the case for the design and construction of ecologically sustainable buildings is considered. The $CH_2$ project is reviewed in detail and the 'triple bottom line' model developed by the City of Melbourne, which underpins the development, is investigated. This paper concludes that the $CH_2$ development should deliver diverse benefits to all stakeholders; the Council, staff, businesses and ratepayers. Further, the business case model developed by the $CH_2$ project could be used as a model for other developments.

## Caveat

This paper is based in part on documentation provided by the City of Melbourne for the purposes of undertaking the study. It should be noted that certain documentation was unavailable due to confidentiality, legal requirements or stage of development of the project. Therefore, this paper must be regarded as limited, to the extent that such documentation has not been considered in its compilation.

## Introduction

In response to the challenges currently facing the world's environment, such as climate change, desertification, pollution and the extinction of various species of flora and fauna, society is increasingly looking beyond economic progress to achieve sustainability in order to preserve the environment for future generations. Motivated by the realisation of the negative impact of development on the environment, the concept of ecologically sustainable development (ESD) has steadily gained credence.

ESD is most commonly defined as:

- "*development that meets the needs of the present without compromising the ability of future generations to meet their own needs*" (Brundtland Commission Report, 1987); or
- "*using, conserving and enhancing the community's resources so that ecological processes, on which life depends, are maintained, and the total quality of life, now and in the future, can be increased*" (Australia's National Strategy for Ecologically Sustainable Development (NSESD), 1992).

With the increasing level of education and awareness about the threats to the environment and the importance of its preservation for future generations, there is a growing emergence of ecologically sustainable buildings throughout the world. Buildings are also recognised as a prime emitter of greenhouse gases. In Australia, buildings are responsible for 30 per cent of all raw materials used by society and consume more than 40 per cent of all energy produced, causing more than 40 per cent of all air emissions (AGO, 1999). Development will not be sustainable if the economic constraints under which the property development process operates are not carefully considered. There is a common perception that there is no demand or support for sustainable development (Kam et al, 2002). However, the acknowledged impact that buildings have on the environment requires that the property and construction industries contribute to the delivery of ecologically sustainable built environment.

The relationship between benefits and costs is commonly assumed to be a major obstacle to the uptake of sustainable development (Kam et al, 2002). 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.

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In Australia, concern for initial costs is reinforced by the involvement of a number of parties in different phases of building delivery, from development, through ownership to occupation. Energy efficient performance gains for potential tenants, for example, is not considered a high priority by developers while the emphasis industry puts on reducing initial costs versus reducing increased operational costs over the full life cycle militates against ecological sustainable development outcomes.

Inappropriate financing models, which focus predominantly on immediate financial return or lack of access to capital, discourage investment in sustainable buildings. There is also no incentive to act, when the investor is often not the ultimate user who is responsible operational costs over the life cycle, such as energy bills. In addition, energy, like other business-related expenses, is tax deductible and the plant and equipment that uses energy can be depreciated against taxable income. Lenders of capital also neglect the future economic and social costs created by environmental impacts in their assessment frameworks.

The property market continues to be unsure about the benefits of ecologically sustainable development 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 five to 10 per cent higher rent for improved comfort and control of the environment (Maguire & Robinson, 2000). Analysis of market evidence has also shown that there are income benefits from owning and operating a socially desirable or 'landmark' asset. This phenomenon is known as psychic income and 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. However, these observations are yet 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 Discounted Cash Flow (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 often 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. Although this process 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).

The development of the City of Melbourne's new staff accommodation, $CH_2$ is a significant example of how buildings can be designed to be more ecologically sustainable. Due for completion in 2006, it has achieved six star world leader certification from the Green Building Council of Australia, the national body whose role is to define and develop a sustainable property industry in Australia and drive the adoption of green building practices through market-based solutions.

$CH_2$ incorporates many innovative sustainable technologies in its design, including:

- phase-change materials for cooling;
- undulating high thermal mass concrete ceilings for passive cooling;
- roof top photovoltaic solar cells configured to power the West façade of louvres;
- automatic night-purge windows and stack ventilation system;
- solar shading and light shelves;
- shower towers for cooling;
- roof top solar collection for hot water generation ;
- natural gas fired co-generation power plant;
- rooftop stormwater collection, sewer mining water extraction plant and fire sprinkler test water recycling systems;
- wind turbine electricity generators;
- green roofscape and social space; and
- active and passive glare control.

As with any development, $CH_2$ had to be deemed feasible before it could proceed. Such feasibility studies are often referred to as 'business cases' for taking a particular course of action. The aim of this paper is to examine the business case for the sustainable design of buildings by specifically considering the example of $CH_2$. In this respect it is hoped $CH_2$ can serve as a model for other projects seeking to be more ecologically sustainable.

The paper commences with a review of business case decision making tools used in the context of property development, and then considers the case for the design and construction of ecological high performance buildings. The paper also investigates the $CH_2$ project in detail and analyses the 'triple bottom line' business case model developed by the City of Melbourne, which underpins the development. The paper concludes that $CH_2$ will deliver diverse benefits to all stakeholders; the Council, staff, business and ratepayers and this is illustrated by comparative feasibility studies.

## Business Case Decision Making Tools

The business case is a key element in the decision to build. This is because the decision to build is concerned not only with the overall philosophy of the owner and whether the commitment of resources is in line with their aims and objectives, but also with the overall financial viability of the proposed project (Brown and Matysiak, 2000). The business case involves various decision making processes, and focuses predominantly on tangible elements such as return on investment, cost of capital, hurdle rates, worker productivity, energy costs and long-term operational and maintenance costs (Morton, 2002). It may also include other considerations such as company brand strategy, company culture and the quality of the work environment.

