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STRENGTHENING ECONOMIC CASES FOR HOUSING POLICIES

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February 2019

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UNSW Built Environment
UNSW Sydney
cityfutures.be.unsw.edu.au

First published February 2019

Glossary

BAU	Business as Usual scenario
BHO	Better Housing Outcomes scenario
CBA	Cost-Benefit Analysis
CEGEM	Cadence Economics General Equilibrium Model
CGE	Computable General Equilibrium
CRA	Commonwealth Rental Assistance
EIA	Economic Impact Analysis
EJD	Effective Job Density
GRP	Gross Regional Product
GVA	Gross Value Add
NPV	Net Present Values
Research Team	City Futures Research Centre, SGS Economics & Planning, and Cadence Economics
Steering Group	CHIA NSW, Shelter NSW, Property Council of Australia, Landcom and Community Sector Banking
Technical Appendix	Prepared by SGS Economics & Planning, and attached at the end of this report

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1 More than meeting needs; promoting productivity?

Productive purpose

This report has the primary aim of persuading governments across Australia to make more serious efforts to understand and account for the productivity effects that arise from housing outcomes. It is not written to support a particular policy initiative or specific bid for housing funding, though the detailed results from the economic modelling reported below will be of immediate interest to housing policymakers and providers in Sydney and New South Wales. A previous report (Maclennan et.al. 2018) identified a wide range of evidence from different localities and time periods that suggested, prima facie, that housing outcomes can impact growth and productivity. This study aimed to strengthen that evidence in relation to the productivity consequences of housing location choices and costs for lower and middle-income households in metropolitan Sydney. The findings suggest that some housing outcomes have substantial productivity effects and they will inform policy debate and decision taking.

These cases for housing as infrastructure, with productivity-enhancing effects, are made first by outlining how housing may affect growth in relation to selected housing outcomes (Chapter 1 and 2). Different scenarios that create Better Housing Outcomes (BHO) in contrast to Business as Usual (BAU) housing development are presented in Chapter 3, and their effects on travel-to-work times, job choices, earnings potentials and spending possibilities are calculated. The differences in incomes induced by different housing outcomes are then examined for their wider economy impacts by using them to provide 'shocks' to an economic model of the metropolitan economy (Chapter 4). Short conclusions, limitations of the present approach and further possibilities for linking housing and growth are presented in Chapter 5.

Accumulating evidence, building arguments

Good, affordable housing that promotes individual wellbeing and social inclusion has long been an aspiration of social policymakers in advanced economies. There is now growing recognition that efficiently designed and well-located homes also play a major role in sustaining environmental quality. Housing assets and activities, including building, financing, repairing and exchanging, are also a major sector of the economy. In Australia housing costs (as noted in annual Household Expenditure Surveys) typically absorb a fifth of household spending, residential investment has typically formed between 4.5% and 6.5% of Gross Domestic Product (GDP), and housing now comprises the largest components (more than half) of the average Australian's debts and assets (all figures drawn from the Australian Bureau of Statistics). The economic scale of the sector means it usually commands some attention in selecting macro-economic policy settings to achieve overall employment and cyclical stability. However, insufficient attention is paid to the question of whether, and how, housing outcomes shape growth and productivity. In the past economic policymakers have rarely evidenced and modelled such questions. This omission is somewhat surprising as housing is an essential infrastructure for economic development. In related policy areas–most notably transport infrastructure investment–close attention is paid to growth and productivity effects.

By contrast, housing practitioners, advocates and ministers usually emphasise social rather than economic outcomes of policies and programs. In this millennium a difficult trinity–rising homelessness, lengthening public housing queues, and markedly rising housing affordability pressures on younger and middle-income Australians–has become the focus of policy debate. Housing advocates always make the 'merit good', or social needs, case for housing policy interventions. In periods of economic slow-down the housing sector, responding to the short-term economic interests of policymakers, has typically also argued for housing investment support based on the employment and multiplier effects of housing investment. Although housing providers and advocates usually recognise that their actions may change the economic trajectories of individuals and neighbourhoods, shaping how people and places grow, they make no evidenced claim for how housing outcomes impact the economic capabilities of people and places.

In recent years an additional economic case for the growth and productivity effects of housing investment has been gaining momentum. It starts from recognising the housing sector as a complex system that produces, maintains and exchanges a good with multiple characteristics and outcomes (such as quality, size, location, asset attractiveness and price/rent). Housing is, for households, a core infrastructure of fixed capital that underpins their economic as well as social activities. Maclennan et al. (2015) set out a framework for how different housing outcomes (such as distance from workplaces, residual incomes after housing costs, space for home-working and homework, and neighbourhood context) could all impact the well-established drivers of economic growth and productivity, including human capital, business capital and innovative capacities. There is a strengthening argument that housing outcomes, in multiple ways, can be plausibly linked to the productivity of individuals and places. The key challenge for better policy-making, for housing and the economy, is to identify the sources and strength of these effects.

Recent Australian studies such as Ong et al. (2017) have established a range of productivity effects of housing outcomes (e.g. labour market mismatches, housing wealth effects on consumption, and the impact of rising house prices on labour market participation of older men). An associated range of neighbourhood effects, related to housing choices, is reviewed in van Ham et al. (2013). Maclennan et al. (2018) noted that the long rise in real house prices and rents, at rates greater than wage increases, had spread affordability difficulties to middle as well as lower-income households, and into home-ownership as well as renting. These price and affordability outcomes, and a range of significant adjustments to them (like increased travel-to-work times and reduced home ownership rates for younger cohorts) both reflected then shaped economy-wide growth processes.

That report, based on the existing literature and interviews with government officials, housing providers and business organisations, concluded that there was a prima facie case that housing, as a form of economic infrastructure, could have significant effects on the productivity of labour and capital. It is important to understand how housing system outcomes have effects on the formation and use of different kinds of capital, especially human and business capital, in metropolitan areas where innovation systems and agglomeration economies may have a particular salience in boosting productivity. Much of the recent recognition of the distinctive productivity gains of large metropolitan areas comes from recognising and understanding these effects. The housing sector has little familiarity with agglomeration economy arguments, and they have been missing in housing investment cases. As the empirical section of this report draws attention to the productivity consequences of housing-residential location decisions and patterns, it is important to explore housing-agglomeration economy links in more detail.

Agglomeration: a tension of productivity and congestion

Agglomeration economies arise because of the productivity benefits associated with the physical proximity of businesses, workers, and consumers in the day-to-day activities of producing and selling goods and services (McKillop et al. 2015). Glaeser (2010) suggests that all agglomeration economies are essentially transport and communication cost savings. This helps to explain why cities have become more productive than regions. Duranton and Puga (2004) describe agglomeration benefits arising from the more effective “sharing, matching and learning” processes within dense labour markets. A more detailed consideration of these different shapers of agglomeration economies is important for understanding how housing outcomes may interact with labour market matching mechanisms to impact productivity.

Sharing benefits accrue where businesses and workers can share a common facility or pool of resources, such as (uncongested) infrastructure. Workers and firms can benefit from these shared resources in ways that raise their productivity. Matching benefits occur through the ability of firms and workers to better match with each other. Firms benefit in this sharing of labour resources through the specialisation and division of labour, i.e. they can find workers to match their very specific skills requirements. Workers with specific skills can similarly find specialised jobs for which their skills are most suited. This better matching of demand for and supply of specific labour skills is reflected in increased productivity. Effective job density within a metropolitan area is critical to securing agglomeration economies, and housing investment patterns that add to or concentrate the pool of labour accessible to jobs will, in this way, enhance productivity through specialisations in matching (as well as shorter

unemployment periods and a reduction in time frictions in job searches). Cities make it easier for different types of workers and firms to find each other, improving the quality of the match.

Sharing and matching effects can also be augmented by learning. Learning occurs due to tacit knowledge transfer, particularly through face to face interactions. Physical proximity among workers, whether in the workplace or through other daily interactions (e.g. whilst shopping, commuting, or socialising) fuels the sharing of knowledge. Knowledge transfers between firms then accrue because of the greater ability for knowledge transfer between workers, raising overall productivity. Increased productivity, whether from sharing, matching or learning effects, leads to expansion of goods and services produced locally and that, in turn, generates higher incomes to support more local spending. It also attracts further labour and required infrastructure, which in turn grows the common pool of resources.

Berthaud (2010) has cautioned urban policymakers and planners that agglomeration economies (rather like the productivity gains from infrastructure) are a potential, not a given, consequence of higher density. For productivity gains to be realised, they require effective matching and learning systems. In the context of Australian metropolitan areas, Maclennan et al. (2018) argue that there is enough evidence to suggest that the rising congestion costs associated with systemic housing shortages are eating into the productivity gains associated with agglomeration economies and innovation. This evidence is reflected in reports of skilled workers and firms leaving or avoiding major cities, and key worker shortages associated with rising rents and house prices. Similar arguments are now emerging across many faster growing metropolitan areas of the USA, Canada and the UK, (Albuoy, Ehrlich and Liu.2016; McKillop et al. 2015; Glaeser and Gyurko 2018).

The housing markets of Australia's biggest cities have altered considerably in the last year. Price falls in Sydney and Melbourne continue, and the media and political attention has shifted to the potential spread of 'housing instabilities' and systemic risks to the wider economy. These are important issues. However, instability and downswings are no excuse to lose focus on housing market outcomes and productivity. Housing sector instability rarely fosters high productivity, and there seems little likelihood that markets will unwind much of the accumulated real house price rises of the last seven years. Policy concerns about productivity require a long-term view. The macroeconomic choices to be made now regarding housing investment programs need to reflect not only short-term employment and medium-term cyclical stability, but also the long-term growth effects of housing infrastructure investments.

Stepping on, stepping up

Building on the research in Maclennan et al. (2018), this report focuses on economic modelling and estimation of selected productivity effects arising from better housing outcomes. The primary aim is to move beyond the prima facie case for 'better economic cases for housing' to produce strengthened evidence on the productivity effects of a narrower range of selected, and researchable, housing outcomes. The potential benefits of investment in non-market housing as 'social infrastructure' have been effectively explored by Lawson et al. (2018). This study takes a different approach. It looks across the housing system as a whole, not least because a preponderance of housing policy concerns now emerges in the market sector, and it emphasises exploring the range of macroeconomic consequences of better housing outcomes, including productivity effects.

In many respects the well-researched housing affordability problem has now become a poorly-perceived productivity problem. Australia has a recognised need to raise productivity rates. While the emphasis in doing so may be primarily on raising skills and innovation, there is no excuse for ignoring how the effective organisation of spatially fixed factors, such as cities, land, infrastructure and housing systems, may facilitate or offset such changes. Policy interest in the economic consequences of housing outcomes for growth and productivity has fallen through the gaps between different levels and sectors of government in Australia. The absence of a housing-economy conversation at municipal and metropolitan levels is highlighted in Maclennan et al. (2015). Housing and economic policy debates need 'new clothes'.

This project is a step forward in strengthening how the housing sector makes economic cases for housing policies and, importantly, how governments evidence the housing investment decisions they make. It is intended to spark a better-informed conversation between housing, infrastructure, planning and economic policymakers. It builds well beyond

conventional housing sector assessments that usually address, separately, the investment requirements to meet housing 'needs', and estimates of the multiplier effects of such investment. This study is emphatically different. It aims to put the economic modelling of housing outcomes, including productivity effects, on an equal footing with the cases and modelling approaches already widely used and accepted in justifying investment in transport infrastructure.

The research team's approach to selecting, scoping and modelling key questions is summarised in the next Chapter, and discussed in more detail in the Technical Appendix. Chapter 3 outlines the key issues addressed and justifies and develops the BAU scenarios and BHO developments. The changes in household incomes from providing BHO options are then framed as 'shocks' to the economy. The major economic impacts of these 'shocks' are then estimated in a Computable General Equilibrium (CGE) model in Chapter 4. Chapter 5 presents the key conclusions of the research.

2 Research focus and approaches

Purpose, policy and productivity

Housing systems create diverse outcomes in economies, with market and spillover effects, place effects and complex dynamics. They are, in short, a challenge for economic modelling. With the recognition of productivity effects, there is a likelihood that new, better models will emerge. With this in mind, and reflecting the available time, resources and data, the realistic aim for the project was to develop a 'strengthened' cases, rather than complete or perfect cases.

There is widespread acceptance in the economics profession that traditional, favourable, macroeconomic estimates of the productivity and growth effects of infrastructure investment, mostly estimated in the 1980's (Aschauer, 1989), can no longer be regarded as a credible basis for policy debate. They have been overtaken by changes in circumstances, data and econometric techniques (Maclennan et al., 2015; Thoung et.al., 2015). More disaggregated approaches, at regional and metropolitan scales, are now regarded as more compelling ways to link different investment programs to different economic outputs. A variety of econometric modelling approaches could, in principle, be used to address key questions about the wider economic effects of how housing outcomes at metropolitan scales respond to different local investment decisions. Time-series models, models with macro-metropolitan economy links, and fully developed metropolitan econometric models would all help. However, such models do not currently exist in Australia. There is no framework of macro to metro modelling within the federal government's analytical weaponry. The major metropolitan chunks of the Australian economy, now larger than several smaller European national economies, are only now beginning to develop workable metropolitan-level economic models. This study used the best approach available–CGE modelling–to address key issues at national, state and metropolitan scales.

As noted, the main aim of this study was to identify whether productivity effects of housing outcomes are of sufficient magnitude that they need to be considered and calibrated in shaping housing and economic policies at metropolitan and state scales. In a modelling context, this means specifying a change, in this instance an increase in housing investment that produces BHO rather than BAU developments, and then identifying how the modelled outcomes of the base case and the new program differ. These proposed investment changes shift housing outcomes, which in turn alter household economic circumstances. These changes then constitute an economic 'shock' to the baseline position of the economy. For example, making housing more affordable leaves households with more disposable income to spend on goods and services; this then 'shocks' the economy, resulting in higher incomes that in turn drive further adjustments.

'Scenarios' are used to build the shock effects and the CGE models then estimate their wider economic effects - in this instance for (i) the Sydney economy; (ii) all of New South Wales; and (iii) Australia, over the longer term. The scenarios that created system 'shocks' were defined by the research team. When governments use CGE modelling they are usually comparing the economy effects of a 'shock' induced by a proposed change in investment programs or projects, compared with existing or baseline policy positions. The key aim here was not to model effects of a specific government program, but to identify that plausible housing investment shocks had significant economic productivity effects. This area of research is widely labelled as Economic Impact Analysis (EIA). This study is an EIA.

This research process also identifies some effects that Cost-Benefit Analysis (CBA) undertaken by treasuries for public policy business cases would be likely to include. It is important to note that CBA of infrastructure investments usually goes well beyond CGE approaches to include other social, environmental and distributional consequences of project outcomes. Hence EIA assessments will understate both wider costs and benefits. When very long-term investments are made, such as housing and transport infrastructure, the possibility of evolutionary and emergent effects on the economy cannot be discounted. This means that 'equilibrium' analytical frameworks, including CGE, may have limitations and understate change. Clearly, however, the CGE modelling results produced here can be used within a CBA of projects when productivity and employment are the dominant concerns for policymakers. In the concluding chapter we discuss the potential for others to use our EIA results for CBA, and provide some illustrative comparator assessments for other infrastructure investments. That will be useful icing for some readers, but it is not the cake. The main aim is shifting and improving how housing policy cases are made for the long term with better EIAs.

The beginnings of wisdom: asking the right questions

The precursor paper (Maclennan et al. 2018) identified a wide range of possible effects of housing outcomes on productivity growth drivers, and identified seven issues likely to be important in the Australian context. These were:

1. How agglomeration economies could be shaped by housing investment and residential densities
2. The consequences of rising house prices and rents for housing expenditures, consumption and productivity
3. Housing construction period effects on costs
4. Labour market effects associated with housing-labour mismatches
5. The efficacy of housing supply solutions
6. Fiscal and other savings arising from inclusionary zoning
7. The consequences of growing shares of ageing households in metropolitan areas implications for intergenerational caring and labour supply within extended families

The research team and the project steering group reviewed this list. Whilst the above topics were all considered relevant and interesting, they were scrutinized in relation to three criteria:

- Does the issue help to build to build the economic case for investment in housing?
- Is the issue potentially suitable for modelling via CGE modelling?
- Is modelling the issue feasible given the project timeframe (that essentially precluded developing new models)?

After consultation it was decided the detailed analysis in this project would attempt to frame and estimate 'shocks' for:

1. **Agglomeration effects and residential densities:** this provides estimates for the housing equivalent of travel time savings for transport infrastructure projects. When workers reduce their travel to work times they may devote more time to working and that constitutes a growth-inducing increase in the supply of labour. The more workers who can access jobs within, say, 30 minutes, the higher the effective supply of labour. This effect is typically estimated for transport investments. However, greater accessibility to potential labour supply is not simply a function of transport investments to reduce travel times (given the existing residential geographies of the metropolitan labour supply), but may also be impacted by the volume and density of housing driven by housing investment strategies. That effect needs to be estimated.
2. **Human capital accumulation effects:** housing outcomes impact human capital formation and use in numerous ways. This topic focusses on the productivity and agglomeration benefits arising through better matching and learning effects when households can access affordable housing closer to jobs, education and services, compared to a situation with poor access to affordable housing and low proximity to jobs.
3. **Housing construction period effects:** anti-cyclical investment in housing (and policy incentives instigating this) may be effective in flattening the boom and bust cycle of the industry. This may therefore bring more certainty, lower risk and greater opportunity to grow the residential construction industry efficiently.

4. **The effects of high housing prices and rents on the consumption and savings behaviours of households:** rising housing prices impact consumption through (at least) two channels: rising wealth, and reduced disposable incomes. Renters are primarily impacted by the latter effect of high rents. There has been remarkably little prior modelling of these household consumption effects of high housing costs, perhaps reflecting a prior assumption that rising housing costs simply transfer income from property users to property owners. The project team started from an assumption that these effects were not likely to be neutral transfers for the growth of the economy, but also recognised that their effects might be difficult to model within the CGE modelling framework.

The technical details of the methods used to develop scenarios, estimate shocks and model their economic impacts are outlined in the **Technical Appendix** (at the end of this report). This rest of this chapter briefly describes the scenarios and CGE modelling approaches, with more substantive discussion on data and patterns to follow in Chapter 3 and 4.

Scenarios to shape shocks

The chosen approach involved creating Business as Usual (BAU) and Better Housing Outcomes (BHO) scenarios. By comparing BAU and BHO scenarios, the effects of better housing outcomes can be established and calibrated as shocks to be modelled.

Business as Usual scenario

This baseline scenario assumes that current levels and patterns of housing investment continue, with most housing developed at market prices, at low and medium density and in less accessible locations, potentially at the urban fringes. The result is a continued undersupply of affordable housing with good access to jobs and services. Good access is considered as within 30 minutes travel, being the goal identified in recent federal government policies (Sustainable Cities, 2016: Prime Minister's Department).

The unmet demand for affordable housing continues to grow, and more households will experience housing payment and other stresses. Also, more households will be renting, often long term. Travel times for low to moderate income households will remain high, as housing they can afford is in remoter or lower job density locations within the metropolitan area. At a metropolitan level, more businesses struggle to find suitable staff within a 30 minute radius, especially in sectors like hospitality, care and education. Workers similarly struggle to find jobs close to home, especially those on median and below median incomes.

