Economic analysis of the Better Apartments initiative

SGS Economics & Planning

Final report

Department of Environment, Land, Water and Planning and the Office of the Victorian Government Architect

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Overview

SGS Economics and Planning Pty Ltd (SGS) was commissioned by the Department of Environment, Land, Water and Planning (DELWP) and the Office of the Victorian Government Architect (OVGA) to provide an economic appraisal of the Government's *Better Apartments* initiative. *Better Apartments* will comprise a package of reforms including:

- Better Apartment planning standards that will form part of the Victoria Planning Provisions (VPP)
- Better Apartments design guidelines that will replace the Guidelines for Higher Density Residential Development (DSE, 2004) (the 'Black Book')
- An education program for planners, architects and other built environment professionals
- The publication of materials designed to improve consumer awareness about issues that affect the design quality and amenity of apartments.

The economic appraisal is based on consideration of the recommended *Better Apartments* planning standards only (item 1 above). The central focus of the appraisal was a cost benefit analysis (CBA) of the standards, consistent with the published DTF standard. This was supplemented with a largely qualitative identification of distributional impacts and consideration of the impacts on the construction sector and any flow on impacts on jobs, output and gross value added.
The impacts of the standards on new apartment developments has been assessed with the assistance of architects, quantity surveyors and property market advisors.

The proposed Better Apartments planning standards

The *Better Apartments* planning standards set out objectives and regulations to address 16 elements of apartment design: building setbacks, functional apartment layout, accessibility, storage, windows, room depth, natural ventilation, solar access to communal open space, private open space, communal open space, building entry and circulation, landscaping, energy efficiency, integrated water and stormwater management, waste and recycling, and noise impacts.

The standards will apply to all apartment developments seeking planning approval in Victoria.

Specific measures of note include: requirements for a minimum proportion of apartments to be naturally cross-ventilated; measures to improve natural light to bedrooms; minimum area requirements for private open space; minimum storage areas; and measures to improve accessibility for residents with impaired mobility.

The final Better Apartments standards do not include specific building separation and setback requirements. However for the purpose of assessing their likely impact it was assumed this element would, on average, result in an increase in building separation and setback requirements for new apartment developments. Those areas covered by City of Melbourne Planning Scheme Amendment C270, which include the Hoddle Grid and Southbank, the specific building setback and separation requirements set out in that amendment were applied.

The role of cost benefit analysis in regulatory reform

Major regulatory initiatives in Victoria must be demonstrated to generate a net community benefit. That is, the value of welfare gains by beneficiaries in moving from a business as usual scenario to the new regulatory regime must be shown to be greater than the value of any welfare losses resulting from this shift, when expressed in present value terms. If the regulatory reform delivers a net community benefit in these terms, it is deemed to result in a more economically efficient allocation of Victoria's collective resources than would have been the case under business as usual. As noted, the purpose of this report is to test whether proposed *Better Apartments* standards would represent an efficient regulatory reform.

The principal steps in the cost benefit analysis method include:

1. Differentiating between the outcomes under a 'business as usual' or 'base case' scenario (continuing with existing standards for apartments) and those arising with the regulatory initiative in question (the 'with project' scenario)
2. Identifying the economic, social and environmental costs and benefits that might arise in moving from the 'base case' to 'with project' scenario
3. Quantifying and monetising these costs and benefits, where possible, over a suitable project evaluation period (in this case 20 years)
4. Generating measures of net community impact using discounted cash flow techniques over the 20 year duration; this requires expression of future costs and benefits in present value terms using a discount rate reflective of the opportunity costs of resources diverted to the implementation of the reforms
5. Testing the sensitivity of these measures to changes in the underlying assumptions utilised
6. Supplementing this quantitative analysis with a description of costs and benefits that cannot be readily quantified and monetised.

It is important to note that all impacts of the proposed regulations versus the base case must be taken into account, whether or not they are 'traded' effects or 'externalities'. As the name implies, traded effects have a price in the market. Externalities on the other hand are unpriced costs and benefits sustained by third parties in any market transaction. The cost benefit analysis must account for these impacts even though they are not directly mediated (bought and sold) in the market.

The market effects of the *Better Apartments* planning standards

The identification of costs and benefits for the CBA was based on a series of assumptions about the likely market effects of introducing new apartment design standards. The key assumptions were as follows:

1. Apartment developers are price takers rather than price makers: they cannot set the price for new apartments but are ruled by prevailing conditions in the market. As a result, development proponents will respond to increased construction costs or reduced development yields (due to the new design standards) by either reducing their margin for profit and risk or, more likely, by offering to pay less for the development site in question. Such a reduction in residual land value may cause some apartment projects to become unviable as development site owners may not be prepared to sell their properties at the lower price. However, this would not constitute a permanent loss of apartment supply. The projects which fall out of viability can be expected to become feasible again as apartment prices increase relative to land prices over time.

2. Reductions in average dwelling yields of apartment projects will require more land to be developed to meet demand. It has been assumed that sufficient additional land is available for this purpose. However, consuming more land will reduce the reserve of development capacity for apartments, which is a cost to the community.

3. Given the significant supply of greenfield housing opportunities at Melbourne's urban fringe, it is assumed there will be no net loss of dwelling supply to Victoria as a result of the new standards. Temporary reductions in apartment supply would displace households to alternative locations, ultimately accelerating housing supply on the urban fringe (via reverse vacancy chain effects).

Costs and benefits of *Better Apartments*

In light of these market effects the *Better Apartments* standards are expected to generate the following marginal costs and benefits relative to a business as usual scenario:

Marginal costs		Marginal benefits	
1.	Reduced reserve of development capacity	1.	Improved dwelling amenity for new apartments
2.	Higher apartment construction costs	2.	Better amenity in the public realm
3.	(Temporary) reduction in apartment supply	3.	Reduced water usage/storm-water Infrastructure costs
4.	Increased network infrastructure costs due to displacement of development to the urban fringe	4.	Improved health for apartment residents
5.	Decreased productivity due to displacement of development to the urban fringe	5.	Reduced risk/increased certainty in apartment development
6.	Increased transport externalities due to displacement of development to the urban fringe	6.	Increase in the proportion of apartments that meet higher accessibility standards
		7.	Existence, bequest value and option value (the general community's willingness to pay for better housing choices and a better capital city)
		8.	Enhanced reputation of Victoria as a place of design quality
		9.	Greater community acceptance of urban consolidation.

Due to data and time limitations not all costs and benefits could be quantified and monetised. Cost 6 and Benefits 7, 8 and 9 have been addressed qualitatively.

In estimating the increase in apartment construction costs a 'balanced portfolio' approach was used. This assumes that, without the introduction of *Better Apartments*, a proportion of future apartments would already meet the standards. For these dwellings no additional costs would be incurred. For those apartments that would not meet the standards, the additional construction costs incurred will vary, depending on the degree of non-compliance. This approach provides an estimate of the average additional costs across the entire portfolio of future apartment projects, rather than assuming all apartments will need to be substantially 'upgraded' to meet the new standards. The *average* additional construction cost, per new apartment, is described in the table below.

The CBA considered the net community benefit that might result from the *Better Apartments* planning standards both with and without the accessibility requirements. Improving accessibility of new apartments might be thought of as a separate (but related) policy agenda and, as such, the impact of these measures has been considered separately.

ESTIMATED AVERAGE CONSTRUCTION COST IMPACTS PER APARTMENT

Cost item	Increase for apartments in developments of 5 or more storeys	Increase for apartments in developments of 4 or less storeys
Functional Apartment Layout	$3,100	$2,800
Accessibility	$1,700	$1,500
Storage	$3,900	$3,500
Room depth	$3,800	$3,400
Natural Ventilation	$2,000	$1,800
Private open space	$4,000	$3,600
Communal open space	$1,100	$1,000
Building entries and circulation	$500	$500
Landscape	$2,300	$2,000
Energy, water and resource efficiency	$900	$800
Water management	$2,000	$1,800
Noise	$500	$500
Total	$25,800	$23,200

Source: SGS Economics & Planning Pty Ltd.

CBA findings

Analysis of the recommended *Better Apartments* standards suggests the initiative would deliver a net benefit of $2.0 billion and a benefit cost ratio (BCR) of 1.51:1. This finding suggests the *Better Apartments* planning standards would be economically justified and would constitute an efficient regulatory reform. The table below provides a summary of the cost and benefits expressed in net present value terms.

BETTER APARTMENTS CBA FINDINGS

PV Foregone Reserve Development Capacity	$974,383,100
PV Higher Construction Costs - Apartments	$2,974,990,400
PV Reduced Apartment Supply	$3,299,800
PV Increased Network Infrastructure Costs	$986,300
PV Productivity Loss	$76,424,200
Total Costs	$4,030,083,800
PV Improved Dwelling Amenity	$2,874,393,600
PV Improved Public Amenity	$805,302,900
PV Stormwater Infrastructure	$231,807,700
PV Reduced Apartment Development Risk	$210,893,800
PV Improved Health - Apartment Residents	$1,721,330,600
PV Improved Accessibility Standards	$235,226,800
Total Benefits	$6,078,955,400
Benefit-Cost Ratio (BCR)	1.51
Net Present Value (NPV)	$2,048,871,600

Source: SGS Economics and Planning Pty Ltd. Discount Rate: 4%

Benefits and costs not included in the CBA

Three additional benefits were not included in the analysis but are likely to add to the weight of evidence in support of the proposed reform. These are:

- Existence, Bequest and Option values
- Enhanced reputation of Victoria as a place of design quality, and
- Greater community acceptance of urban consolidation.

In CBAs related to cultural facilities or environmental assets it is routine practice to value non-user benefits as being equivalent to direct user benefits. Were a similar logic to be applied to the *Better Apartments* planning standards, the existence, bequest and option values might be estimated by adding together the Improved Dwelling Amenity and Improved Public Amenity benefits which would provide $5 billion in additional benefits.

Melbourne has an enviable reputation for liveability. Allied to this is Melbourne's reputation as a design capital. This is recognised as an important factor in Victoria's ability to attract and retain knowledge workers as well as win inward investment and tourist visitation. To the extent that the *Better Apartments* will help preserve the substance behind this Melbourne brand, the proposed reforms would deliver significant economic benefits in terms of additional net in-migration, a larger visitor economy and greater investment from other jurisdictions.

By creating better quality apartments, and higher amenity neighbourhoods featuring these apartments, the *Better Apartments* reforms might be expected to mitigate endemic community resistance to housing diversification and densification in established urban areas. If so, the potential supply of housing from the existing urban footprint could be significantly expanded relative to the base case. This implies a range of urban consolidation benefits in the medium to long term.

Increased transport externalities have not been included due to insufficient time to provide a robust comparison of difference in average vehicle kilometre travelled of those household displaced as a result of the temporary reduction in apartment supply. Given the number of household effected is relatively modest it is not anticipated that this cost would be significant.

Distributive effects

The principal beneficiaries of *Better Apartments* will be purchasers and renters of apartments that will be built to higher standards. They will enjoy a significant boost in consumer surplus compared to business as usual. Other significant beneficiaries will be governments and employers to the extent that they enjoy savings in health care costs and/or improved productivity resulting from improved housing standards for occupiers of apartments.

A key group who will be adversely effected will be those purchasers and renters of apartment projects rendered temporarily unviable by the lift in development standards.

The overall distributional impacts are summarised in the table below.

As shown in the CBA, the value of welfare gains by beneficiaries are expected to significantly exceed the value of welfare losses by those parties which are adversely affected.

OVERVIEW OF DISTRIBUTIONAL IMPACTS

Positively affected Victorians	Nature of benefit	Scale of benefit
Purchasers and renters of newly constructed apartments	Boost to consumer surplus as a result of market provision of higher quality apartments	Approximately 178,000 households over 20 years
Government	Reduced health care outlays	Not quantified
Developers	More transparent and efficient approval system for apartments	Over 5,000 projects will be benefited over 20 years
Employers	Improved worker productivity	Not quantified
People with mobility disability	Great choice of suitable housing options	Not quantified
Adversely affected Victorians	**Nature of impact**	**Scale of adverse impact**
Purchasers and renters of marginally viable projects temporarily displaced projects	Foregone preferred housing option	Approximately 1,300 households may be affected
Development site owners	Reduced residual land value due to reduced yield arising from higher standards (separation, apartment size, tree planting, etc.)	Approximately 5,000 property owners may be affected over 20 years
High rise apartment developers in marginal markets	Lost market share to other forms of housing development	Approximately 50 projects could be temporarily unviable, pending underlying land value increases.

Source: SGS Economics & Planning Pty Ltd.

1 INTRODUCTION

1.1 Background

SGS Economics and Planning Pty Ltd (SGS) was commissioned by the Department of Environment, Land, Water and Planning (DELWP) and the Office of the Victorian Government Architect (OVGA) to provide an economic appraisal of the Government's *Better Apartments* initiative.

The Office of the Victoria Government Architect (OVGA) and the Department of Environment, Land, Water and Planning (DELWP) have identified a range of measures for consideration by Government, including regulatory reform that will impact the planning and design of apartment buildings.

The OVGA and DELWP have framed these options with regard to:

1. A study of the impacts of various reform measures on the design project feasibility in case study locations across inner, middle and suburban areas in Melbourne (undertaken by Hayball and Charter Keck Cramer)
2. A desktop study of the relationship between apartment design standards and health and social outcomes (undertaken by the McCaughey VicHealth Community Wellbeing Unit of Melbourne University)
3. Input from a Project Reference Group which includes representation from peak industry, local government and consumer bodies
4. Consideration of submissions from the community and stakeholders on the *Better Apartments – A Discussion Paper* (2015)
5. Feedback received in response to the public exhibition of draft *Better Apartments* planning standards (in August 2016), and
6. Further advice from technical experts and via external review.

In its assessment of the merits of introducing the *Better Apartments* measures, the Victorian Government is advised to consider them in the context of a formal cost benefit analysis (CBA). A CBA measures whether a program, project or regulation will deliver a *net community benefit*; that is, whether the benefits generated for the community as a whole will be greater than the costs generated, regardless of incidence.

Formal CBAs have the advantage of transparency and consistency of methodology. However, their efficacy is constrained when the regulatory reforms in question are anticipated to generate substantial intangible and non-traded effects. In these situations, CBAs can be supplemented by other forms of program appraisal, including Multi-Criteria Analysis (MCA) and Triple Bottom Line (TBL) Analysis. These broader evaluation techniques also facilitate assessment of distributive effects, that is, the incidence of costs and benefits across different groups in the community.

Beyond the net welfare effects of policy initiatives, governments are interested in the economic impacts of any proposed variation to existing laws. This concerns the stimulatory (or dampening) effect that the reform package might have on the Victorian economy, as measured through employment, output and value added outcomes.

Against this background, DELWP and OVGA commissioned SGS in May 2016 to undertake an economic appraisal of the emerging *Better Apartments* planning standards. This initial appraisal considered three different levels of intervention that were described as 'lower', 'moderate' and 'higher' standards.

Drawing on the findings of this preliminary assessment, and feedback received through industry consultation, a refined version of the *Better Apartment* planning standards were produced and placed on public exhibition in August 2016. SGS also provided an economic appraisal of these refined standards.

Following the public exhibition, further refinement to the standards was completed. This report provides an economic appraisal of this most recent version of the *Better Apartments* planning standards.

1.2 The Better Apartments initiative

The government's *Better Apartments* initiative will comprise a package of reforms including:

- Better Apartment planning standards that will form part of the Victoria Planning Provisions (VPP)
- Better Apartments design guidelines that will replace the Guidelines for Higher Density Residential Development (DSE, 2004) (the 'Black Book')
- An education program for planners, architects and other built environment professionals, and
- The publication of materials designed to improve consumer awareness about issues that affect the design quality and amenity of apartments.

Better Apartments will apply to all new apartment developments seeking planning approval in Victoria.

This economic appraisal is based on consideration of the recommended *Better Apartments* planning standards only (item 1 above).

1.3 Objective and scope

The objective of this economic appraisal is to *"test whether the regulatory reforms potentially arising from the Better Apartments project are likely to deliver a net community benefit, without undue shock effects on the Victorian economy, or have unacceptable distributional consequences"*.[1]

The scope of the commissioned economic evaluation included:

1. Review of the emergent package of regulatory reforms for apartments and a qualitative rating of their potential impacts as individual initiatives and in combination, to identify likely key drivers of net community benefit.
2. Development of an economic assessment methodology in consultation with the stakeholder advisory group.
3. Review of the price and supply impacts of changes to apartment standards in NSW (that is, the introduction of SEPP 65), drawing out any implications for reform in Victoria.
4. Preparation of a preliminary CBA, consistent with the published DTF standard, using desk top research to generate the required data.
5. Identification of likely distributional effects and the scope for their mitigation.
6. Scenario specification for the impacts of the reform measures on the construction sector, and simulation, if necessary, of the flow on impacts on jobs, output and gross value added through input output modelling, acknowledging the limitations of an I/O (versus computable general equilibrium) approach in terms of static production functions and assumed spare capacity in the economy.

[1] DELWP project brief.

1.4 This report

This report sets out the draft findings of the economic appraisal of the recommended *Better Apartments* planning standards.

Before determining the costs and benefits associated with the introduction of recommended *Better Apartments* standards, it was necessary to consider the likely market effects of the change, including impacts on dwellings prices, land values and housing supply. These matters are discussed in Chapter 2. The chapter includes analyses of the impacts of SEPP 65 on apartment supply and prices in NSW.

The key features of cost benefit analysis and its role in regulatory reforms within the planning system are outlined in Chapter 3.

The *Better Apartments* planning standards assessed in this report are summarised in Chapter 4 and described in full in Appendix A.

Chapter 5 describes the costs and benefits and the methods by which they have been quantified and monetised.

Chapter 6 sets out the results of the CBA. Potential distributive effects are also outlined.

1.5 Peer review

An earlier draft on this cost benefit analysis was subject to an independent peer review process. A comprehensive response to the issues raise in the peer review was provided to DELWP and the feedback has been taken into consideration in the finalisation of this final report.

2 MARKET EFFECTS OF *BETTER APARTMENTS*

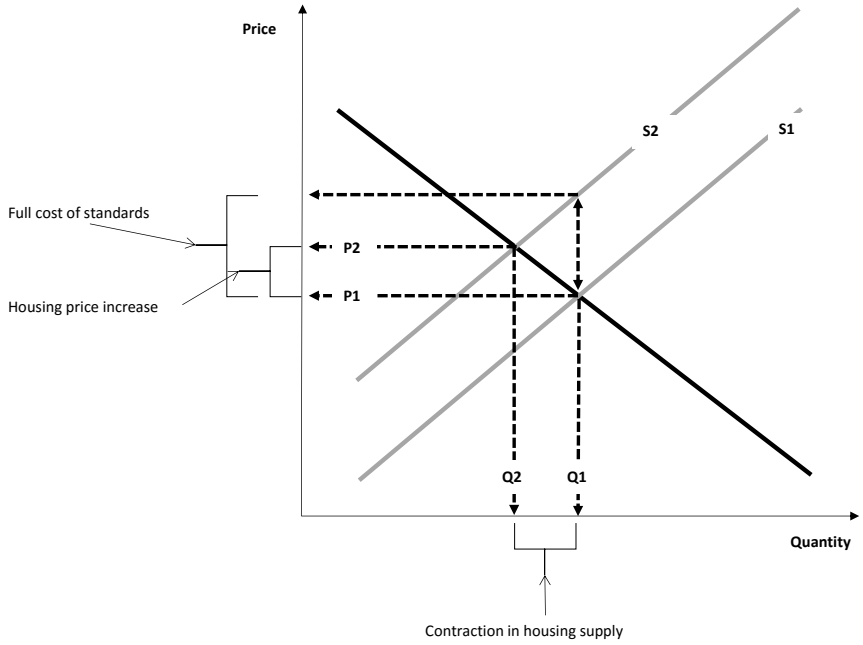
2.1 Overview

Conceptualising the impacts of the *Better Apartments* standards and identifying the costs and benefits, requires consideration of the likely market effects. These include impacts on dwellings prices, impact on underlying land values, and influence on housing supply, in terms of both type and location. This section of the report outlines these issues.