The fundamental principle of development economics and business case decision making is that the total benefits created are (at least) equivalent to the total costs incurred (Robinson, 2004b). Therefore, all forms of development economic appraisal are a form of cost-benefit analysis. A cost-benefit analysis compares the cost and the benefit of a given measure to evaluate if the benefit outweighs the cost (Kwong, 2004). Examples of costs involved in property development include the cost of initial land and construction, and the future cost of maintenance and operations. Benefits include enhanced property values realised through sales or rentals, and enhanced production processes of the eventual occupiers of the building. The range of costs and benefits considered is often determined from the investor's viewpoint. Developers with short-term return time frames may simply be interested in the initial capital costs of development and sales values, whereas longer term owner-occupiers may also wish to consider the operational costs and benefits of the proposed development. Further, investors may also wish to consider the effect of their development on external stakeholders.

Some of the common forms of cost-benefit analysis used in the property industry are considered below.

### Residual Analysis

This is the simplest form of analysis used within the property industry, and it essentially evaluates the difference between the project costs and revenues to arrive at a residual figure which may represent either the profit or the land value (Brown and Matysiak, 2000). This is illustrated in the following formulas:

- Profit = Net Development Revenue – (Land cost + Development cost + Interest cost)
- Land Value = Net Development Revenue – (Development cost + Interest cost + Profit) (Brown and Matysiak, 2000).

As illustrated above, the profit of the proposed project can be estimated using this method, or alternatively the analysis can be used to provide an indication of how much to pay for land to achieve the desired profit. The residual analysis is a simple, static model for business case decision making processes, which considers only the initial cost and return of development. Indeed, there is an explicit assumption within this method that the value will be realised (through sales) only on completion of development. Whilst this may be applicable for speculative type developments, it is not the case for owner-occupied type developments, such as those undertaken by government. Further, residual analysis does not take into consideration operational costs and benefits of buildings throughout their life-cycle.

A comparative residual analysis for the proposed $CH_2$ development project is illustrated later in this paper.

### Return on Investment

The return on investment (ROI) approach is a method of estimating the profitability of the project as a percentage of the capital outlay or investment. It is in effect an extension of the residual analysis and is calculated as follows:

- Return on investment based on the gross profit
  ROI = Gross profit/Total Cost
- Return on investment based on the total rent received
  ROI = Rental income/Total Cost (Brown and Matysiak, 2000).

Based on the above methodology, a project may be deemed acceptable if the return on investment is greater than an agreed or preset target return, often referred to as a 'hurdle rate'.

ROI can also be reconfigured to determine what a likely or appropriate investment outlay or value should be. In this case, the above equation for rental is re-written as:

- Total Cost or Investment = Rental income/ROI

In this scenario, the ROI is often referred to as the capitalisation rate, or the rate at which income is capitalised. Direct capitalisation, as this method is known, is a common method for valuation of income producing property (Robinson, 1989).

Both the ROI and direct capitalisation methods are, like residual analysis, static methods of feasibility analysis. That is, they analyse the asset only at a given point in time, often only considering the value that is realised upon sale or letting at the completion of construction. Dynamic methods of project appraisal, which consider the project over a given timeframe, are now considered.

### Pay-Back Period

The pay-back period of a project is defined as the number of years required to repay the initial investment from its future cash flows (Whipple, 1995).

Payback period is a simple analysis to estimate the time taken for cash inflows to equal (or payback) the original capital outlay. The choice of project, or whether to proceed with a project, is made on the basis of an agreed cut-off period, whereby a project with a pay-back period less than the cut-off period is accepted (Brown and Matysiak, 2000). Payback period provides an indication for investors as to how long it will take to recover an initial capital outlay, thereby estimating the liquidity of the project.

A variation is the discounted pay-back period. This approach is the same as the previous method, although it takes into account the time value of money, by discounting the future cashflows to reflect their present worth. The discounted pay-back period is therefore the time it takes for the discounted cash flows to equal the initial investment (Brown and Matysiak, 2000).

## Net Present Value

The net present value (NPV) is defined as the present value of an investment's future net cash flow, less the initial investment (Brown and Matysiak, 2000, p 6). The NPV is effectively an adaptation of the payback period method to determine if future cashflows return the initial cash outflow at the target discount rate during the investment period.

A project is deemed acceptable if the NPV is greater than zero when discounted at the target discount rate. In other words, a positive NPV indicates the inflows outweigh the initial investment and the project would appear feasible at the target discount rate and investment period. Conversely, a negative NPV would indicate the inflows do not match the investment and the project would not appear feasible.

## Internal Rate of Return

The Internal Rate of Return (IRR) is an extension of the net present value (NPV) method. Whilst the NPV simply identifies a 'yes or no' scenario for a given cashflow and discount rate, the IRR determines the actual discount or percentage rate that a cashflow is returning to equate to the initial investment. This is the discount rate that equates the present value of the net cash inflows of a project with the present value of the capital investment. As such, the discount rate is akin to a rate of return. A project may be deemed acceptable if the IRR exceeds the opportunity cost of capital (Brown and Matysiak, 2000), or another yardstick set by the investor. Quite often this is determined as the 'risk-free' rate (in Australia the ten-year government bond rate is a common proxy), plus an allowance for risk as determined by the nature of the project. The IRR is a dynamic method of project appraisal, and the *discounted* cashflow upon which it is based can be as simple or complex as required, or as the inputs allow. The IRR can also be used to determine the initial capital investment required to equate to a future set of cashflows at a given rate of return or discount rate. To this end, it is often used in the valuation of property. (Robinson, 2004b)

In practice, the NPV and IRR methods can be utlilised at different levels to undertake a financial lifecycle analysis of a complete project, of an element of a project (e.g. a roofing system), or of an individual component of a system (eg a hot water boiler). This is often termed life cycle costing, but is also known as life cost, recurrent cost, cost in use, operational cost, occupancy cost, ultimate cost and terotechnology (Langston, 2005).