Better Housing Outcomes scenario

In this scenario housing is recognised as a key economic infrastructure, and the aim is to provide more affordable housing within 30 minutes travel of jobs and services. The scan of feasible locations for BHO developments identified locations within Sydney with shorter travel to work times than BAU localities, but they are still significantly greater than the 30-minute target.

It is assumed that an investment program is developed providing a subsidy for developers to deliver affordable housing close to jobs and services. It is further assumed that over a 10-year timeframe, 125,000 affordable dwellings will be delivered in well-serviced, accessible locations. Where BAU delivers market housing in poorly accessible locations, the incentive triggers investment for BHO. Further, to model instability effects on housing construction productivity, the changed housing investment is to be rolled out in an anticyclical pattern to counter cyclical instability.

CEGEM modelling

The impacts of the changes from BAU to BHO policy scenarios involve direct effects on the incomes of households, which then have further flow-on effects throughout the economy. For instance, better labour force outcomes flow through the economy in terms of improved productivity in industry sectors and enhanced consumer spending, which impact on the Gross Regional Product (GRP) of the state.

Econometric CEGEM modelling was used to capture these flow-on effects and establish the total impacts of investments. Simply put, a CEGEM model links the different sectors and activities in an economy though a matrix of input-output relationships. When a 'shock' impacts a particular sector a concatenation of linked impacts spreads across the economy until the shock is dissipated by output and price changes that restore the system to a new equilibrium. CEGEM models can be operated at different spatial scales and in this project the CEGEM modelling framework was refined through a specific regional disaggregation to measure the impacts of Sydney housing market interventions on Sydney, the rest of New South Wales, and Australia.

The core BHO scenario used below is a culmination of several economic factors that drive changes in the CEGEM, including travel time savings, improvements to the human capital stock, and the cost to government of the policy options. Additionally, the potential benefits of government maintaining "shovel ready" projects to both capitalise on and partially mitigate natural cycles in the construction sector were analysed.

The next chapter outlines and justifies the key elements of the chosen scenarios and the shocks they create for subsequent modelling.

3 Better housing, stronger economy

Housing and neighbourhood effects, for some socio-economic groups and some kinds of markets and neighbourhoods, can have a series of effects on human capital. In this study we focus on what can feasibly be measured and modelled with existing data and models.

Maclennan et al. (2018) brought together academic literature indicating a variety of ways in which housing outcomes were likely to affect household wellbeing, capabilities and productivity. For instance, there is likely to be a chain of damaging effects on the formation and use of human capital for low income renters. Small, poor quality homes limit learning opportunities for children; the frequent household moves experienced by many low-income families in rental markedly damage school performance; neighbourhoods with concentrated poverty often have negative impacts on the school performance of teenagers and their transition into the workplace; address-based hiring discrimination occurs against residents of disadvantaged neighbourhoods; and potentially severe labour market mismatches often occur for low income workers forced to the edge of metropolitan area, but undertaking low-wage city centre jobs.

These potential chains of housing disadvantage are likely to impair capabilities to learn and work and erode the productivity of low skilled labour. Lifetime health effects of poor quality (or just badly located) homes may have similar effects. Along with other significant plausible mechanisms of housing outcomes eroding capability and human capital, these chains of effects are left to the side in this analysis. They would require substantial research using panel data for places and people to look at the life-cycle trajectories of individuals and households through the housing system and the labour market. They are mentioned here because many of these effects are not captured in the scenarios and shocks developed, and in consequence the negative effects of poor housing outcomes for poorer workers and the potential benefits of BHO are probably understated.

Defining Better Housing Outcomes

It is consistent with most approaches to housing policies in Australia, and other advanced economies, to define good housing outcomes as affordable homes with good accessibility to jobs and services. Policy judgements are required to give empirical dimensions to 'affordable' and 'good access'. To operationalise these ideas we focused on both low and moderate income households (up to median incomes for New South Wales), as affordability stresses now occur across these income ranges. The study also defined 'good accessibility' as requiring travel to work times of under 30 minutes to jobs and services, and 30% of household incomes as an upper limit to 'affordable' payments for adequate housing. It is recognised that other modelling contexts may set different limits to 'good' and 'poor' housing outcomes.

If investment in housing infrastructure were to secure improved access to jobs and job opportunities, facilitate job stability, and increase disposable incomes, then households, communities, and the city would all secure measurable benefits. These would include:

- **Travel time savings** for those households experiencing better housing outcomes closer to jobs and services. Part of these travel time savings will be used for leisure, with the remainder used as working time, thereby increasing economic productivity. Reduced travel time may also lead to reductions in travel related environmental externalities (reducing the consumption of 'natural capital'), but these effects are unmeasured here[1].

1. In a full CBA approach it would be important to estimate whether developing BHO leads to congestion in the use of local and metropolitan wide infrastructure. In estimating the costs of delivering BHO, allowance is made for localised infrastructure costs but not wider metropolitan provisions.

- **Enhanced human resource accumulation**. Households enjoying better housing location outcomes have greater access to jobs that better fit their capabilities and better fit the needs of employers. A wider range of jobs within specified travel distances raises labour participation and productivity, which is reflected in increased lifetime earnings. This benefit flows on through the economy, generating a range of further productivity effects. It is important to note that the effects of reduced travel times on work effort within existing jobs (travel time savings) and better labour market matching of households and job opportunities are widely recognised productivity benefits in justifying transport infrastructure investments. Reduced travel times and better matching can occur through either transport investment, to allow workers to cover the distance travelled more quickly, or housing investment, to provide more housing within given time-distances to employment opportunities. It is important to separately identify such transport and housing induced effects and not allocate them all to transport gains (whilst housing effects are, as at present, ignored).
- **Reduced levels of budgetary stress** for households securing homes within 'affordable housing' limits, resulting in enhanced disposable income and consequences in consumption patterns. The households enjoying better housing outcomes no longer pay more than 30% of their income on rent, and instead can spend on other primary needs including education and saving for a home loan deposit. Lower levels of financial stress are also associated with improved (mental) health outcomes and policy may have income distribution objectives that are better met by such outcomes; these benefits are not included in this estimation.
- **The dollar value difference in rents paid** when in housing payment stress (i.e. without better housing outcomes) and when paying a maximum of 30% of income on rent. This difference is used as an overall proxy measure for the value of the reduced levels of payments stress these households experience when better housed. Some commentators might argue that the 'excess' rent payments made by younger and poorer households simply constitute a transfer to the property owners, whose higher incomes will lead to spending that offsets the lost consumption (and productivity effects) of those paying the 'excess'. This may be partly true, but redistributing income from lower- and middle-income households to better off households is not likely to be a consumption neutral transfer (see Maclennan and Miao 2017). This study assumes that reduced housing expenditures may have productive consequences in the economy due to different consumption and saving patterns of those experiencing improved housing outcomes, compared to all tax payers or landlords. However, the flow-on effects of reducing excess housing payments could not be subjected to EIA within the CGE modelling framework, and presented outcomes are probably under-estimated.
- **Anti-cyclical managed investment in housing** can facilitate structural productivity improvements in the construction industry, as downswings destroy the complex networks of labour and firms involved in construction, and upswings may quickly inflate input costs. That is, investment in securing better housing outcomes is better maximised during cyclical industry downturns not just because it creates employment stability via multiplier effects into other sectors, but because it also secures higher long-term output with greater productivity and lower costs.

Better housing outcomes, independent of the specific enabling policy intervention, are accompanied by a cost. This cost would be equal to the total cost of developing the (equivalent) dwellings as affordable housing instead of homes produced and exchanged at full market prices and rents. There are many different ways that governments can induce market providers (whether for-profit or non-profit) to create a gap between 'market' and 'affordable' outcomes, including taxes, loan subsidies, income-related and others forms of support. For simplicity, we assume a grant system in this research. It is also assumed that building higher density housing development in locations close to jobs and services has a different total development cost than lower density, market price housing at the urban fringe. The potential benefits and costs factors in creating our better housing outcomes are described in more detail below.

Contrasting scenarios

This section develops and contrasts the BAU and BHO scenarios to establish the effects of better housing outcomes. As the investment program modelled below involves 12,500 homes per annum for the next 10 years and is aimed at affordable rentals, it falls well short of likely additional supply requirements in the Sydney metropolitan area. As such, creating the BHO will not lead to vacancies elsewhere in the metropolitan area, but instead reflects key assumptions about the most productive ways in which to support metropolitan development.

Selecting BAU and BHO geographies

Low to moderate income households typically reside in locations with reasonably affordable rents. A number of more affordable areas in Sydney were selected, using the SGS Rental Affordability Index for mid-2018 (SGS, November 2018), as BAU localities. This group of more affordable areas have poorer access to jobs and services than the chosen BHO locations. The criteria for selecting BHO localities were those with high accessibility to jobs within a 30-minute radius, residential development potential, and proximity to key service precincts (and employment) locations. These desiderata were measured for each of the BAU and BHO locations as follows (and as explained in more detail in the Technical Appendix):

- The accessibility of home locations, for both BAU and BHO areas, to jobs was proxied by an Effective Job Density (EJD) measure, previously developed by SGS (outlined in the Technical Appendix).
- Residential growth potential of each BHO locality was identified by first measuring the area of mesh blocks that have been zoned to have their predominant use as “Residential” (and are located in R3 and R4 residential zones). The area devoted to existing dwellings and any non-developable land (such as space devoted to other infrastructure) within each block was deducted from the total block area and then the potential residential uplift capacity calculated by assuming an average floorspace of 87 sqm per unit on vacant, developable land.
- The proximity of potentially developable land to well serviced precincts was determined by identifying locations within 800 meters of a hospital (as a proxy for broader service hubs). Areas meeting this criteria, that also have relatively high EJD scores and significant residential yield uplift potential, were identified as BHO localities. They include areas such as Randwick, Liverpool, Auburn, Canterbury, Kogarah, Campsie, North Shore and Parramatta.

Effects of BHO: travel time savings

Some of the travel time savings accruing to BHO households will be used for leisure and personal activities, while some will be used as working time. Whilst it can be argued that both forms of time savings add to household real incomes and outputs, and enhance productivity, for simplicity the study assumes that only increased work time adds to productivity. To develop scenarios to estimate the travel time savings, it was essential to make realistic assumptions about where households would live in the BAU and BHO scenarios, how moving to the BHO areas would reduce average travel times and change travel modes, and how households might divide their gains between work and leisure activities.

Once BAU and BHO localities were identified it was possible to calculate, and compare, the average travel times for workers in these different geographies (BAU areas in Table 1, BHO areas in Table 2).

Table 1 Average travel time from selected BAU geographies (minutes)

Representative geographies: BAU	Average Private Travel Time	Average Public Travel Time
Fairfield	60.7	88.7
Blacktown	61.0	78.8
Mt Druitt	68.7	93.0
Penrith	83.4	106.7
Campbelltown	89.6	98.0

Source: SGS Economics and Planning, 2018, based on TPA Travel Time Matrix, 2016

Table 2 Average travel time from BHO geographies (minutes)

Representative geographies: BHO	Average Private Travel Time	Average Public Travel Time
Auburn	48.8	63.3
Canterbury	51.6	72.2
North Shore	51.7	68.5
Parramatta	51.9	68.5
Campsie	52.2	73.1
Liverpool	59.1	73.0
Randwick	59.5	74.7
Kogarah	60.5	74.5

Source: SGS Economics and Planning, 2018, based on TPA Travel Time Matrix, 2016

By contrasting the average travel to work time for employees in the BAU and BHO zones the likely travel time savings associated with moving to a particular BHO location can be identified. Transport for New South Wales (TfNSW) has calculated that the value of time to each person travelling by either car or bus is $16.89 per hour. A worker would save around $2,700 per year on average[2] if they were to relocate from a BAU to a BHO area. Detailed tables are available in the Technical Appendix.

Travel mode changes

Typically, outlying areas such as the BAU locations display higher rates of private car usage over public transport. TfNSW provides data for the proportion of households located within small areas that commute by a particular transport mode. The data shows that the BAU areas rely 8% more on private transportation, and 3% less on public transportation, than the BHO localities. The change in transport mode between BAU and BHO geographies varies across each individual location. For instance, a commuter in Penrith moving to Randwick could be expected to reduce their private transport usage by approximately 22%. Conversely, a commuter in Mt Druitt could be expected to increase their private transport usage by around 5% if they moved to Parramatta. Overall, average private travel use reduces by 8% on moving from a BAU to a BHO locality.

Table 3 Private mode of travel change between BAU and BHO geographies

	Better Housing Geography							
	Randwick	Liverpool	Auburn	Canterbury	Kogarah	Campsie	Nth Shore	Parramatta
Fairfield	-18%	-6%	-10%	-7%	-16%	-7%	-23%	-20%
Blacktown	-8%	4%	0%	3%	-6%	3%	-13%	-10%
Mt Druitt	-3%	9%	5%	8%	-1%	8%	-8%	-5%
Penrith	-22%	-10%	-14%	-11%	-20%	-11%	-27%	-24%
Campbelltown	-14%	-2%	-6%	-3%	-12%	-3%	-19%	-16%
Average[2]	-13%	-1%	-5%	-2%	-11%	-2%	-18%	-15%

Source: SGS Economics and Planning, based on Transport for NSW Household Travel Survey, 2016/17

2 Working five days per week for 48 weeks per year.

3 Average private travel mode change in Better Housing Geographies = -8%

There are similar differences when comparing mode changes on public transportation usage. A commuter in Penrith would be expected to increase their public transport usage by around 11% if they moved to Kogarah. Conversely, a commuter in Campbelltown would use public transport around 1% less if they moved to Randwick (see Technical Appendix). Overall, there is an increase of around 3% in public transport usage if shifting from a BAU to a BHO location.

Estimated travel time savings

When allowance is made for changing travel modes on relocations from BAU to BHO localities, the average worker is expected to save around $2,544 dollars per year.

Using travel time savings

Not all travel time savings are used for work. According to SGS Economics & Planning (2015), in the short term, travel time savings are likely to be used for work. In the long term, savings are likely to be used for leisure. They estimate that likely proportion of business travel time savings used for leisure is around 45% for commuters travelling by car, 53% for train and 55% for bus. If it is assumed that an average 50% of travel time savings will be used for productive purposes, then an average productive travel time savings (or labour supply increase) per worker of $1,277 per annum would be achieved by locating in BHO as opposed to BAU neighbourhoods.

Table 4 Weighted average travel time savings per worker

Travel Mode	Savings ($)	Modal Split in BAU %	Savings per worker
Public Transport Savings ($)	$2,983	17%	
Private Transport Savings ($)	$2,466	83%	
			$2,554

Source: SGS Economics and Planning, 2018

Productivity improvements: human capital accumulation

The discussion above on agglomeration economies notes that households with greater accessibility to labour markets can access a wider range of jobs that better fit their capabilities and preferences, and better fit the needs of the employers. Labour market participation and productivity therefore increase, and this is reflected in the workers' increased earnings. This benefit then flows on through the economy, generating a cumulative growth in productivity fuelled both by higher returns to city scale and higher spending per capita. It is important, therefore, to identify how better access to more jobs, occasioned by the availability of BHO, raises the productivity and earnings of workers.

Human capital and agglomeration: contrasting BAU and BHO geographies

This analysis assumes that labour market agglomeration benefits drive human capital accumulation and that more skilled workers earn higher incomes. Employers pay more for skilled employees if they meet their exact requirements. In consequence, areas with high access to jobs and to employees within a 30-minute radius are better equipped to optimally match worker capabilities with employer requirements. A worker living close to jobs and services has better chances to match their precise skills to the different requirements of metropolitan employers.

The analysis makes several assumptions. It is assumed that workers who move to a BHO do adjust their work choices to match their skills more effectively to the wider job opportunities. Further, it is also assumed that new supplies of labour into labour markets proximate to BHO does not impact the general level of wage rates. In consequence, the increased earnings (after adjusting for age, gender and skill level) of workers living in a BHO area are a proxy for the agglomeration-induced productivity benefits of better labour market matching. To determine the agglomeration benefits of BHO, the difference in annual earnings between BAU and BHO geographies were analysed. BAU geographies typically have lower Employment Job Densities than BHO geographies. The differences in annual earnings were analysed by age, gender and qualification level.

Human capital differences by qualification

The Technical Appendix describes earnings differences broken down by skills qualification, age and gender and by whether individuals are residents of BAU or BHO localities. Lifetime differences in expected earnings were calculated for these different skill-age-gender groups and earnings differences for all those groups calculated and contrasted for BHO and BAU geographies. The gap, measured by the Net Present Value (NPV) of differences in expected earnings across the lifespan, equates to around $425,000 for those with postgraduate degrees and $491,446 with undergraduate qualifications. For unqualified workers and workers with certificates, the earnings gap is significantly less. Workers with trade certificates earn approximately $88,000 more in BHO areas, while unqualified workers earn approximately $56,000 more (these are lower proportional as well as lower absolute differences for the less skilled groups).

Reduced housing payments stress

Consumption, residual incomes and transfers

There is a widespread view in housing policy debate in the advanced economies that middle and lower-income rental households should not be required to pay more than 30% of their household incomes for housing costs. This widely used policy guideline is also subject to ambiguities (what to include as housing costs; how to deal with costs that substitute for housing attributes such as transport and energy costs; which concept of income to use etc). Nonetheless, for this study our BHO scenario involves our target group paying no more than 30% of their income on rent.

There has been research in Australia (Ong et al., 2017) on how rising house prices, through the mechanisms of housing equity withdrawal and housing wealth based 'feelgood' factors, may impact household consumption. The impacts of rising housing costs for renters and consumption has been relatively ignored. At first sight this seems a surprising, major omission. If tenants faced lower rents they would be able to choose to spend on other primary needs including education, health, transport and food, or to accumulate savings, including a home loan deposit. Higher levels of consumption of goods in the metropolitan economy may have direct positive impacts on productivity. Higher savings may also support in asset accumulation and growth in the future. In this study the focus is on consumption-economy-productivity effects. Other gains from lower housing payments in relation to income, such as reduced anxiety about meeting payments, are not considered here. The dollar value difference (between rents paid by low- and middle-income groups and rents calculated as a maximum of 30% of household income) is the proxy for the reduced levels of budgetary stress or 'excess rent' these households experience.

There is a major caveat in this argument that cautions against over-estimating reduced rent effects on overall consumption in the economy. Reduced rent payments by tenants in a metropolitan area also imply either reduced rental payments to landlords or increased payments from taxpayers to tenants. Both these effects, that would differ in magnitude (especially if tax-sourced subsidies to the metropolitan area were federal in origin), would clearly offset the consumption/savings gains of renters in BHO with reductions in the spending/saving possibilities of either landlords or taxpayers. Economist call this process a 'transfer effect'.

The research team rejected an a priori assumption that transfers of rent between tenants and landlords in modern metropolitan housing markets are likely to be neutral. Rather, they are of major importance to the economy over the long term. Higher rent payments in relations to income will prolong the period that households will remain in rental housing to save for a house deposit. This may impact tenure choices, family formation and lifetime savings and consumption patterns. We also recognise that lower rent payments that leave households with higher residual incomes (after housing costs) may interact with other housing-based productivity effects. For instance, it is plausible to argue that higher residual incomes allow households to spend more on transport and education that allows them to pursue better labour market opportunities and higher skills. High rents typically reinforce growing disposable income (after housing costs) inequalities within and between generations.