2.2 Market adjustments

If the *Better Apartment* standards mean higher development costs, conventional economic theory suggests that only part of this will be reflected in higher dwelling prices. This is illustrated in Figure 1. Additional development costs are shown in a leftward shift in the supply curve (from S1 to S2). For any given quantity of housing supply, developers in this conceptualisation of the market will require a higher price to cover the additional costs associated with the regulation in question.

FIGURE 1. HIGHER DESIGN STANDARDS IMPACT ON HOUSING PRICE AND QUANTITY



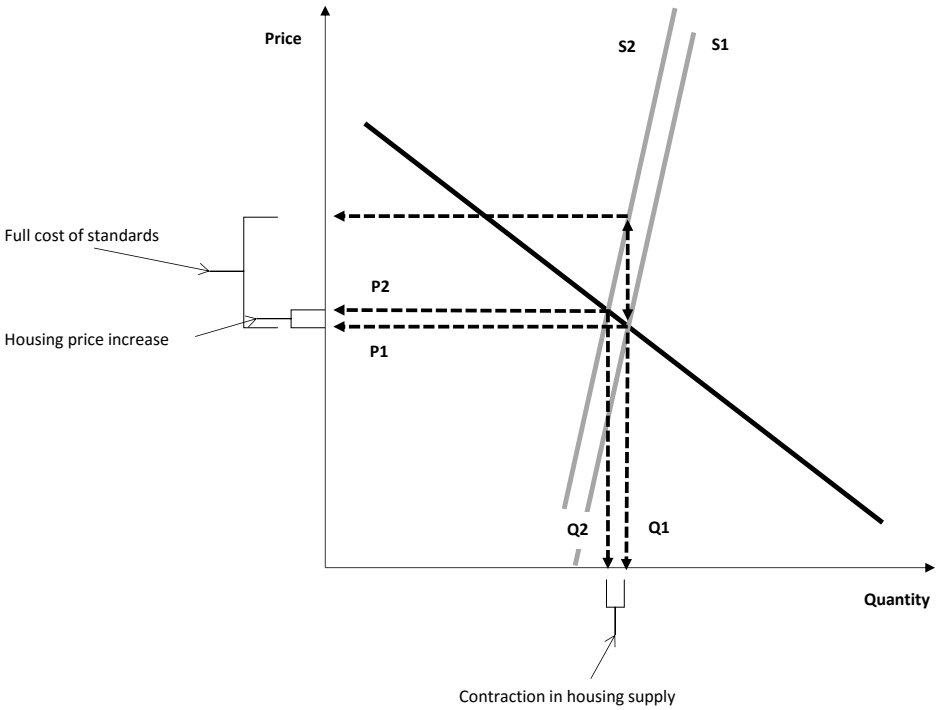
Source: SGS Economics & Planning Pty Ltd

With this leftward translation of the supply curve a new equilibrium price is established (P2 up from P1), and housing supply into the market contracts from Q1 to Q2. It is noteworthy that the increase in price is less than the full amount of the cost impost represented by the new regulations.

It is evident that the extent to which regulatory costs are passed forward depends on the slopes, or price elasticities, of the demand and supply curves. If supply is relatively insensitive to price, that is, supply is

inelastic, a smaller contraction in delivered housing might be anticipated. Moreover, the boost to housing prices would be a smaller proportion of the cost of the regulation. This is illustrated in Figure 2, which shows the same regulatory cost quantum as in Figure 1 but operating in the context of highly inelastic supply.

FIGURE 2. IMPACT OF HIGHER DESIGN STANDARDS ON HOUSING PRICE AND QUANTITY – WITH INELASTIC SUPPLY



Source: SGS Economics & Planning Pty Ltd

As reported by the now defunct National Housing Supply Council and others[2], housing supply in Australia is generally understood to be inelastic.

2.3 Residual land value adjustment

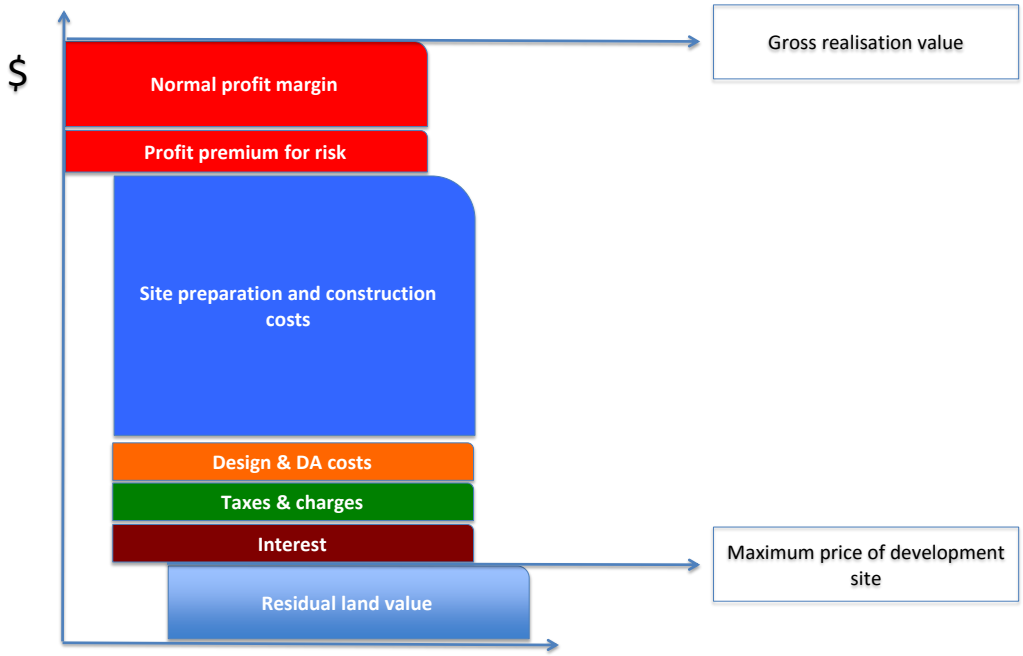
The conceptual framework just described is useful to a point. However, it is limited in its appreciation of the distinguishing features of the apartment development market. In particular, it overlooks the fact that the price of a crucial component of the apartment production function – land – can be seen to be a 'floating' rather than fixed price commodity.

A developer will value a property on a residual basis. That is, as a price taking agent in the market, the developer will pay no more for a site than the residual after all development costs and margins for profit and risk are deducted from anticipated gross realisation upon completion of the project (Figure 3). The *Better Apartments* standards may add to construction costs and/or reduce development capacity of some sites. This will either reduce the gross realisation achievable from projects on these properties (other things equal) and/or add to the expenses that need to be deducted from the gross realisation.

[2] See, for example, Xiangling Liu and Glenn Otto (2014) Housing Supply Elasticity in Sydney Local Government Areas, UNSW Australian School of Business Research Paper No. 2014 ECON 13

The upshot is a reduction in the market value of the land. It could be argued that this would trigger withholding of this land from the development market, leading to reduced housing construction activity as suggested by the basic supply demand analysis set out in Figure 1 and Figure 2.

FIGURE 3. RESIDUAL LAND VALUE



Source: SGS Economics & Planning Pty Ltd

However, two factors need to be borne in mind when contemplating the possibility of development site withholding. Firstly, the sellers of development sites will be operating in a highly competitive market. Any individual seller is the holder of a very small proportion of total development capacity in a district.

Secondly, leaving aside transitional effects – where properties have transacted or are in the process of being transacted during the course of development rule changes – otherwise motivated vendors would have little incentive to withhold sites for as long as there is a sizeable (albeit reduced) margin between the residual land value to a developer-buyer and the value of the land under the next best use.

Prima facie, one might expect that many projects would proceed largely unaffected by the *Better Apartments* standards notwithstanding increases in costs and reductions in yield, as these impacts will be absorbed in residual land value adjustments.

Having said this, some projects that are currently on the margins of viability *will* be rendered uneconomic as the buffer between their residual land value and the market price of their sites in the next best use will be too small. These projects could only proceed after a period of time during which underlying real increases in apartment prices (that is, over and above price increases for other land uses) work to replenish the residual land value buffer required for commercial viability.

2.4 Available land for apartment developments

More stringent regulation of apartment developments will likely reduce the number of apartments that can be built on any given site relative to the existing regulations. If demand for apartments remains constant a decrease in yield will require additional apartment projects to be constructed to satisfy this demand. Additional projects will require additional land to be developed, or existing approvals to be brought to the market earlier, than under a business as usual scenario.

For the purposes of the CBA it has been assumed that there is sufficient land and/or existing approvals to accommodate any increase in the number of apartment projects required to meet demand. Given significant numbers of recent apartment approvals and identified opportunities for apartment development in the central city and nominated activity centres, this is thought a reasonable working assumption.

It might be noted that the implementation of the new residential zones *might* have an impact on the availability of land for new apartments. However a significant proportion of apartment supply occurs on land zoned Capital City, Commercial 1 or 2 or Mixed Use. Provided land with these zonings continues to be available for apartments, this proportion of apartment supply will be largely unaffected by the introduction of the standard residential zones.

2.5 Vacancy chain effects

A key question relates to whether the apartment projects which are temporarily displaced from the bounds of commercial viability would represent an absolute loss of housing to Victoria for the duration of this 'suspension'.

Arguably, non-production of these apartments would trigger a reverse vacancy chain effect under which households that otherwise would have moved into these dwellings will no longer vacate their existing homes thereby denying other households a vacancy opportunity. Ultimately, by this logic, non-production of the apartments in question would lead to the addition of compensating units at the end of the vacancy chain – most likely on the urban fringe.

In this formulation of market effects of the *Better Apartments* standards the total supply of new housing in Victoria would be unchanged, however there would be a shift in the *mix* of housing produced, in terms of both location and dwelling type. Given Melbourne's extensive supply of greenfield land for urban growth, this mix shift but fixed supply formulation would seem to be a reasonable hypothesis.

Past analysis of dwelling supply and migration patterns undertaken by SGS has suggested that each additional dwelling constructed in the City of Melbourne would result in a corresponding reduction in demand for dwellings in greenfield LGAs by a factor of 0.62. (The residual 0.38 reduction in demand would come from other established area LGAs.)

Were this finding applied in reverse it suggests that only 62% of any reduction in apartment supply as a result of *Better Apartments* would be replaced by supply in greenfield LGAs. However, the cost benefit analysis adopts a conservative position (on the high side for costs) by assuming that the reduction of apartment supply would generate a one-for-one increase in greenfield dwelling supply.

2.6 Price/affordability impacts

The upshot of this discussion is that SGS does not expect the introduction of better apartment standards to push prices up per se.

In some interpretations, 'conventional economic theory' would imply that dwelling prices would increase to reflect the additional construction costs implied by the better apartment standards. However, there are several reasons to expect that introduction of new standards would have negligible impact on prices, including that:

- Newly constructed apartments would form only a very small proportion of total dwellings coming onto the market each year, including turnover of existing apartments and houses; this reinforces the 'price-taking' as opposed to 'price-making' situation of apartment developers
- Housing supply in Australia has generally been observed to be inelastic (not sensitive to price), suggesting that any upward pressure on prices as predicted by theory would be modest, and
- Conventional theory does not allow for the fact that the land price paid by developers is, itself, a floating element in the feasibility equation – unlike other commodities, developers have greater opportunity to pass additional costs backwards to land sellers.

For the purposes of economic evaluation it is therefore reasonable to assume that apartment prices are set 'exogenously', in much the same way that world commodity prices are. Cost increases for individual producers are not likely to affect prices for consumers, though they may render some projects unviable. This latter effect has been allowed for in the CBA.

2.7 Evidence from NSW – SEPP 65

Introduced in 2002, State Environment Protection Policy (SEPP) # 65 sets out a series of standards for apartment construction in NSW. Under SEPP 65, apartment projects must be designed by registered architects. Projects of a particular scale are subject to independent design review.

Amongst other things, SEPP 65 addresses minimum floor areas, noise transfer between apartments, car parking standards, access to sunlight and daylight, privacy and environmental performance.

SEPP 65 was launched in 2002 as a set of guidelines, but took on statutory force over the subsequent five years after a series of rulings in the NSW Land and Environment Court, and therefore did not effectively start until 2007.

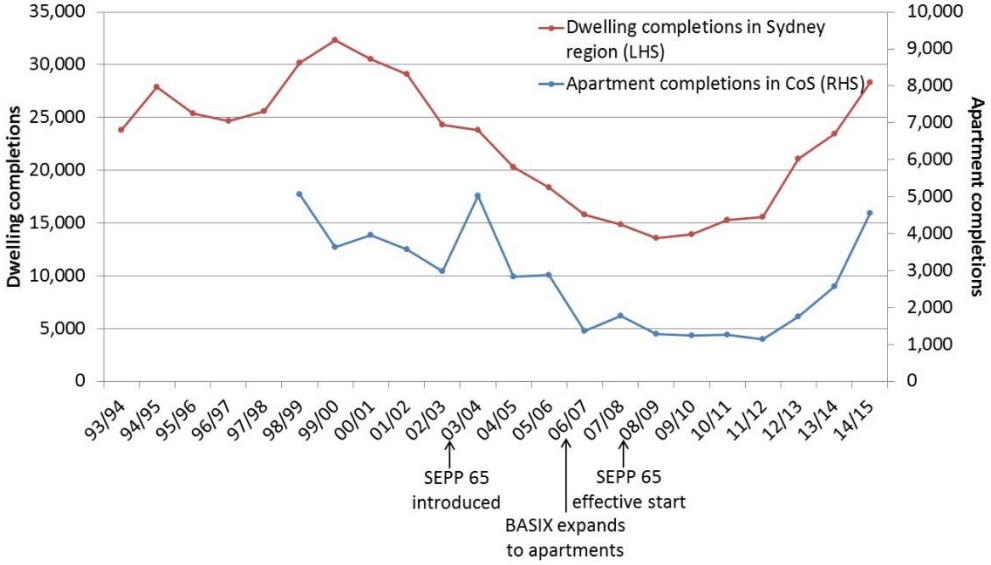
To shed light on the potential market impacts of the proposed *Better Apartments* standards in Melbourne, this sub-section of the report examines the evidence regarding how the SEPP 65 regulations might have impacted housing supply and prices in Sydney. It takes into account data up to Financial Year 2014/15 and the effective start time for SEPP 65, reflected by the policy's ramp up period.

The analysis investigates whether the introduction of SEPP 65 had an impact on attached dwelling prices and attached dwelling supply, and if so, to what the extent. It presents dwelling completion and median price data for the City of Sydney and Greater Sydney before undertaking two statistical techniques to identify whether the introduction of SEPP 65 induced a significant change in supply and price trends.

Housing supply trends

The following chart displays historical dwelling completions in both the City of Sydney LGA and Sydney Region as a whole. As almost all of the new dwellings built in the City of Sydney are apartments, the blue curve can also be seen as a proxy for total housing completions from 1998/99 to 2014/15.

FIGURE 4. DWELLING COMPLETIONS IN CITY OF SYDNEY AND SYDNEY REGION

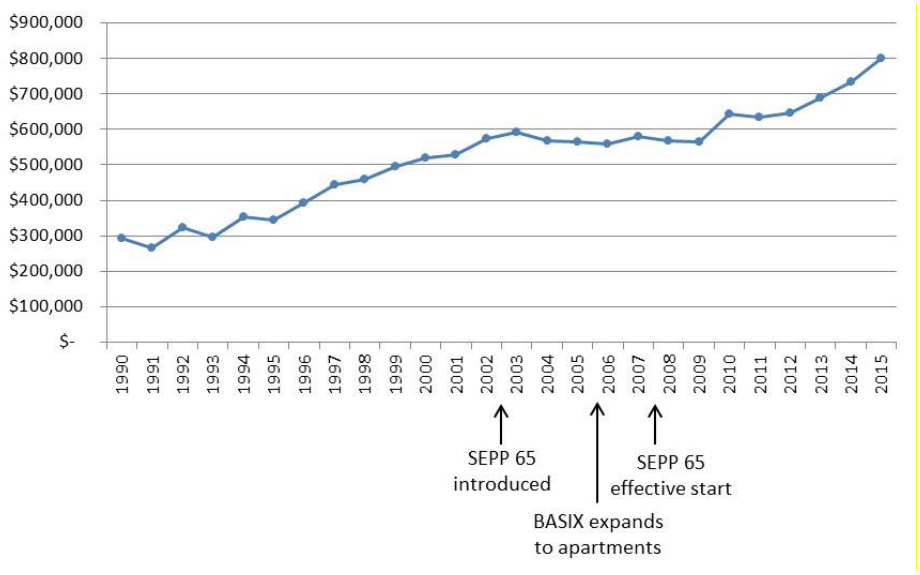


Source: Metropolitan Development Program Housing Completion data, 2003 - 2015

Apartment price trends

The following chart shows the median sales price (in 2015 dollars) of residential strata units in the City of Sydney LGA from 1990 to 2015. Over this period, the real appreciation of median apartment prices in the City of Sydney was around 173 percent.

FIGURE 5. MEDIAN SALES PRICE OF APARTMENTS IN CITY OF SYDNEY, IN 2015$



Source: RPdata, 2016

Impact of SEPP 65

As identified on both charts above, SEPP 65 was introduced in 2002. However, as noted, SEPP 65 only became effective five years later, so any impact which it might have had on prices and volumes will only have occurred from 2007. The Policy was introduced only as a set of guidelines with no significant mandatory force. The requirement to comply with, as opposed to take account of its provisions was stepped up gradually over three to five years as a result of Land and Environment Court rulings[3].

[3] Pers communication, P Cantrill City of Sydney Nov 2014

Moreover, at the point of introduction there will have been a significant pipeline of apartment projects at various stages of approval which had not yet reached construction and marketing stage. This wave of projects will have been immune from any cost boosting effect associated with SEPP 65.

No other significant regulatory interventions occurred around the time of SEPP 65's introduction. However, in October 2005, all new residential apartment buildings were required to comply with the Building Sustainability Index (BASIX).

BASIX is a regulatory scheme requiring all new residential development in NSW to achieve certain targets for reduced water, energy consumption, greenhouse gas emissions and thermal comfort. Compliance with these sustainability measures might be assumed to increase design and construction costs of new dwellings. BASIX was introduced to single dwellings in the Sydney Metropolitan region in 2004. The compliance requirement was extended to all dwelling types in October 2005.

Statistical tests

SGS has applied statistical techniques to investigate whether the introduction of SEPP 65 induced a significant change in supply and price trends.

Specifically, the *Chow test* and the *CUSUM test* were used to determine whether there has been a structural 'break' in the time series; that is, whether there has been a shift in supply or price trends at or after the effective commencement of SEPP 65 during 2007/08 which significantly deviates from previous trends.

Since the apartment completion data for the City of Sydney goes back to 1998/99, which is only four years before the introduction of SEPP 65, these statistical tests were applied to the other two time series; dwelling completions in the Sydney Region and median sales prices of apartments in the City of Sydney LGA. For these two time series earlier data is available.

Chow Test

The Chow test uses regression modelling to identify whether there is a significant difference in either the base level of prices or dwelling completions, or the rate of increase after the effective start of SEPP 65. First, a regression model predicting median strata unit sales prices or dwelling completions as a function of time is generated. Then, a second regression model predicting median strata unit sales prices or dwelling completions (annual) as a function of time, as well as two *'dummy'* variables. One of these dummy variables indicates whether each data point has been observed before or after the effective start of SEPP 65. The other dummy variable indicates whether the rate of increase in median prices has changed after the effective start of SEPP 65. Taken together if the two dummy variables are statistically significant a change in house price or supply trends around this period is indicated. Such a change may be attributed to the effective start of SEPP 65.

The Chow test for median strata unit prices indicates that prices from 2008 onwards were significantly different from the trend observed in previous years. The yearly rate of growth in median prices following SEPP 65 was stronger. Up to 2007, median prices increased by a trend of $21,356 per year. From 2008 onwards, this increased to $25,803 per year. However, this result was not statistically significant.