Life cycle costing is an evaluation method which takes into account relevant costs of a building's design, systems, components, materials and operation over time. It incorporates initial investment costs, future replacement costs, operation and maintenance costs, and salvage and resale values, adjusting them to a consistent timeframe and combining them in a single cost-effectiveness measure to make it easier to compare alternative projects (US Department of Commerce, 1980). Life cycle costing can also be undertaken in terms of energy and greenhouse gas emissions rather than costs (Robinson, 2004a).

## Social Cost-Benefit Analysis

Although the above methods of cost benefit analysis are used predominantly to evaluate the financial impact of a development in terms of private cost and benefits, the business case for development can also be expanded to include the social costs and benefits affecting the external stakeholders of the project. Examples of the various social costs and benefits of property development include:

- social costs – increased traffic congestion, creation of adverse micro climate, environmental effects and overloading of infrastructure; and
- social benefits – contribution to wealth accumulation, provision of employment opportunities, urban renewal and growth, pollution reduction and ecologically sustainable development (Robinson, 2004a).

A social cost-benefit analysis will often take the form of a planning balance sheet which concentrates on the direct impact of development on different interest groups and community sectors (Snell 1997) and may include non-financial factors, or recognise equity considerations in decision making processes. The goal achievement matrix is another form of social cost-benefit that attempts to prioritise the objectives of a development across all stakeholders and then score each proposal based on a pre-assigned weighting. Both the planning balance sheet and goals achievement matrix analysis are limited by the subjective judgment on which they are inevitably based.

# The Case for Ecologically Sustainable Buildings

While the above mentioned business case decision making tools can be used to evaluate ESD buildings, they have generally not been used, or used inappropriately. ESD buildings by their nature must be considered over the entire lifespan 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. Focusing on the increased capital costs of ESD, and the use of static business case analysis tools which support this view, leads to inappropriate or inadequate consideration of the real value of ESD projects.

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). This belief is a major obstacle to ESD investment because higher initial construction costs reduce the profitability of the project (Robinson, 2004a). Indeed, six Californian property developers interviewed in 2001 estimated that green buildings cost 10 to 15 per cent more than conventional buildings (Berman, 2001). In terms of capital development cost, there is very little published information about the cost premium of ESD buildings. What information is available tends to support the contention that ESD buildings require additional capital expenditure. Exactly how much extra expenditure depends on the number of sustainability measures introduced, although there are some broad guidelines that can be inferred from the limited information available.

One of the pioneers in ESD building development in 1987 was the International Netherlands Group (ING), whose bank headquarters in Amsterdam included a range of ESD elements such as passive solar heating and ventilation, cogeneration and waste heat capture, daylit office space and interior cores, and rainwater collection and usage. The additional cost of these features was estimated at approximately two per cent of the development cost (Rocky Mountains Institute, 2004). The more recently completed 60L building in Melbourne, arguably the "the premier green building in Australia" (The Green Building Partnership, 2004), is believed to have carried a capital cost premium in the order of five per cent. 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 two per cent, although this premium varied from 0.66 per cent in level 1 certified buildings, up to 6.5 per cent 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 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. In the residential sector, the Colorado Court energy and resource efficient affordable housing project in California, estimated that the project's special energy measures cost in the order of 12 per cent of the total construction cost (Global Green USA, 2004).

However, there is a large body of evidence that suggests ESD buildings, whilst having an initial capital investment surcharge, repay this investment many times over in terms of lower energy and operational costs. The ING bank cost premium payback period was just three months and annual savings of US $2.9 million continue. The building uses around 10 per cent of the energy of its predecessor, and 20 per cent of a new conventional 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 10 to15 per cent 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 two per cent to support green technologies in buildings would, on average over a 20 year period, result in life cycle savings of 20 per cent of total construction costs. Of these savings, approximately 30 per cent (six per cent of the total saving) emanated from reduced energy and resource usage, and 70 per cent (14 per cent) from increased productivity and health values (Capital E, 2003).

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

The renovation of the Reno Post Office in Nevada, undertaken with the objective of reducing energy costs, also heralded a six per cent increase in worker productivity (Smith, 1999). Likewise, the Pennsylvania Power and Light Company, who incorporated task lighting for their drafting staff, reduced energy bills by 73 per cent and produced a return on investment of 24 per cent. In addition, quicker drawing production times, coupled with increased quality and accuracy of work, reduced sick leave and improved worker morale, combining to produce a return on investment of over 1000 per cent. (Smith 1999).

After PNC Realty Services moved into 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).

The benefits described above are considerable. 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 per cent on an employee's annual salary (AEC 2003).

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

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 organisational branding and public perception. Although these benefits are sometimes difficult to measure precisely, they clearly have a financial impact that is starting to signal 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 simply 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. ESD buildings have other financial benefits too in terms of reduced risk to building occupants due to improved indoor air quality. This also 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 per cent insurance premium rebate as a reflection of the relationship between design and physical ailments, predominantly due to poor indoor air quality (Mills, 2001).