After exploration of these ideas within the CGE framework the research team concluded that it was not an appropriate framework for understanding the economic consequences of 'excess rents' and that a different approach needs to be developed. It was possible to estimate the extent and pattern of excess rents and they are reported below. The exclusion of excess rent effects from the CGE modelling is likely

to mean that our estimates of the overall impact and benefits of BHO are conservative. It is also worth noting that recent and younger home-owners also face high burdens of housing payments to income, and they should be included within any future consideration of high housing costs and longer-term economic consequences.

Overspend on rent under BAU

An estimate was made of the income that households in BAU areas spent on rent above the 30% income threshold. This was calculated using ABS data (see the Technical Appendix), by comparing rent payments to household incomes in NSW.

The analysis revealed that households in rental stress in NSW 'overspend' beyond the 30% threshold by an average of $5,893 per annum. This single figure shows the huge gap between government's social merit aspirations for housing rent burdens and what tenants now pay for housing. If these households actually paid a maximum of 30% of income on rent, their disposable incomes would be higher by $5,893 per annum. The total, indicative annual 'overspend' on rent in NSW is approximately $1.8B. This is in addition to any Commonwealth Rental Assistance (CRA) paid, which approximates $1.4B for NSW (430,000 of the 1.35 million national recipients of CRA live in NSW, and the national spend on CRA is approximately $4.4 bn).

Anti-cyclical productivity impacts

The productivity proposition in relation to BHO scenarios relates not just to what is provided–affordable homes in accessible locations–but to how programs are provided. In this section we address the question of whether cyclical instabilities in construction lowers the productivity of construction activities and wider economic activities. This prompts a second question: does government support for investment in affordable housing during periods of economic downturn have both employment stabilisation and productivity effects within the construction sector?

The significant employment and multiplier effects of housing investment stimulus programmes, allowing for how they are designed and delivered, are well established. The broad nature and outcomes of the most recent housing stimulus program in Australia–the Social Housing Initiative–are well documented (and summarised in the Technical Appendix). A 2012 program review by KPMG concluded that the Social Housing Initiative resulted in significant stabilisation and housing policy gains. But the design of the program and its evaluation did not look at the productivity effects of the 20,000 units provided, reinforcing our earlier critique that these potentially important questions need to be addressed for housing as well as transport infrastructure.

Housing construction and productivity

So why might the issues of productivity and housing construction productivity be related? There is a general and longstanding argument, now widely used in China for example, that in phases of rapid growth and urbanisation the share of construction in the economy rises. As construction sector labour productivity is often estimated to be low relative to other economy sectors, aggregate demand shifts to housing construction will lower short and medium productivity in the economy until development is completed. Australia, by advanced economy standards, has both a high population growth rate and high levels of urbanisation, so a negative productivity effect could be anticipated. However, national statistics suggest that Australian construction sector is relatively efficient by international standards and that average labour productivity is close to the national average, thus rendering a 'transformational effect' unlikely.

There is a stronger prima facie case for suggesting that instability in the level of construction demand and output are more damaging to productivity. One argument relates to the management and organisation of construction firms–that fluctuations in output, in the downswing, quickly destroy inter-firm linkages for different skills and make them slower to re-establish in the subsequent upswing. It is also argued that labour training and technological innovation in the sector are diminished by instability. A more stable sector may lead to greater certainty for firms (i.e. a reduced risk profile), enabling strategic planning for structural growth and enhanced overall productivity outcomes. A more straightforward argument is that in downswings there is a cost reduction for materials and labour, so that costs per unit of housing produced fall.

Changes in the construction economy

Gross Value Add (GVA) for construction across NSW has increased from $19.6B to $43B between 1990 and 2018, at an annual average growth rate of around 3.2%. This has slightly outpaced overall industry GVA across NSW, which experienced annual

average growth of around 2.8%. Construction output contributes around 7.9% to NSW GVA, which has increased slightly from 7.6% in 1990.

The total annual GVA for the construction industry can be seen in Figure 1. It shows that the construction sector experiences significant fluctuations in GVA when compared with all industries across NSW.

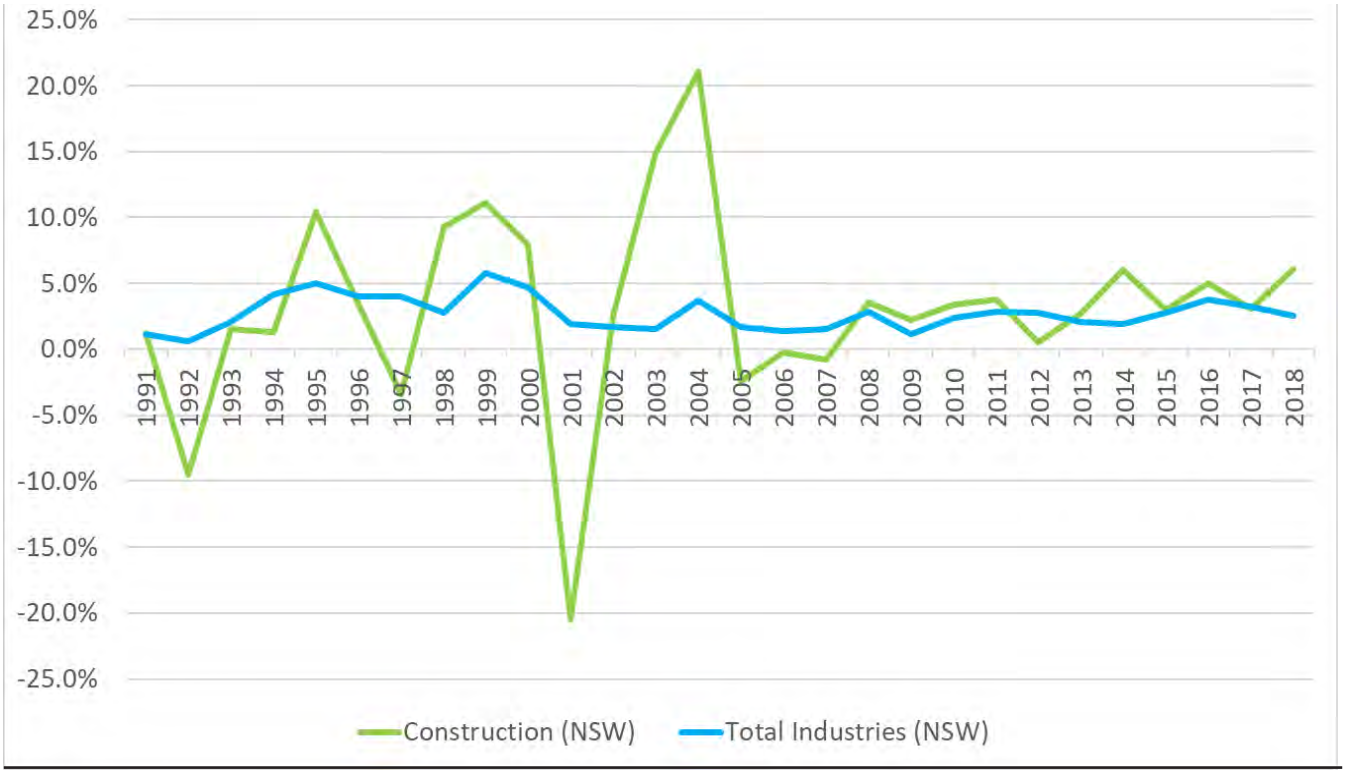
The GVA per hour worked is an indicator of labour productivity. GVA per hour worked in the construction sector has remained relatively flat over time, rising by 6.6% from $58.2/hour in 1995 to $62.0 in 2018. This contrasts with GVA per hour worked across all industries in NSW, which has risen around 38.6% from $59.0 to $81.7/hour (which suggests that metropolitan construction productivity growth is falling behind the industrial sector).

This indicates that productivity has largely stalled over the past 20 years (hinting at a 'transformation effect' at the metropolitan scale) when compared to overall productivity across NSW. The figure below suggests there is a relation between the industry downturn in 2008-09 and lower productivity. This would suggest that anticyclical investment would potentially drive an increase in productivity. Since 2013 GVA per hour worked has remained stable and lagged industry growth and productivity growth in the wider economy. The evidence of a link between industry downturn and labour productivity therefore appears to be weak.

Costs and downturns

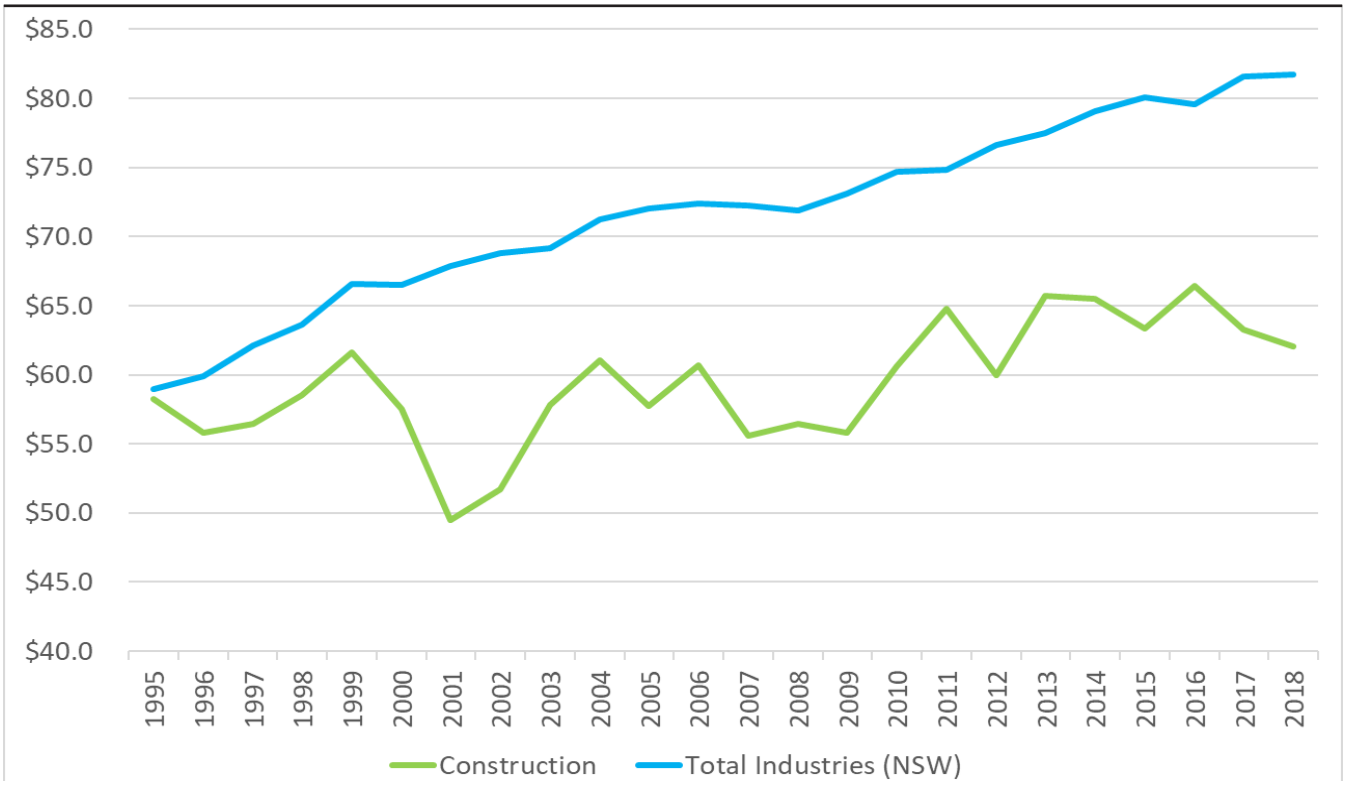
When materials and labour costs were considered together some evidence of reduced costs was found, and there is qualitative evidence about the structural and strategic impacts of stability on the industry, but the overall statistical evidence is not strong. In all, there is limited evidence that links industry downturns to possible cost savings, and vice versa and that anti-cyclical investment generates economic impact beyond what is typically expected of investment in other parts of the industry cycle.

Figure 1 GVA change construction vs. all industries in Sydney



Source: SGS Economics and Planning, 2018

Figure 2 GVA per hour worked



Source: SGS Economics and Planning, 2018

Subsidy for developing affordable housing

With excess demand for housing in the Sydney metropolitan housing market (signalled by sharply rising house prices in most recent years), it is probable that the volume of housing stimulus suggested below would have been capable of being sold or let at full market prices. This would not have removed the productivity gain but altered its detail and distribution. Higher income and skills groups would have secured the gains from travel time and wider labour market choices and market sector house prices/rents would have been lower than otherwise. However, the BHO scenario was formulated on the objective of making housing available to middle and lower-income households. This allows the socio-economic and skills profiles of the BHO localities to replicate what is found in the BAU areas. This will require a subsidy to reduce the cost of housing to below full market levels.

This could be delivered by different methods. Where land values have risen significantly over the levels paid by current landowners, the unearned gain is a potential source of subsidy to below-market rate occupants. In effect the scarcity 'economic rents' that are an inherent feature of metropolitan growth would be redistributed, in part from landowners to property purchasers (and, with the right arrangements, tenants). Such a strategy has a strong basis in concerns about productivity because 'taxing scarcity rents' makes no difference to output and productivity. Any form of subsidy from state or federal sources, on the other hand, will have some lost output as part of the opportunity cost of raising tax revenues to pay for the subsidy. Although such approaches to providing affordable housing have been extensively used in market-oriented housing systems like London and California, and land uplift gain capture commended in the federal government's Cities Paper (in the financing of city deals), they have only been weakly pursued in the Sydney metropolitan area. This could change if governments choose to make housing investment decisions more productive to raise metropolitan and national productivity growth.

We assume that a government incentive exists to encourage private and not-for-profit housing

investment to initiate development. An annual subsidy is assumed to enable and leverage investment in BHO areas. To highlight the relevance of the arguments in this paper we assume a subsidy of $8,500 per dwelling per annum for 15 years to deliver an additional 125,000 new affordable homes provided in Sydney over 10 years. It is not assumed here that this is the optimal subsidy delivery mode, and we do not explore different ways of channelling support into the system. That would require further work when policy options become clear.

Development cost of higher density housing in accessible locations

The modelling in this paper addresses the costs and benefits of the development of higher density, affordable housing in relatively accessible 'infill' locations, relative to the cost of housing at the urban fringes. Infill development is often characterised by smaller dwellings, at a high density, in established urban areas with available infrastructure (that may need upgrading due to the intensification of use). Land prices in urban infill areas are higher. In contrast, residential development at the urban fringe is characterised by larger dwellings, at a lower density, with the need to develop new infrastructure to service the development. Land prices at urban fringes are lower.

Research by SGS (2016) shows that construction costs in infill areas are lower than in greenfield areas, ranging from $11,000 to $14,000 per dwelling. In addition, some research suggests the providing infrastructure for infill development is lower too. Trubka, Newman and Bilsborough (2012) have estimated the capital costs per dwelling for a suite of physical infrastructure in both greenfield and infill locations. They conclude that the cost to provision electrical, water and sewage, telecommunications and gas infrastructure is $19,800 lower for infill dwellings. They further conclude that the cost of social infrastructure (fire, ambulance, police, education and health) in infill areas is $46,100 lower.

It is reasonable to assume that affordable units would be smaller than full-market units, resulting in higher densities again, and therefore the associated construction costs and per unit land values would be lower again. In all, there are various factors affecting the overall development cost of higher density affordable housing in well accessible locations compared to lower density, full market housing at the urban fringes.

These costs seem to cancel each other out and there is little overall total cost difference for infill and fringe sites. However, so as not to exaggerate arguments for infill solutions, the sensitivity analysis assumes an additional development cost for BHO scenarios

Table 5 Summary target population profile

Target population profile - per 1,000 dwellings					
Age	Employed persons (in %)	Household type	Employed persons	Income category	Renting households
20-24 years	14%	Family households	908.1	$1-$7,799	10
25-29 years	11%	Single person households	428.6	$7,800-$15,599	50
30-34 years	12%	Total	723.3	$15,600-$20,799	80
35-39 years	11%			$20,800-$25,999	120
40-44 years	11%	Qualifications	Employed people	$26,000-$33,799	100
45-49 years	11%	Higher degree	7%	$33,800-$41,599	120
50-54 years	11%	Bachelor degree	19%	$41,600-$51,999	130
55-59 years	9%	Skilled labour	22%	$52,000-$64,999	150
60-64 years	10%	Unqualified	52%	$65,000-$77,999	140
				$78,000-$90,999	110
	Average household size	2.60		Total	1,000
	Total employed persons	723			
	Total residents	2600			

of $100,000 per dwelling. This represents a 20% increase of the development cost per dwelling. Assuming the subsidy would increase accordingly, the subsidy would grow from $8,500 per dwelling to $10,200 per dwelling per annum for 15 years.

Target population

The scenario developed so far specifies locations, household expenditure limits, service accessibility and the broad features of the investment program. The final step before summarizing BHO benefits and estimating their economic effects is to spell out the key economic features of the potential client group(s). As a rule of thumb, the profile needs to resemble as much as possible households that would benefit from BHO scenarios, i.e. low to moderate income households in NSW. The key characteristics of the target population benefitting from BHO are summarised in Table 5 below, with detailed descriptions in the Technical Appendix. This completes our 'framing of the scenarios and shocks' to be modelled.

Summary: key modelling inputs/shocks

The effects generated for contrasting the consequences of BAU and BHO are now applied as shocks for the relevant socio-economic target groups, and their impacts and follow-on effects for the Sydney, NSW and Australian economies estimated. The direct effects are summarised in Table 5 below, and the economic consequences of these 'shocks' are modelled in the next section of the report.

4 Economic consequences of Better Housing Outcomes

Economic Impact Assessment of providing Better Housing Outcomes

This section of the report outlines the modelling approach, including model calibration, scenario specification and shock generation. It also comments on the inclusion of program costs, before presenting the main modelling results. As the EIA results are a partial contribution to framing a wider CBA analysis, they are then briefly presented in CBA format.

The CEGEM model

CGE models are a genre of economic model used extensively to assess both the economy-wide impacts of major policy changes and economic developments. For example, over the last decade the Commonwealth Treasury has undertaken CGE assessments of the economic impacts of climate change response policies, and reviewed taxation efficiency analysis. The Productivity Commission has also used CGE modelling to consider the impact of economic reforms.

The particular model used here, the Cadence Economics General Equilibrium Model (CEGEM), examines how 'economic shocks' to the Australian and global economies work their way into and across key economic linkages between multiple commodities and multiple regions over different time periods. Like

Table 6 Summary modelling inputs: effects of providing BHO rather than BAU

Impact	Unit value
Overall travel time savings (not modelled)	$2,554
Of which, productively used travel time savings	$1,277 per working person p/a
Human capital accumulation	$19,865 per working person p/a
Reduced levels of housing payments stress (not modelled)	$5,893 per household p/a
Policy/subsidy cost	$8,500 per dwelling p/a for 15 years
Additional construction cost	$50,000 per dwelling

all economic models, CEGEM is a representation of the economic 'system'. It is based on conventional economic theories and assumptions, applied to parameters and data that constitute an approximation to the working structure of an economy. This allows CGE models to build on existing data and standard national accounting frameworks to identify the likely outcomes of shocks. These outcomes are best viewed as probabilistic rather than a precise, definitive outcome. Specific details of the CEGEM model are outlined in the Technical Appendix.

Model calibration

The CEGEM framework was adapted to consider the geography of the impacts of the housing market intervention within the Sydney metropolitan area, by disaggregating Australia into three distinct economic regions: The Greater Capital City Statistical Area of Sydney ; the remainder of New South Wales; and the remainder of Australia.