Meanwhile, trend based median prices were estimated to be $178,151 lower from 2008 onwards compared to the period from 1990 to 2007. This price change moved in the opposite direction of our expectations, and again, was not statistically significant.

Results from the Chow test for dwelling completions in the Sydney Region also showed dwelling completions from 2008 onwards were significantly different from the trend observed in previous years. Regression estimates indicated that after accounting for time trends, there were 47,695 fewer completions per year from 2008 onwards, compared to the period from 1993 to 2007. The probability of

such a shift arising from random chance, rather than any underlying change in trend, was estimated at less than 1 per cent.

However, the yearly rate of growth in dwelling completions was slower prior to the effective introduction of SEPP 65. From 1990 to 2007, the number of dwelling completions decreased by a trend of 597 per year, while from 2008 onwards, this was reversed to an increase of 1,965 per year. Again, the probability of obtaining such a result by chance was estimated at less than 1 per cent. This impact is in the opposite direction to the hypothesised supply suppressing effect of SEPP 65.

CUSUM Test

The CUSUM test uses historical time series data to predict future values in the series. As the time series increases in length, predictions should become more precise, and the prediction 'error' (difference between actual and forecast values) should be stable, or become smaller. If the error becomes significantly larger after a particular time period, this is evidence of a change in the underlying trend of a series, particularly if it exceeds pre-specified statistical bounds.

Figure 6 provides the result from CUSUM test for median strata unit prices in the City of Sydney LGA. This indicates that a structural break may have occurred at or around 2007, as the value of the errors increases significantly in the period from 2007 to 2009, compared to previous forecast years.

figure 7 provides the result from CUSUM test for dwelling completions in the Sydney Region. By contrast, it does not provide strong evidence for a structural break around the time of SEPP 65 becoming effective, with error values remaining well within the statistically specified bounds during the effective commencement of SEPP 65.

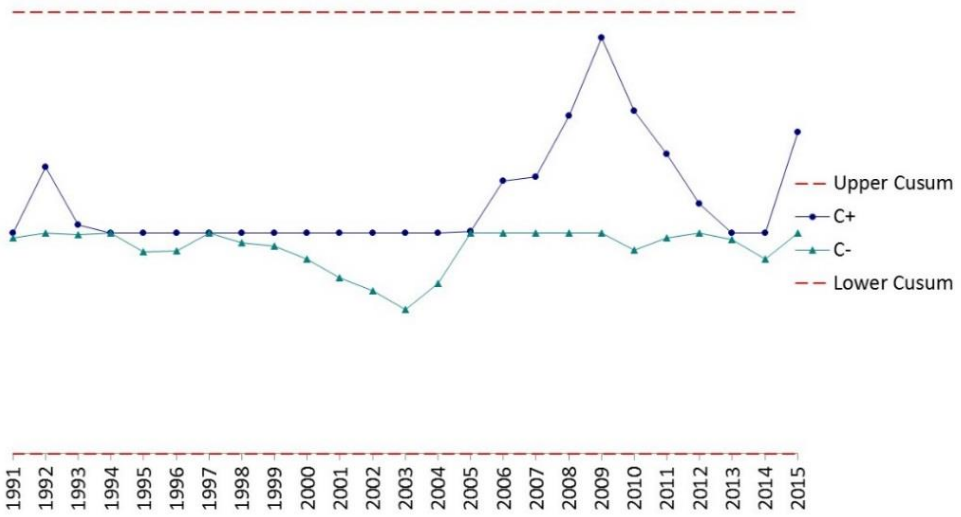
In summary, the CUSUM test provides evidence of a structural break in median strata prices in the City of Sydney LGA coinciding with SEPP 65 becoming effective during 2007. However, the CUSUM test provides no evidence of adverse impacts dwelling completions in the Sydney Region.

Conclusion from statistical tests

The Chow and CUSUM tests are inconclusive with respect to the price boosting and supply suppressing effect of SEPP 65. Taken together, the tests have mixed results; they provide opposing signals as to whether there has been a structural break in both median strata unit prices and dwelling completions. Given these inconsistencies, it is doubtful that SEPP 65 was responsible for any shift that might have occurred.

Other statistical analyses could potentially be undertaken to further probe whether SEPP 65 led to price increases and/or supply suppression in Sydney. For example, time series analysis of differences in apartment approvals and price movements between Sydney and Melbourne might shed light on this issue. However, this additional analysis was beyond the scope of the current study.

FIGURE 6. CUSUM PLOT FOR MEDIAN STRATA UNIT PRICES IN CITY OF SYDNEY



Source: SGS Economics and Planning Pty Ltd, 2016.

FIGURE 7. CUSUM PLOT FOR DWELLING COMPLETIONS IN SYDNEY REGION

Source: SGS Economics and Planning Pty Ltd, 2016.

2.8 Economic impact of *Better Apartments*

Based on our conceptualisation of the market impacts of the *Better Apartments*, particularly the assumptions regarding residual land value adjustment and vacancy chain effects, and the observed impacts of SEPP 65, we conclude that this policy initiative may shift the mix of housing production in Victoria for a period, but not the overall quantum of residential building in the state. Apartment projects which are marginally viable now may be replaced by lower density housing construction via vacancy chain effects.

It is likely that the production function for apartments, particularly higher rise dwellings, will be different from that for lower density housing forms. The latter may be more labour intensive and may make less use of manufactured components and mechanised construction techniques. However, these variations in production process and allied supply chains are not discernible within the 114 sector input output table which SGS constructs for Victoria and Melbourne using ABS data. This table identifies the Residential Building Construction and distinguishes it only from 'Non-Residential Building Construction', 'Heavy and Civil Engineering Construction' and 'Construction Services'.

We have therefore set aside further analysis of economic impacts of the *Better Apartment* initiative. In any case, we would expect these effects to be modest versus a business as usual scenario for Victoria.

Accordingly, the remainder of this report is focussed on the cost benefit analysis of the initiative.

3 COST BENEFIT ANALYSIS

3.1 Net community benefit

Major regulatory initiatives in Victoria must be demonstrated to generate a net community benefit. That is, the value of welfare gains by beneficiaries in moving from a business as usual scenario to the new regulatory regime must be shown to be greater than the value of any welfare losses from this shift, when expressed in present value terms.

If the regulatory reform delivers a net community benefit in these terms, it is deemed to result in a more economically efficient allocation of Victoria's collective resources than would have been the case under business as usual.

As noted, the purpose of this report is to test whether proposed Better Apartments standards will represent an efficient regulatory reform.

We now outline the role of CBA in the development regulation system and the key features of this method of assessing regulatory efficiency.

3.2 Cost benefit analysis and development regulation

Assessing net community benefit of planning scheme amendments

It is likely that, in large part, implementation of new apartment standards will require amendments to all or at least many planning schemes in Victoria.

All planning scheme provisions must be compliant with the Planning and Environment Act and the Victoria Planning Provisions (VPP), including the State Planning Policy Framework.

As set out in Clause 10.02 of the VPP,

> *The State Planning Policy Framework seeks to ensure that the objectives of planning in Victoria (as set out in Section 4 of the Planning and Environment Act 1987) are fostered through appropriate land use and development planning policies and practices which integrate relevant environmental, social and economic factors* ***in the interests of net community benefit and sustainable development*** (emphasis added)

There is no specific guidance given within the Planning and Environment Act, VPP, ministerial directions and attendant departmental publications about the scope of the *net community benefit* test in planning and how it might be applied.

This does not mean there should be a 'free-for-all' in the application of this crucial test, with ad hoc or idiosyncratic interpretations of *net community benefit* prevailing.

Looking more broadly at how regulatory efficiency is maintained in Victoria, there is clear, government endorsed, direction on how to assess *net community benefit*. The *Victorian Guide to Regulation* states that:

> *Given that legislation and regulation can potentially have significant impacts on the parties that it affects, as well as on society, the environment, and the economy as a whole, it is vital that legislative proposals are closely examined to ensure that they represent the best option available to government to meet the relevant policy objective. In Victoria, this is achieved through the adoption of stringent and formalised policy development and evaluation processes, which are based on an* ***analytical cost benefit framework*** *that examines the economic, social and environmental impacts of the legislative proposals*[4]*.*

There is no reason, in principle, why proposed planning regulations should be treated differently to any other form of regulation in terms of how *net community benefit* is defined and measured. Indeed, as discussed below this has been endorsed by a recent Parliamentary Enquiry into Victoria's regulatory impact assessment process.

Planning scheme amendments are statutorily exempt from Victoria's Regulatory Impact Statement (RIS) process. This is because the planning system has its own legislated processes for formal public consultation on scheme amendments including, in most cases, independent enquiry into the net community benefit of such proposals.

Exemption from the RIS process does not imply that cost benefit analysis is ill-suited to the assessment of *net community benefit* of planning scheme amendments. Exemption from RIS processes simply reflects the imperative to avoid duplication in the appraisal of regulatory initiatives, including planning scheme amendments.

The 2013 *Inquiry into the Regulatory Impact Statement Process* undertaken by the Legislative Council Environment and Planning Legislation Committee (Report No. 2, November 2013) agreed that "subjecting planning scheme amendments to the RIS process would to some extent duplicate the existing assessment and consultation requirements of the PEA and has the potential to add unnecessary delay" (page 60).

However, the Committee concluded that the process for consideration of scheme amendments within the planning system should be amended to require the preparation of rigorous cost benefit analysis, as occurs in the RIS system. More specifically, the Committee recommended that:

> *"That the Minister for Planning, in consultation with the Victorian Competition and Efficiency Commission, amend Ministerial Direction 11 (Strategic Assessment of Amendments) to require a cost-benefit analysis for significant changes to planning schemes." (Recommendation 13, page 60)*

CBA logic

As noted that there is an established discipline and method for conducting such analyses. This is common to all Australian jurisdictions. In Victoria, guidance on how to prepare a cost benefit analysis of a regulatory initiative is provided by the Department of Treasury and Finance (DTF)[5].

In short, a cost benefit analysis must address the full spectrum of environmental, social and business impacts of the proposal at hand. Positive and negative effects are quantified and monetised (expressed in dollar terms) as far as possible and then compared to arrive at a conclusion as to whether the proposal is likely to make the community better off, or worse off, in net terms compared with persevering with business as usual conditions.

The principal steps in the generic cost benefit analysis method (see Figure 8) include:

[4] Department of Treasury and Finance (DTF) (2014) Victorian Guide to Regulation, page 2
[5] DTF Victorian Guide to Regulation; Toolkit 2: Cost benefit analysis; Updated July 2014

1. Differentiating between the outcomes under a 'business as usual' or 'base case' scenario (for example, continuing with existing standards for apartments) and those arising with the regulatory initiative in question (the 'with project' scenario)
2. Identifying the economic, social and environmental costs and benefits that might arise in moving from the 'base case' to 'with project' scenario
3. Quantifying and monetising these costs and benefits, where possible, over a suitable project evaluation period (in this case 20 years)
4. Generating measures of net community impact using discounted cash flow techniques over the 20 year duration of the regulation; this requires expression of future costs and benefits in present value terms using a discount rate that is reflective of the opportunity costs of resources diverted to the implementation of the reforms
5. Testing the sensitivity of these measures to changes in the underlying assumptions utilised
6. Supplementing this quantitative analysis with a description of costs and benefits that cannot be readily quantified and monetised.

It is particularly important to note that *all* impacts of the proposed regulations versus the base case *must* be taken into account, whether or not they are 'traded' effects or 'externalities'.

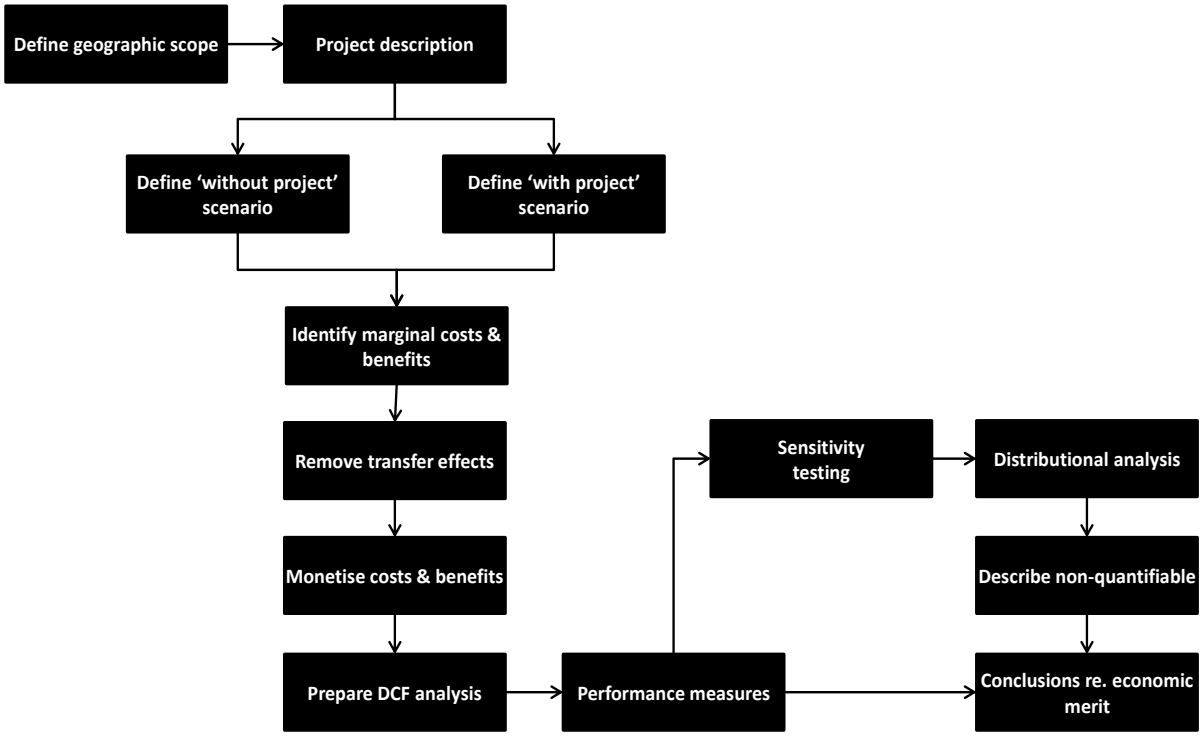
As the name implies, traded effects have a price in the market.

Externalities on the other hand are unpriced costs and benefits sustained by third parties in any market transaction. The cost benefit analysis must account for these impacts even though they are not directly mediated (bought and sold) in the market. The monetised value of these external effects needs to be imputed using a variety of techniques as advised by DTF in its *Cost Benefit Analysis Tool Kit*.

Another vital characteristic of CBA in the context of the *Better Apartments* initiative is that the community benefit delivered by this regulatory initiative is judged by reference to the *'Kaldor-Hicks'* rule. This states that the initiative in question is worth undertaking if the gain in welfare by the beneficiaries is greater than the loss in welfare for those adversely affected. In other words, the regulatory initiative would be warranted if the beneficiaries could, if required, compensate those adversely affected and still be better off. This is where the term *'net' community benefit* comes from. Whether such compensation is actually paid is not material.

The *'Kaldor Hicks'* rule differs from the *'Pareto'* test which is sometimes invoked in town planning practice. The Pareto test is that an initiative is *only* warranted if there are *no* losers in the process. The Pareto test is not sanctioned in regulatory impact assessment because it places an unworkable onus of proof on the economic merits of regulatory change.

FIGURE 8. COST BENEFIT ANALYSIS METHOD



Source: SGS Economics & Planning Pty Ltd

Common errors and misapplications in cost benefit analysis

There are some common pitfalls in assessment of *net community benefit* in matters of planning regulation. One is to confuse 'economic impact' with 'economic benefit'. The former deals with the commercial flow on effects of an initiative or program (sales made, people employed, suppliers contracted and so on), while the latter relates to an improvement in community welfare.

By way of illustration, a $10 million construction contract to dig a long trench then fill it up again would generate the same economic *impact* (that is, multiplier) as a $10 million contract using the same equipment and workers to undertake earthworks for the improvement of a parkland. The economic *benefit* from the latter is clearly superior to the former.

Another pitfall is to construe construction and operational jobs as a 'benefit' of a proposal whereas they are typically factored into cost benefit analyses as a cost. This is because the labour in question has an opportunity cost – it could be deployed elsewhere to produce benefits for the community were it not for the project at hand. Employment is usually only counted as a benefit when the project creates jobs for people who would otherwise be permanently unemployed or underemployed.

For these reasons, amongst others, the DTF advises that the use of economic multipliers should generally be avoided in economic (CBA) evaluations.

A third common misapplication of economic thinking to the *net community benefit* test in urban planning issues is to implicitly or explicitly confine the analysis to the local district or host region of the development in question. Again, in line with usual advice offered by jurisdictional Treasuries, the frame for assessing *net community benefit* should be set at the state jurisdiction level. To do otherwise runs the risk of patently illogical findings; that is, a *net community benefit* may be found for the local area, but this might be more than offset by transfers or external costs for neighbouring communities or the host metropolitan area or state.

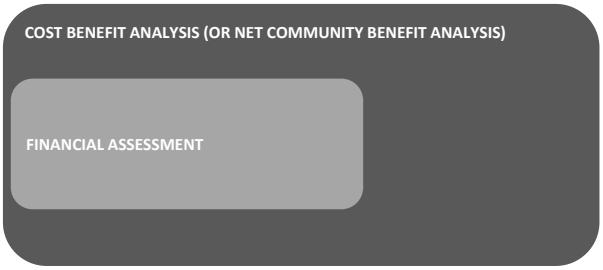
The upshot, in the case of the *Better Apartments* reforms is that it must be demonstrated to generate a *net community benefit* at the level of the state and not necessarily at the local or district levels.

Distinguishing financial and cost benefit analysis

Financial analysis is sometimes confused or conflated with CBA. Financial analysis is undertaken from the narrow perspective of an investor, or buyer, or seller in the market and only tracks market transacted costs and benefits. It also takes into account tax liabilities. In contrast, CBA is undertaken from a society wide perspective and, as noted, considers all impacts on welfare, whether priced or unpriced. Moreover, because CBA is concerned with net effects, tax impacts are typically set aside as they are simply transfers within the wider community.

Accordingly, financial analysis can be seen to be a subset of CBA or *net community benefit* assessment.

FIGURE 9. FINANCIAL VERSUS COST BENEFIT ANALYSIS (NET COMMUNITY BENEFIT ANALYSIS)



Source: SGS Economics & Planning Pty Ltd

4 PROPOSED *BETTER APARTMENTS* REFORMS

4.1 Overview

This chapter describes the Recommended Better Apartments Standards on which the economic appraisal is based.

4.2 Scope

Current regulation of planning and building standards for housing in general and apartments in particular in Victoria is not uniform in scope. Lower-rise apartment buildings up to four storeys in scale are subject to the 'ResCode' which cover a range of site planning and dwelling amenity parameters, including site coverage, private open space provision, building setbacks, privacy and overshadowing. Apartments in buildings of five or more storeys are not covered by these provisions; however they must comply with the building standards set out in the National Construction Code and the Guidelines for Higher Density Residential Development (DSE, 2004). All apartment development may be subject to additional design guidelines and policies adopted by the host municipality.

Better Apartments will comprise a package of reforms intended to apply to the full spectrum of apartment types from small, low-scale infill projects through to major high-rise towers. The package has five elements:

- Better Apartment planning standards that will form part of the VPP (see Appendix A)
- Better Apartments design guidelines that will replace the Guidelines for Higher Density Residential Development (DSE, 2004) (the 'Black Book')
- An education program for planners and professionals
- The publication of materials designed to improving consumer awareness about issues that affect the design quality and amenity of apartments.

This economic appraisal is based on consideration of the recommended *Better Apartments* planning standards only (item 1 above). It compares the proposed Better Apartment Standards to a Base Case which assumes the continuation of the current regulatory regime for high-rise apartments in Victoria.

4.3 Details of *Better Apartments* planning standards

The *Better Apartments* planning standards set out objectives and regulations to address 16 elements of apartment design: building setbacks, functional apartment layout, accessibility, storage, windows, room depth, natural ventilation, solar access to communal open space, private open space, communal open space, building entry and circulation, landscaping, energy efficiency, integrated water and stormwater management, waste and recycling, and noise impacts.