In this way ESD buildings take on a social role, in addition to financial and environmental dimensions. Such an approach is in line with current trends towards 'triple bottom line' reporting procedures and serves as an appropriate business case decision making model. A project deemed feasible under such criteria would clearly embody the ethos of ecologically sustainable development.

## Council House 2

Having considered the main business case decision making tools and the case for ESD buildings, the remainder of this paper is concerned with the City of Melbourne's Council House 2 ($CH_2$).

The $CH_2$ building is a pioneering, six Green Star rated building currently under construction in Little Collins Street, in the heart of Melbourne's CBD.

The building incorporates many innovative sustainable technologies and will provide long-term accommodation for City of Melbourne staff.

## Drivers for Looking at New Accommodation

The drivers that led to a search for new accommodation by the City of Melbourne included the following:

- to replace old accommodation at the end of its functional life, which no longer met statutory regulations for occupational health and safety, and disabled access;
- to promote staff wellbeing and effectiveness; and
- to house staff in the same location ($CH_2$ – Business Case).

Ultimately it was decided that new accommodation was required, and it would be more effective to be in one building rather than spread over the various Council leases currently in place at the time (Council House 2 – Stories and Lessons).

With the need for new accommodation clearly identified, the City of Melbourne developed a 'triple bottom line' business case for the project with a series of clear financial, environmental and social strategic initiatives.

## Financial Drivers

After the sale of its share in electricity supply company, Citipower Ltd., in the mid 1990s, the City of Melbourne established an investment fund. The sale proceeds were $200 million overall and the Council decided a portion of these funds could be invested into municipal projects evaluated against two criteria:

- Firstly, any project must demonstrate a return of 150 per cent of the 10 year bond rate; and
- Secondly, funds can only be used for strategic projects (Adams, 2004), such as those promoting the growth of Melbourne.

In addition to the above, the specific financial drivers of the $CH_2$ project were:

- Low risk, high return investment over a 50 year life; and
- To 'future proof' or reduce the risks of the accommodation option chosen ($CH_2$ – Business Case).

After consideration of a number of different alternative accommodation options, it was decided the development of CH2 presented the lowest risk to the City of Melbourne. The total cost of the $CH_2$ building is estimated to be approximately $51 million. Specific estimated costs for the building are as follows:

- $29.9 million for the base building excluding fit out and sustainability costs;
- $11.3 million sustainability features;
- $2.8 million demonstration and education process; and
- $7.1 million council specific requirements.

*(Source: http://www.melbourne.vic.gov.au/rsrc/PDFs/CH2/CH2FactSheet.pdf).*

The $11.3 million cost for sustainability features represents an investment premium of approximately 22 per cent for the project. This is higher than the results of the literature review identified earlier in this paper, which found the cost premium for 'green' buildings was up to approximately 12 per cent, although the majority was lower than this. However, it must remembered that $CH_2$ has achieved the highest level of ESD certification from the Green Building Council of Australia, and so could be expected to carry a higher than usual sustainability price tag. Whether the 22 per cent premium is conservative or not is beyond the scope of this paper, although it does impact on the financial return of the investment.

Life cycle cost analyses were also conducted for the various ESD features of the project to estimate their effect on long-term maintenance and operation costs. Expected savings from reduced energy and water usage, and increases in the effectiveness and well being of the staff, emanating from the ESD features of the project were estimated. These are summarised in Table 1:

**Table 1 – Estimated Savings for $CH_2$ ***

| | Conservative | | Optimistic | |
|---|---|---|---|---|
| | **Savings ($/yr)** | **%** | **Savings ($/yr)** | **%** |
| Staff effectiveness and well-being improvement | $350,000 | 51 | $1,120,000 | 77 |
| Energy Savings | $270,000 | 40 | $270,000 | 19 |
| Water Savings | $60,000 | 9 | $60,000 | 4 |
| **Total Estimated Savings Per Year** | **$680,000** | **100** | **$1,450,000** | **100** |
| **Total Current Estimated Savings Over 50 Years** | **$34,000,000** | | **$72,500,000** | |
| **Discounted Total Current Estimated Savings** | **$8.823m** | | **$18.813m** | |

** These figures are based on 2004 costs of salaries, energy and water. (Source: $CH_2$ – Business Case, AEC, 2003)*

The conservative figures above represent the minimum benefits that can be expected from the $CH_2$ building, whilst the optimistic figures represent benefits that could "feasibly be achieved based on all the research assessed" (AEC, 2003). Note that the energy and water savings remain constant for both scenarios, reflecting their more certain status in comparison with effectiveness and well-being (productivity improvement). The distribution of estimated savings ranges from 51%/49% (conservative) for the productivity and energy savings respectively, to 77%/23% (optimistic) for the productivity and energy savings respectively. The split for the optimistic figures are slightly above the results of the literature review which identified that financial benefits from investment in environmental features in a building would be in the order of 70%/30% for productivity and energy savings respectively. However, given that $CH_2$ has advanced sustainability features, it is not unreasonable to suggest that the savings will be above the norm.

Based on these figures, payback period, Net Present Value and Internal Rate of Return calculations have been performed and are now presented. A discount rate of 7.5 per cent has been used throughout. This represents the stipulated return of the Council (ie the 10 year bond rate x 150 per cent), using a five per cent (rounded) 10 year bond yield as at June 2003 (Source: http://www.rba.gov.au/statistics/bulletin/F02HIST.XLS). The date of June 2003 has been chosen as this was the approximate date of the development of the business case for $CH_2$. An annual allowance for inflation has been included at 2.1 per cent as the prevailing rate at June 2003, as measured by the as measured by Domestic Final Demand Index of the Australian Bureau of Statistics.