Calibration of the underlying database draws primarily on the results of the 2016 Census of Housing and Population. The Census provides the best source of data for establishing the economic footprint of the regions of Australia, especially the industry of employment for people living in each area, and the wages paid across different industries. To understand how shocks are transmitted across the economy, it is important to identify the economic sectors they impact. This analysis decomposes the Australian and 'region' economies into 17 distinct production sectors (see Technical Appendix).

The BHO scenario involves three key drivers modelled below: travel time savings used in production; improvements to the human capital stock arising from access to better jobs; and the cost to government of the policy options. Further, the benefits of government maintaining 'shovel ready' projects in order to capitalise on and mitigate cycles in the construction sector were analysed. These shocks and influences were entered into the model in a series of incremental steps, or rounds, to illustrate the relative impacts of each of the shocks.

The rounds undertaken in this analysis of implementing the BHO scenario were:

- **Round 1** – Labour productivity: this round assesses the impacts of the human capital accumulation effects arising from wider job choices for the target population group
- **Round 2** – Labour productivity effects from Round 1 are enhanced by travel time savings, thus incorporating the productivity effects of travel times now used for work
- **Round 3** – Builds on Round 2 by including the cost of funding the policies through an increase in taxation of labour
- **Round 4** – Builds on Round 3 by allowing for the potential benefits of maintaining a stock of projects to build strategically during downturns in the housing construction cycle that utilise opportunities for reducing construction prices and policy costs to the public sector.

Modelling results

Table 7, below, shows the magnitude of the economic impacts from the successive shocks in Round 3. These include the estimated net present value of the scenarios over the modelling period from 2019-59 (the period extends well beyond the period of the program as the expenditure is on durable, fixed capital infrastructure). Snapshots of the impacts at ten-year intervals (2029, 2039, 2049 and 2059) are reported. The figures in the table columns represent the difference between the outcome achieved with the BHO program and the BAU approach. For example, the investments in affordable housing achieving BHO are projected to result in Gross Regional Product in the Sydney region being $3,943 million higher in 2059 than it otherwise would have been. The key impacts of the CEGEM, for each of the Rounds, are available in the Technical Appendix. These are presented in relation to GRP (a broad measure of regional, aggregate economic activity), Aggregate Consumption by households (regarded by many commentators as a better measure of household wellbeing than GRP), employment, wage growth (a proxy measure of labour productivity growth), and investment.

The key results

The aggregate impacts of the chosen housing 'shocks', valued as net present values (NPV) of future streams of impacts to 2059, are large and significant. Building 12,500 BHO homes per annum over the next decade in Sydney results in:

- $2.26B NPV worth of travel time savings (of which $1.129B is estimated to be used to supply additional work effort in the market economy, and this facilitates economic growth)

- $17.57B NPV worth of human capital uplift associated with better job choices from BHO investments (and this is a pure productivity gain)
- a cost to government of $7.27B NPV

These are substantial, non-marginal gains from the proposed housing investment program, even leaving aside reduced rent burden and other effects (such as environmental gains) that are likely to be positive. The relative scale of the impacts of the productivity dividend (human capital accumulation), the increase in effective labour supply (productive travel time savings), and the funding (policy incentive) are clear. The effects cannot be dismissed in Treasury scrutinies as 'second-round' effects.

The burden of public funding requirements, indicated by the difference between the GRP figures in Sydney for Round 2 (no policy costs) and Round 3 (including policy costs), is felt most in the first half of the timeframe, at $70M in 2029, $130M in 2039 reducing to $12M by 2059. These differences in GRP between Round 2 and Round 3 estimates suggest that the cost to the public sector ranged between 25-35 cents for each dollar of increased programme outputs throughout the funding period.

The human capital accumulation impacts arising from providing homes accessible to jobs are not only the most significant in terms of the shock size, but also the most significant in terms of the ratio between the direct shock and the impact on GRP. This is a relatively unsurprising result–in general any economic shock that has an underlying impact on the productivity of a factor of production (in this case, the labour force) will have a larger impact on economic output than the size of the direct shock. In simple terms, raising productivity, in this case by producing better housing outcomes, means that the economy is doing more with less.

GRP is often regarded as a poor indicator of household economic welfare. One of the best indicators of economic welfare in an economic modelling framework is household consumption, as it demonstrates the impact of a policy on household consumption possibilities. In net present value terms, household consumption in the Sydney region increases by $14.8B in Round 3, as a result of BHO.

While the direct impacts are imposed only on the Sydney region, and the bulk of the economy-wide effects are (unsurprisingly) felt in the Sydney region, the rest of NSW and the rest of Australia benefit indirectly from the improved conditions in Sydney. The direct shocks of the BHO scenario improve spending potential and business productivity in Sydney, which is immediately linked to the rest of Australia through the trade of goods and services–for example, the purchasing of agricultural or construction inputs from surrounding regions. These links are tightest with the Rest of NSW; however, they are also felt through the rest of Australia. BHO scenarios in Sydney raise output, consumption and productivity in these other 'regions' too.

Round 4, set out in the Technical Appendix, found that the potential impact of a strategic rescheduling of construction of 2,500 dwellings, brought forward to take advantage of a hypothetical temporary downturn in the housing construction market in 2024, increases GRP in that year. The government saves approximately $1 million in policy costs for the 2,500 dwellings moved forward.

Round 5, also depicted in the Technical Appendix, tests the sensitivity of the overall results to assumptions regarding per dwelling policy cost per annum. The key macroeconomic variable that is sensitive to policy cost assumptions is the level of household consumption, however a 20% increase in the assumed policy cost still results in a net present value increase in household consumption of $14.7B dollars. This is largely driven by the constant increase in labour productivity and supply between the Round 3 and Round 5 scenarios.

Starting a Cost-Benefit comparison

As noted earlier, the figures reported above become an important, but only partial, input to a credible cost benefit analysis on the BHO program. In the main scenario modelled, the policy incentive for improved housing outcomes adds to $8,500 per dwelling per annum for 15 years. The net present value of the policy incentive cost is $7.2B. However, raising taxes to pay for the program distorts economic behaviour (referred to as the deadweight cost of tax). In this instance, for every tax dollar the government raises and spends on BHO there is an additional cost of 20 to 30 cents. These deadweight costs estimated in Round 3 are $1.183B, and added to the direct program costs of $7.2B, this makes a total cost of $8,456 million (present value).

The first phase report (Maclennan et. al., 2018) drew attention to a wide range of potential benefits and productivity impacts from better housing outcomes.

Most of them were not able to be addressed in this study. A conservative approach was also taken regarding the assumptions made for quantifying the marginal values. In establishing benefits (see the Technical Appendix), several the effects identified above but not included in the EIA are now included in the formative CBA. The key items included are:

- The average per worker travel time savings per annum ($2,554, including the $1,277 productive travel time savings) add up to a direct benefit of $2,259M over the lifetime of the project. Added to their estimated productivity flow-on effects, they amount to $1,355M, to yield a total benefit of travel time savings of $3,615M (NPV).
- Similarly, for the improved job choice effects on human capital accumulation ($19,865 per worker per annum on average) valued at $17,570M, the additional indirect flow-on effects add a further $12,235M. This yields a total human capital accumulation benefit of $29,805M (NPV).

Arguably, the reduction in housing payments stress adds a further present value of $7,206 M, but some value of lost benefits to landlords, unless they are given a shadow price of zero, needs to be netted from that total. This has not been modelled, however, and thus cannot yet be scored into a CBA.

Table 7 Round 3 Results: Estimated Direct Impact over the Period to 2059 and for Selected Individual Years

		Total NPV/Average	2029	2039	2049	2059
Gross Regional Product per household	Sydney	$31,107	$3,200	$3,565	$3,818	$3,932
	Rest of NSW	$1,010	$86	$135	$158	$168
	Rest of Australia	$862	$71	$120	$139	$136
Household Consumption per household	Sydney	$14,781	$1,370	$1,828	$2,176	$2,504
	Rest of NSW	$1,360	$129	$172	$190	$197
	Rest of Australia	$874	$80	$119	$126	$113
Employment (total)	Sydney	2,576	2,495	2,926	3,351	3,181
	Rest of NSW	161	185	196	185	163
	Rest of Australia	99	112	128	115	88
Real Wage growth per annum (Labour Productivity)	Sydney	0.22%	0.17%	0.25%	0.31%	0.25%
	Rest of NSW	0.06%	0.08%	0.08%	0.07%	0.05%
	Rest of Australia	0.01%	0.01%	0.01%	0.01%	0.01%
Additional Investment	Sydney	$4,298	$538	$384	$341	$329
	Rest of NSW	$627	$79	$56	$48	$45
	Rest of Australia	$618	$78	$61	$46	$30

The two labour productivity related effects that were estimated, plus their estimated knock on effects, create total benefits $33,420M (NPV). The net benefits of providing 12,500 units per annum in Sydney over the next decade amount to $24,964M over the lifetime of the project (40 years), with a cost/benefit ratio of 2.95. This reaffirms that investment in better housing outcomes is a strongly worthwhile economic investment for Sydney, NSW and Australia. This is a stronger case for housing policy investment, driven by real productivity effects. It places the cost/benefit ratios for housing investments for middle and low-income households in appropriate locations at least on a par with transport and other infrastructure investments.

5 Stronger foundations, more stories to build

This report strengthens the economic narrative that the housing sector needs to develop, and sets the perspective of economic policymakers in a context of more localised, fixed resources that characterize the real housing systems of the nation. We recognise that there are important aspects of housing outcomes with potentially significant outcomes that have been omitted in this analysis, because there was not the data nor models available to examine them in more detail. Within academia, this year, like most years, it is unlikely that there will be any PhDs in housing economics submitted at an Australian university. There needs to be a longer-term capacity to develop and improve upon the foundations of the housing economic policy narrative laid out in this paper. Within governments across Australia, a new effort is needed to evidence housing policy decisions and to initiate a sustained conversation between economics, housing and planning bureaucracies.

Our substantive conclusions are both clear and strong. Three stand out. First, the direct impacts on human capital, travel time savings, and public funding requirements have large and sustained impacts on all relevant macroeconomic indicators in the Sydney economy, with associated indirect impacts in the remainder of NSW and the rest of Australia. Secondly, the main mechanism through which these impacts are experienced is the improvement in human capital associated with affordable housing, both in terms of the size of the direct shock, and the impact that each dollar of human capital has on the economy. Finally, the policy costs are comparatively low in direct terms. If funded through taxation mechanisms that approximately reflect the economic efficiency of the existing taxation base, the deadweight cost of the policy is small in relation to the modelled benefits of the scenarios. Putative cost-benefit interpretations of the results suggest a benefit-to-cost ratio of at least 3.

Housing investment is, in short, economically worthwhile for governments as well as individuals. Longstanding policy perspectives about housing in public investment decision-taking need to change. And as they do, investment strategies that link housing, transport and other place-related investments must be developed. These need to assemble land and infrastructure efficiently, and place more of the burden on taxing or reducing 'scarcity economic rents', rather than productive investment and effort.

Scott Morrison spoke about housing in Melbourne in 2017 and remarked that we won't solve Australia's growing housing affordability by doing 'housing business as usual'. Our analysis reflects a similar conclusion, with BHO scenarios far outscoring the BAU scenario in creating potentially better economic and housing outcomes for so many Australians.

References

Albouy, D, Ehrlich, G and Liu, Y. (2016) Housing Demand, Cost of Living Inequality and the Affordability Crisis. *NBER Working Paper 22816*. Cambridge, Mass.

Aschauer, D. (1989) Is Public Expenditure Productive? *Journal of Monetary Economics*, Volume 23, pp.177-200.

Duranton, G and Puga, D. (2004) Micro-foundations of urban agglomeration economies. In Duranton, G, Henderson JV and Strange, WC (eds): *Handbook of Regional and Urban Economics*. Elsevier, Amsterdam.

Glaeser, E. (ed). (2010) *Agglomeration Economics*. University of Chicago Press, Chicago.

Glaeser, E. and Gyurko, J. (2018) The Economic Implications of Housing Supply. *Journal of Economic Perspectives*, Volume 32, issue 1, pp.3-30.

KPMG (2012) *Social Housing Initiative Review*, September 2012. Available at: http://www.nwhn.net.au/admin/file/content101/c6/social_housing_initiative_review.pdf

Legaspi, J, Hensher, DA & Wang, B. (2015) Estimating the wider economic benefits of transport investments: The case of the Sydney North West Rail Link project. *Case Study Transport Policy*, http://dx.doi.org/10.1016/j.cstp.2015.02.002 .

Maclennan, D, Ong, R and Wood, G. (2015) *Making connections: housing, productivity and economic development*, AHURI Final Report No. 251, Australian Housing and Urban Research Institute Limited, Melbourne, https://www.ahuri.edu.au/research/final-reports/251

Maclennan, D, Crommelin, L, Van Nouwelant ,R and Randolph, B (2018) *Making Better Economic Cases for Housing Policies*. City Futures Research Report, UNSW Sydney. Available at: https://cityfutures.be.unsw.edu.au/research/projects/delivering-affordable-housing-improving-economic-arguments-housing-interventions/

McKillop, T et al. (2015) The Case for Agglomeration Economies. *Manchester Independent Economic Review*. Available at http://manchester-review.co.uk/wp-content/uploads/2015/02/Agglomeration.pdf

Ong, R et al. (2017) *Inquiry into housing policies, labour force participation and economic growth*. AHURI Final Report No. 285, AHURI, Melbourne. doi:10.18408/ahuri-8107001

SGS Planning and Economics (2015) *Greater MacArthur Investigation Area: Economic and Employment Area*. Report prepared for the NSW Department of Planning and Environment, September 2015. Available at: https://www.planning.nsw.gov.au/-/media/Files/DPE/Reports/greater-macarthur-investigation-area-economic-and-employment-analysis-2015-09.pdf

Transport for New South Wales (2018) *Principles and Guidelines for Economic Appraisal of Transport Investment and Initiatives*. NSW Government, June 2019. Available at: http://www.transport.nsw.gov.au/sites/default/files/media/documents/2017/principles-and-guidelines-for-economic-appraisal-of-transport-investment.pdf

Thoung, C, Tyler, P and Beaven R. (2015) Estimating the Contribution of Infrastructure to National Productivity in Europe. *Infrastructure Complexity*, Volume 2, Number 5.

Trubka, R, Newman, P and Bilsborough, D. (2012) Assessing the Costs of Alternative Development Paths in Australian Cities. *Curtin University Sustainability Policy Institute Report*, Curtin University, Fremantle.

van Ham, M, Manley, D, Bailey, N, Simpson, L, Maclennan, D (Eds.) (2013) *Understanding Neighbourhood Dynamics: New Insights for Neighbourhood Effects Research*. Springer, Dordrecht.

SGS Economics & Planning

BETTER ECONOMIC CASES FOR HOUSING

TECHNICAL REPORT

FEBRUARY 2019

Prepared for

CFRC UNSW

Independent insight.

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1. INTRODUCTION AND SCOPE

This first section describes the background and aim of the project.

1.1 Aims of the Project

This technical background report aims to justify and quantify the economic case for investment in housing using the framework used to justify investment in transport infrastructure.

In New South Wales, transport infrastructure projects must meet the requirements set out in the NSW Treasury guidelines for business cases for public policy initiatives.

1.2 Scope

In 2018 the New South Wales Federation of Housing Associations published a report by Duncan Maclennan and colleagues titled 'Making Better Economic Cases for Housing Policies'. MacLennan et al.'s paper gives rise to a range of questions summarised under research topics:

1. Agglomeration effects and residential densities
2. Paying for housing, consumption and productivity
3. Housing construction period effects
4. Labour market effects (mismatch costs)
5. Housing supply solutions
6. Inclusionary zoning
7. Ageing households and caring families

All of these topics could be included in this study and so a selection was made based on the following criteria:

- ✓ Does the question/topic help to build to build the economic case for investment in, or other relevant policy measure for, housing?
- ✓ Is the question/topic suitable for modelling via CGE-modelling?
- ✓ Is modelling the question/topic doable in the timeframe?

The scope of this work was determined in consultation with a Steering Group and includes measuring the following economic processes:

1. Agglomeration effects and residential densities. This topic focusses on quantifying the equivalent of travel time savings for transport infrastructure projects. The more jobs and workers can be accessed within 30 minutes, the better the productivity outcomes for the economy.
2. Human capital accumulation effects. This topic focusses on the productivity and agglomeration benefits of households gaining access to affordable housing close to jobs, education and services compared to a situation with poor access to affordable housing and proximity to jobs.
3. Housing construction period effects. Anti-cyclical investment in housing may flatten the boom and bust cycle of housing construction. This may bring more certainty, lower risk and greater opportunity to strategically and structurally grow the housing industry.
4. Household consumption and productivity effects. House prices and rents may impact economy-wide productivity through the consumption and savings behaviours of households. Rising housing prices impact consumption through at least two channels,

rising wealth and reduced disposable incomes. Renters are primarily impacted by the latter, however, there has been remarkably little prior modelling of the household consumption effects of excess and changing housing costs.

These processes involve direct and indirect, or flow-on effects to the economy. For instance, better labour force outcomes improve productivity in industry sectors and increase consumer spending which in turn impact the Gross Regional Product of the State. Econometric CEGEM modelling was used to capture these flow-on effects and establish total effects.

1.3 The remainder of this report

The report is structured as follows:

- Section 2: Better Housing Outcomes, describes the Business as Usual scenario and the Better housing Outcomes scenario, and quantifies the direct impacts
- Section 3: CGE Modelling, presents the indirect and total impacts on the economy in terms of Gross Regional Product, household consumption, employment, wage growth and investment, at the regional, State and national level
- Section 4: Integrated results and interpretation, summarises the results and presents them in a Cost Benefit Analysis framework. While incomplete as a CBA, the framework includes the main costs and benefits and illustrates how the results can be used to build a robust case for investment in better housing outcomes.

2. BETTER HOUSING OUTCOMES

This section conceptualises the effects in the scope of the study. It describes a Business as Usual Scenario and a Project "Better Housing Outcomes" Scenario where investment in housing enables agglomeration benefits in the form of travel time savings and productivity gains, reduced levels of housing stress and anticyclical investment. The results of this section produce shock scenarios for the CGE modelling (Section 3) to determine the flow-on and total productivity effects on the economy.

Better housing outcomes are defined as affordable housing with good accessibility to jobs and services.

If housing is recognised as key economic infrastructure, the broad policy aim would be to enable the development of affordable housing for low to moderate income households in well accessible locations close to jobs and services.

In this scenario households and the community experience a range of benefits including:

- Travel time savings for those households located closer to jobs and services. Some of these travel time savings will be used for personal and recreative purposes, while some will be used as working time, thereby increasing economic productivity.
- Enhanced human resource accumulation. Households enjoying better housing outcomes have greater access to jobs that better fit their capabilities and the needs of employers. Under these circumstances labour participation and productivity increases, increasing their potential lifetime earnings. This benefit flows on through the economy generating a range of further productivity effects.
- Reduced levels of housing stress. Households enjoying better housing outcomes no longer pay more than 30% of their income on rent and instead can spend on other primary needs such as education or a deposit on a home loan. Lower levels of financial stress are also associated with improved health outcomes. The dollar value difference in rents paid when in housing stress (i.e. without better housing outcomes) and rents paid when paying a maximum of 30% of income on rent is the proxy for the reduced levels of stress these households experience.
  From an econometric perspective reduced levels of housing stress may have productive consequences in the economy due to different consumption and saving patterns. The flow-on effects of lower levels of housing stress have not been assessed, and therefore presented outcomes are conservative.
- Anticyclical investment in housing. Investment in better housing outcomes can generate structural productivity growth in the sector when it is undertaken in an anti-cyclical manner. That is, investment in better housing outcomes is maximised during cyclical downturns in the industry.