The standards will apply to all apartment developments seeking planning approval in Victoria.

Specific measures of note include: requirements for a minimum proportion of apartments to be naturally cross-ventilated; measures to improve natural light to bedrooms; minimum area requirements

for private open space; minimum storage areas; and measures to improve accessibility for residents with impaired mobility.

The final Better Apartments standards do not include specific building separation and setback requirements. However for the purpose of assessing their impact it was assumed this element would, in general, result in an increase in building separation and setbacks for new apartment developments relative to business as usual. Those areas covered by City of Melbourne Planning Scheme Amendment C270, which include the Hoddle Grid and Southbank, the specific building setback and separation requirements set out in that amendment were applied.

The impacts of the standards on new apartment developments has been assessed with the assistance of Hayball architects, WT Partnership quantity surveyors and property market advisors Secret Agent and m3property.

5 COSTS AND BENEFITS

5.1 Overview

The chapter described the costs and benefits that have been considered in the CBA. It should be read with reference to the preceding chapter on Market effects of the *Better Apartments* initiative.

5.2 Costs

The *Better Apartments* initiative is expected to generate marginal costs versus the Base Case of six types:

1. Reduced reserve of development capacity
2. Higher construction costs
3. Temporary reduction in apartment supply
4. Increased network infrastructure costs
5. Decreased productivity
6. Increased transport externalities.

Reduced reserve development capacity

The reform case introduces regulations which will reduce the floorspace yield or envelope achievable from the stock of land available for apartment developments in Victoria. This, by itself, does not necessarily mean that fewer apartments will be built, though this may happen for other reasons (see below). However, more developable land will be consumed to produce a given quantity of apartments compared to the Base Case. Such a reduction in reserve development capacity is a resource cost to Victoria.

Higher development costs for apartments

Some of the proposed regulations in the reform case is likely to increase construction costs. Higher ceiling heights or minimum storage requirements, for example, will increase material costs and construction time/costs.

As discussed earlier in this report, apartment developers will generally be price takers. Consequently these additional costs may be passed backwards to land sellers for viable projects. Nevertheless, it would cost Victoria more – in labour and materials – to build the same quantum of housing versus the Base Case.

Reduced apartment supply

Marginally viable apartment projects – that is, those where the residual land value does not offer a sufficient premium on the market value of the site in question under the next best use – will be rendered unviable for the length of time it takes for underlying land price increases (for apartments) to reinstate a suitable premium. This reduction in housing supply may be offset by the addition of housing projects elsewhere (namely on the urban fringe) as a result of vacancy chain effects. However, this shift in the *mix* of housing supply will represent foregone value in housing *services*, to the extent that the replacement housing offers services of lesser quality as measured by, say, rent per square metre.

Increased infrastructure costs

Any displacement of housing supply to the urban fringe through vacancy chain effects will trigger the need to provide the required support infrastructure for this housing in greenfield areas. To the extent that the marginal infrastructure costs of accommodating a dwelling on the fringe is greater than that for an infill dwelling, there will be a net cost for Victoria.

Decreased productivity

The displacement of housing supply to the urban fringe will result in a lowering of the labour productivity of affected households relative to the Base Case. Households at the urban fringe are, on average, less productive than households located in middle ring and inner city locations. This reduction in productivity will be a net cost for Victoria.

Increased transport externalities

The displacement of housing supply to the urban fringe will result in higher private vehicle usage relative to the base case. Higher vehicle kilometres travelled (VKT) will increasing households travel costs and the externalities (pollution, collisions, and so on) associated with car use. Travel costs are mostly reflected in the reduction in housing services (see Reduced Apartment Supply above) but the externalities are not accounted for.

5.3 Benefits

The offsetting benefits of the Better Apartments reforms are anticipated to include:

1. Improved dwelling amenity
2. Better amenity in the public realm
3. Reduced storm water runoff and water consumption
4. Improved health for apartment residents
5. Reduced risk in apartment development, due to greater planning certainty
6. Higher levels of accessibility in new apartments
7. Existence, bequest value and option value
8. Enhanced reputation of Victoria as a place of design quality
9. Greater community acceptance of urban consolidation.

Improved dwelling amenity

Occupiers of newly constructed dwellings under the Reform Case regulations will enjoy a number of benefits versus their counterparts in the Base Case, including improved privacy, better daylighting, better ventilation and better solar access.

Improved amenity in the public realm

Regulation of building separation, overshadowing, improvements to building entries and the provision of deep soil planting under the Reform Case will improve the quality of the public realm from a perspective of pedestrians and the public more generally.

Reduced storm water runoff and water consumptions

The proposed changes to apartment design standards are intended to reduce storm water run-off and water consumption. These changes can be expected to generate cost savings via reduced expenditure on storm water infrastructure and reduce water use.

Improved health for apartment residents

It is hypothesised that apartments that are well ventilated, have good solar access, privacy and thermal comfort are conducive to better health outcomes for residents. DELWP and the OVGA commissioned separate research investigating this thesis.

Reduced risk in apartment development, due to greater planning certainty

There is currently no consistent approach to planning and design standards for high-rise apartments in Victoria. This leads to uncertainty in the development approval process which, in turn, leads to elevated risk and the associated cost premium. Greater consistency and predictability in standards could reduce this risk premium.

Higher levels of accessibility in new apartments

Higher accessibility standards have been introduced as part of the *Better Apartments* planning standards. These provide for additional design requirements for doorways, passageways and the dimensions of bedrooms and bathrooms that would be applied to most new apartments (25% of two bedroom dwellings would be exempt from these requirements). These standards will increase the proportion of new apartments that can be occupied by, or visited by, individuals with impaired mobility, providing a benefit to the Victorian community.

Existence, bequest value and option value

The research literature on the value of unpriced cultural and environmental assets, such as conservation of special habitats (Great Barrier Reef, bio-diversity in the Murray River, retention of old growth forests), preservation of historic buildings and sites and construction of major museums and arts institutions shows that non-users (or non-visitors) are typically willing to pay amounts of roughly the same order as users of (or visitors to) to such resources. This willingness to pay on the part of 'external constituencies' stems, in part, from a citizen's pride in a well-planned, liveable home or capital city versus a city of poorer quality. This is known as 'existence value'. For related, but different reasons, citizens appear to be willing to pay to bequeath a better quality city to future generations. Meanwhile, option value refers to the fact that Victorians may welcome higher apartment design standards as this will expand their future housing choices.

If the Reform Case is seen to preserve or enhance Melbourne's liveability versus the Base Case, this can be expected to produce a material improvement in welfare for Victorians, above and beyond the impacts listed above.

Enhanced reputation of Victoria as a place of design quality

Melbourne has an enviable reputation for liveability. Allied to this is Melbourne's reputation as a design capital. This is recognised as an important factor in Victoria's ability to attract and retain knowledge workers as well as win inward investment and tourist visitation.

To the extent that the Reform Case will help preserve the substance behind this Melbourne brand – quality streets, diverse built form, commitment to good design, and so on – the proposed reforms would deliver economic benefits versus the Base Case in terms of net in-migration, a larger visitor economy and greater investment from other jurisdictions.

Greater community acceptance of urban consolidation

By creating better quality apartments, and higher amenity neighbourhoods featuring these apartments, the *Better Apartments* reforms might be expected to mitigate endemic community resistance to housing diversification and densification in established urban areas. If so, the potential supply of housing from the existing urban footprint could be significantly expanded relative to the base case. This implies a range of urban consolidation benefits in the medium to long term.

5.4 Projected apartment supply between 2016 to 2036

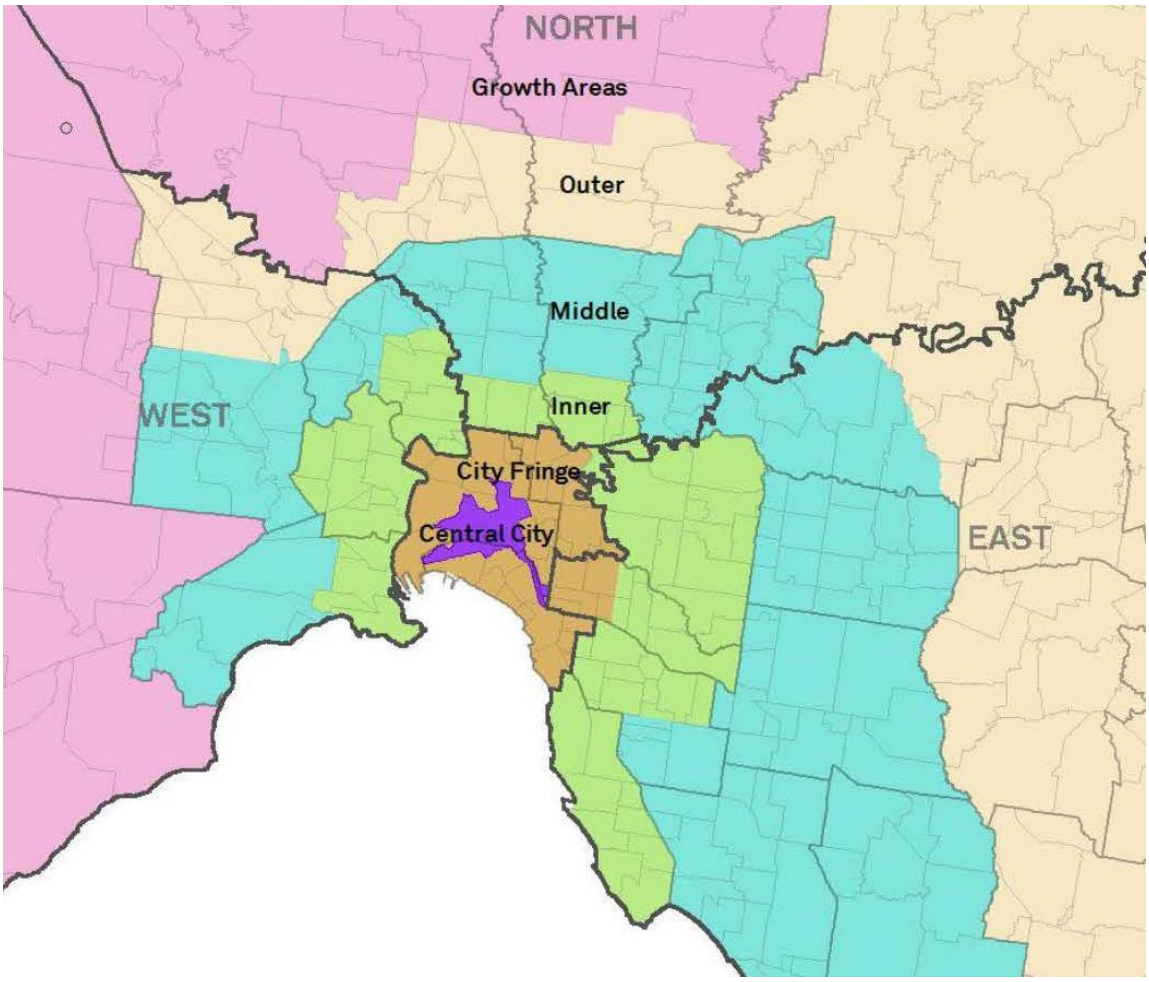
The projected supply of apartments for the CBA is based on a share of the Victoria in the Future (VIF) 2014 dwelling forecasts for Metropolitan Melbourne. The total net additional dwellings forecast for the Melbourne Metropolitan area to 2036 is 768,000.

For the purpose of the CBA the split of dwelling between high-rise apartments (developments of 10 or more storeys), mid-rise (5 to 9 storeys), low-rise (4 storeys or less) and other dwelling types (non-apartments) was 61,000, 57,000, 58,000 and 610,000 respectively. This split is based on that evidenced in past dwelling supply for the period 2008-2014.

Apartments were estimated to be 23% of the total supply of new dwellings for the evaluation period.

These projections suggest that 63% of future apartment supply will be in the Central and Central Fringe regions (see map below), 20% in the inner regions, 14% in the middle region and the remaining 3% will occur in Outer, Growth or Other areas.

FIGURE 10. APARTMENT SUPPLY REGIONS



Source: CKC, 2015.

5.5 Quantification and monetisation

The measurement strategies, principles and assumptions used to quantify and monetise the marginal costs and benefits described above are described in Table 1.

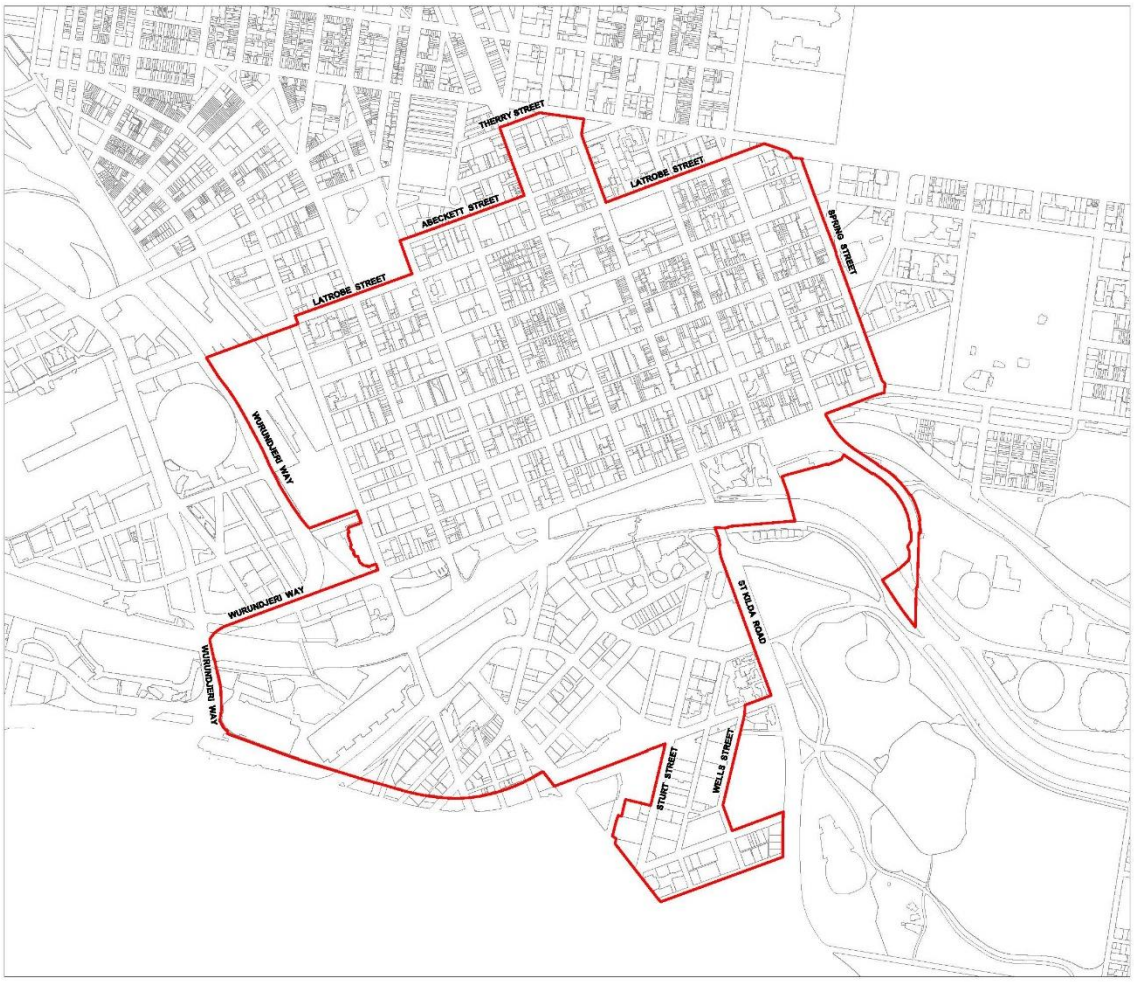
A few points to note in relation to the assumptions and approach:

- For developments in the areas covered by the City of Melbourne Planning Scheme Amendment C270 (see figure below) the specific setback and separation requirements set out in that amendment have been applied in the analysis.

- As a result of difference in average construction costs for different scales of apartment development, different cost assumptions have been used for apartment developments of five or more storeys, and apartment developments of four or fewer storeys.

- The higher accessibility standards set out additional design requirements for doorways, passageways and the dimensions of bathrooms. In considering the introduction of Disability Standards and amended Access Provisions of the Building Code, the Australian Building Codes Board (ABCB) found a 'cost effective' set of standards would result in a BCR of 1.23:1. In the absence of more rigorous analysis of the accessibility measures in Better Apartments, the BCR identified by the ABCB was used as a guide for the likely benefits that might be expected relative to the additional construction costs incurred.

FIGURE 11. CITY OF MELBOURNE PLANNING SCHEME AMENDMENT C270 AREA



Source: DELWP, 2016

TABLE 1. METHODS FOR QUANTIFYING AND VALUING COST AND BENEFITS

COSTS			
Impacts	**Measurement and monetisation strategy (and rationale**	**Method**	**Assumptions**
1. Foregone reserve development capacity	The amount (m^2) of land which is developable for high-rise apartments in 2036 will be less than what it would have been under the Base Case, because of reductions in yield implied by the higher design standards. The reduced stock of developable land may can be valued at an average per square metre rate in 2016 $s.	Estimated the net change in number of apartment projects likely to be undertaken in 2016 – 2036, by applying an assumption about the average reduction in yield. Yield reductions based on Hayball advice. Estimated the amount of residential land in square metres that would be used in the Reform Case versus the Base Case. Valued the difference in land used by applying a generic rate per square metre.	Average reduction in apartment yield: – Apartment developments in the area covered by City of Melbourne Planning Scheme Amendment C270: 17% – All other projects: 10%
2. Higher construction costs for apartments	Higher standards can directly increase construction costs per square metre of sellable floor space in high-rise residential buildings	Consulted with Hayball and WT Partnership to understand those changes to the standards that likely to affect construction cost (as opposed to yield), and by what margin. Estimated an average cost increase provision per apartment. Construction cost estimates were based on a 'balanced portfolio' approach that assumes without *Better Apartments* some apartments would comply with some (or all) of the BA standards. The additional construction costs are an estimate of the average additional expenditure per dwelling that would be required to ensure all apartments meet the standards. Source average apartment construction costs (per unit) from WT Partnership.	Average increase in apartment construction cost as a result of the Better Apartments standards was estimated as follows: Apartments in developments of five or more storeys: $25,800 Apartments in developments of 4 storeys or less: $23,200 See Appendix B for more detailed breakdown of these costs.

3. Reduced apartment supply	Some projects which are viable in the Base Case may no longer be viable in the Reform Case because of a reduced margin between RLV and the value of the development site in the next best use.	*Intended method:* Consult valuers to confirm the industry rules of thumb for margin between RLV of an apartment project, versus land value under continuing current use. Impute the RLV of all high-rise projects undertaken in Melbourne in the latest full year of data availability, by applying a generic RLV rate per m^2 of sellable floorspace For each project, compare the imputed RLV with the value of the host site (assuming continuing current use and capital improvements) by applying generic rates per m^2 of floor area or land area. Re-estimate the RLV of completed projects assuming the reduction in yield and increase in construction costs implied by the higher design standards in the reform case. Compare these recalculated RLVs with value of the host sites under continuing current use and development as estimated above, and test for the required margin. From this estimate the number of projects (and apartments) that will be rendered unviable. Apply an underlying real growth rate for gross realisations of apartments to estimate the length of time before unviable projects become viable again. Apply the ratio for lost projects and 'apartment years' identified in the above analysis to the projected production of apartments in Melbourne. Assume that these lost 'apartment years' will be replaced with 'house years' in greenfield areas. Calculate the average aggregate rent difference between an apartment year and a house year per unit. Estimate the ongoing loss of housing services by applying the average rent difference to the annual loss of apartment years.	In the absence of reliable valuations data it was not possible to calculate loss of apartment projects (lost 'apartment years'). To estimate the lost apartment years it was assumed that 5% of the annual supply of apartments would be postponed during the first year of the evaluation period, 4% of supply in the second year, 3% in the third year, 2% in the fourth year and 1% in the fifth year. (By year six it is assumed that all apartment projects made unviable by *Better Apartments* would have returned to being viable as a result of the growth in apartment prices.)