*(Source:http://www.abs.gov.au/ausstats/abs@.nsf/0/43742a462f6606ecca256e7d0000264a?OpenDocument)*

The conservative figures represent a non-discounted payback period on the premium paid for the sustainability features of approximately 17 years, and a discounted payback period of 41 years, as shown in Table 2 over page.

The optimistic figures represent a payback period on the premium paid for the sustainability features of approximately eight years, and a discounted payback of approximately 11 years as shown in Table 3 over page.

## Table 2 – Payback Period for ‘Conservative’ Estimated Savings for $CH_2$

| Year | Non-discounted | Cumulative | Inflation adjusted at 2.1% P.A | Discounted PV at 7.5%* | Cumulative |
|---|---|---|---|---|---|
| 0 | -$11,300 | -$11,300 | -$11300 | -$11,300 | -$11,300 |
| 1 | $680 | -$10,620 | $694 | $646 | -$10,654 |
| 2 | $680 | -$9,940 | $709 | $613 | -$10,041 |
| 3 | $680 | -$9,260 | $724 | $583 | -$9,458 |
| 4 | $680 | -$8,580 | $739 | $553 | -$8,905 |
| 5 | $680 | -$7,900 | $754 | $526 | -$8,379 |
| 6 | $680 | -$7,220 | $770 | $499 | -$7,880 |
| 7 | $680 | -$6,540 | $786 | $474 | -$7,406 |
| 8 | $680 | -$5,860 | $803 | $450 | -$6,956 |
| 9 | $680 | -$5,180 | $820 | $428 | -$6,528 |
| 10 | $680 | -$4,500 | $837 | $406 | -$6,122 |
| 11 | $680 | -$3,820 | $855 | $386 | -$5,736 |
| 12 | $680 | -$3,140 | $873 | $366 | -$5,370 |
| 13 | $680 | -$2,460 | $891 | $348 | -$5,022 |
| 14 | $680 | -$1,780 | $910 | $330 | -$4,692 |
| 15 | $680 | -$1,100 | $929 | $314 | -$4,378 |
| 16 | $680 | -$420 | $948 | $298 | -$4,080 |
| 17 | $680 | $260 | $968 | $283 | -$3,796 |
| 18 | | | $988 | $269 | -$3,528 |
| 19 | | | $1,009 | $255 | -$3,272 |
| 20 | | | $1,030 | $243 | -$3,030 |
| 21 | | | $1,052 | $230 | -$2,799 |
| 22 | | | $1,074 | $219 | -$2,580 |
| 23 | | | $1,097 | $208 | -$2,372 |
| 24 | | | $1,120 | $197 | -$2,175 |
| 25 | | | $1,143 | $187 | -$1,988 |
| 26 | | | $1,167 | $178 | -$1,810 |
| 27 | | | $1,192 | $169 | -$1,640 |
| 28 | | | $1,217 | $161 | -$1,480 |
| 29 | | | $1,242 | $153 | -$1,327 |
| 30 | | | $1,268 | $145 | -$1,182 |
| 31 | | | $1,295 | $138 | -$1,045 |
| 32 | | | $1,322 | $131 | -$914 |
| 33 | | | $1,350 | $124 | -$790 |
| 34 | | | $1,378 | $118 | -$672 |
| 35 | | | $1,407 | $112 | -$560 |
| 36 | | | $1,437 | $106 | -$454 |
| 37 | | | $1,467 | $101 | -$353 |
| 38 | | | $1,498 | $96 | -$257 |
| 39 | | | $1,529 | $91 | -$166 |
| 40 | | | $1,561 | $87 | -$79 |
| 41 | | | $1,594 | $82 | $3 |
| | **Payback** | **17 Years** | | | **41Years** |

### Table 3 – Payback Period for "Optimistic" Estimated Savings for $CH_2$

| Year | Non-discounted | Cumulative | Inflation adjusted at 2.1% P.A | Discounted PV at 7.5%* | Cumulative |
|---|---|---|---|---|---|
| 0 | -$11,300 | -$11,300 | -$11,300 | -$11,300 | -$11,300 |
| 1 | $1,450 | -$9,850 | $1,480 | $1,377 | -$9,923 |
| 2 | $1,450 | -$8,400 | $1,512 | $1,308 | -$8,615 |
| 3 | $1,450 | -$6,950 | $1,543 | $1,242 | -$7,373 |
| 4 | $1,450 | -$5,500 | $1,576 | $1,180 | -$6,193 |
| 5 | $1,450 | -$4,050 | $1,609 | $1,121 | -$5,072 |
| 6 | $1,450 | -$2,600 | $1,643 | $1,064 | -$4,008 |
| 7 | $1,450 | -$1,150 | $1,677 | $1,011 | -$2,997 |
| 8 | $1,450 | $300 | $1,712 | $960 | -$2,037 |
| 9 | | | $1,748 | $912 | -$1,125 |
| 10 | | | $1,785 | $866 | -$259 |
| 11 | | | $1,822 | $823 | $564 |
| **Payback period** | **8 years** | | | **11 years** | |

** 10 year bond rate at June 2003 x 150%.*

The internal rate of return and net present values for the sustainability features investment of $CH_2$ are shown in Table 4 below.