Better housing outcomes, independent of the specific enabling policy incentive or intervention, are achieved at a cost. In this study this cost is funded through increased taxation.

In addition, higher density housing development in locations close to jobs and services would likely have a different total development cost than lower density, full market price housing at the urban fringes.

The benefits and costs factors are described in Sections 2.2 to 2.7.

2.1 Scenarios

This section describes and compares the business as usual and Better Housing Outcomes scenarios.

Business as Usual Scenario

Under this scenario the current levels and patterns of housing investment continue with the majority of housing being developed at market prices, at low and medium density, and at the urban fringes. The result is a continued strong and growing undersupply of affordable housing with good access (within 30 minutes) to jobs and services.

As housing is increasingly unaffordable more households will be experience housing stress and home ownership will decline.

Travel times for low to moderate income households will increase as affordable housing is pushed to the outer fringes of metropolitan areas.

At a metropolitan level, both workers and businesses will struggle to find jobs and suitable staff within a 30 minutes radius. This will be especially difficult for sectors like hospitality, care and education.

Better Housing Outcomes – Project Scenario

Housing is recognised as key economic infrastructure, and more affordable housing is provided within a 30-minute radius of jobs and services.

An incentive will be rolled out that offers a subsidy for developers to deliver affordable housing close to jobs and services. It is assumed that over a 10-year timeframe, 125,000 affordable dwellings will be delivered in accessible locations.

The investment in housing will be rolled out anticyclical to the trend in the building construction industry.

2.2 Travel time savings

Travel time savings accrue to households experiencing better housing outcomes. Some of these travel time savings will be used for personal and recreative purposes, while some will be used as working time, thereby increasing economic productivity.

In order to determine travel time savings of better housing outcomes realistic assumptions need to be made about:

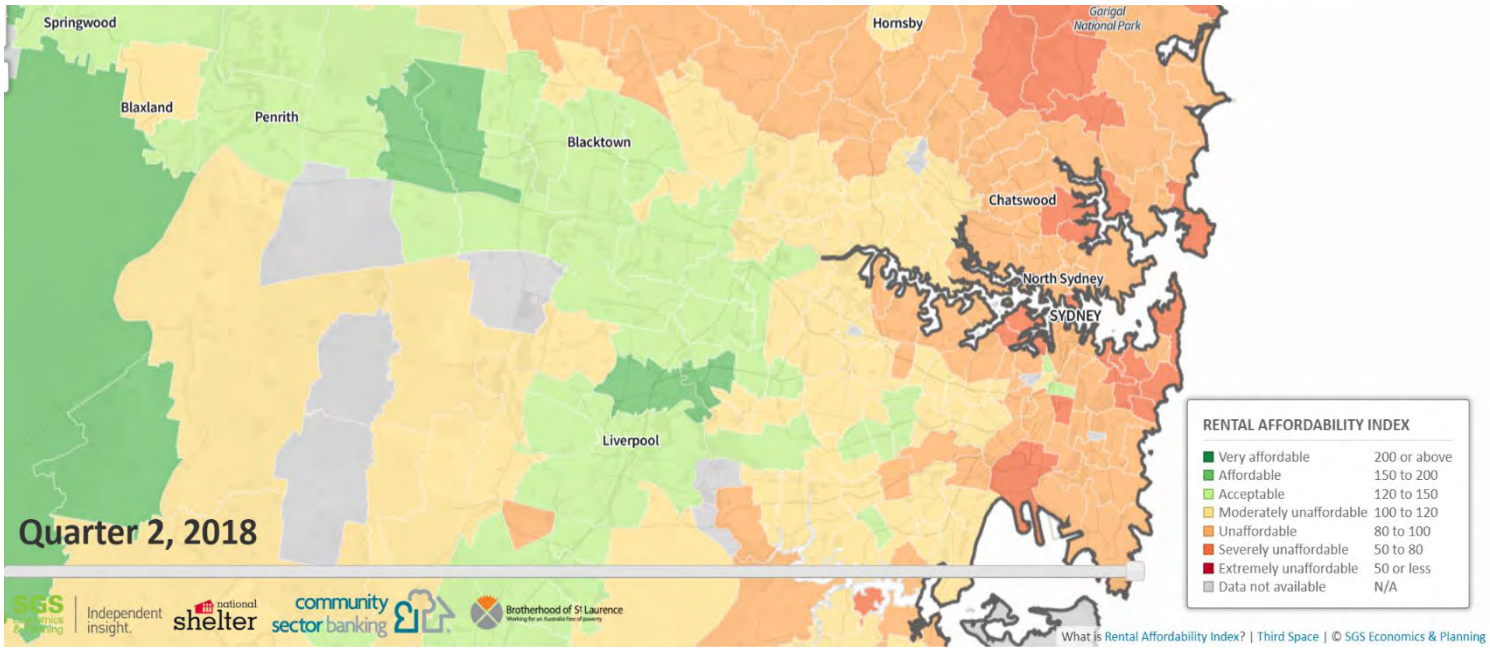
- Representative geographies of residence for households under the BaU scenario and the Better Housing Outcomes scenario.
- The average travel time savings households experience by living in a more accessible location[1], i.e. the difference in average travel times in BaU and Better Housing Outcomes geographies.
- The likely share of time savings that will be used for work vs leisure[2] .

[1] This analysis only factors in travel time savings and does not consider the wider benefits from living closer to work.
[2] Travel time savings can result in more time working, or for leisure. This study has factored in the productivity benefits that arise out of time that workers may typically spend working. It should be noted that while there is increased literature that analyses the productivity outcomes that arise out of leisure, this has not been a focus of this analysis.

Selecting presentative geographies

Low to moderate income households typically reside in locations with reasonably affordable rents. Figure 1 highlights the latest results of the SGS Rental Affordability Index (Nov 2018).

FIGURE 1 RENTAL AFFORDABILITY INDEX FOR AVERAGE INCOME HOUSEHOLDS, GREATER SYDNEY



Source: SGS Economics and Planning, 2018

Using the results of the Rental Affordability Index, a representative mix of relatively affordable areas across Greater Sydney at an SA3 geography were selected: Penrith, Mr Druitt, Blacktown, Fairfield and Campbelltown. This group of more affordable areas are at varying distances west and south-west from the City. These more affordable locations generally have poorer access to jobs and services than locations under the "Better Housing Outcomes" scenario.

Geographies capable of providing better housing outcomes

Better housing outcomes close to jobs and services can be delivered across a range of areas of Greater Sydney. For the analysis a mix of possible locations for better housing outcomes were chosen to create a representative sample.

The selection of the geographies is based on:

- Accessibility to jobs within 30-minutes
- Residential development potential
- Proximity to key service and employment precincts like hospitals

Effective Job Density (EJD)

The accessibility to jobs is determined based on Effective Job Densities (EJD). SGS has developed a measure of effective job density (EJD) to analyse agglomeration and its related benefits. EJD enables a 'real life' representation of the proximity component, in terms of travel time, of agglomeration that other more basic measures overlook. The measure is derived from the density and accessibility of all jobs across a region and is calculated using three variables: the travel times between locations, the transport mode of those trips and the employment levels at those locations.

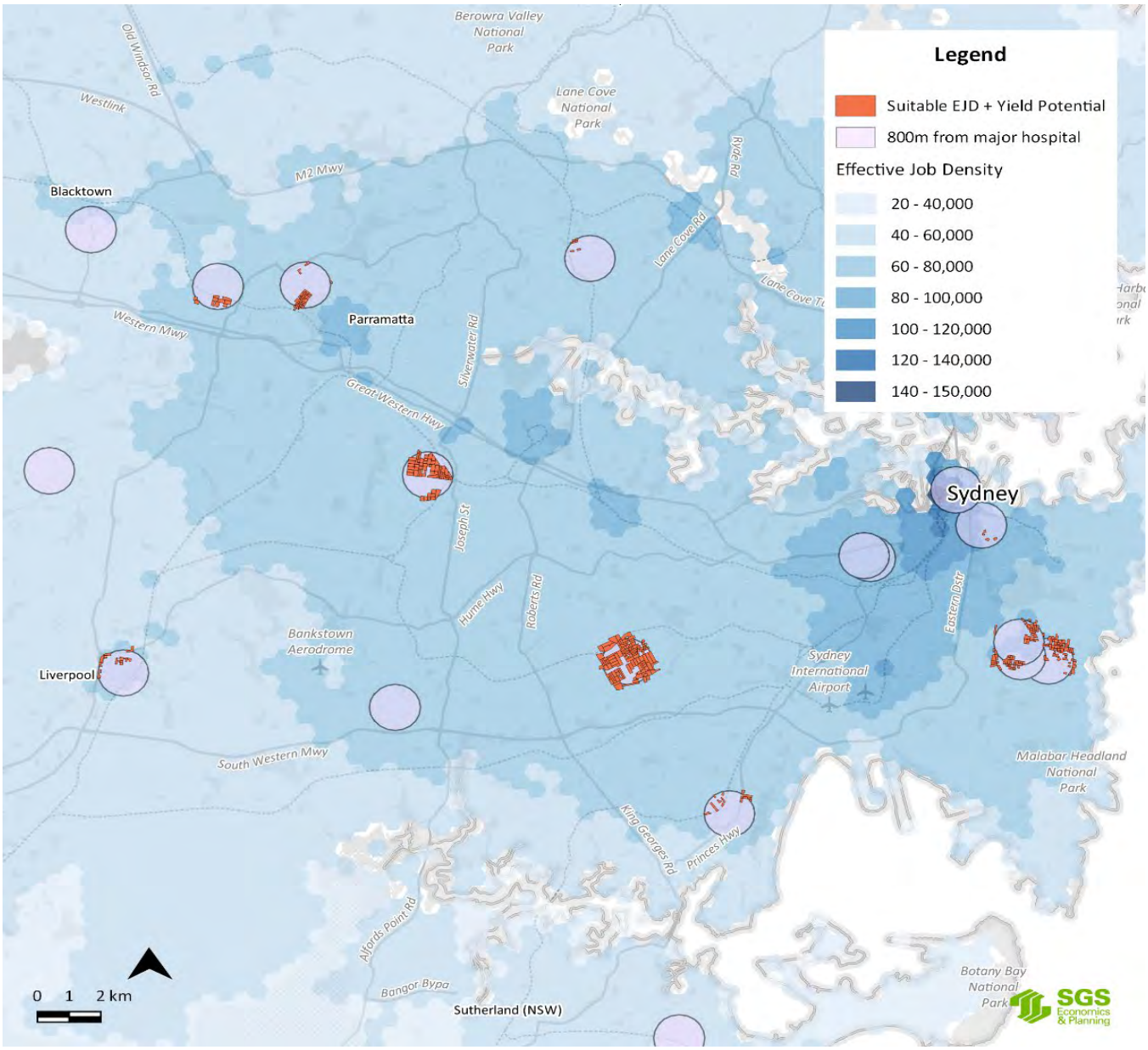
The residential growth potential is determined by estimating the residential development potential in areas. The residential uplift component is comprised of measuring the area of

mesh blocks that have been categorised to have their predominant use as “Residential” and are located in R3 and R4 residential zones. Using a generic apartment floorspace number of 87 sqm, it was possible to calculate potential residential uplift capacity within each Mesh Block, after subtracting the existing number of dwellings within, in addition to removing any non-developable land such as infrastructure.

Given the large volume of potential sites based on EJD and residential uplift, an additional variable of determining sites based on their walking distance to major Sydney hospitals was introduced. The proximity to key precincts was determined by identifying locations within 800 meters of a hospital.

Figure 2 illustrates areas which hold high EJD scores, residential yield uplift potential and are also located within an 800 metres radius of a hospital.

FIGURE 2 EJD, RESIDENTIAL UPLIFT AND PROXIMITY TO HOSPITALS



Source: SGS Economics and Planning, 2018

Based on this analysis, a representative mix of possible locations for better housing outcomes is Randwick, Liverpool, Auburn, Canterbury, Kogarah, Campsie, North Shore and Parramatta.

Private and Public Travel Time Savings

The following tables highlight the average travel time between the BaU and Project geographies. For instance, a resident that privately commutes from Mt Druitt would save an average of 20 minutes per trip if they relocated to Auburn. A resident catching public transport and living in Fairfield would save 15 minutes on average if they relocated to Campsie.

TABLE 1 PRIVATE TRAVEL TIME SAVINGS IF WORKER MOVED FROM BAU TO BETTER HOUSING GEOGRAPHIES

	Better Housing Geography							
	Randwick	Liverpool	Auburn	Canterbury	Kogarah	Campsie	North Shore	Parramatta
Fairfield	1.17	1.63	11.88	9.06	0.23	8.52	9.03	8.77
Blacktown	1.44	1.89	12.14	9.32	0.49	8.78	9.29	9.03
Mt Druitt	9.12	9.58	19.83	17.01	8.18	16.47	16.98	16.72
Penrith	23.88	24.34	34.59	31.77	22.94	31.23	31.74	31.48
Campbelltown	30.06	30.51	40.76	37.95	29.11	37.40	37.92	37.66

Source: SGS Economics and Planning, 2018

TABLE 2 PUBLIC TRAVEL TIME SAVINGS IF WORKER MOVED FROM BAU TO BETTER HOUSING GEOGRAPHY

	Better Housing Geography							
	Randwick	Liverpool	Auburn	Canterbury	Kogarah	Campsie	North Shore	Parramatta
Fairfield	14.06	15.71	25.45	16.51	14.18	15.60	20.19	20.20
Blacktown	4.19	5.84	15.58	6.64	4.31	5.73	10.33	10.33
Mt Druitt	18.34	20.00	29.73	20.80	18.47	19.89	24.48	24.49
Penrith	32.05	33.70	43.44	34.51	32.18	33.59	38.19	38.19
Campbelltown	23.33	24.99	34.72	25.79	23.46	24.87	29.47	29.47

Source: SGS Economics and Planning, 2018

Transport for New South Wales (TfNSW) has calculated that the value to each person on the road travelling by either car or bus is around $16.89[3] per hour. Travel time benefits accrue if workers live closer to their jobs. A worker would save around $2,700 per year on average[4] if they were to relocate to the Better Housing geographies.

TABLE 3 SAVINGS PER WORKER ($) PER ANNUM, PRIVATE TRAVEL

	Better Housing Geography							
	Randwick	Liverpool	Auburn	Canterbury	Kogarah	Campsie	North Shore	Parramatta
Fairfield	158	220	1,605	1,224	30	1,151	1,220	1,185
Blacktown	194	255	1,641	1,260	66	1,186	1,256	1,221
Mt Druitt	1,233	1,294	2,679	2,299	1,105	2,225	2,294	2,259
Penrith	3,227	3,288	4,674	4,293	3,099	4,219	4,289	4,254
Campbelltown	4,061	4,123	5,508	5,127	3,934	5,054	5,123	5,088
Total	**8,873**	**9,181**	**16,107**	**14,203**	**8,234**	**13,835**	**14,182**	**14,007**
Average	**1,775**	**1,836**	**3,221**	**2,841**	**1,647**	**2,767**	**2,836**	**2,801**

Average private travel benefit per worker in Better Housing = $2,466

Source: SGS Economics and Planning, 2018

[3] TfNSW, 2018. '*Principles and Guidelines for Economic Appraisal of Transport Investment and Initiatives Combined*'.
[4] Working five days per week for 48 weeks per year.

TABLE 4 SAVINGS PER WORKER ($) PER ANNUM, PUBLIC TRAVEL

	Better Housing Geography							
	Randwick	Liverpool	Auburn	Canterbury	Kogarah	Campsie	North Shore	Parramatta
Fairfield	1,899	2,123	3,438	2,231	1,916	2,108	2,729	2,729
Blacktown	566	789	2,105	898	583	774	1,395	1,396
Mt Druitt	2,479	2,702	4,018	2,811	2,496	2,687	3,308	3,308
Penrith	4,331	4,554	5,870	4,663	4,348	4,539	5,160	5,160
Campbelltown	3,152	3,376	4,691	3,484	3,169	3,361	3,982	3,982
Total	**12,427**	**13,545**	**20,121**	**14,087**	**12,512**	**13,470**	**16,574**	**16,576**
Average	**2,485**	**2,709**	**4,024**	**2,817**	**2,502**	**2,694**	**3,315**	**3,315**

Average public travel benefit per worker in Better Housing = $2,983

Source: SGS Economics and Planning, 2018

Factoring in travel mode distribution

Another element to keep in mind is the transport mode distribution across the different geographies. Typically, outlying areas display a greater propensity for private car usage over public transport compared to more accessible locations.

TfNSW provides data for the proportion of households located within NSW SA3 geographies that commute by a particular transport mode. The data highlights that the baseline BaU SA3 geographies rely on private transportation around 8% more and public transportation 3% less than the Better Housing geographies. This is expected, given the location of the BaU geographies in outlying areas, compared to the Better Housing geographies which tend to have better access to public transport networks.

TABLE 5 MODE OF TRAVEL

Category	% Private	% Public
Average BaU	76%	11%
Average Better Housing	68%	14%
Greater Sydney	69%	12%

Source: Transport for NSW Household Travel Survey, 2016/17

When factoring in travel mode profiles, the **average worker experiencing better housing outcomes is expected to have saved around $2,544 dollars per year**.

TABLE 6 WEIGHTED AVERAGE TRAVEL TIME SAVINGS PER WORKER

Travel Mode	Savings ($)	Modal Split in BaU %	Savings per worker
Public Transport Savings ($)	$2,983	17%	
Private Transport Savings ($)	$2,466	83%	$2,554

Source: SGS Economics and Planning, 2018

Factoring in how travel time savings are used

Not all travel time savings are used for productive purposes. According to Wang and Hensher (TfNSW, 2015), business travel time savings can be used either for work (comprising business travel and commuting) or leisure. Their methodology assumes that in the short term, travel

time savings are likely to be used for work while in the long term savings are likely to be used for leisure.

The likely proportion of business travel time savings used for leisure is around 45% for commuters travelling by car, 53% for train and 55% for bus.

TABLE 7 TRAVEL TIME SAVINGS USED FOR LEISURE OR WORK

Category	Work	Leisure	Total
Car	55%	45%	100%
Train	47%	53%	100%
Bus	45%	55%	100%

Source: Transport for NSW, 2015

Assuming on average 50% of travel time savings would be used for productive purposes, the average productive travel time savings per worker experiencing better housing outcomes is $1,277 per annum.

2.3 Productivity improvements: Human capital accumulation

Households enjoying better housing outcomes can access a greater range of jobs, that better fit their capabilities and better fit the needs of the employers. Because of this, their labour participation and productivity increase, which is reflected in their increased earnings. This benefit flows through the economy generating a range of further productivity effects.

Agglomeration economies arise because of the productive benefits associated with physical proximity of firms, workers, consumers and the day to day business of selling goods and services[5]. They help to explain why cities have become more productive than regions. Duranton and Puga (2004) describe agglomeration benefits along the lines of "sharing, matching and learning".