4. Increased network infrastructure costs	An increase in housing construction on the urban fringe will encounter higher network infrastructure costs relative to those in established urban areas.	Researched the cost difference in supplying network infrastructure to accommodate a dwelling on the urban fringe versus in an infill situation. Converted this to an annualised amount assuming an average infrastructure life 50 years. Applied the annualised cost to the lost apartment years calculated for Cost 3 above.	The difference in the median network infrastructure cost per dwelling for infill and greenfields development is in the order of $60,000 per dwelling over the lifetime of the infrastructure (assumed to be 50 year) (Infraplan, 2013). An assumption of $40,000 difference in infrastructure cost per dwelling was applied in the CBA.
5. Decreased labour productivity	Any increase in households at the urban fringe will result in a marginal decrease in productivity as, relative to the base case, a proportion of workers will be displaced from more productive locations.	Calculate the number of workers displaced from inner and middle ring locations to the urban fringe based on the 'lost apartment years' assumptions for Cost 3 (Reduced apartment supply). Calculate marginal decrease in productivity by comparing productivity of workers in LGAs where 'apartment years' will be lost, to that of workers in LGAs on the urban fringe. This approach assumes the loss of apartment years results in similar geographic shifts in employment from established areas to the urban fringe. This equivalence is unlikely in practice as some displaced households may simply travel further to access employment. This cost is therefore likely to be conservative on the high side.	GVA per annum per employee: - CoM: $145,333 - City fringe: $100,949 - Suburban: $88,769 - Greenfield: $77,802 Assumed 1.9 workers per household.
6. Increased transport externalities	Any increase in households at the urban fringe will result in a marginal change in vehicle kilometres travels by households relative to the base case.	Compared the average VKT per household in LGAs where 'apartment years' will be lost, to that of households in LGAs on the urban fringe. Multiplied additional VKT per annum by lost apartment year by per kilometre cost of transport externalities.	Not quantified.

BENEFITS			
Impacts	**Measurement and monetisation strategy (and rationale**	**Method**	**Assumptions**
1. Improved dwelling amenity	Better quality apartments can be expected from application of the higher design standards. However, prices will still be determined by the market. Purchasers/occupiers of apartment projects which do go ahead can therefore expect an increase in consumer surplus	Commissioned statistical analysis of apartment sales and attributes to determine the impact on dwelling prices of selected dwelling features: sunlighting/daylighting, separation/privacy, cross-ventilation and outdoor space. Analysis was based on 886 apartment sales in 12 buildings of five or more storeys and 510 Apartments in 20 buildings of 4 storeys or less. Apartments were classified as Grade A, B and C based on the presence of the attributes listed above. Identified premiums were applied to the median price for apartments (2016) for the projected production of apartments during 2016-2036.	Additional consumer surplus: Type B apartment to Type A: / Type C apartment to Type B: Five storeys+: 9% / 9% Four storey or less: 14% / 7% Mix of apartments: Grade: / Base Case: / Project Case: Grade A / 16% / 30% Grade B / 24% / 50% Grade C / 60% / 20%
2. Better amenity in the public realm	Improved street amenity can be anticipated by reduced perceived building bulk for pedestrians and more extensive, deep soil, tree planting.	Treat better apartment buildings as offering amenity benefits similar to those experienced in heritage or culturally significant precincts featuring heritage/cultural asset. The Allen Consulting Group previously assessed the willingness to pay (WTP) for the conservation of built heritage at $105 per person, per annum. Of this total $13.57 was an individual's willingness to pay for more stringent development controls for allowable modifications to heritage assets.	This WTP for more stringent development control identified by Allen Consulting was applied to the population of Melbourne for each year of the evaluation period. 20% was deducted to account to reflect a 'risk premium' that the more flexible approach in the latest standards might not achieve the same level of benefits (as the previous, less flexible approach).

3. Reduced storm water runoff and water consumptions.	Changes to apartment design standards are intended to reduce storm water run-off and water consumption providing cost savings through reduced expenditure on storm water infrastructure and reduced water use.	SGS previously undertook a review BCRs for water sensitive urban design and energy efficiency measures. This review found the BCR of these initiatives ranged from 0.8 to 1.2 across all housing types and, when applied to higher density housing, typically achieving higher BCRs. On this basis a BCR of 1:1 has been applied to estimate the benefits of complying with the water management measures in Better Apartments.	The average cost per dwelling has been estimated at $1800 for apartment in developments of four or fewer storeys and $2000 for apartments in developments of five or more storeys. Based on the assumed BCR of 1:1 this amount has been included as the benefit of the water management requirements of Better Apartments.
4. Improved health for apartment residents	Greater use of natural ventilation, improved orientation and improved thermal comfort can also be expected to improve health outcomes for residents.	A comprehensive literature search conducted by McCaughey VicHealth Community Wellbeing Unit (2015) confirmed the link between apartment standards and health outcomes (see Appendix D). However, it did not provide a basis for monetising this benefit. The value of improved health outcomes was therefore estimated as an increase in resident satisfaction, monetised as an increase in the value of leisure time ($14 per hour) for an average of 6 waking hours spent in the apartment per day. The 5% boost in satisfaction is informed by observed productivity increases for commercial occupancies in high rating 'green buildings'. The better more sustainable design of these commercial buildings has been shown to be associated with an uplift in worker productivity of around 11%. In a domestic context, improved health is taken to be proxied by an improvement in the notional productivity of leisure time for residents. Sleep time was excluded from this calculation, even though improved sleep outcomes are likely to be associated with Better Apartment standards.	Improved health outcomes through an increase in resident satisfaction have been estimated using the following assumptions: - Type B apartment to Type A: 5% increase - Type C apartments to Type B: 5% increase Mix of apartments: Grade: Base Case: With Better Apartments: Grade A 16% 30% Grade B 24% 50% Grade C 60% 20%

5. Reduced risk in apartment development, due to greater planning certainty	As design standards will be clearer and, to some extent, non-negotiable, approval pathways may be smoother and more predictable, leading to cost savings for proponents.	Through discussions with relevant architects and developers, make an assessment of approval time savings that may arise with the new standards and convert this to cost saving per unit, based on typical interest rates faced by proponents.	$500 per person (2008 dollars), per month of time saved in approval process and 3 month time saving.
6. Higher levels of accessibility	In considering the introduction of Disability Standards and amended Access Provisions of the Building Code, the Australian Building Codes Board (ABCB) undertook cost benefit analysis of both a draft set of standards in 2004 and a revised and more cost effective set of standards in 2009. They assessed the benefit cost ratio of the initial standards as 0.49:1 and that of the later standards as 1.23:1. In the absence of more rigorous analysis of the accessibility measures in *Better Apartments*, the high BCRs identified by the ABCB was used as a guide for the likely magnitude of benefits that might be expected, relative to the additional construction costs that might be incurred.	The impact of including the accessibility measures in the CBA assumed a BCR of 1.23.	The average cost per dwelling has been estimated at $1,500 for apartments in developments of four or fewer storeys and $1,700 for apartments in developments of five or more storeys. Based on a BCRs of 1.23 these costs were used to estimate the benefits of the accessibility requirements in *Better Apartments*.
7. Existence and legacy value	Non user willingness to pay can be assumed to be broadly commensurate with user willingness to pay based on scholarly studies.	Estimate non-user value as the sum of *Benefit Items 1* and *2*.	Not quantified.

8. Brand value for Melbourne	Melbourne's liveability is an acknowledged engine for Victoria's economic development. This liveability is dependent on adequate investment in infrastructure, particularly city shaping projects (historically, CityLink and Western Ring Road, and prospectively, Melbourne Metro) and appropriate stewardship of Central Melbourne's distinctive urban qualities and values. Melbourne's population growth in the 2000s and the current decade significantly exceeded projections for this period made in the 1990s. This has been attributed to successful combination of liveability enhancement and infrastructure investment. A run down in apartment liveability and perceived quality of housing in Melbourne could reasonably be expected to have the reverse effect on the city's prospective population growth. That is, population growth will fall short of projections by a margin. The economic value of this reduction in in-migration can estimated on the basis of foregone value added per worker not coming to (or staying in) the state.	Measure the % margin in in-migration actually received in Victoria in the past 2 decades versus earlier official projections. Assume a nominal proportion of this margin (20%) was due to Melbourne's perceived livability. Assume that in the Base Case, in-migration will be lower compared to Reform Case. Assume that the value of each migrant to Victoria is equivalent to the present value of lifetime earnings multiplied by 2 (to account for total value added). Apply this value per migrant to migrants retained under the Reform Case versus the Base Case.	Not quantified.
9. Greater community acceptance of urban consolidation	*Better Apartments* can be expected to mitigate community concern about poor quality developments adversely affecting neighbourhoods. This is more likely to be relevant in suburban neighbourhoods.	Potentially could be measured via wiliness to pay survey.	Not quantified.

Source: SGS Economics & Planning Pty Ltd.

5.6 Time frame and spatial frame

A 20 year time horizon was used in the CBA of the Project Case versus the Base Case (2016 – 2036). This period is long enough for all major impacts – both negative and positive – to be revealed. Moreover, a 20 year time frame allows for reasonably accurate projections of housing production requirements.

As the reform options of interest to this CBA are changes to regulations for high-rise apartment development, the analysis was focussed on the Melbourne metropolitan area. This recognises that the vast majority of apartment construction activity is located in the metropolitan area, and in the central city region in particular.

5.7 Discount rate

The reforms embodied in *Better Apartments* represents a diffuse set of benefits and costs which allude to the Victorian Government's stewardship of Melbourne's liveability and Victoria's competitiveness. They do not represent a *commercial* initiative as such. The Victorian Government's agency in the reforms cannot be realistically construed as a proxy for private sector investment.

With reference to the DTF guidance, the *Better Apartments* reforms are best characterised as 'Category 1 Investments' where '*the benefits … can be articulated but are not easily translated to monetary terms'* (see Table 2). Consistent with this categorisation, the benchmark (real) discount rate applied was 4%. As per standard practice, NPV outcomes under a varied discount rates were also tested.

TABLE 2. DTF RECOMMENDED DISCOUNT RATES

Categories	Types of Investment	Basis	Rate (real)
Category 1	Provision of goods and services in traditional core service delivery areas of government, such as public health, justice and education. The benefits of these projects can be articulated but are not easily translated to monetary terms. E.g. schools, hospitals, police stations and civic open spaces.) Other projects in this category include projects evaluating potentially catastrophic scenarios for which considerable uncertainty surrounds estimates of costs and benefits.	Projects falling within this category should use a real risk free rate plus a very small risk premium. Based on long-term average government bond rates, **an appropriate real discount rate for these projects is four per cent.**	4%
Category 2	Provision of goods and services in traditional core service delivery areas of government (i.e. non-commercial investments), but those for which the benefits attributed to the project are more easily translated to monetary terms. E.g. public transport, roads and public housing).	These projects should be discounted using a risk free rate plus a modest risk premium depending on the project's sensitivity to the economy. Based on long term average government bond rates, **an appropriate real discount rate for these projects is seven per cent.**	7%
Category 3	Commercial investments with similar risks as the private sector. While there should ideally be limited government involvement in this area, government should require a rate of return on commercial investments comparable to that which the private sector requires given the degree of risk associated with the area of activity.	These projects should use a market rate of return as the default discount rate, commensurate with the risk profile associated with the industry and specific characteristics of the project. Given that there is the potential for such investments to be significantly more risky than an average market return, **project proponents should liaise with DTF regarding the appropriate rate.**	Consult with DTF.

Source: Department of Treasury and Finance

6 FINDINGS

6.1 Overview

This chapter sets out the results of the CBA. The CBA considered the net community benefit that might result from the *Better Apartments* standards both with and without the inclusion of the accessibility requirements. Improving accessibility of new apartments might be thought of as a separate (but related) policy agenda and, as a result, the impact of these measures has been considered separately.

6.2 CBA findings

Table 3 provides a summary of the cost and benefits expressed in net present value terms. The analysis of the Recommended *Better Apartments Standards* suggest the initiative would deliver a net benefit of $2.0 billion and a benefit cost ratio (BCR) of 1.51:1.

The most significant costs are the Foregone Reserve of Development Capacity (24% of total cost) and Higher Construction Costs (74% of the total costs). The influence of the other costs was found to be marginal. The most significant benefits are Improved Dwelling Amenity (47% total benefits), Improved Public Amenity (13%) and improved Health and Wellbeing (28%). The other benefits accounted for 11% of the total.

TABLE 3. CBA FINDINGS

PV Foregone Reserve Development Capacity	$974,383,100
PV Higher Construction Costs - Apartments	$2,974,990,400
PV Reduced Apartment Supply	$3,299,800
PV Increased Network Infrastructure Costs	$986,300
PV Productivity Loss	$76,424,200
Total Costs	$4,030,083,800
PV Improved Dwelling Amenity	$2,874,393,600
PV Improved Public Amenity	$805,302,900
PV Stormwater Infrastructure	$231,807,700
PV Reduced Apartment Development Risk	$210,893,800
PV Improved Health - Apartment Residents	$1,721,330,600
PV Improved Accessibility Standards	$235,226,800
Total Benefits	$6,078,955,400
Benefit-Cost Ratio (BCR)	1.51
Net Present Value (NPV)	$2,048,871,600

Source: SGS Economics and Planning Pty Ltd. Discount Rate: 4%

These findings indicate that, based on the assumptions that have informed this CBA, the *Better Apartments* initiative would be economically justified and would create a net community benefit.

Arguably, the 'core' or least contentious impacts of the proposed reforms relate to the increase in housing construction costs arising from the higher standards and the boost to dwelling amenity from these standards. It should be noted that these effects are independent of each other and have been treated as such in the estimation of the CBA. It is possible for regulations to boost costs without necessarily boosting dwelling amenity. Increasing fire standards or mandating on-site water retention might have this effect.

6.3 Sensitivity testing

A series of sensitivity tests have been applied to the five most significant costs and benefits to test the robustness of the CBA findings (see table below). In each case the sensitivity test simulates a change to the cost or benefit that would negatively impact the benefit cost ratio.

Test	Cost/Benefit	Change
1	Foregone Reserve Development Capacity (Cost 1)	Increased the foregone reserve development capacity impact by 10%
2	Higher Construction Costs (Cost 2)	Increased construction cost impact by 10%
3	Improved Dwelling Amenity (Benefit 1)	Reduced the improved dwelling amenity impact by 10%
4	Improved Public Amenity (Benefit 2)	Reduced the improved public amenity impact by 10%
5	Improved Heath – Apartment Residents (Benefit 5)	Reduced the improved health impacts by 10%.
6	Combined impact of sensitivity test 1 to 5.	(See above.)

These test were applied to the CBA findings both with and without the accessibility requirements. For the case where the accessibility requirements were includes it was assumed these requirements provided a lowest level of benefits (a BCR of 0.49:1).

The results of these test are shown in the table below. In each case the sensitivity test resulted in a deterioration of the resulting BCR relative to the initial CBA findings. When all the sensitivity test were combined tests, with the accessibility requirements, the BCR falls below 1. In all other cases it remains above 1 which suggests the findings that the Better Apartments initiative would provide a net community benefit is relatively robust.

6.4 Benefits and costs not included in the CBA

In CBAs related to cultural facilities or environmental assets it is routine practice to value non-user benefits as being equivalent to direct user benefits. Were a similar logic applied to the Better Apartments initiative the existence, bequest and option values might be estimates by adding together the Improved Dwelling Amenity and Improved Public Amenity benefits. The total of these benefits is $5 billion.

The value of the enhanced reputation of Victoria as a place of design quality has not been monetised, however, it is anticipated this would be significant relative to the other benefits. Greater community acceptance of urban consolidation has also not been quantified.

By creating better quality apartments, and higher amenity neighbourhoods featuring these apartments, the *Better Apartments* reforms might be expected to mitigate endemic community resistance to housing diversification and densification in established urban areas. If so, the potential supply of housing from the existing urban footprint could be significantly expanded relative to the base case. This implies a range of urban consolidation benefits in the medium to long term.

Increased transport externalities have not been included due to insufficient time to provide a robust comparison of difference in average vehicle kilometre travelled of those household displaced as a result of the temporary reduction in apartment supply. Given the number of household effected is relatively modest it is not anticipated that this cost would be significant.

TABLE 4. IMPACT OF SENSITIVITY TEST ON BCR AND NPV

	Benefit-Cost Ratio (BCR)	Net Present Value (NPV)
CBA findings	1.51	$2,048,871,600
Test 1: 10% increase in development capacity impact (Cost 1)	1.47	$1,951,433,300
Test 2: 10% increase in construction cost impact (Cost 2)	1.40	$1,751,372,500
Test 3: 10% decrease in dwelling amenity impact (Benefit 1)	1.44	$1,761,432,300
Test 4: 10% decrease in public amenity impact (Benefit 2)	1.49	$1,968,341,300
Test 5: 10% decrease in improved health impact (Benefit 5)	1.47	$1,876,738,500
Test 6: Combination of Tests 1 to 5	1.25	$1,113,831,500

6.5 Distributive effects

The principal beneficiaries of the reform will be purchasers and renters of apartments that will be built to higher standards. They will enjoy a significant boost in consumer surplus compared to business as usual.

Other significant beneficiaries will be to government and employers to the extent that they enjoy savings in health care costs and/or improved productivity resulting from improved housing standards for occupiers of apartments.

In terms of adverse effects, a key group will be those purchasers and renters of apartment projects rendered temporarily unviable by the lift in development standards.

Overall distributional impacts are summarised in Table 5.

As shown in the CBA, the value of welfare gains by beneficiaries is expected to significantly exceed the value of welfare losses by those parties which are adversely affected.

TABLE 5 OVERVIEW OF DISTRIBUTIONAL IMPACTS

Positively affected Victorians	**Nature of benefit**	**Scale of benefit**
Purchasers and renters of newly constructed apartments	Boost to consumer surplus as a result of market provision of higher quality apartments	Approximately 178,000 households over 20 years
Government	Reduced health care outlays	Not quantified
Developers	More transparent and efficient approval system for apartments	Over 5,000 projects will be benefited over 20 years
Employers	Improved worker productivity	Not quantified
People with mobility disability	Great choice of suitable housing options	Not quantified
Adversely affected Victorians	**Nature of impact**	**Scale of adverse impact**
Purchasers and renters of marginally viable projects temporarily displaced projects	Foregone preferred housing option	Approximately 1,300 households may be affected
Development site owners	Reduced residual land value due to reduced yield arising from higher standards (tower separation, apartment size, tree planting, etc.)	Approximately 5,000 property owners may be affected over 20 years
High rise apartment developers in marginal markets	Lost market share to other forms of housing development	Approximately 50 projects could be temporarily unviable, pending underlying land value increases.

Source: SGS Economics & Planning Pty Ltd.

APPENDIX A: BETTER APARTMENT STANDARDS

Better Apartments
Draft Design Standards

9 November 2016

VICTORIA State Government | Environment, Land, Water and Planning

Contents

Building Setback

Objectives

To ensure the setback of a building from a boundary appropriately responds to the urban context.
To allow adequate daylight into new dwellings. To limit views into habitable room windows and private open space of new and existing dwellings.
To provide reasonable outlook from dwellings.
To ensure the building setbacks provide appropriate internal amenity to meet the needs of residents.

Standard

The built form of the development must be appropriate to the urban context and the site.

A building should be setback a reasonable distance from side and rear boundaries, and other buildings within the site to:

- Ensure adequate daylight into new habitable room windows.
- Avoid direct views into habitable room windows and private open space of new and existing dwellings. Developments should avoid relying on screening to reduce views.
- Provide an outlook from dwellings that creates a reasonable visual connection to the external environment.
- Ensure the dwellings are designed to meet the internal amenity objectives of Clause XX.