### Table 4 – Internal Rate of Return for Estimated Savings

| No. of years | 10 | 15 | 20 | 30 | 40 | 50 |
|---|---|---|---|---|---|---|
| **Optimistic** | | | | | | |
| IRR | 7.01% | 11.88% | 13.67% | 14.81% | 15.09% | 15.17% |
| NPV* ($'000) | -$259 | $3,461 | $6,336 | $10,274 | $12,627 | $14,032 |
| **Conservative** | | | | | | |
| IRR | -6.38% | 0.82% | 3.97% | 6.52% | 7.45% | 7.85% |
| NPV* ($'000) | -$6,122 | -$4,378 | -$3,030 | -$1,182 | $79 | $580 |
| **Energy and Water Savings Only** | | | | | | |
| IRR | -16.06% | -6.99% | -2.65% | 1.25% | 2.90% | 3.73% |
| NPV* ($'000) | -$8,787.21 | -$7,940.64 | -$7,286.38 | -$6,389.98 | -$5,854.59 | -$5,534.81 |

** Discount rate 7.5% = 10 year bond rate at June 2003 x 150%.*

Table 4 shows that the optimistic savings return achieves the required June 2003 return of 7.5 per cent pa, (10 Year bond rate x 150 per cent) after slightly more than 10 years, and after 20 years achieves a return of 13.67 per cent pa. The return thereafter increases to 15.17 per cent pa for a 50 year investment. The conservative savings figures achieve the required return of 7.5 per cent pa at around 40 years. Hence, based upon both optimistic and the conservative savings estimates, the additional investment of $11.3 million in the sustainability features of $CH_2$ appear to be viable.

The declining rate of investment return over longer investment periods reflects the reduced importance of future values with respect to discounted cashflow calculations. It should also be noted that the above calculations make no allowance for real rises (over and above inflation) in future staffing/energy costs, which would increase the return on investment for the sustainability features of the building.

Clearly, the estimated savings from the effectiveness and well-being of staff represent the largest potential gain from the project (Table 1). Indeed, without this component of the estimated savings, the additional investment in the sustainability features would not have been viable in terms of the stated return criteria. The internal rate of return of this scenario (energy and water savings of $330,000 pa) only becomes positive after approximately 25 to 30 years (table 4), and achieves a maximum of 3.73 per cent pa after 50 years – clearly well below the required return criteria.

Therefore, the stated savings for staff effectiveness and well-being are critical to the business case for $CH_2$, and as such merit further consideration.

An in depth analysis was undertaken by consultants into the potential productivity benefits at $CH_2$ (AEC, 2003). The study concluded that gains would be achieved as detailed in Table 5.

### Table 5 – Summary of Potential Productivity Gains at $CH_2$

| Predicted area of saving for CoM | Annual cost | Estimated % Saving to be achieved at $CH_2$ | | Estimated $ Saving to be achieved at $CH_2$ | |
|---|---|---|---|---|---|
| | | **Conservative** | **Optimistic** | **Conservative** | **Optimistic** |
| Decreased absenteeism caused by office environment | $153,142 | 90 | 95 | $137,827 | $145,485 |
| Decreased sick leave due to injury caused by office environment | $30,628 | 5 | 10 | $1,531 | $3,063 |
| Reduced stress related to work | $122,513 | 10 | 15 | $12,251 | $18,377 |
| Reduced non-work related stress | $122,513 | 5 | 10 | $6,175 | $12,251 |
| Reduced staff turnover due to dissatisfaction with indoor environment | $66,055 | 10 | 40 | $6,606 | $26,422 |
| Improved worker productivity (gain for each 1% improvement) | $186,950 | 1 | 4.9 | $186,950 | $916,055 |
| | | | **Total** | **$351,340** | **$1,121,653** |
| | | | **(say)** | **$350,000** | **$1,120,000** |

*Source: AEC, 2003.*

As acknowledged by the consultants in their report, the results are by necessity subjective, although they are based on currently available evidence, and utilise existing City of Melbourne payroll records as the starting point for the study.

Clearly the biggest component of the expected gains is the improved worker productivity itself, which represents approximately 54 per cent and 82 per cent (conservative and optimistic respectively) of the entire productivity gains for the organisation calculated for the $CH_2$ building, and 28 per cent and 63 per cent (conservative and optimistic respectively) of the overall estimated savings as shown in Table 1. These figures were based on a total annual wages expenditure of $18,965,000, and the rationale that every one per cent increase in productivity will result in a one per cent salary saving. The optimistic rate of a 4.9 per cent increase is calculated from research demonstrating that for every doubling of the fresh air (ventilation) rate, the productivity of occupants rises by 1.7 per cent (AEC, 2003). The $CH_2$ building will deliver a threefold improvement in the ventilation rate against Australian Standard 1668.2, which is calculated to be worth a 2.9 per cent improvement in productivity gains. A further one per cent improvement is added for the quality of air provided by the $CH_2$ ventilation system (considered to be the best indoor air quality of any HVAC system), and a further one per cent improvement is added for the improved thermal comfort of occupants (AEC 2003). The conservative estimate of a one per cent increase in productivity is based on 0.5 per cent improvement for increased quantity of fresh air, and a 0.5 per cent increase in quality of fresh air, with no allowance for improvement due to thermal comfort.

Other potential financial drivers include returns to be gained from the incorporation of retail and car parking into the proposed development. However, no financial information on these elements has been obtained by the authors and is therefore not considered further.

## Environmental Drivers

In addition to the financial returns derived from reduced energy consumption, the City of Melbourne is keen to promote itself as a leading 'green' organisation in Victoria. In order to do this, the City has a number of environmental criteria to which $CH_2$ must conform, including:

- incorporation of the latest ecologically sustainable design features;
- a five star energy level rating;
- a 20 per cent reduction of energy consumed in Council buildings by 2005 (based upon 1996 levels); and
- a five per cent increase in the use of renewable energy by 2005, and a 10 per cent increase by 2020.