Sharing benefits accrue through the sharing of a common pool of resources, such as infrastructure, suppliers and the same pool of workers. These workers are also sharing the same pool of firms, which in turn are able to benefit from these shared resources. This expansion of goods and services in turn attracts further labour and required infrastructure, growing the common pool of resources. Firms benefit in this sharing of labour resources through the specialisation and division of labour. That is, workers can better specialise on a narrower set of tasks, which manifests as increased productivity.

Matching benefits occur as firms and workers are better able to match with each other. The better the match, the higher the benefits. Cities make it easier for different types of workers and firms to find each other, reducing search costs and improving the quality of the match. This results in productivity benefits through specialisations in matching, as well as shorter unemployment periods and a reduction in time frictions when one searches for a job.

Learning occurs through the benefits that accrue from tacit knowledge transfer through face to face interactions. The physical proximity, whether in the workplace or in the daily interactions among workers fuels the sharing of knowledge. Knowledge transfers between firms accrue as a result of the greater ability for knowledge transfer between workers, raising overall productivity.

Interestingly, McKillop et al (2015) highlight that high productivity in particular places tend to be offset by high costs of living and producing. The ability for a city to reduce the cost of living is the best spatial policy for creating agglomeration and realising its benefits in high productivity, high cost geographies[6].

Human capital and agglomeration

Agglomeration benefits can be measured through human capital accumulation. Higher human capital is thought to attract higher incomes, with employers able to pay more for employees if they meet their exact requirements.

Areas with high access to jobs and to employees are better equipped to match worker capabilities with employer requirements. A worker living close to jobs and services has better chances to access a job that meets the exact capabilities of this worker, while the employer benefits from engaging a worker that meets their exact requirements and therefore is able to be more productive. The increased earnings are a proxy of the agglomeration benefits of better housing outcomes.

[5] McKillop, T et al. 2015. *The Case for Agglomeration Economies*. Manchester Independent Economic Review. https://www.parisschoolofeconomics.eu/IMG/pdf/Overman3-PSE-MEEDM.pdf
[6] Ibid.

Measuring human capital between BaU and Better Housing Geographies

To determine the agglomeration benefits of Better Housing Outcomes, the difference in annual earnings between BaU and Better Housing geographies were analysed. BaU geographies typically have lower Effective Job Density than Better Housing Geographies. The differences in annual earnings were analysed by age, gender and qualification level.

Human capital differences by qualification

The figure below shows the earning human capital differences for male Postgraduate and Bachelor degrees living in Better Housing geographies compared to the BaU geographies. The gap equates to around $425,000 for postgraduates and $491,446 for bachelors.

FIGURE 3 COMPARING EARNINGS BETWEEN MALES WITH POSTGRADUATE AND BACHELOR DEGREES

Source: SGS Economics and Planning, 2018

TABLE 8 EXAMPLE LIFETIME EARNINGS (HUMAN CAPITAL) BY LOCATION – POSTGRADUATE AND BACHELOR

Geography	20-24 years	25-29 years	30-34 years	35-39 years	40-44 years	45-49 years	50-54 years	55-59 years	60-64 years
Male BaU Postgraduate	51,232	59,045	73,748	81,820	87,031	90,359	91,724	92,908	87,042
Male BaU Bachelor	42,197	61,260	74,613	80,670	82,550	82,228	79,032	80,782	73,737
Male Better Housing Postgraduate	42,154	54,563	79,520	93,410	104,437	108,789	110,549	106,159	100,426
Male Better Housing Bachelor	39,353	62,424	82,823	93,354	101,433	101,695	96,089	92,842	85,344
Male Postgraduate Gap	(9,078)	(4,482)	5,772	11,590	17,406	18,429	18,826	13,251	13,384
Male Bachelor Gap	(2,844)	1,163	8,210	12,684	18,884	19,468	17,057	12,059	11,608
Male Postgraduate Gap %	0.82	0.92	1.08	1.14	1.20	1.20	1.21	1.14	1.15
Male Bachelor Gap %	0.93	1.02	1.11	1.16	1.23	1.24	1.22	1.15	1.16
Lifetime Male Postgraduate Earnings Gap = $425,484									
Lifetime Male Bachelor Earnings Gap = $491,446									

FIGURE 4 HUMAN CAPITAL DIFFERENCES BY SKILLED/UNQUALIFIED LABOUR

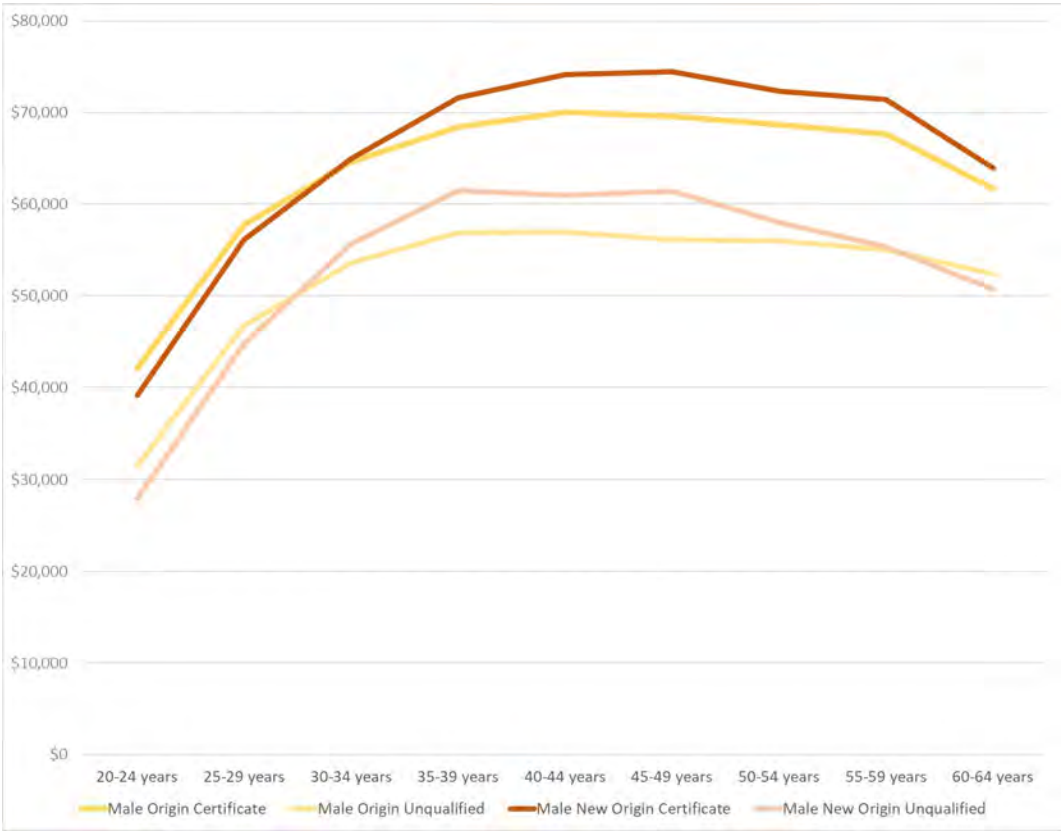


TABLE 9 EXAMPLE LIFETIME EARNINGS (HUMAN CAPITAL) BY LOCATION – CERTIFICATE/UNQUALIFIED

Geography	20-24 years	25-29 years	30-34 years	35-39 years	40-44 years	45-49 years	50-54 years	55-59 years	60-64 years
Male BaU Certificate	42,081	57,755	64,622	68,448	70,046	69,566	68,674	67,631	61,733
Male BaU Unqualified	31,499	46,745	53,589	56,888	56,962	56,094	56,007	55,022	52,387
Male Better Housing Certificate	39,124	56,126	64,954	71,645	74,143	74,458	72,299	71,419	63,914
Male Better Housing Unqualified	28,005	44,776	55,638	61,475	60,991	61,438	58,015	55,350	50,697
Male Certificate Gap	(2,957)	(1,630)	332	3,197	4,097	4,892	3,625	3,788	2,181
Male Unqualified Gap	(3,494)	(1,969)	2,049	4,588	4,029	5,343	2,008	328	(1,690)
Male Postgraduate Gap %	0.93	0.97	1.01	1.05	1.06	1.07	1.05	1.06	1.04
Male Bachelor Gap %	0.89	0.96	1.04	1.08	1.07	1.10	1.04	1.01	0.97
Lifetime Male Certificate Earnings Gap = $87,625									
Lifetime Male Unqualified Earnings Gap = $55,963									

Source: SGS Economics and Planning, 2018

For unqualified workers and workers with certificates, the earnings gap is significantly less. Unqualified workers earn approximately $56,000 more in Better Housing geographies. Workers with trade certificates earn approximately $88,000 more in Better Housing geographies.

Human Capital Improvements - BaU and Better Housing demographics

Table 14 provides a breakdown of the human capital differences between BaU and Better Housing geographies by age, gender and qualification. It indicates that degree earners have greater earning capacity across all qualification levels, though most notably for those with higher level qualifications.

TABLE 10 HUMAN CAPITAL DIFFERENCES BETWEEN GEOGRAPHIES

Sex	Qualification	20-24	25-29	30-34	35-39	40-44	45-49	50-54	55-59	60-64
Male	Postgraduate	-45,392	-22,412	28,859	57,952	87,028	92,146	94,128	66,255	66,920
Male	Bachelor	-14,219	5,817	41,048	63,422	94,418	97,339	85,285	60,297	58,038
Male	Certificate	-14,785	-8,149	1,660	15,986	20,484	24,459	18,124	18,940	10,906
Male	Unqualified	-17,468	-9,844	10,246	22,938	20,145	26,716	10,040	1,639	-8,449
Female	Postgraduate	-41,527	-21,041	44,513	85,633	72,201	70,614	88,146	21,497	25,590
Female	Bachelor	-10,173	7,057	33,479	54,153	50,932	50,551	44,026	31,807	47,512
Female	Certificate	-6,256	6,770	18,550	26,609	29,357	25,495	26,792	26,254	29,452
Female	Unqualified	-16,363	4,270	22,863	35,783	34,330	27,072	19,751	18,348	12,111

Source: SGS Economics and Planning, 2018

Based on the population profile of households (see section 2.8) it is possible to calculate a weighted average annual human capital gain per worker. This average improvement in annual earnings is $19,685, meaning that the average worker is expected to have earnings of around $20,000 per annum more when experiencing better housing outcomes. This ranges from greater earnings of around $40,170 for higher degree holders to greater earnings of around $11,973 for unqualified workers.

TABLE 11 QUALIFICATION AND IMPROVED HUMAN CAPITAL ACCUMULATION (PER ANNUM)

Qualification	Earnings Gap Between BaU and Better Housing areas (on average across gender and age)	% Qualifications
Higher Degree	$40,170	7%
Bachelor Degree	$41,015	19%
Certificate Level	$13,701	22%
Unqualified	$11,973	52%
Total	**$19,685**	

Source: SGS Economics and Planning, 2018

2.4 Reduced housing stress

Households enjoying better housing outcomes have reduced housing stress. They no longer spend more than 30% of their income on rent, enabling them to spend on other primary needs including education, health, transport, food and savings for a deposit on a home loan. Lower levels of housing stress are also associated with improved health outcomes.

Housing stress is defined as occurring when a household spends more than 30% of their income on housing. The dollar value difference in rents paid in and not in housing stress is the proxy for the reduced levels of stress these households experience.

From an econometric perspective reduced levels of rental payments would largely be a transfer effect, as the reduced payments in rent are enabled by a government incentive. However, this transfer effect may have productive consequences in the economy due to different consumption and saving patterns of those experiencing better housing outcomes compared to all tax payers.

From a welfare perspective reduced levels of stress, including better health outcomes, represent a real gain not a transfer effect.

Housing stress

Whenever lower income households are spending 30% of their income or more on rent, they have insufficient funds available to pay for other primary needs such as food, power, transport, education and medical needs. Also, it erodes their ability to save for a deposit on a mortgage.

There are at least two ways in which this benefit interacts with the benefit of human capital accumulation:

- Lower rents arguably facilitate better labour market opportunities due to increased ability to spend on transport and education. This impact would at least partially be covered by the improved human resource accumulation and as such this benefit of lower rents is not further quantified to prevent double counting.
- Improved human resource accumulation would also allow households to pay higher rents over time. This effect has not been quantified, leading to a conservative approach to the estimation of benefits.

In order to determine the impact of excess housing spend, the following assumption needs to be calibrated:

- Amount spent on rent above 30% of income Overspend on rent by households under the BaU or the amount spent on rent above 30% of income

Overspend on rent under BaU

A generic estimate of the overspend of households in rental stress was calculated by comparing rent payment to household incomes[7]. Because the scenario does not focus on a particular housing policy in a particular geography, the scope for the analysis was NSW.

ABS data on households by rent payments (discrete categories for instance $375 to $399) and by total (gross) income level (discrete categories for instance $650 to $799) were used to estimates of the number of households paying 30% or more of income on rent, and how much these households were paying over the 30% threshold.

Table 16 shows NSW households by income category (lowest to moderate income[8]) and by rent category. In NSW, definitions of affordable housing include housing for the lowest incomes up to those households earning up to 120% of the median income (approximately $1,783 per month or $92,726 per annum). All categories below and including the yellow cells are paying 30% or more of their income on rent. Households above the red cells pay less than 100% of their income on rent[9]. For the estimate of average household overspend, only households between and including the red and yellow cells were included.

[7] The focus is on renters experiencing housing stress. Housing stress is most concentrated among renters and high rents also prevent households from saving for a deposit on a mortgage. These households would benefit from better housing outcomes.

[8] Moderate incomes as defined by DPE are those households up to 120% of median income households, that is $1,783 for renting households (2016 levels).

[9] Some households may be paying very high shares of their income on rent as a result of losses from earlier years, receiving support from parents and/or other reasons. To keep the estimates conservative and to prevent outliers to skew the results, those households paying 100% of their income or more on rent have been excluded.

TABLE 12 HOUSEHOLDS BY INCOME AND RENT CATEGORY (LOWEST TO MODERATE INCOME), NSW (2016)

HIND Total Household Income (weekly)	Negative income	Nil income	$1-$149 ($1-$7,799)	$150-$299 ($7,800-$15,599)	$300-$399 ($15,600-$20,799)	$400-$499 ($20,800-$25,999)	$500-$649 ($26,000-$33,799)	$650-$799 ($33,800-$41,599)	$800-$999 ($41,600-$51,999)	$1,000-$1,249 ($52,000-$64,999)	$1,250-$1,499 ($65,000-$77,999)	$1,500-$1,749 ($78,000-$90,999)	$1,750-$1,999 ($91,000-
Threshold rent			$ 1,170	$ 3,510	$ 5,460	$ 7,020	$ 8,970	$ 11,310	$ 14,040	$ 17,550	$ 21,450	$ 25,350	$ 29,250
Average income			$ 3,900	$ 11,700	$ 18,200	$ 23,400	$ 29,900	$ 37,700	$ 46,800	$ 58,500	$ 71,500	$ 84,500	$ 97,500
Lower bound			$ 1	$ 7,800	$ 15,600	$ 20,800	$ 26,000	$ 33,800	$ 41,600	$ 52,000	$ 65,000	$ 78,000	$ 91,000
Upper bound			$ 7,799	$ 15,599	$ 20,799	$ 25,999	$ 33,799	$ 41,599	$ 51,999	$ 64,999	$ 77,999	$ 90,999	$ 103,999
Average annual rent													
0	84	890	430	1103	1145	2472	1383	2068	1852	2132	1823	1370	1217
$ 1,950	72	266	406	2422	945	1031	431	450	362	329	287	211	238
$ 4,524	45	197	277	1848	1308	1336	463	525	321	262	157	94	95
$ 5,824	118	717	600	4070	10753	10509	1780	2140	1447	1007	574	338	264
$ 7,124	52	245	272	1252	2052	2992	1782	1308	895	730	449	248	207
$ 8,424	108	514	451	1869	3574	5721	3428	4369	2039	1844	1221	596	461
$ 9,724	76	330	292	1212	2043	3413	2701	2836	1879	1493	980	552	459
$ 11,024	109	539	360	1515	2369	4353	3621	4893	4010	3192	2073	1256	933
$ 12,324	53	316	150	643	1033	2158	2292	2664	2350	2054	1440	974	717
$ 13,624	89	494	259	972	1474	3251	3679	4328	4164	4064	3111	1938	1548
$ 14,924	75	473	169	623	890	1891	2410	3033	3235	3334	2504	1588	1133
$ 16,224	122	846	323	944	1526	2953	3893	5255	5527	6408	5110	3432	2649
$ 17,524	53	363	128	403	636	1334	2005	2755	3116	3876	3246	2267	1792
$ 18,824	128	697	240	750	1042	2074	3135	4416	5306	6881	6248	4547	3630
$ 20,124	95	525	166	391	543	1090	1723	2579	3244	4549	4351	3457	2962
$ 21,424	161	878	246	624	742	1644	2464	3584	4730	6502	6449	5400	4815
$ 22,724	55	433	127	246	279	618	871	1392	1847	2739	2858	2689	2475
$ 25,974	298	2080	525	1074	1119	2252	3401	4858	6796	10029	10694	10429	10027
$ 31,174	172	1717	347	570	469	929	1311	1912	2725	4198	4882	4806	4882
$ 36,374	138	1089	211	295	243	378	562	781	1145	1830	2060	2059	2228
$ 41,574	67	565	116	134	119	198	242	343	468	744	885	903	950
$ 46,774	28	276	40	78	62	73	132	156	211	367	375	439	436
over $50,000	77	556	108	139	109	184	204	232	352	518	544	602	614

Source: ABS Census 2016, Selected dwelling characteristics

Table 17 shows the rental overspend by category.