Decision Guidelines

Before deciding on an application, the responsible authority must consider:

- The purpose of the zone or overlay that applies to the land.
- Any relevant urban design objective, policy or statement set out in this scheme.
- The urban context report and site description.
- The design response.
- The relationship between the proposed building setback and the building setbacks of existing adjacent buildings, including the interface with laneways.
- The extent to which the proposed dwellings are provided with reasonable daylight access through the layout of rooms and the number, size, location and orientation of windows.
- The impact of overlooking on the amenity of existing and proposed dwellings.
- The existing extent of overlooking into existing dwellings and private open space.
- Whether the development meets the objectives of Clause XX.

Functional Layout

Objectives

To encourage dwellings that provide functional areas that meet the needs of residents.
To provide dwellings that can be adapted to meet the changing needs of residents.

Standard

A dwelling should have bedrooms that meet the minimum internal room dimensions specified in Table 1.
All bedrooms should provide an area in addition to the minimum internal room dimensions to accommodate a wardrobe.

Table 1 Bedroom dimensions

Bedroom type	Minimum width	Minimum depth
Main bedroom	3 metres	3.4 metres
All other bedrooms	3 metres	3 metres

A dwelling should have a living area (excluding dining and kitchen areas) that meets the minimum internal room dimensions specified in Table 2:

Table 2 Living area dimensions

Dwelling type	Minimum width	Minimum area
Studio and 1 bedroom dwelling	3.3 metres	10 sqm
2 or more bedroom dwelling	3.6 metres	12 sqm

Decision Guidelines

Before deciding on an application, the responsible authority must consider:

- The design response.
- The useability, functionality and amenity of habitable rooms.

Accessibility

Objective

To ensure the design of dwellings meets the needs of people with limited mobility.

Standard

At least 50% of dwellings should comply with all of the following requirements:

- A clear opening width of at least 850mm at the entrance to the dwelling and main bedroom.
- A clear path with a minimum width of 1.2 metres that connects the dwelling entrance to the main bedroom, an adaptable bathroom and the living area.
- At least one adaptable bathroom that meets one of the design options specified in Table 1:

Table 1 – Bathroom design

	Design option A	Design option B
Clear door opening	850 mm	820mm
Door Design	A slide door, a door that opens outwards, or a door that opens inwards that is clear of the circulation area and has readily removable hinges.	A slide door, a door that opens outwards, or door that opens inwards and has readily removable hinges.
Circulation area	A minimum clear circulation area in front of the shower and the toilet of 1.2 metres by 1.2 metres. The circulation area for the toilet and shower can overlap. The circulation area must be clear of the toilet, basin and the door swing.	A minimum clear circulation area of 1 metre wide and 2.7 metres deep. The circulation area can include a shower area with a removable shower screen. The circulation area must be clear of the toilet and basin.
Path to circulation area	A clear path with a minimum width of 900mm from the door opening to the circulation area.	
Shower	A hobless (step-free) shower.	A hobless (step-free) shower with a removable shower screen located on the furthest wall from the door opening.
Toilet	A toilet located in the corner of the room.	A toilet located closest to the door opening and clear of the circulation area.

Storage

Objective

To provide adequate storage facilities for each dwelling.

Standard

Each dwelling should have convenient access to usable and secure storage space.

The total minimum storage space (including kitchen, bathroom and bedroom storage) should meet the requirements specified in Table 1.

Table 1 Storage

Dwelling type	Total minimum storage volume	Minimum storage volume within the dwelling
Studio	8 cubic metres	5 cubic metres
1 bedroom dwelling	10 cubic metres	6 cubic metres
2 bedroom dwelling	14 cubic metres	9 cubic metres
3 or more bedroom dwelling	18 cubic metres	12 cubic metres

Decision Guidelines

Before deciding on an application, the responsible authority must consider:

- The design response.
- The useability, functionality and location of storage facilities provided for the dwelling.

Windows

Objective

To allow adequate daylight into new habitable room windows.

Standard

A window in a habitable room should be located in an external wall.

A window may provide daylight to a bedroom from a smaller area within the room, where:

- The area is at least:
  - A minimum width of 1.2 metres.
  - A maximum depth of 1.5 times the width, measured from the external surface of the window.
- The window is clear to the sky.

Decision Guidelines

Before deciding on an application, the responsible authority must consider:

- The design response.
- The extent to which the habitable room is provided with reasonable daylight access through the number, size, location and orientation of windows.
- The useability and amenity of the dwelling based on the layout, siting, size and orientation of habitable rooms.

Room Depth

Objective

To ensure that single aspect habitable rooms allow for adequate daylight.

Standard

A single aspect habitable room should not exceed a room depth of 2.5 times the ceiling height.

A single aspect open plan habitable room depth may be increased to 9 metres provided the following requirements are met:

- The room combines the living area, dining area and kitchen.
- The kitchen is located furthest from the window.
- The ceiling height is at least 2.7 metres measured from finished floor level to finished ceiling level, except where services are provided above the kitchen.

The room depth is measured from the external surface of the habitable room window to the rear wall.

Decision Guidelines

Before deciding on an application, the responsible authority must consider:

- The design response.
- The extent to which the habitable room is provided with reasonable daylight access through the number, size, location and orientation of windows.
- The useability, functionality and amenity of the dwelling based on layout, siting, size and orientation of habitable rooms.
- Any overhang above habitable room windows that limits daylight access.

Natural Ventilation

Objectives

To encourage natural ventilation of dwellings.
To allow occupants to effectively manage natural ventilation of dwellings.

Standards

The design and layout of dwellings should maximise openable windows, doors or other devices in an external wall of the building, where appropriate.

At least 40% of dwellings should achieve effective cross ventilation. Effective cross ventilation is achieved where:

- There is a maximum breeze path through the dwelling of 18 metres.
- There is a minimum breeze path through the dwelling of 5 metres.
- The ventilation openings have approximately the same area.
- The breeze path is measured between the ventilation openings on different orientations of the dwelling.

Decision Guidelines

Before deciding on an application, the responsible authority must consider:

- The design response.
- The size, orientation, slope and wind exposure of the site.
- The extent to which the orientation of the building and the layout of dwellings maximises opportunities for cross ventilation.
- Whether an alternative design meets the relevant objectives having regard to the amenity of the dwelling and the site context.

Solar Access to Communal Open Space

Objective

To allow adequate solar access into communal outdoor open space.

Standard

The communal outdoor open space should be located on the north side of a building, if appropriate.

At least 50 percent or 125 square metres, whichever is the lesser, of the primary communal outdoor open space area used by occupants should receive a minimum of two hours of sunlight between 9am and 3pm on 21 June.

Decision Guidelines

Before deciding on an application, the responsible authority must consider:

- The design response.
- .
- The useability and amenity of the primary communal outdoor open space areas based on the urban context, the orientation of the building, the layout of dwellings and the sunlight it will receive.

Private Open Space

Objective

To provide adequate private open space for the reasonable recreation and service needs of residents.

Standard

A dwelling should have private open space consisting of:

- An area of 25 square metres, with a minimum dimension of 3 metres at natural ground floor level and convenient access from a living room, or
- An area of 15 square metres, with a minimum dimension of 3 metres at a podium or other similar base and convenient access from a living room, or
- A balcony with a minimum area and dimension specified in Table 1 and convenient access from a living room, or
- A roof-top area of 10 square metres with a minimum dimension of 2 metres and convenient access from a living room.

If an air conditioning/heating/condenser unit is located on a balcony, the balcony must be an additional 1.5 square metre in area.

Table 1 Balcony size

Dwelling Type	Minimum Area	Minimum Dimension
Studio or 1 bedroom dwelling	8 square metres	1.8 metres
2 bedroom dwelling	8 square metres	2 metres
3 or more bedroom dwelling	12 square metres	2.4 metres

Decision Guidelines

Before deciding on an application, the responsible authority must consider:

- The design response.
- The useability, accessibility and functionality of the private open space.
- The amenity of the private open space based on the orientation of the lot, the wind conditions and the sunlight it receives.
- The availability of and access to public or communal open space.

Communal Open Space

Objectives

To provide adequate and useable communal open space for the benefit of residents.

To integrate the layout of development with communal open space provided in the development.

Standard

Developments with 40 or more dwellings should provide a minimum area of communal open space of 2.5 square metres per dwelling or 250 square metres, which ever is lesser.

Communal open space should:

- Be located to:
  - Provide passive surveillance opportunities, where appropriate.
  - Provide outlook for as many dwellings as practicable.
  - Avoid overlooking into habitable rooms and private open space of new dwellings.
  - Minimise noise impacts to new and existing dwellings.
- Be designed to protect any natural features on the site.
- Maximise landscaping opportunities.
- Be accessible and useable.

Decision guidelines

Before deciding on an application, the responsible authority must consider:

- Any relevant urban design objective, policy or statement set out in this scheme.
- The design response.
- The amenity of the communal space based on the orientation of the lot, the wind conditions and the sunlight it receives.
- The useability of the communal open space based on its size, accessibility and reasonable recreation needs of residents.
- The availability of and access to public open space.

Building Entry and Circulation

Objectives

To provide each dwelling and building with its own sense of identity.
To ensure the internal layout of buildings provides for the safe, functional and efficient movement of residents.
To ensure internal communal areas provide adequate access to daylight and natural ventilation.

Standard

Entries to dwellings and buildings should:

- Be visible and easily identifiable.
- Provide shelter, a sense of personal address and a transitional space around the entry.

The layout and design of buildings should:

- Clearly distinguish entrances to residential and non-residential areas.
- Provide windows to building entrances and lobbies, including open stairs and lift areas.
- Provide common areas and corridors that:
  - Include at least one source of natural light and natural ventilation.
  - Avoid obstruction from building services.
  - Maintain clear sight lines.

Decision Guidelines

Before deciding on an application, the responsible authority must consider:

- The design response.
- The useability and amenity of internal communal areas based on daylight access and the natural ventilation they will receive.

Landscaping

Objectives

To encourage development that respects the landscape character of the neighbourhood.
To encourage development that maintains and enhances habitat for plants and animals in locations of habitat importance.
To provide appropriate landscaping.
To encourage the retention of mature vegetation on the site.
To promote climate responsive landscape design and water management in developments that supports thermal comfort and reduces the urban heat island effect.

Standard

The landscape layout and design should:

- Be responsive to the site context and protect any predominant landscape features of the neighbourhood.
- Provide a safe, attractive and functional environment for residents.
- Consider landscaping opportunities such as green walls, green roofs and roof top gardens to reduce heat absorption and improve storm water management.
- Maximise opportunities for deep soil area to allow for planting of canopy trees.
- Take into account the soil type and drainage patterns of the site and integrate planting and water management.
- Allow for intended vegetation growth and structural protection of buildings.
- In locations of habitat importance, maintain existing habitat and provide for new habitat for plants and animals.

Development should provide for the retention or planting of trees, where these are part of the character of the neighbourhood and the local context.

Development should provide for the replacement of any significant trees that have been removed in the 12 months prior to the application being made.

The landscape design should specify landscape themes, vegetation (location and species), paving and lighting.

A development should achieve the minimum deep soil areas specified in Table 1.

If the development cannot achieve the deep soil areas specified in Table 1, an equivalent canopy cover should be achieved by providing either:

- Canopy trees or climbers (over a pergola) with planter pits sized appropriately for the mature tree soil volume requirements.
- Vegetated planters, green roofs or green facades.

Table 1 Deep soil areas

SITE AREA	750-1000	1001-1500	1501-2500	>2500

(SQUARE METRES)				
Deep soil areas (% of site area)	5% (minimum dimension of 3 metres)	7.5% (minimum dimension of 3 metres)	10% (minimum dimension of 6 metres	15% (minimum dimension of 6 metres)
Minimum tree provision (number and size of trees per area of deep soil)	1 small tree (6-8 metres) per 30 square metres deep soil	1 medium tree (8-12 metres) per 50 square metres deep soil Or 1 large tree per 90 square metres deep soil	1 large tree (Over 12 metres) per 90 square metres deep soil Or 2 medium trees per 90 square metres deep soil	1 large tree per 90 square metres deep soil Or 2 medium trees per 90 square metres deep soil
Existing canopy tree		If an existing canopy tree over 8 metres can be retained without damage during the construction period the minimum deep soil requirement is 7% of the site area.		

Decision Guidelines

Before deciding on an application, the responsible authority must consider:

- Any relevant landscape character objective, policy or statement set out in this
- scheme.
- Any relevant plan or policy for landscape design in the State Planning Policy Framework and Local Planning Policy Framework, including the Municipal Strategic Statement and local planning policies.
- The design response.
- The location and size of gardens and the predominant plant types in the neighbourhood.
- The health of any trees to be removed.
- Whether a tree was removed to gain a development advantage.
- The suitability of the proposed location and soil depth for canopy trees.
- The ongoing management of landscaping within a development.
- The soil type and drainage patterns of the site.

Energy Efficiency

Objectives

To achieve and protect energy efficient dwellings and buildings.
To ensure the orientation and layout of development reduce fossil fuel energy use and make appropriate use of daylight and solar energy.
To ensure dwellings achieve adequate thermal efficiency.

Standard

Buildings should be:

- Oriented to make appropriate use of solar energy.
- Sited and designed to ensure that the energy efficiency of existing dwellings on adjoining lots is not unreasonably reduced.

Living areas and private open space should be located on the north side of the development, if practicable.

Developments should be designed so that solar access to north-facing windows is optimised.

A dwelling located in a climate zone identified in Table 1 should not exceed the specified maximum NatHERS annual cooling load.

Table 1 Cooling load

NatHERS CLIMATE ZONE	NatHERS MAXIMUM COOLING LOAD MJ/M^2 PER ANNUM
Melbourne Central (Climate Zone 21 Melbourne)	30
Melbourne North and West (Climate Zone 60 Tullamarine)	22
Melbourne South and East (Climate Zone 62 Moorabbin)	21

Note: Refer to NatHERS zone map, Nationwide House Energy Rating Scheme (Commonwealth Department of Environment and Energy). Maximum cooling load levels are currently being prepared for all relevant Victorian climate zones.

Decision Guidelines

Before deciding on an application, the responsible authority must consider:

- The design response.
- The size, orientation and layout of the site.
- The existing amount of solar access to abutting properties.
- The availability of solar access to north-facing windows on the site.

Integrated water and stormwater management

Objectives

To encourage the use of alternative water sources such as rainwater, stormwater and recycled water.
To facilitate on-site stormwater collection, utilisation and infiltration within the development.
To encourage measures to filter sediment and wastes from stormwater prior to its discharge from the site.

Standards

Buildings should be designed to collect rainwater for non-drinking purposes such as flushing toilets, laundry appliances and garden use.

Dwellings should be connected to a non-potable dual pipe reticulated water supply, where available from the water authority.

The stormwater management system should be:

- Designed to meet the current best practice performance objectives for stormwater quality as contained in the Urban Stormwater – Best Practice Environmental Management Guidelines (Victorian Stormwater Committee 1999) as amended.
- Designed to maximise infiltration of stormwater, water and drainage of residual flows into permeable surfaces, tree pits and treatment areas.

Decision Guidelines

Before deciding on an application, the responsible authority must consider:

- Any relevant water and stormwater management objective, policy or statement set out in this scheme.
- The design response.
- Whether the stormwater discharge from the site will adversely affect water quality entering the drainage system.
- Whether the stormwater treatment areas can be effectively maintained.

Waste and Recycling

Objectives

To ensure dwellings are designed to encourage waste recycling.
To ensure that waste and recycling facilities are accessible, adequate and attractive.
To ensure that waste and recycling facilities are designed and managed to minimise impacts on residential amenity, health and the public realm.

Standard

The development should include dedicated areas for:

- Bin and recycling enclosures which are adequate in size, durable, waterproof and blend in with the development. These areas should be adequately ventilated.
- Bin and recycling enclosures that are located and designed for convenient access by residents and made easily accessible to people with limited mobility.
- Adequate area and facilities for bin washing. These areas should be adequately ventilated.
- Collection, separation and storage of general waste and recyclables, including where appropriate opportunities for on-site management of food waste through composting or other waste recovery as appropriate.
- Collection, storage and reuse of garden waste, including opportunities for on-site treatment (where appropriate), or offsite removal for reprocessing.
- Adequate circulation area for waste collection vehicles that allows waste vehicles to enter and leave the site without reversing.
- Adequate internal storage space within each dwelling to enable the separation of recyclables, residual waste and where appropriate food waste.

Waste and recycling management facilities should:

- Be designed to meet the best practice waste and recycling management guidelines for residential development adopted by Sustainability Victoria.
- Protect public health and amenity of occupants and adjoining premises from the impacts of odour, noise and waste collection vehicle movements.
- Be maintained in accordance with a Waste Management Plan approved by the responsible authority.

Decision Guidelines

Before deciding on an application, the responsible authority must consider:

- The design response
- Any relevant waste and recycling objective, policy or statement set out in this scheme.

Noise impacts

Objective

To contain noise sources in developments that may affect existing dwellings.

To protect residents from external and internal noise sources.

Standard

The layout of new dwellings and buildings should minimise noise transmission within the site.

The location of noise sensitive rooms (such as living area and bedrooms) and private open space should take account of:

- The layout of adjoining dwellings, and
- The location of mechanical plants, lifts, building services, non-residential uses, car parking, and communal areas.

Noise sources, such as mechanical plants should not be located near bedrooms of immediately adjacent existing dwellings.

New dwellings should be designed and constructed to include acoustic attenuation measures to reduce noise levels from off-site noise sources.

A building within a noise influence area specified in Table 1 should be designed and constructed to achieve the following noise levels:

- Not greater than 35dB(A) for bedrooms, assessed as an LAeq,8h from 10pm to 6am.
- Not greater than 40dB(A) for living areas, assessed LAeq,16h from 6am to 10pm.

This does not apply to a building, or part of a building that is obstructed by an existing solid building or works or the natural topography of the land.

Noise levels should be measured in an unfurnished and finished floor with the windows closed.

Table 1 Noise influence area

Noise source	Noise influence area
Zone interface	
Industrial zone 1, 2&3	**300m** to the zone boundary
Road	
Freeways and tollways	**300m**
Other roads	**300m and carrying 40,000 Annual Average Daily Traffic Volume.**
Railway	
Railway servicing passengers in Victoria	**80m**
Railway servicing freight in non Metropolitan Melbourne	**80m**
Railway servicing freight in Metropolitan Melbourne	**135m**

Decision guidelines

Before deciding on an application, the responsible authority must consider:

- The design response.
- An acoustic report by a suitably qualified consultant submitted with the application or demonstration that the design treatment incorporated into the development meets the noise levels.
- Whether the impact of potential noise sources within a development have been mitigated through design, location and siting.
- Whether the layout of rooms within a dwelling mitigates noise transfer within and between dwellings.
- Whether an alternative design meets the relevant objectives having regard to the amenity of the dwelling and the site context.

APPENDIX B: YIELD AND CONSTRUCTION COST IMPACT ASSUMPTIONS

The following is a summary of inputs provided by Hayball and WT Partnership on the impacts on *Better Apartments* on development yield and construction costs.

Yield impacts

The exhibited *Better Apartments* planning standards included specific setback and separation requirements that impacted on apartment yields. Testing of a range of apartment development found yield reductions of between 5% and 40% might result. On average, the yield reductions assumptions applied ranged from 10% (for developments of 4 storeys or less) to 30% (for developments between 5 and 9 storeys). Changes to building footprint and massing that resulted in a loss of yield relative to the Base Case generally assisted in achieving compliance with standards relating to other issues such as cross ventilation, dwelling frontage widths and room depth.

In the most recent version of the standards the specific setback requirements have been removed. The impact of removing of the specific setback/separation requirements (and relying on context specific guidance provided through Design and Development Overlays or Structure Plans, for example) was difficult to assess.

To reflect the current standards shift towards a more flexible and context specific setback requirements, an average yield loss of 10% was applied.