By comparison with the existing staff accommodation building, $CH_2$ is estimated to reduce electricity consumption by 85%, gas consumption by 87%, and water mains supply by 72%. This results in $CH_2$ using only 13% of the energy consumed by the existing staff accommodation building. Greenhouse gas emissions are estimated to be 64% less than a five-star rated building.

*(http://www.melbourne.vic.gov.au/info.cfm?top=171&pg=1941)*

Further, the City of Melbourne was keen to develop a 'lighthouse' ecologically sustainable demonstration project to show how such development can be integrated within the community.

## Social Drivers

The business case for $CH_2$ also incorporates a number of social drivers which emanate from the City of Melbourne's local government role. As the City's responsibility to its ratepayer base must be considered in all of its decisions, the source of funding for the project was a prime consideration.

The City of Melbourne has reallocated assets within the investment portfolio to streamline the performance of the portfolio, and to ensure that the project is fully funded by equity resulting in minimal risk to the ratepayers. This funding option allows the City to have full control over all aspects of the development, in order to benefit from capital gain, and to have no ongoing rental expenses apart from normal outgoings. In addition, the strategic approach taken with $CH_2$ reduces risks to ratepayers through the long-term provision of healthy accommodation to staff, increased productivity, and the reduced likelihood of civil action against the Council for poor indoor air quality, commensurate with potentially lower insurance premiums.

The City of Melbourne also believes $CH_2$ is an opportunity to develop retail business within the Melbourne CBD, by providing an integrated retail precinct that potentially links the QV development with Collins Street and Federation Square. This will be done primarily through the incorporation of retail and car parking facilities in the $CH_2$ building.

In addition, the City anticipates $CH_2$ will provide some leadership and encouragement to the building and property industry, particularly in Melbourne's CBD. The project is considered a "beacon type project on sustainability" (Adams, 2004), both in terms of its environmental aspects, and the potential benefits for the building's occupants.

From the view of a socially responsible organisation, the City of Melbourne sees the project as a means of boosting its responsibility to its staff. It is hoped the provision of a healthy working environment will promote the City as a responsible employer, and establish it as an employer of choice. This in turn is expected to reduce staff churn and provide other financial benefits considered earlier. Further, the business case for $CH_2$ includes genuine acknowledgement for staff wellbeing and satisfaction. For example, the $CH_2$ business case concludes:

*"Many studies talk about the increase in productivity. This gives the perception that the outcome is for people to do more with less. This is not the intention of $CH_2$ or the City of Melbourne. Through a great work environment, fresh air, natural light, low emitting materials and greenery, the City of Melbourne hopes to create a healthy place to work – a place where, at the end of the day, you feel you have achieved what you wanted, and you have been effective. With the added bonus that you have fewer sick days, less headaches, and feel good while you are at work."*

## Residual Analysis of $CH_2$

A comparative study of two hypothetical properties, one a conventional office building and the other the $CH_2$ building having ESD features, is provided to illustrate the potential of this paper. The data used in the study are described below.

### Value

Market rental values for office buildings are currently around \$350 per $m^2$ gross effective after allowing for lease incentives. Property economists currently predict a substantial rise in rents (50 per cent 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 \$500 per $m_2$ has been adopted for the conventional building in this study. A 10 per cent rental premium is allocated for the ESD building to reflect the improved internal environment.

An allowance is also made for improved productivity. In relation to $CH_2$, optimistic salary savings of \$1.12 million pa are estimated and this amounts to \$120 per $m^2$ pa. The conservative savings of \$350,000 pa amount to approximately \$35 per $m^2$ pa.

The outgoings (not including occupiers' utilities) for $CH_2$ have been reduced from \$80 per $m^2$ (current for a conventional building) to \$65 per $m^2$ in line with the energy and water savings discussed above.

The net operating income is capitalized at eight per cent for the conventional building. An indicative allowance for psychic income is made by firming the capitalisation rate from 7.5 per cent to 7.75 per cent. It is assumed that both buildings are fully pre-committed.

### Costs

Building costs are estimated at \$29.9 million for the conventional building and \$51 million for the ESD building ($CH_2$) 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 eight per cent is adopted for both buildings. Developer's profit is included at 10 per cent.

### Results

The residual studies describe above are illustrated in Table 6. As can be seen, the land value for the conventional building is \$8.75 million and for the ESD building is \$0.3 million (conservative savings) and \$9.2 million (optimistic savings). This hypothetical study indicates that the worth of the ESD building (\$63 to 75 million) is substantially greater than its estimate of price (\$49 million) as suggested by the conventional building.

It should be noted that these are indicative studies only. In time, when ESD buildings are more acceptable to the market, their advantages will be recognised in the additional rent paid by tenants. However, the approach outlined above is suitable for consideration by owner-occupiers.