TABLE 13 INDICATIVE OVERSPEND BY INCOME CATEGORY AND BY HOUSEHOLD (LOWEST TO MODERATE INCOME), NSW (2016)

HIND Total Household Income (weekly)	Negative income	Nil income	$1-$149 ($1-$7,799)	$150-$299 ($7,800-$15,599)	$300-$399 ($15,600-$20,799)	$400-$499 ($20,800-$25,999)	$500-$649 ($26,000-$33,799)	$650-$799 ($33,800-$41,599)	$800-$999 ($41,600-$51,999)	$1,000-$1,249 ($52,000-$64,999)	$1,250-$1,499 ($65,000-$77,999)	$1,500-$1,749 ($78,000-$90,999)	$1,750-$1,999 ($91,000-$103,999)	Total (up to moderate income households)
Average annual rent														
$ -														
$ 1,950	$ 140,400	$ 518,700	$ 316,680	$ 3,777,957	$ 3,316,808	$ 5,227,015	$ 3,025,556	$ 4,211,983	$ 4,376,526	$ 5,132,351	$ 5,596,457	$ 4,937,388	$ 6,497,384	
$ 4,524	$ 203,580	$ 891,228	$ 929,056	$ 1,874,149	$ 1,224,092	$ 3,334,456	$ 2,058,429	$ 3,562,571	$ 3,054,568	$ 3,412,773	$ 2,657,358	$ 1,957,630	$ 2,348,966	
$ 5,824	$ 687,232	$ 4,175,808	$ 2,792,400	$ 9,418,591	$ 3,915,705	$ 12,567,188	$ 5,599,613	$ 11,739,719	$ 11,888,335	$ 11,807,931	$ 8,969,238	$ 6,599,737	$ 6,184,424	
$ 7,124	$ 370,448	$ 1,745,380	$ 1,819,488	$ 4,524,916	$ 3,414,836	$ 311,617	$ 3,289,305	$ 5,475,092	$ 6,189,688	$ 7,810,871	$ 6,432,307	$ 4,520,011	$ 4,580,051	
$ 8,424	$ 909,792	$ 4,329,936	$ 3,271,554	$ 9,184,546	$ 10,593,872	$ 8,033,142	$ 1,871,174	$ 12,608,279	$ 11,450,718	$ 16,828,067	$ 15,904,563	$ 10,087,807	$ 9,600,717	
$ 9,724	$ 739,024	$ 3,208,920	$ 2,497,766	$ 7,531,550	$ 8,711,658	$ 9,229,264	$ 2,036,959	$ 4,497,471	$ 8,109,482	$ 11,683,994	$ 11,491,333	$ 8,625,469	$ 8,962,366	
$ 11,024	$ 1,201,616	$ 5,941,936	$ 3,547,440	$ 11,383,937	$ 13,181,471	$ 17,430,066	$ 7,438,077	$ 1,398,864	$ 12,093,559	$ 20,830,513	$ 21,812,787	$ 17,993,268	$ 17,004,718	
$ 12,324	$ 653,172	$ 3,894,384	$ 1,673,100	$ 5,667,498	$ 7,090,667	$ 11,446,356	$ 7,687,712	$ 2,701,696	$ 4,032,248	$ 10,733,896	$ 13,141,224	$ 12,687,178	$ 12,135,834	
$ 13,624	$ 1,212,536	$ 6,730,256	$ 3,225,586	$ 9,830,954	$ 12,033,957	$ 21,470,092	$ 17,122,618	$ 10,015,641	$ 1,731,599	$ 15,954,654	$ 24,346,219	$ 22,724,697	$ 24,188,816	
$ 14,924	$ 1,119,300	$ 7,059,052	$ 2,324,426	$ 7,111,015	$ 8,423,094	$ 14,946,748	$ 14,349,502	$ 10,961,717	$ 2,860,225	$ 8,754,584	$ 16,340,728	$ 16,556,250	$ 16,231,188	
$ 16,224	$ 1,979,328	$ 13,725,504	$ 4,862,442	$ 12,002,158	$ 16,426,093	$ 27,179,855	$ 28,240,406	$ 25,823,858	$ 12,071,797	$ 8,496,047	$ 26,704,094	$ 31,319,917	$ 34,505,477	
$ 17,524	$ 928,772	$ 6,361,212	$ 2,093,312	$ 5,647,702	$ 7,672,799	$ 14,012,536	$ 17,151,071	$ 17,119,983	$ 10,856,611	$ 100,195	$ 12,743,309	$ 17,741,202	$ 21,012,723	
$ 18,824	$ 2,409,472	$ 13,120,328	$ 4,236,960	$ 11,485,613	$ 13,925,444	$ 24,481,807	$ 30,892,760	$ 33,182,486	$ 25,384,700	$ 8,767,426	$ 16,406,311	$ 29,673,040	$ 37,845,836	
$ 20,124	$ 1,911,780	$ 10,566,100	$ 3,146,364	$ 6,496,133	$ 7,962,633	$ 14,283,524	$ 19,218,600	$ 22,731,693	$ 19,736,983	$ 11,709,808	$ 5,768,773	$ 18,065,763	$ 27,030,768	
$ 21,424	$ 3,449,264	$ 18,810,272	$ 4,982,484	$ 11,178,430	$ 11,845,399	$ 23,680,423	$ 30,687,026	$ 36,249,114	$ 34,927,030	$ 25,189,723	$ 166,707	$ 21,199,590	$ 37,681,468	
$ 22,724	$ 1,249,820	$ 9,839,492	$ 2,737,358	$ 4,726,681	$ 4,816,698	$ 9,705,166	$ 11,979,865	$ 15,888,497	$ 16,039,625	$ 14,171,997	$ 3,641,521	$ 7,060,911	$ 16,151,479	
$ 25,974	$ 7,740,252	$ 54,025,920	$ 13,022,100	$ 24,126,497	$ 22,955,334	$ 42,684,746	$ 57,831,114	$ 71,238,441	$ 81,104,483	$ 84,485,800	$ 48,381,260	$ 6,509,260	$ 32,846,948	
$ 31,174	$ 5,361,928	$ 53,525,758	$ 10,411,388	$ 15,768,566	$ 12,059,936	$ 22,439,206	$ 29,109,641	$ 37,980,255	$ 46,690,559	$ 57,194,182	$ 47,473,300	$ 27,990,865	$ 9,393,700	
$ 36,374	$ 5,019,612	$ 39,611,286	$ 7,428,044	$ 9,694,924	$ 7,512,138	$ 11,095,869	$ 15,401,132	$ 19,575,101	$ 25,572,602	$ 34,448,195	$ 30,743,749	$ 22,698,725	$ 15,872,606	
$ 41,574	$ 2,785,458	$ 23,489,310	$ 4,686,864	$ 5,100,596	$ 4,297,584	$ 6,841,722	$ 7,890,204	$ 10,380,603	$ 12,885,962	$ 17,873,968	$ 17,809,873	$ 14,650,407	$ 11,707,943	
Total overspend in range	$ 1,401,660	$ 7,331,116	$ 5,657,626	$ 66,527,157	$ 113,352,230	$ 196,210,592	$ 271,874,176	$ 302,069,818	$ 286,398,997	$ 253,740,904	$ 147,882,996	$ 71,849,258	$ 36,974,249	*$ 1,761,270,779*
Total households in range	371	2315	1555	14004	27935	33492	36934	42450	42303	41,348	27,828	19,238	9,110	*298,883*
Average overspend for households in range	$ 3,778.06	$ 3,166.79	$ 3,638.34	$ 4,750.58	$ 4,057.71	$ 5,858.43	$ 7,361.08	$ 7,115.90	$ 6,770.18	$ 6,136.72	$ 5,314.18	$ 3,734.76	$ 4,058.64	*$ 5,892.84*

The totals provide the results by income category and the grand total. **It shows that households in rental stress in NSW overspend on average $5,893 per annum**. If these households would pay a maximum of 30% of income on rent their disposable income would effectively be higher by $5,893 per annum. The total, indicative annual overspend on rent in NSW is approximately $1.8 bn. This is in addition to any Commonwealth Rental Assistance paid, which is indicatively $1.4 bn for NSW (430,000 of total 1.35 M recipients of CRA live in NSW, and the total CRA spent is approximately $4.4 bn nationally).

2.5 Anti-cyclical productivity impacts

This section describes how government investment into affordable housing during periods of economic downturn could be both financially prudent and improve productivity in the construction sector.

Anti-cyclical investment refers to government stimulus into affordable housing during times of economic downturn. The concept is that investment during these periods may be beneficial through reduced input costs such as materials and labour. Similarly, there are other benefits that could occur such as reducing fluctuations in the construction sector. A more stable sector may lead to greater certainty for firms, enabling the sector to strategically plan for structural growth and enhanced overall productivity outcomes.

While some evidence of reduced costs and structural and strategic impacts on the industry was found, it was not statistically robust. For the purpose of modelling impacts, a scenario was included to assess the possible economic impacts using the evidence found.

The case for anti-cyclical investment

A recent example of anti-cyclical investment in Australia was the Social Housing Initiative announced at the early stages of the Global Financial Crisis in February 2009.

A review of the stimulus package undertaken by KPMG in 2012[10].

The KPMG report did not provide any evidence of cost savings or productivity improvements due to the anticyclical nature of the incentive. It merely demonstrated the economic impacts of the stimulus package.

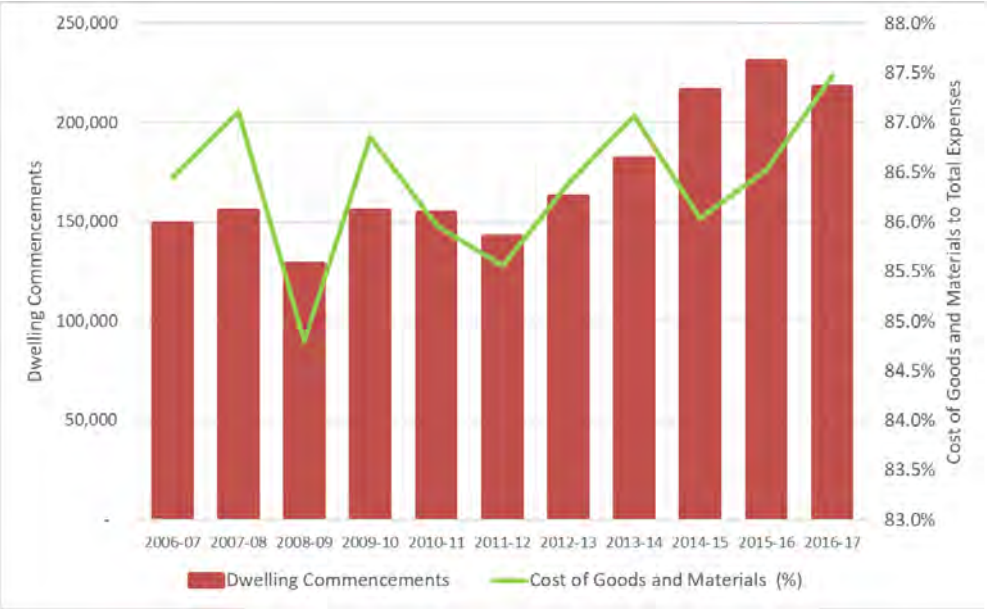
Cost savings of anti-cyclical investment

Reduced cost of materials during downturn

One of the alleged key benefits to anti-cyclical investment is the alleged cost savings from the reduced cost of construction material. Figure 6 compares dwelling commencements with the material costs as share of total dwelling construction costs (material costs represent the majority of construction costs). The figure suggests that when dwelling commencements go down, the cost of material tends to respond accordingly in 2008-09 and 2010-2012, but this relation does not hold in 2014-15. Other external forces may also influence material costs, for instance the performance of the mining industry.

[10] *Social Housing Initiative Review, September 2012.* KPMG. http://www.nwhn.net.au/admin/file/content101/c6/social_housing_initiative_review.pdf

FIGURE 5 RELATIONSHIP BETWEEN PRIVATE DWELLING COMMENCEMENTS AND COST OF MATERIALS



Source: ABS 8155.0, 8752.0

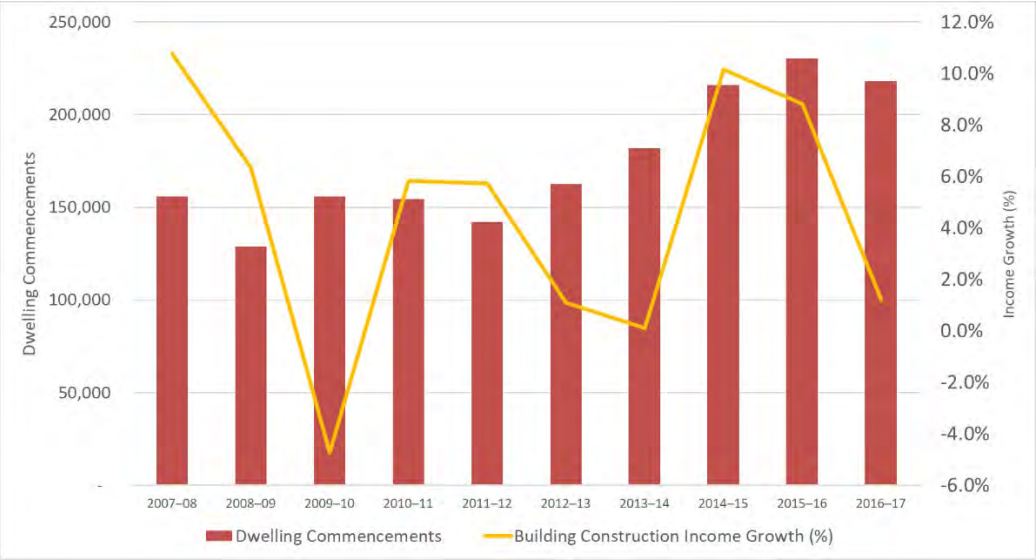
*Housing construction in this instance refers to Building Construction which is is a subdivision of the Construction industry measurements as per ABS calculations.

Reduced costs of labour during downturn

The cost of labour in the construction industry is expected to decrease and at least increase at a slower rate during a period of downturn. Labour costs indicatively make up between 10 to 20% of the total construction costs. Since 2006-07, average construction labour costs have typically risen around 5.9% per year, compared with the Australian industry average of around 4.6%. ABS data indicates that the growth in construction labour costs fell from 13.2% in 2007-08 to 4.7% in 2008-09 and 5.1% in 2009-10. Most interestingly was that labour costs for the subdivision of Building Construction (which is predominantly associated with housing construction) fell by -4.7% in the 2009-10 period.

The figure below suggests that responses in labour costs to industry downturns occur delayed by approximately one year. This is true over 2008-09 and 2009-10 and again over 2011-12 and 2012-2014. However, there is an unexpected drop in labour costs from 2015 to 2017. This may be due to external factors such as performance of the mining sector.

FIGURE 6 RELATIONSHIP BETWEEN DWELLING COMMENCEMENTS AND LABOUR INCOME GROWTH



Source: ABS 8155.0, 8752.0

* Housing construction and Labour Income Growth refers to Building Construction which is a subdivision of the Construction industry measurements as per ABS calculations.

There is some evidence of labour costs respond with a delay to an economic downturn in the industry.

Improving productivity in the construction sector

Anti-cyclical investment could improve productivity

According to McKinsey, cited in Economist (2017), the construction sector globally is known for having the lowest productivity gains of any industry.

The Economist (2017) argues that there are two big structural trends which hold back the desire for firms to engage in productivity improving behaviour. The first is that volatility in the sector has discouraged firms from investing. According to Luyten, cited in the Economist (2017), *"The industry has learned through bitter experience to prepare for the next recession"*. Investing in capital in such a fluctuating industry brings high fixed costs, making firms less adaptive[11].

The second is that the complexity and customised nature of construction limits the ability for the industry to consolidate into larger, more efficient firms. Instead, tens of thousands of firms proliferate – resulting in high levels of competition and thin margins. The lack of profitability may also limit investment.

Anti-cyclical construction programs could assist in lengthening the construction business cycle for certain firms.

The article is qualitative and with limited references and further statistical evidence is needed.

Measuring productivity

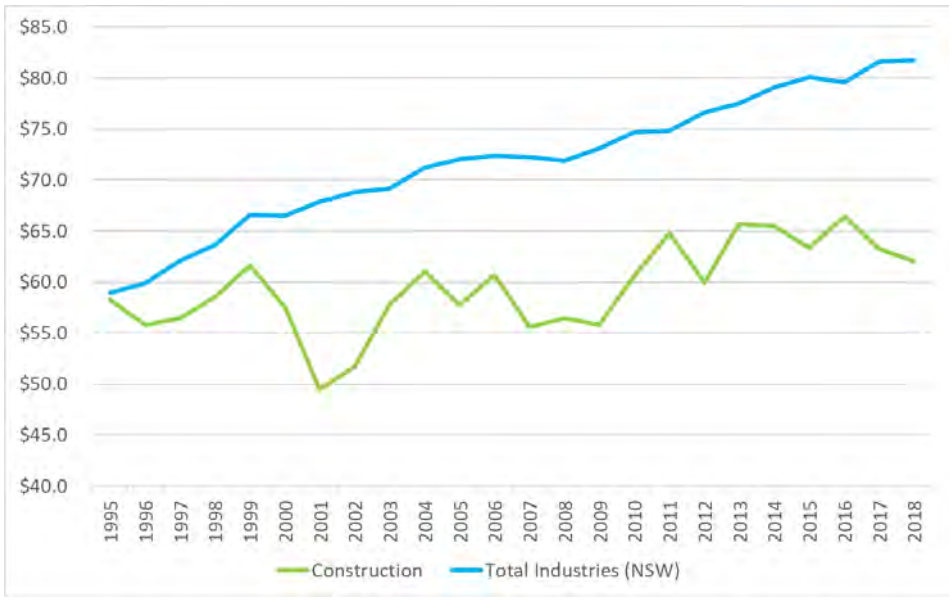
One way to determine the productivity effects of economic downturn in the construction industry is to look at changes in Gross Value Add within the industry over time.

[11] *Why construction industry productivity is set in concrete, August 2017. The Economist*. https://www.theaustralian.com.au/business/property/why-construction-industry-productivity-is-set-in-concrete/news-story/6cb61fbc840b7d18a35644e16e536bbc

The GVA per hour worked is a solid indicator of labour productivity. GVA per hour worked in the construction sector has remained relatively flat over time, rising by 6.6% from $58.2/hr in 1995 to $62.0 in 2018. This contrasts with GVA per hour worked across all industries in NSW, which has risen around 38.6% from $59.0 to $81.7/hr.

This indicates that productivity has largely stalled over the past 20 years, when compared to overall productivity across NSW. The figure below suggests a relationship between the industry downturn in 2008-09 and lower productivity, indicating anticyclical investment could drive an increase in productivity. Since 2013, GVA per hour worked has remained stable and lagged industry growth and productivity growth in the wider economy. The evidence of a link between industry downturn and labour productivity therefore remains weak.

FIGURE 7 GVA PER HOUR WORKED



Source: SGS Economics and Planning, 2018

In all, there is limited evidence that could link industry downturns to possible cost savings, and vice versa that anti-cyclical investment generates economic impact beyond what is typically expected of investment in any other parts of the industry cycle.

2.6 Subsidy for developing affordable housing

Better housing outcomes, independent of the specific enabling policy incentive or intervention, is accompanied by a cost.

The cost of better housing outcomes would equal the total cost of developing the dwellings as affordable housing instead of generic full market housing. This in turn would equal a policy or government incentive to enable and encourage the private and not-for-profit sector to initiate housing development.

An annual subsidy, somewhat in line with the phased out NRAS, is assumed to enable and leverage investment in better housing outcomes (i.e. affordable housing close to jobs and services).

It is assumed the incentive would be to deliver affordable housing with a subsidy of $8,500 per dwelling per annum for 15 years. The scenario assumes a shock of 125,000 new affordable dwellings in NSW over 10 years. Contrary to the earlier NRAS scheme, it has been assumed that the housing delivered under this subsidy remains affordable indefinitely.

For the purpose of the report, a fairly generic shock was used. The assumed subsidy could easily be replaced by a Government co-investment in better housing outcomes with the sector (where the subsidy would be replaced by a Government co-investment).

2.7 The relative development cost of higher density housing in accessible locations

This section discusses the development costs of higher density, affordable housing in accessible locations relative to the cost of housing provided at the urban fringes.

Infill development is characterised by smaller dwellings, at higher densities, in established urban areas with available infrastructure that may need upgrading due to the intensification of use. Land prices in urban infill areas are higher.

Residential development at the fringes is characterised by larger dwellings, at a lower density with the need to develop new infrastructure. Land prices at urban fringes are generally lower.

Land values in well-accessible locations are obviously higher. Table 19 below shows an overview of the per unit land values across areas of Sydney (Hill PDA, 2016). Since the release of the data, the property market has changed and as a result land values would now be different.