It has been noted in discussions during this assessment that there is evidence that the market is moving towards including some aspects of Better Apartment design without being compelled to do so via regulation. If this is the case the Base Case – or business as usual practice – is in fact changing. It is plausible that greater awareness by both developers and consumers of issues related to apartment design would impact the apartment market, even without the introduction of the *Better Apartments* standards. If this were the case the CBA could overstate the benefits in the Reform Case relative to the Base Case.

It is understood that the Built Environment Sustainability Scorecard (BESS) – an assessment tool created by local governments in Victoria – is also being use by some councils to assess new apartment developments. This will also impact the Base Case without regulation. Given the limited understanding of the scope and application of BESS it has not been taken into account.

The impacts of the *Better Apartments* measures will be highly site specific and in addition to site size will relate to site shape, orientation, interfaces with the public realm (street, lanes, open space) other development, form (and use) of adjacent development, and so on.

Combined effects of the new residential zones on dwelling supply (and the vacancy chain effect for new dwellings) has not been tested. Some commentators have suggested that the application of the new residential zones could have a negative impact on the supply of apartments in suburban locations.

Construction cost impacts

The follow tables outline the average construction cost impact of the individual elements and totals for low rise and mid/high rise apartments.

In each case these cost estimates are the average cost per dwelling, that take into account the fact that under the Base Case a proportion of apartment would achieve the required Better Apartment Standards without any additional cost. For example, the Better Apartments standards suggest that 40% of apartment should to be naturally cross ventilated. If an apartment development has four corner apartments a proportion of dwellings will achieve this requirement without any intervention.

TABLE 6. AVERAGE PER DWELLING CONSTRUCTION COST IMPACT

Cost item	Increase for apartments in developments of 5 or more storeys	Increase for apartments in developments of 4 or less storeys
Functional Apartment Layout	$3,100	$2,800
Accessibility	$1,700	$1,500
Storage	$3,900	$3,500
Room depth	$3,800	$3,400
Natural Ventilation	$2,000	$1,800
Private open space	$4,000	$3,600
Communal open space	$1,100	$1,000
Building entries and circulation	$500	$500
Landscape	$2,300	$2,000
Energy, water and resource efficiency	$900	$800
Water management	$2,000	$1,800
Noise	$500	$500
Total	$25,800	$23,200

Source: SGS Economics & Planning Pty Ltd.

APPENDIX C: SECRET AGENT STUDY PARTS 1 AND 2

Secret Agent Apartment Regulation Study

PREPARED FOR SGS ECONOMICS AND PLANNING ON 12 MAY 2016
AUTHORS: RICHARD ROSSMANN, JODIE WALKER, AARON OSBORNE.

SECRET AGENT
INSIDE PERSPECTIVE

Executive Summary

The aim of this paper was to determine the price premium consumers are willing to pay for A-Grade apartments, over B-Grade and C Grade apartments. The sample used for the study consists of 886 apartments from inner Melbourne. On average, an A-Grade apartment attracts a price premium of $50,837 over B-Grade and $100,817 over C-Grade apartments, or 9% and 18% over the sample average sales price of $559,698. Both results were statistically significant, at all levels of significance for the A-Grade premium (1%, 5% and 10%) and at the 5% and 10% levels for C-Grade price penalties. When looking at individual factors' sales price impact, weights were assigned according to the perceived importance of each factor. This found that on average, an apartment with all four factors (sunlight, open views, outdoor space and cross ventilation in order of importance) attracted a price premium of $96,755, which was also found to have statistical significance at all levels.

Methodology

To construct a sample, apartment buildings were selected from inner Melbourne. The number of apartments sampled is shown in table 1 (right), while all buildings are listed in Appendix A. The sample consists of apartment sales over a 10 year timespan from 01/04/2006 to the 31/03/2016.

Table 1 : Study Sample

AREA	n
CBD	280
INNER SOUTH	246
INNER NORTH	148
INNER EAST	128
INNER WEST	84
TOTAL	886

In order to assign individual apartments a rating out of 4 (where 4=all factors present and 0=no factors present), each was judged on four factors:

1) Sunlight
If the apartment was fully North-facing and sunlight was unobstructed by other buildings, 1/1 was assigned for sunlight. If the apartment was partially North-facing or had natural light slightly obstructed 0.5/1 was assigned for sunlight. Otherwise the apartment received a sunlight rating of 0/1.

2) Cross Ventilation
To receive a rating of 1/1 for cross ventilation, the apartment must have at least two windows or a window and a balcony door on separate walls (e.g. on the North-side and South-side, or North-side and West-side). Otherwise a score of 0/1 was given.

3) Outdoor Area
0/1 was assigned if the apartment had no direct access to outdoor space. If the apartment had a balcony or terrace, it received an outdoor rating of 1/1.

4) Open Views
To get a 1/1 rating for open views and privacy, window views must not be immediately blocked by another building. This means if there was a building of the same height or higher than the apartment's location on the next block or across a laneway, the apartment received a score of 0/1. If some windows had an open view but not all, a rating of 0.5/1 was assigned.

Note that there are several other factors part of the regulation review, such as storage, but due to the difficulty of finding measurable data these were left out of the study.

An apartment was deemed A-Grade if it received a non-weighted score of 4/4 (i.e. all four factors were present). B-Grade apartments had a rating higher than 1/4 but lower than 4/4. Finally, C-Grade apartments had only one factor, or two partial factors present, which means a rating of 1/4 or lower was assigned.

When analysing results using hedonic regression techniques, the following factors were also deemed to impact the sales price of an apartment and were accounted for: Date of sale, floor level, size in m2 and location as either North, South, West, East or in the CBD. Apartments where data on any of the above factors could not be found were left out of the study.

All regression output used to create tables and figures in the results section is attached in Appendix B.

Results

Table 2 below gives a summary of the sample. As all price impacts listed are plus or minus the average price of apartments in the study, the mean sales price should be used as a point of comparison.

Table 2 : Sale/Passed In Price Summary Statistics

SAMPLE MEAN	$559,698.48
SAMPLE MEDIAN	$480,000.00
SAMPLE n	886
STANDARD DEVIATION	308,325.20

Holding all other factors listed in the methodology constant, table 3 below shows the average price impact of an A-Grade and a C-Grade rating. These are relative to B-Grade apartments. In other words, an A-Grade apartment is expected to sell for $50,837 more than a B-Grade apartment on average, while a C-Grade apartment is expected to sell for $49,980 less than a B-Grade apartment on average. This means that the average price difference between an apartment with a 4/4 rating and an apartment with a rating of 1/4 or lower is $100,817. Confidence intervals for both ratings are given in the table.

Table 3 : A-Grade and C-Grade rating price difference, compared to B-Grade

TYPE	PRICE IMPACT	LOWER 90%	UPPER 90%
A-GRADE	$50,837.07	$20,125.82	$81,548.31
C-GRADE	-$49,979.58	-$89,509.49	-$10,449.67

When looking at each individual factor, the assumption was made that not all four factors have an equal impact on sales price. Given this, each factor's importance was estimated and is shown in row one of table 4 below. The factor value row shows each factor's average impact on sales price, given the weighting assigned to each one. An apartment with all four factors present is expected to sell for $96,755 more than an otherwise identical apartment with no factors present. The confidence interval shows that 90% of the time we expect the true premium to lie between $57,494 and $136,016.

Table 4 : Individual Factor Weightings and Impact on Average Sales Price

	SUNLIGHT	CROSS VENT	BALCONY	OPEN VIEW	ALL FACTORS
POP ESTIMATE IMPORTANCE	0.5	0.1	0.15	0.25	1
SAMPLE IMPORTANCE	0.25	0.25	0.25	0.25	1
APPLIED WEIGHTS	2	0.4	0.6	1	4
FACTOR VALUE	$48,377	$9,675	$14,513	$24,189	$96,755
LOWER 90%	$28,747	$5,749	$8,624	$14,373	$57,494
UPPER 90%	$68,008	$13,602	$20,402	$34,004	$136,016

Property data tends to skew to the right tail of the distribution, as there is much more room for sales price above the mean than there is below. This is reinforced by the rather large standard deviation (over 308,000) and the median being well below the average ($480,000 compared to $559,698). As such, any confidence interval will tend to be on the large side. **However, given the results, we expect the average apartment to be 17.29% higher if all four factors are present, compared to no factors being present.**

Limitations

Note that all findings presented were statistically significant and are thus a very close approximation of the population constants. However, data was only sampled from a select area of inner Melbourne and may not be applied to regions outside the study area freely.

Due to time limitations, selection of apartment buildings and weighting of individual factors was based on the expert opinions of the Secret Agent team. Results may be improved if a survey of consumers was conducted, asking them to rate the importance of each factor when selecting an apartment. However, the price impact of all four factors being present is likely to remain unaffected by the weighting of each individual factor.

Conclusion

The main findings of Secret Agent's research into apartment design regulations were that natural light, cross ventilation, an open view and access to outdoor space all had a positive impact on the sample of apartment sales from inner Melbourne. The impact of each individual factor depends on the weights assigned to each, but combined the expected sales price of an apartment with all four factors increased by $96,755 on average. If the study was repeated, the true price premium is expected to lie between $57,494 as the lower and $136,016 as the upper bound of a 90% confidence interval.

Appendix A

Building	n*
118 Russel Street Melbourne	95
31 Spring Street Melbourne	93
601 Little Collins Street Melbourne	91
50 Claremont Street South Yarra	131
97 Flemington Road North Melbourne	102
1 Queensberry Street Carlton	31
108 Elgin Street Carlton	24
118 Dudley Street West Melbourne	88
2 Albert Road South Melbourne	165
1 Graham Street Port Melbourne	87

*Note some sales were omitted before analysing results due to missing data on key factors outlined in methodology ($\sum n \neq 886$).

Appendix B

Summary Statistics Output:

	Sale/PassedinPrice
Mean	559698.48
Standard Error	10358.39
Median	480000.00
Mode	480000.00
Standard Deviation	308325.20
Sample Variance	95064429531.45
Kurtosis	20.63
Skewness	3.67
Range	3197000.00
Minimum	53000.00
Maximum	3250000.00
Sum	495892850.00
Count	886.00

Regression Output, Weighted Factor Analysis:

SUMMARY OUTPUT

Regression Statistics	
Multiple R	0.815859
R Square	0.665626
Adjusted R Square	0.662576
Standard Error	179100.7
Observations	886

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	8	5.6E+13	7E+12	218.2264	1E-202
Residual	877	2.81E+13	3.21E+10		
Total	885	8.41E+13			

	Coefficients	*Standard Error*	*t Stat*	*P-value*	*Lower 90.0%*	*Upper 90.0%*
Intercept	-2315969	268728.2	-8.61826	3.14E-17	-2758455	-1873483
Weighted Rating	24188.67	5960.937	4.057865	5.39E-05	14373.44	34003.91
North	201785.8	20399.75	9.891582	6.06E-22	168195.8	235375.9
South	212813.1	16983.76	12.53039	2.97E-33	184847.7	240778.4
East	199779	20917.14	9.550967	1.24E-20	165336.9	234221
West	115633.3	24095.32	4.798994	1.87E-06	75958.1	155308.5
Date	51.63764	6.542414	7.892751	8.8E-15	40.86495	62.41034
Level	21738.06	1472.254	14.76515	3.16E-44	19313.86	24162.27
Apt size m2	6197.7	198.6597	31.19756	2.5E-144	5870.588	6524.811

Regression Output, Graded Apartment Analysis:

SUMMARY OUTPUT

Regression Statistics	
Multiple R	0.815017
R Square	0.664253
Adjusted R Square	0.660803
Standard Error	179570.5
Observations	886

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	9	5.59E+13	6.21E+12	192.5671	9.137E-201
Residual	876	2.82E+13	3.22E+10		
Total	885	8.41E+13			

	Coefficients	*Standard Error*	*t Stat*	*P-value*	*Lower 90.0%*	*Upper 90.0%*
Intercept	-2214151	269702.9	-8.20959	7.91E-16	-2658242.71	-1770059.82
A Grade	50837.07	18651.36	2.725649	0.006546	$20,125.82	$81,548.31
C Grade	-49979.6	24007.07	-2.08187	0.037644	-$89,509.49	-$10,449.67
North	196556.5	21265.18	9.243118	1.77E-19	161541.391	231571.651
South	206219.6	17667.67	11.67215	2.32E-29	177128.138	235311.129
East	201747.6	20973.55	9.619144	6.85E-21	167212.628	236282.503
West	110855.9	24714.05	4.485541	8.24E-06	70161.8534	151549.925
Date	50.70823	6.56646	7.722309	3.12E-14	39.8959338	61.5205326
Level	21239.6	1528.724	13.89368	8.29E-40	18722.4095	23756.7889
Apt size m2	6178.418	205.6935	30.037	8E-137	5839.72366	6517.11155

Secret Agent Apartment Regulation Study Part 2

PREPARED FOR SGS ECONOMICS AND PLANNING ON 12 AUGUST 2016
AUTHOR: RICHARD ROSSMANN

SECRET AGENT
INSIDE PERSPECTIVE

Executive Summary

The aim of this study was to determine the price premium consumers are willing to pay for A-Grade apartments, over B-Grade and C Grade apartments, in small apartment buildings (defined by limiting the number of levels to 4). The sample used consisted of 510 apartments from inner Melbourne. On average, an A-Grade apartment attracts a price premium of $63,728 over B-Grade and $103,522 over C-Grade apartments. This is 12% and 19% respectively over the sample average sale price of $538,555. Both results were statistically significant at the 5% and 10% levels. When looking at an individual factor's sale price impact, weights were assigned according to the perceived importance of each factor. This found that on average, an apartment with all four factors (sunlight, open views, outdoor space and cross ventilation in order of importance) attracted a price premium of $114,753, which was found to have statistical significance at all levels (1%, 5% and 10%).

Methodology

To construct a sample, apartment buildings were selected from inner Melbourne. The main difference to part 1 of the study is that this time the number of floors in each building was restricted to a maximum of 4. Ground floor was counted as level 0, meaning that a building could have a maximum number of 5 floors or levels. The number of apartments sampled is shown in Table 1. The sample consists of apartment sales over a 10-year and 7-month timespan from 01/01/2006 to the 31/07/2016. In total, sales from 20 different apartment building were sampled. The complete list of buildings can be found in Appendix A.

Table 1 : Study Sample

AREA	n
CBD	60
INNER SOUTH	94
INNER NORTH	90
INNER EAST	135
INNER WEST	131
TOTAL	510

In order to assign individual apartments a rating out of 4 (where 4=all factors present and 0=no factors present), each was judged on four factors: sunlight, cross ventilation, outdoor area and open views. For a full breakdown of how these factors were assigned, see the methodology section of part 1 of the study. Similarly, apartments were categorised into A-Grade, B-Grade and C-Grade using the same method as in part 1.

When analysing results using hedonic regression techniques, the same factors as for the first part of the study were accounted for (apartment size, date of sale and location), except the level of the apartment, which was not found to have a significant impact on results. In other words, there is no indication of buyers willing to pay a premium for an otherwise identical apartment on level 3 compared to, say, level 2 or 1. Also, one additional parameter was included in part 2: the age of the apartment building, which is equivalent to the first recorded sale of an apartment in the building. Controlling for this variable was found to increase the precision of results.

All regression output used to create tables and figures in the results section is attached in Appendix B.

Results

Table 2 gives a summary of the sample. As all price impacts listed are plus or minus the average price of apartments in the study, the mean sale price should be used as a point of comparison.

Table 3 shows the expected effects on the sale price of A-Grade and C-Grade ratings. Compared to B-Grade apartments, an apartment in the sample is expected to sell for $63,728 more if it is A-Grade, and $39,794 less if it is C-Grade. This means that the average price difference between an apartment with a 4/4 rating and an apartment with a rating of 1/4 or lower is $103,522. Confidence intervals for both ratings are given in the table.

Table 2 : Sale/Passed In Price Summary Statistics

SAMPLE MEAN	$538,555
B-GRADE MEAN	$543,099
SAMPLE MEDIAN	$500,000
SAMPLE n	510
STANDARD DEVIATION	232,278

Table 3 : A-Grade and C-Grade rating expected price difference, compared to B-Grade

TYPE	PRICE IMPACT	LOWER 90%	UPPER 90%	% IMPACT
A-GRADE	$63,727.72	$14,246.77	$113,208.68	11.73%
C-GRADE	-$39,794.29	-$72,743.55	-$6,845.04	-7.33%

As in part 1 of the study, the assumption was made that not all four factors have an equal impact on sale price. Table 4 shows the expected impact of each factor using the same weights as in the first study. An apartment with all four factors present is expected to sell for $114,753 more than an otherwise identical apartment with no factors present. The confidence interval shows that 90% of the time we expect the true premium to lie between $67,883 and $161,623.

Table 4 : Individual Factor Weightings and Impact on Average Sale Price

	SUNLIGHT	CROSS VENT	BALCONY	OPEN VIEW	ALL FACTORS
POP ESTIMATE IMPORTANCE	0.5	0.1	0.15	0.25	1
SAMPLE IMPORTANCE	0.25	0.25	0.25	0.25	1
APPLIED WEIGHTS	2	0.4	0.6	1	4
FACTOR VALUE	$57,376	$11,475	$17,213	$28,688	$114,753
LOWER 90%	$33,941	$6,788	$10,182	$16,971	$67,883
UPPER 90%	$80,811	$16,162	$24,243	$40,406	$161,623

Given the results, we expect the average apartment to sell for 21.31% more if all four factors are present, compared to no factors being present.

Limitations

For details on limitations, consult part 1. Both the limitation of sample findings not being applicable to regions outside the study area and the applied weights being based on expert opinion outlined in the first study apply.

Conclusion

In the previous study looking at larger buildings, the magnitude of A-Grade and C-Grade ratings were very similar (roughly +/- $50,000), while all four factors were expected to increase average sale price by about $98,000. When limiting the height to 5 storeys, the positive impacts of an A-Grade rating were of greater magnitude than the negative impact of a C-Grade rating: $63,700 (11.73%) and -$39,800 (-7.33%) respectively. The total differences between A and C-Grade were similar: $100,800 for large, and $103,500 for small buildings. When looking at individual factors, the price impact of all four factors was about 4% larger for apartments in smaller buildings: 21.31% compared to 17.29%.