### Table 6: Residual Studies

| | | Conventional Building | | | $CH_2$ Conservative | | | $CH_2$ Optimistic | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Basis | Value | Calculation | Basis | Value | Calculation | Basis | Value | Calculation |
| **DEVELOPMENT RETURNS** | | | | | | | | | | |
| Floor Area | $m^2$ | 9,373 | | | 9,373 | | | 9,373 | | |
| Gross Rental Value | Rent/$m^2$ | $500 | | | $550 | | | $550 | | |
| Staff Savings | Value/$m^2$ | $0 | | | $35 | | | $120 | | |
| | | $500 | | | $585 | | | $670 | | |
| Outgoings | | $80 | | | $65 | | | $65 | | |
| Net Rental Value | | $420 | $3,936,660 | | $520 | $4,873,960 | | $605 | $5,670,665 | |
| Net Income | | | | $3,936,660 | | | $4,873,960 | | | $5,670,665 |
| Capitalisation Rate | | 8.00% | | ÷0.08 | 7.75% | | ÷0.0775 | 7.50% | | ÷0.075 |
| Capitalised Value | | | | $49,208,250 | | | $62,889,806 | | | $75,608,860 |
| Less Sales Commissions and Costs | | 1.50% | $738,124 | -$738,124 | 1.50% | $943,347 | -$943,347 | 1.50% | $1,134,133 | -$1,134,133 |
| | | | | $48,470,126 | | | $61,946,459 | | | $74,474,733 |
| Less Letting Commissions and Costs | | 15.00% | $590,499 | -$590,499 | 15.00% | $731,094 | -$731,094 | 15.00% | $850,600 | -$850,600 |
| **NET RETURNS** | | | | $47,879,627 | | | $61,215,365 | | | $73,624,133 |
| **DEVELOPMENT COSTS** | | | | | | | | | | |
| **Developer's Allowance for Profit and Risk** | | 10.00% | $4,352,693 | -$4,352,693 | 10.00% | $5,565,033 | -$5,565,033 | 10.00% | $6,693,103 | -$6,693,103 |
| | | | | $43,526,934 | | | $55,650,332 | | | $66,931,033 |
| Building Costs | | | $29,900,000 | | | $51,045,000 | | | $51,045,000 | |
| Consultants' Fees | | 0.00% | $0 | | 0.00% | $0 | | 0.00% | $0 | |
| | | | $29,900,000 | | | $51,045,000 | | | $51,045,000 | |
| Construction Finance | Interest | 8.00% | | | 8.00% | | | 8.00% | | |
| | Construction Period | 24 | $2,392,000 | | 24 | $4,083,600 | | 24 | $4,083,600 | |
| Total Construction Costs | | | $32,292,000 | -$32,292,000 | | $55,128,600 | -$55,128,600 | | $55,128,600 | -$55,128,600 |
| **GROSS RESIDUAL LAND VALUE** | | | | $11,234,934 | | | $521,732 | | | $11,802,431 |
| Less Rates and Taxes | | | | -$100,000 | | | -$100,000 | | | -$100,000 |
| | | | | $11,134,934 | | | $421,732 | | | $11,702,433 |
| Less Holding Costs | Interest | 8.00% | | | 8.00% | | | 8.00% | | |
| | Preconstruction Period | 6 | | -$1,855,822 | 6 | | -$70,289 | 6 | | -$1,950,405 |
| | | | | $9,279,112 | | | $351,443 | | | $9,752,026 |
| Less Land Purchase Expenses | | 6.00% | | -$525,233 | 6.00% | | -$19,893 | 6.00% | | -$552,001 |
| **NET RESIDUAL LAND VALUE** | | | | $8,753,879 | | | $331,550 | | | $9,200,024 |

## Conclusion

The intention of this paper is to examine the business case for sustainable design within the context of the City of Melbourne's new $CH_2$ building. The paper identifies the more common business case decision making tools and also presents a general case for ESD buildings which is based on reduced energy usage (and greenhouse gas emissions) together with increased production productivity, and an acknowledgement of the health and welfare needs of building occupants. The paper also concludes that a 'triple bottom line' model for business case decision making is appropriate for ESD buildings – one that considers and evaluates the financial, environmental and social aspects of a proposed development.

There can be no doubt the City of Melbourne has considered the 'triple bottom line' in its decision making process for the $CH_2$ building. With respect to financial drivers, the project has incurred a significant cost premium of 22 per cent for the sustainability features. However, these features achieve substantial financial savings through major reductions in energy and water use, together with wellbeing and other improvements for occupants such as: reduced absenteeism, reduced churn, reduced stress and increasing the quality of the work environment to support productivity gains by occupants. The optimistic (likely) scenario of anticipated savings is expected to payback the upfront investment cost after approximately 8-11 years, and the internal rate of return over a 50 year time horizon is 15.17 per cent, well above the stipulated criteria of the risk free bond rate x 150 per cent. Importantly, no allowance for future increases in costs (over and above the assumed inflation rate) of energy or employment has been factored into the calculations.

Of the estimated savings, the improved effectiveness and wellbeing of staff represents the greatest saving, and within this category improved productivity is the major driver. Indeed, the 22 per cent investment in sustainability features would not be feasible without this component, as the energy savings alone produce an internal rate of return of only four per cent over 50 years. The $CH_2$ building has provided a strong link between building design, particularly indoor air environments, and production productivity, and in turn this has formed a substantial component of the business case for the development. It will be essential to undertake a post-occupancy analysis of this component to validate the business case and provide further tangible evidence of this aspect of ecologically sustainable building for future developments.

The environmental component of the business case represents more than just energy savings which can be measured in monetary terms (and indeed have been included in the financial component). It is also concerned with being ecologically responsible for future generations. The City of Melbourne has developed a number of environmental criteria (energy level rating, energy reduction targets and use of renewable energy) and the $CH_2$ design conforms to these.

Finally, $CH_2$ provides a leading example of the social drivers of a business case for a proposed development. $CH_2$ has specifically considered the needs and interests of the Council, council staff, ratepayers, central business district businesses and the wider community in its development. For this reason it provides a leading example of the business case for sustainable design for future development projects.

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