Appendix A

Building	n
16 Adam St Burnley	17
2 Alexander St Seddon	13
58 Ballarat St Yarraville	41
366 Church St Richmond Victoria	25
10 Clifton St Prahran	42
28 Jeffcott St West Melbourne	19
394 La Trobe St Melbourne	35
6 Lisson Gr Hawthorn	57
8 Lord St Richmond Victoria	19
465 Macaulay Rd Kensington	39
11 Mount St Prahran	24
294 Nicholson St Seddon	19
72 Patterson St Middle Park	13
6-12 Pearl Street Northcote	18
33 Princes St Port Melbourne	15
85 Rathdowne St Carlton	29
156 Rose St Fitzroy	32
449 St Kilda Rd Melbourne	25
45 York St Richmond Victoria	17
52-54 Young St Fitzroy	11
Total	**510**

Appendix B

Summary Statistics Output:

Sale.PassedinPrice	
Mean	538555.1
Standard Error	10285.45
Median	500000
Mode	360000
Standard Deviation	232278.1
Sample Variance	5.4E+10
Kurtosis	2.693496
Skewness	1.407088
Range	1336000
Minimum	174000
Maximum	1510000
Sum	2.75E+08
Count	510

Regression Output, Weighted Factor Analysis:

SUMMARY OUTPUT

Regression Statistics	
Multiple R	0.792383823
R Square	0.627872123
Adjusted R Square	0.621929961
Standard Error	142821.7369
Observations	510

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	8	1.72427E+13	2.15534E+12	105.6639238	1.9218E-102
Residual	501	1.02194E+13	20398048531		
Total	509	2.74621E+13			

	Coefficients	*Standard Error*	*t Stat*	*P-value*	*Lower 90.0%*	*Upper 90.0%*
Intercept	-3291547.01	254817.49	-12.9173	3.7734E-33	-3711460.95	-2871633.07
Weighted Rating	28688.19	7110.55	4.0346	6.3237E-05	16970.70	40405.67
Apt Size m2	3899.06	233.77	16.6790	5.32779E-50	3513.83	4284.29
Sale Date	73.94	6.16	12.0007	2.43407E-29	63.79	84.10
Age	11.30	2.10	5.3693	1.21143E-07	7.83	14.76
Outer West	-100647.40	24903.99	-4.0414	6.14812E-05	-141686.71	-59608.10
Inner West	-93054.26	23741.55	-3.9195	0.000101084	-132177.98	-53930.54
Inner North	194496.30	20616.96	9.4338	1.4769E-19	160521.60	228471.00
Inner East	109419.23	20664.94	5.2949	1.78523E-07	75365.45	143473.00

Regression Output, Graded Apartment Analysis:

SUMMARY OUTPUT

Regression Statistics	
Multiple R	0.789225442
R Square	0.622876798
Adjusted R Square	0.61608858
Standard Error	143920.8432
Observations	510

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	9	1.71055E+13	1.90061E+12	91.75851908	5.5673E-100
Residual	500	1.03566E+13	20713209104		
Total	509	2.74621E+13			

	Coefficients	*Standard Error*	*t Stat*	*P-value*	*Lower 90.0%*	*Upper 90.0%*
Intercept	-3206112.91	256358.90	-12.5063	2.04125E-31	-3628568.50	-2783657.32
C-Grade	-39794.29	19994.61	-1.9903	0.047107365	-72743.55	-6845.04
A-Grade	63727.72	30026.55	2.1224	0.034296822	14246.77	113208.68
Apt Size m2	3884.37	238.98	16.2542	5.27158E-48	3490.56	4278.18
Sale Date	73.73	6.22	11.8570	9.47135E-29	63.49	83.98
Age	10.81	2.15	5.0391	6.54804E-07	7.28	14.35
Outer West	-80859.65	24812.34	-3.2588	0.001194786	-121748.08	-39971.22
Inner West	-76521.53	23776.55	-3.2184	0.001372936	-115703.07	-37340.00
Inner North	202020.40	21312.36	9.4790	1.03019E-19	166899.61	237141.19
Inner East	114802.30	21482.05	5.3441	1.38336E-07	79401.89	150202.71

APPENDIX D: APARTMENT DESIGN AND HEALTH AND WELLBEING

A following literature review was undertaken to understand the costs and benefits of apartment design and quality on health and wellbeing as evidenced in academic studies and, where relevant, additional practitioner advice has also been included.

Summary

The evidence suggests that there are health and wellbeing benefits associated with the types of improvements to apartments that the *Better Apartments* initiative seeks to address. Some challenges arise, however, in the application of these findings to a formal cost benefit analysis.

Firstly, where the setting or circumstances associated with a study are unknown or different to the inner Melbourne context, the findings may not be directly transferable. Moreover, studies concerned with fundamental shifts in apartment quality and design (for example, projects addressing *very* poor living conditions) may have limited applicability to the *Better Apartments* initiative where the shift of the proposed reforms is limited. In addition, while notable benefits associated with each of design elements have been evidenced in the literature, these have not always been quantified.

While there are wider health and wellbeing benefits associated with the elements intended to be addressed by the *Better Apartments* initiative, the literature does not provide a robust method for quantification of these benefits within the context of a formal CBA.

The findings from the literature review are given below.

Daylight/sunlight

Evidence from the literature shows that limited daylight penetration into dwellings is associated with a reduction in resident well-being. In Brown and Jacobs (2011) study, it was found that after controlling for confounding variables, participants that reported inadequate natural light in their dwellings were 1.3 times as likely to self-report symptoms of depression. The incidence of falls was 2.5 times as likely.

Cheung and Chung (2008) found that 'quality of view' (the pleasantness and agreeableness of the external view of the window) and 'general brightness' (the overall lighting level of the interior surfaces of the room) were the most important aspects of a day-lit residential room.

In a valuation provided by the Property Services team at the City of Melbourne (SGS, 2016), an approximate premium of 3% to 4% for units with good light and ventilation was calculated using the sale price of comparable units within a single development in East Melbourne and in the Melbourne CBD, comparing those that had access to light and ventilation with those that did not. A premium of 3.5% in apartment prices could be used to value daylight penetration and natural ventilation.

Natural ventilation

Wargocki et al's (2002) review of the literature on the effects of ventilation on health, comfort, and productivity in non-industrial environments found that ventilation (both natural and mechanical) was strongly associated with comfort (perceived air quality) and health (including Sick Building Syndrome symptoms, inflammation, infections, asthma and allergies), as well as productivity.

Ruotsalainen et al's (1991) Helsinki study on indoor air quality and health found that better outcomes were achieved with natural ventilation in comparison to balanced ventilation (mechanical supply and exhaust). For example, 60.9%of participants reported incidences of coughing in apartments with balanced ventilation compared to 7.5% in apartments with natural ventilation. Sensation of dryness was also lower in apartments with natural ventilation, though this may have limited transferability in an Australian context.

See discussion on City of Melbourne Property Services valuation (SGS, 2016) above.

Space

While the benefits of various spatial configurations of and within dwellings across demographics is inconclusive in the literature, the evidence suggests that lack of needed space or crowding can have negative health and well-being impacts.

Oswald et al (2011), for instance, found that life satisfaction in people aged 65-80 increased with apartment size in metres, while it decreased with those above the age of 80 years, indicating that desired space varies among different demographics.

A 1980 study on student dormitories by Baum and Davis found that by changing the groupings of residential apartments, such that only around 20 residents would share common corridor areas rather than 40, found that symptoms of stress, withdrawal and helplessness were reduced. The authors found that in a short-corridor setting, residents actively developed and used shared space for social purposes, and experienced less crowding stress than long-corridor residents. While these findings are significant to research on spatial configuration of apartments, it must be noted that they are based on a student dormitory context which likely has vastly different daily resident activity and interaction than a typical apartment context.

In terms of crowding, the WHO (2007) LARES report found that those who reported not having a place in their dwelling to be alone had an increased chance of depression by 50%. Evans et al (1996) found, however, that residents of crowded homes with greater architectural depth (that is, the number of spaces one must pass through to get from one room in the house to another) were less likely to socially withdraw or to be psychologically distressed than residents in crowded homes with relatively low depth.

Outlook

In terms of outlook from dwellings, the literature suggests that views onto natural settings generally provide greater benefits to residents than other settings, while the benefits of views onto non-natural settings is contested.

Velarde et al's (2007) review of the literature on the links between landscape views and health outcomes found that views onto natural landscapes are associated with a stronger positive health effect in comparison to urban landscapes, the latter of which were found to provide less benefit, and in some cases even have a negative effect on health. While Kaplan's (2001) research largely supports the finding that views of natural elements are more beneficial to well-being, she also found that sense of security and community is negatively affected by having a view of a park. It was further found that views of built elements affected resident satisfaction but not overall well-being. The WHO (2007) LARES report found

that having a 'bad' view out of a window resulted in a 40 per increase in the chance of depression in residents.

Outlook to natural or 'green' settings has also been linked to cognitive function and ability to direct attention, as found by Wells (2000) and Tennessen and Cimprich (1995).

In a Hong Kong-based study, Jim and Chen (2010) found that a view of a neighbourhood park from an apartment raised the price of the apartment by 1.95%. They found that street views had the opposite effect, however, with units located near a main street experiencing a price suppression of 1.39%. In a study of 184 single-family detached homes in Fairfax County, Virginia, Rodriguez and Sirmans (1994) found that a 'good view' adds about 8% to the value of a single-family house.

In a study of the impact of ocean and lake views on residential property prices, Benson et al (1998) found a range in property price premiums based on quality of view. This ranged from an 8.2% increase in property value for a poor partial ocean view, to 58.9% for an unobstructed ocean view.

Noise

Exposure to noise has been linked with various physical and mental health problems in the literature, including hypertension, cardiovascular disease, migraines, chronic allergies, asthma, gastric or duodenal ulcers, fatigue, depression and accidents (Babisch et al 2014; Maschke and Niemann 2007; WHO 2007).

Noise disturbance is most often associated with traffic noise exposure and neighbour noise. Exposure to noise during the day (including duration of stay at apartment during the day) was linked with greater levels of noise annoyance and disturbance and the problems derived from it (Babisch et al 2014; Jakovljevic 2009). Sleep disturbance and associated issues were also linked to noise annoyance, with the WHO (2007) finding that the chance of sleep disturbance by noise resulting in a 100 per cent increase of depression. Jakovljevic (2009), Babisch et al (2014) and Bluhm et al's (2004) studies found that the orientation of different rooms to the road plays a role in the impact of noise on sleep disturbance and health problems. Bluhm et al's (2004) Stockholm-based study found that 27% of participants with street-facing bedroom windows reported sleep disturbances compared to 15.9% of participants with bedroom windows facing a quiet side.

Apartment residents were found to have more sleep problems than people living in detached or semi-detached houses (Bluhm et al 2004). Apartments were also found to have the loudest neighbour noise, followed by terrace housing and semi-detached houses; it was hypothesised that this is because noise can more easily be transferred in such settings (Wang et al 2015). Apartment residents were found not to suffer significantly from traffic noise.

In a study on the impact of noise on apartment rents in Geneva (where noise sources are varied, but mostly traffic-related), Baranzini and Ramirez (2005) found that with every dB(A) increase there was a 0.7% reduction in the price of rents. They note that this result is lower than that of previous Swiss studies but that it is in line with other industrialised countries. It was further found that noise has a greater economic impact when the background noise in an area is lower.

Wang et al (2015) cautions that studies on noise annoyance and disturbance are based in different places with vastly different traffic levels, however.

Outdoor space

The literature suggests that outdoor space within residential developments can have an impact on mental well-being and social interaction between residents.

In a study on the relationship between the courtyard design of high-rise housing complexes and the social interaction of residents in Taipei, Huang (2006) found that scenic spaces (landscaped elements with visual significance) and activity spaces (included spacious open areas and recreational facilities) facilitated the highest proportions of social interaction at 26.71% and 23.29% respectively. In terms of design elements, the proportions of social interaction were highest based on areas with visual focus (water features and sculptures, 29.84%), plants (25.63%), play areas/playgrounds (24.65%) and open areas/plazas/lawns (21.46%).

Rooftop gardens have similarly been found to provide positive benefits on the mental well-being and quality of life of residents in housing complexes (Kim and Ohara 2010; Kimura et al 2008).

To find the premium for units with direct (on-site) access to high quality public domain (calculated as a percentage of the base market price), the total value of four low rise developments within Southbank were analysed by the by the Property Services team at the City of Melbourne (SGS, 2016). Two included large open space and recreational facilities (Subjects 1 & 3 below) and two had no public domain (such as parklands or a plaza) (Subjects 2 & 4 below). Adjustments to the total value of each development were made to ensure that they were comparable, bringing each development back to a base end value. The premium of the developments with a high quality public domain over the developments with no public domain was found to be as follows:

	Subject 2	Subject 4
Subject 1	1.12%	1.06%
Subject 3	1.08%	1.35%

A premium of 1% for ready access to high quality public domain could thus be used.

Thermal comfort

Improvements to insulation and heating in homes has been found to improve not only the cost of heating for households but also resident comfort and health, including sinusitis, hypertension, overweightness and respiratory disease.

A Glasgow study on the health effects of improving the thermal quality of housing found that a implementing a package of interventions in a block of flats that were previously cold, damp and mouldy, caused improvements in the cardiovascular, respiratory and other health of residents (Lloyd et al 2008). In a study based on three US cities, insulation, heating and ventilation improvements resulted in an improvement in self-reported mean general health score from 3.07 to 2.78 (0.29 point improvement), where 1 = 'excellent' and 5 = poor (Wilson et al 2014). Research by Howden-Chapman et al (2007), Clinch and Healy (2000) and Vandentorren et al (2006) support these findings. The WHO (2007) LARES report found that extensive exposure to dampness and mould results in a 60% increase in chance of depression in residents. It must be noted, however, that in the Wilson et al study, two measures of asthma severity worsened with the implementation of energy conservation measures.

Kilbourne et al (1982) and Vandentorren et al (2006) further found that living on the higher floors of multi-storey buildings was closely associated with increased risk of heatstroke and/or death, with the latter study finding an association with sleeping on the topmost floor under the roof and death.

A Swiss study on willingness to pay (WTP) for energy-saving measures in Switzerland's residential buildings (Banfi et al 2008), where apartment tenants and house owners were asked to choose between their housing status quo and one of several hypothetical situations with different attributes and prices, found that those in rented flats in multi-family houses (as opposed to owners of single-family houses) were willing to pay an increased rent of 1% to 3% for enhanced insulation in their buildings. The willingness to pay for an enhanced insulated window (defined as having triple glazing, double-coated pane and a rubber seal, as opposed to standard insulation which is coated with a rubber seal) was 1%, and 3% for an enhanced façade insulation (compared to standard insulation).

According to the Federal Department of Industry, Innovation and Science (2016), appropriate insulation can save up to 40% in heating and cooling bills.

General

Estimates on property values and premiums applicable to specific design interventions were provided by the Property Services team at the City of Melbourne (SGS, 2016). The average base market price for residential units of 50-190 sqm was estimated to be $6,250 per square metre.

REFERENCES

Babisch, W., Wölke, G., Heinrich, J., and Straff, W. (2014). Road traffic noise and hypertension – accounting for the location of rooms. *Environmental Research, 133*, 380-387.

Banfi, S, Farsi, M., Filippini, M., and Jakob, M. (2008). Willingness to pay for energy-saving measures in residential buildings. *Energy Economics, 30*(2), 503-516.

Baranzini, A., and Ramirez, J.V. (2005). Paying for Quietness: The Impact of Noise on Geneva Rents. *Urban Studies, 42*(4), 633-646.

Baum, A., and Davis, G.E. (1980). Reducing the stress of high-density living: an architectural intervention. *Journal of Personality and Social Psychology, 38*(3), 471-81.

Benson, E.D., Hansen, J.L, Schwarz Jr, A.L., and Smersh, G.T. (1998). Pricing Residential Amenities: The Value of a View. *Journal of Real Estate Finance and Economics, 16*(1), 55-73.

Bluhm, G., Nordling, E., and Berglind, N. (2004). Road traffic noise and annoyance – an increasing environmental health problem. *Noise Health, 6*(24), 43-49.

Brown, M.J., and Jacobs, D.E. (2011). Residential light and risk for depression and falls: results from the LARES study of eight European cities. *Public Health Reports*, *126*, 131-140.

CKC (2015) Apartment Market – Benchmarking Project Metropolitan Melbourne Analysis.

Cheung, H.D, and Chung, T.M. (2008). A study on subjective preference to daylit residential indoor environment using conjoint analysis. *Building and Environment, 42*(12), 2010-2111.

Clinch, J.P., and Healy, J.D. (2000). Housing standards and excess winter mortality. *Journal of Epidemiology and Community Health, 54*(9), 719-720.

Department of Industry, Innovation and Science (Australian Government) (2016). *Insulation*. Retrieved from <http://yourenergysavings.gov.au/energy/heating-cooling/insulation>.

Evans, G.W., Wells, N.M.., and Moch, A. (1996). Housing and Mental Health: A Review of the Evidence and a Methodological and Conceptual Critique. *Journal of Social Issues, 59*(3), 475-500.

Howden-Chapman, P., Matheson, A., Crane, J., Viggers, H., Cunningham, M., Blakely, T., Cunningham, C., Woodward, A., Saville-Smith, K., O'Dea, D., Kennedy, M., Baker, M., Waipara, N., Chapman, R., Davie, G. (2007). Effect of insulating existing houses on health inequality: cluster randomised study in the community. *British Medical Journal*, *334*(7591), 460-464.

Huang, S.C.L. (2006). A study of outdoor interactional spaces in high-rise housing. *Landscape and Urban Planning, 78*(3), 193-204.

Infraplan (2013) Urban Infill vs Greenfield Development: a review of economic costs and benefits for Adelaide

Jakovljevic, B., Paunovic, K., and Belojevic, G. (2009). Road-traffic noise and factors influencing noise annoyance in an urban population. *Environment International, 35*(3), 552-556.

Jim, C.Y., and Chen, W.Y. (2010). External effects of neighbourhood parks and landscape elements on high-rise residential value. *Land Use Policy, 27*(2), 662-670.

Kaplan, R. (2001). The Nature of the View from Home: Psychological Benefits. *Environment and Behaviour*, *33*(4), 507-542.

Kilbourne, E.M., Choi, K., Jones, T.S., and Thacker, S.B. (1982). Risk-factors for heatstroke: a case-control study. *Jama-Journal of the American Medical Association, 247*(24), 3332-3336.

Kim, D. and Ohara, K. (2010). A study on the role of gardening and planning of green environments for daily use by residents in senior housing. *Journal of Asian Architecture and Building Engineering*, *9*(1), 55-61.

Kimura, M., Nishiwaki, M., and Miyata, M. (2008). ATTITUDES AMONG RESIDENTS TOWARDS THE CREATION OF A COMMUNITY BY HORTICULTURAL ACTIVITY ON THE ROOF TOP OF A HOUSING COMPLEX IN TOKYO. *Acta Horticulturae, 790*, 205-211.

Lloyd, E.L., McCormack, C., McKeever, M., and Syme, M. (2008). The effect of improving the thermal quality of cold housing on blood pressure and general health: a research note. *Journal of Epidemiology and Community Health, 62*(9), 793-797.

Maschke, C. and Niemann, H. (2007). Health effects of annoyance induced by neighbour noise. *Noise Control Engineering Journal, 55*(3), 348-356.

Oswald, F., Jopp, D., Rott, C., and Wahl, H.W. (2011). Is aging in place a resource for or risk to life satisfaction? *Gerontologist, 51*(2), 238-50.

Rodriguez, M., and Sirmans, C.F. (1994). Quantifying the value of a view in single-family housing markets. *Appraisal Journal, 62*(4), 600-603.

Ruotsalainen, R., Jaakkola, J.J.K., Rönnberg, R., Majanen, A., Seppänen, O. (1991). Symptoms and perceived indoor air quality among occupants of houses and apartments with different ventilation systems. *International Journal of Indoor Environment and Health, 1*(4), 428-438.

SGS Economics and Planning (2016). *Local liveability cost benefit analysis*. Report for the City of Melbourne.

Tennessen, C.M. and Cimprich, B. (1995). Views to Nature: Effects on Attention. *Journal of Environmental Psychology, 15*(1), 77-85.

Vandentorren, S., Bretin, P., Zeghnoun, A., Mandereau-Bruno, L., Croisier, A., Cochet, C., Ribéron, J., Siberan, I., Declercq, B., and Ledrans, M. (2006). August 2003 heat wave in France: risk factors for death of elderly people living at home. *European Journal of Public Health, 16*(6), 583-591.

Velarde, M.D., Fry, G., and Tveit, M.S. (2007). Health Effects of Viewing Landscapes – Landscape Types in Environmental Psychology. *Urban Forestry & Urban Greening*, *6*(4), 199-212.

Wang, C., Si, Y., Abdul-Rahman, H., and Wood, L.C. (2015). Noise annoyance and loudness: Acoustic performance of residential buildings in tropics. *Building Services Engineering Research & Technology*, *36*(6), 680-700.

Wargocki, P.J., Sundell, J., Bischof, W., Brundrett, G., Fanger, P.O., Gyntelberg, F., Hanssen, S.O., Harrison, P., Pickering, A., Seppänen, O., and Wouters, P. (2002). Ventilation and health in non-industrial indoor environments: report from a European multidisciplinary scientific consensus meeting (EUROVEN). *Indoor Air, 12*(2), 113-28.

Wells, N.M. (2000). AT HOME WITH NATURE: Effects of "Greenness" on Children's Cognitive Functioning. *Environment and Behaviour*. *32*(6), 775-795.

Wilson, J., Dixon, S.L., Jacobs, D.E., Breysse, J., Akoto, J., Tohn, E., Isaacson, M., Evens, A., Hernandez, Y. (2014). Watts-to-Wellbeing: does residential energy conservation improve health? *Energy Efficiency, 7*(1), 151-160.

World Health Organization (WHO) (2007). *Large analysis and review of European housing and health status (LARES): Preliminary Overview*.

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