TABLE 14 APPROXIMATE LAND VALUES, PER UNIT

Sydney area	Land value per unit
Central	$252,000
Eastern suburbs	$189,109
Inner West	$174,583
North Sydney	$271,893
Northern Beaches	$205,479
Northern Suburbs	$144,182
South Sydney	$154,650
Sutherland Shire	$100,000
Upper North Shore	$284,091
Western Sydney	$79,896

Source: Hill PDA, 2016

Research by SGS (2016[12]) shows that construction costs in infill areas are lower than in Greenfield areas, ranging from $11,000 to $14,000 per dwelling. In addition, the provisioning of infrastructure for infill development is lower too. Trubka, Newman and Bilsborough (2012) estimated the capital costs per dwelling for a suite of physical infrastructure in both greenfield and infill locations. They conclude that the cost to provision of electrical, water & sewage, telecommunications and gas infrastructure is $19,800 lower for infill dwellings. They further conclude that the cost for social infrastructure (fire, ambulance, police, education and health) is $46,100 lower for infill dwellings.

It is reasonable to assume that affordable units would be smaller than full-market units, resulting in higher densities again, and therefore the associated construction costs and per unit land values would possible be lower again.

In all, there are various factors affecting the overall development cost of higher density affordable housing in well accessible locations compared to lower density, full market housing at the urban fringes.

[12] SGS (2016) Greater MacArthur Investigation Area CBA

These costs seem to mostly compensate for each other, leaving little cost difference. To remain on the conservative side however, the sensitivity analysis assumes an additional development cost for Better Housing Outcomes of $100,000 per dwelling. This represents a 20% increase of the development cost per dwelling. Assuming the subsidy would increase accordingly, the subsidy would grow from $8,500 per dwelling to $10,200 per dwelling per annum for 15 years.

2.8 Target population

As a rule of thumb, the profile of the households needs to resemble as much as possible that of households that would benefit from better housing outcomes, i.e. low to moderate income households in NSW. The dwellings will house a target population with the following employment, household income and qualifications profile.

The following target population profile is a description of what these households look like based on available statistics around:

- Workforce participation
- Qualifications
- Household income
- Age

This data informs the shock into the model.

Qualifications

The qualification levels of renters and the total population are similar, with the entire population, including home owners, having slightly higher levels of Certificate level qualifications. Renters have a slightly higher level of Bachelor Certificate Levels.

TABLE 15 QUALIFICATION LEVELS OF RENTERS AND TOTAL POPULATION, IN NSW, BAU AND BETTER HOUSING AREAS (EXCLUDING 0-15 YEAR OLDS)

	Renters			All persons		
	NSW	BaU	BH	NSW	BaU	BH
Postgraduate Degree Level	7%	2%	11%	6%	3%	9%
Graduate Diploma and Graduate Certificate Level	1%	1%	2%	1%	1%	2%
Bachelor Degree Level	17%	8%	24%	16%	11%	21%
Advanced Diploma and Diploma Level	8%	7%	9%	8%	8%	9%
Certificate Level	13%	16%	11%	14%	18%	12%
Level of education inadequately described	1%	1%	1%	1%	1%	1%
Level of education not stated	3%	4%	3%	9%	8%	9%
Not applicable	47%	61%	37%	42%	50%	36%
Overseas visitor	2%	1%	3%	2%	1%	2%
Total	100%	100%	100%	100%	100%	100%

Source: ABS Census (2016)

For the purpose of the modelling, the target population should be reflective of the wider community of renters, as per table below.

TABLE 16 QUALIFICATION PROFILE OF TARGET POPULATION

Qualification	Share of population
Postgraduate Degree Level	7%
Graduate Diploma and Graduate Certificate Level	1%
Bachelor Degree Level	17%
Advanced Diploma and Diploma Level	8%
Certificate Level	13%
Level of education inadequately described	1%
Level of education not stated	3%
Not applicable	47%
Overseas visitor	2%
Total	100%

Source: SGS (2019), based on ABS Census (2016)

Income profile

The target population would generally have very low to moderate income households. According to FACS and DPE definitions, households qualifying for affordable housing have very low and low to moderate incomes, with moderate being up to 120% of the median income. The median income in NSW is approximately $78,000 meaning moderate income households would be earning $93,600 per annum.

The table below shows the distribution of renting households by income category.

Based on this Census data, the target population (renters in NSW) has the following household income profile.

TABLE 17 HOUSEHOLD INCOME PROFILE FOR SHOCK SCENARIO

Income category	renting households
$1-$7,799	1%
$7,800-$15,599	5%
$15,600-$20,799	8%
$20,800-$25,999	12%
$26,000-$33,799	10%
$33,800-$41,599	12%
$41,600-$51,999	13%
$52,000-$64,999	15%
$65,000-$77,999	14%
$78,000-$90,999	11%
Total	100%

Source: SGS, 2018 (based on ABS Census)

Employment profile

The target population, being representative of all renting households in NSW, would have the following employment profile:

TABLE 18 EMPLOYMENT PROFILE OF TARGET POPULATION

	Households with workers	Workers per 1,000 households	Share of all renting households
Family households	70%	908.1	61%
Single person households	43%	428.6	39%
Total	59%	723.3	100%

Source: ABS Census, 2016; SGS, 2018

Single family households represent 61% of all renting households (dwellings, ABS Census). Of these households, 69.7% have employed persons in them, some of them two (ABS, Census 2016).

For the scoping of the target population, 39% is assumed to be a single person household. The number of employed people among single person households is assumed to be equal to average participation rates of persons in the population. Of all population aged 15 and over 43% is employed (ABS, Census 2016).

Together, this equals to 908 employed persons per 1,000 dwellings. This is slightly simplified reflection of the actual household composition of renting households (table below).

TABLE 19 HOUSEHOLD COMPOSITION OF RENTERS, NSW (2016)

	Count	Share
One family household	498,885	61%
Multi family households	14,316	2%
Non-family households (group, single person, visitor)	289,872	36%
- **Of which single person households**	218,070	27%
Non-classifiable	11,474	1%
Not applicable	0	0%
Total	**814,549**	**100%**

Source: ABS Census, 2016

Age profile

A clear age profile is important for the shock scenario as it determines the level of human capital accumulation resulting from better housing outcomes.

ABS does not provide data on age for renters specifically. Therefore, the typical age profile of all persons was used.

Summary target population

The key characteristics of the target population benefitting from better housing outcomes is summarised below.

TABLE 20 SUMMARY TARGET POPULATION PROFILE

Target population profile - per 1,000 dwellings					
Age	Employed persons (in %)	Household type	Employed persons	Income category	Renting households
20-24 years	14%	Family households	908.1	$1-$7,799	10
25-29 years	11%	Single person households	428.6	$7,800-$15,599	50
30-34 years	12%	Total	723.3	$15,600-$20,799	80
35-39 years	11%			$20,800-$25,999	120
40-44 years	11%	Qualifications	Employed people	$26,000-$33,799	100
45-49 years	11%	Higher degree	7%	$33,800-$41,599	120
50-54 years	11%	Bachelor degree	19%	$41,600-$51,999	130
55-59 years	9%	Skilled labour	22%	$52,000-$64,999	150
60-64 years	10%	Unqualified	52%	$65,000-$77,999	140
				$78,000-$90,999	110
	Average household size	2.60		Total	1,000
	Total employed persons	723			
	Total residents	2600			

Summary key modelling inputs

In summary, the direct effects are as follows (Table 27).

TABLE 21 SUMMARY MODELLING INPUTS

Impact	Unit value
Travel time savings	$2,554
Of which, productively used travel time savings	$1,277 per working person per annum
Human capital accumulation	$19,865 per working person per annum
Reduced levels of housing stress	$5,893 per household per annum
Policy/subsidy cost	$8,500 per dwelling per annum for 15 years
Additional construction cost	$50,000 per dwelling

2.9 Economic consequences

As mentioned, this study was scoped around selected economic consequences that would occur as a result of better housing outcomes. It is important to note the treatment of these consequences.

Economic impact modelling is required to quantify the impacts of the Project Better Housing Outcomes scenario whereby an incentive generates the development of 125,000 affordable dwellings for ten years in well-accessible locations. However, there are impacts that are not suitable for CGE modelling. They include:

- Reduced levels of rental stress allowing household quality of living improvements [13]. Reduced rental stress is incorporated in a cost-benefit analysis (CBA) approach.
- All travel time savings compared to the BaU scenario – only increase in the productive use of travel time saving is an economic impact.

[13] Reduced levels of stress provide a range of benefits for households including improved education opportunities, better health outcomes and intergenerational benefits (of not growing up in poverty).

3. CGE MODELLING

Improving housing outcomes for low income or otherwise vulnerable households provides clear benefits to those households as described in Section 2. Improving these outcomes however does come at a direct financial cost to government. Qualitatively it is clear that there are indirect costs and benefits in the broader economy as a result of these forces.

Quantification of the net economic impacts of these forces requires analysis in an appropriate economy wide modelling framework. In this section we describe the modelling framework used to undertake the economy wide analysis of the policy interventions detailed previously, describe model calibration, scenario specification and shock generation, and finally outline the estimated economy wide impacts of the interventions in housing markets.

3.1 The CEGEM model

Computable General Equilibrium models are used extensively in the public and the private sector to assess the economy-wide impacts of major policy changes and economic developments. For example, the Commonwealth Treasury has used CGE modelling to assess the economic impacts of climate change response policies and analyse taxation efficiency. The Productivity Commission has also used CGE modelling to consider the impact of economic reforms.

The CEGEM model is a multi-commodity, multi-region, dynamic CGE model of the Australian and world economy. Like all economic models, CEGEM is a based on a range of economic theory, assumptions, parameters and data that constitute an approximation to the working structure of an economy. Computable General Equilibrium models build on standard national accounting frameworks and identities, with behavioural overlay built on standard and well-established economic theory.

Specific details of the CEGEM model include:

- Genealogy of the model: The CEGEM model is related to the GTEM family of models, and its construction shares key features of other economic models such as the global economic framework underpinning models such as GTAP and GTEM, with state and regional modelling frameworks similar to Monash-MMRF and TERM.
- The factors of production: Labour, capital, land and a natural resource comprise the four factors of production. On a year-by-year basis, capital and labour are mobile between sectors, while land is mobile across agriculture. The natural resource is specific to mining and is not mobile. A representative household in each region owns all factors of production. This representative household receives all factor payments, tax revenue and interregional transfers. The household also determines the allocation of income between household consumption, government consumption and savings.
- Treatment of capital and investment: Capital in each region of the model accumulates by investment less depreciation in each period. Capital is mobile internationally in CEGEM where global investment equals global savings. Global savings are made available to invest across regions. Rates of return can differ to reflect region specific differences in risk premiums.
- Treatment of labour markets: The model assumes labour markets operate in a model where employment and wages adjust in each year so that, for example, in the case of an increase in the demand for labour, the real wage rate increases in proportion to the increase in employment from its base case forecast level.

- **Commodities and Industries:** CEGEM determines regional supplies and demands of commodities through optimising behaviour of agents in perfectly competitive markets using constant returns to scale technologies. Under these assumptions, prices are set to cover costs and firms earn zero pure profits, with all returns paid to primary factors. This implies that changes in output prices are determined by changes in input prices of materials and primary factors.
- **Demand for products:** Demand for intermediate inputs by industry is driven by the underlining production function for each industry, that is, the proportion of primary factor and intermediate inputs required to produce the output of each industry and the elasticity with which substitution may occur in response to price changes. Likewise, the householder and the government have underlying utility functions, calibrated to real world data and again with the potential for substitution. Inputs may be sourced in the home region, interstate (in the case of Australia), or internationally, with interregional substitution driven by an elasticity of substitution (the 'Armington assumption').

3.2 Model calibration

The CEGEM modelling framework was refined through a specific regional disaggregation in order to measure the impacts of the housing market interventions described. In particular, the Australian economy has been decomposed into the three distinct economic regions of the Greater Capital City Statistical Area of Sydney[14], the remainder of New South Wales, and the remainder of Australia.

Calibration of the underlying database draws primarily on the results of the 2016 Census of Housing and Population. The Census provides the best source of data for establishing the economic footprint of the regions of Australia, in particular the industry of employment for people living in each area, and the wages paid across different industries.

At the sectoral level, the Australian economy has been decomposed into 17 distinct production sectors, as outlined in Table 29 below.

TABLE 22 PRODUCTION SECTORS IN THE CEGEM MODEL

Number	Sector
1	Agriculture
2	Coal
3	Oil
4	Gas
5	Other Mining
6	Processed Foods
7	Rest of Manufacturing
8	Electricity
9	Water and Waste services
10	Construction
11	Trade
12	Transport
13	Communications
14	Finance and Insurance
15	Other Business Services

[14] As defined by the Australian Statistical Geography Standard, ABS Cat. 1270.0.55.001.

16	Recreational Services
17	Other Services and Government

3.3 Description of the scenarios

The core scenario is a culmination of a number of economic drivers, including travel time savings, improvements to the human capital stock, and the cost to government of the policy options. Additionally, the potential benefits of government maintaining "shovel ready" projects in order to both capitalise on and partially mitigate natural cycles in the construction sector were analysed.

Given there are many forces at play in the core scenario, the scenario has been built incrementally in rounds, so as to illustrate the relative impacts of each of the shocks on the outputs of the economic model.

The rounds undertaken in this analysis are as follows:

- **Round 1** – Labour productivity. This round assesses the human capital accumulation analysed in Section 2.3. This is anticipated to improve the labour force productivity of that component of the target population engaged in the labour force. It is implemented as an appropriately scaled shock to aggregate labour force productivity shock in the GCCSA of Sydney.
- **Round 2** – Labour productivity and travel time savings. The analysis in Section 2.2 identifies an aggregate stock of travel time savings as a result of the policy interventions described. The travel time savings identified may manifest themselves both inside and outside of the market economy, for example, if someone spends an hour longer in the labour force per week this is a market impact. That same additional hour spent at home with family, while having an appropriate impact on personal utility, is not part of the market economy.
  This round builds on round 1, adding to it a shock of 50 per cent of the identified travel time saving through an increase in effective labour supply.
- **Round 3** – Labour force and public funding. The rounds identified come at some cost, which must be met through some public finance mechanism (Section 2.6). This round builds on round 2, including the cost of funding the policies through an increase in taxation of labour.
  Funding the policy through taxation is one of a range of options available, including through debt financing, or through reduction in expenditure elsewhere. It is generally the most transparent (and most frequently used in these exercises) funding mechanism as it avoids the intertemporal distortions of debt funding and questions of neutrality when diverting expenditure from elsewhere. Taxation of labour was chosen as the deadweight cost of this taxation approximates average deadweight cost of the Australian mix of taxes.

Finally, we undertake analysis of the potential benefits of maintaining a stock of "shovel ready" projects to strategically build during downturns in the housing construction cycle (Section 2.5). The real-world benefits of this round (round 4) are twofold:

- First, there is evidence to suggest that downturns in the housing construction cycle provide strategic opportunities to capitalise on reduced construction prices, potentially reducing the cost of the policy to the public sector. This impact is the core of what is being measured in Round 4 and builds on those impacts already captured in Round 3.
- Second, downturns in housing construction have disruptive potential for employees in the sector, reducing income stability and potentially necessitating geographical relocation to follow work. Although possibly significant, measuring the welfare impacts of these effects is outside the scope of a CGE model and so were excluded.

The direct housing impacts modelled in this report are significant, at approximately $2.3 billion NPV worth of travel time savings (of which $1.1 billion is estimated to occur in the market economy), $17.6 billion NPV worth of human capital development, and at a cost to government of $7.3 billion NPV (see Section 2).

3.4 Results

Table 30, Table 31 and Table 32 show the magnitude of the economic impacts of Rounds 1, 2 and 3, including the net present value of the scenarios over the modelling period from 2019 to 2059, and snapshots of the impacts at ten year intervals in 2029, 2039, 2049 and finally at 2059.

For the single year columns in these tables the results are to be interpreted as the difference in the particular variable between the policy scenario and the BaU *in that year*. For example, in Round 3, the investments in affordable housing are projected to result in gross regional product in the Sydney region being $3.9 billion higher in 2059 than it would have otherwise been in 2059.

The relative impacts of the productivity dividend (human capital accumulation), the increase in effective labour supply (productive travel time savings), and the funding (policy incentive) are clear comparing the three tables. Of particular note:

- The impost of the public funding requirements is felt in particular in the first half of the timeframe, with a long run difference in gross regional product of $12 million in Sydney between round 2 and round 3 in 2059. This compares to differences Sydney gross regional product in 2029 and 2039 of approximately $70 million and $130 million respectively. The differences in gross regional product suggest that the effective marginal excess burden of the funding mechanism used range between 25 and 35 cents in the dollar throughout the funding period.
- The human capital accumulation impacts are not only the most significant in terms of shock size, but also the most significant in terms of the ratio between the direct shock and the impact on gross regional product. This is a relatively unsurprising result – in general any economic shock that has an underlying impact on the productivity of a factor of production, in this case the labour force, will have a larger impact on economic output than the size of the direct shock. In simple terms – more is being done with less.
- While being one of the most recognisable macroeconomic indicators, gross regional product, or most commonly, the national analogue of gross domestic product, is in general a poor indicator of household economic welfare. One of the best indicators of economic welfare in an economic modelling framework is household consumption, showing the impact of a policy on household consumption possibilities. In net present value terms, household consumption in the Sydney region increases by $14.8 billion in Round 3.
- While the direct impacts are imposed only on the Sydney region and the bulk of the economy wide effects are predictably felt in the Sydney region, the rest of NSW and to a lesser extent Australia benefit indirectly from the improved conditions in Sydney. The direct shocks of the Better Housing scenario improve the spending potential and business productivity in Sydney, which is immediately linked to the rest of Australia through the trade of goods and services. For example, through the purchasing of agricultural or construction inputs from surrounding regions.

TABLE 23 ROUND 1 RESULTS

		NPV/Average	2029	2039	2049	2059
GRP	Sydney	$29,805	$3,133	$3,388	$3,488	$3,540
	Rest of NSW	$970	$84	$129	$147	$153
	Rest of Australia	$827	$70	$115	$128	$122
Household Consumption	Sydney	$14,175	$1,342	$1,751	$2,008	$2,286
	Rest of NSW	$1,305	$126	$165	$175	$178
	Rest of Australia	$837	$78	$114	$116	$100
Employment	Sydney	1,542	2,014	1,829	1,634	1,460
	Rest of NSW	152	182	186	169	146
	Rest of Australia	93	110	122	104	77
Wage growth	Sydney	0.34%	0.50%	0.41%	0.33%	0.26%
	Rest of NSW	0.06%	0.08%	0.08%	0.06%	0.05%
	Rest of Australia	0.01%	0.01%	0.01%	0.01%	0.00%
Investment	Sydney	$4,114	$526	$357	$302	$291
	Rest of NSW	$600	$77	$52	$42	$39
	Rest of Australia	$591	$76	$57	$40	$25

TABLE 24 ROUND 2 RESULTS

		NPV/Average	2029	2039	2049	2059
GRP	Sydney	$32,290	$3,372	$3,683	$3,835	$3,942
	Rest of NSW	$1,050	$91	$140	$161	$169
	Rest of Australia	$895	$75	$125	$141	$135
Household Consumption	Sydney	$15,351	$1,443	$1,900	$2,199	$2,528
	Rest of NSW	$1,413	$136	$179	$192	$198
	Rest of Australia	$906	$84	$124	$127	$112
Employment	Sydney	3,032	3,728	3,550	3,358	3,186
	Rest of NSW	165	195	203	186	163
	Rest of Australia	101	118	132	115	87
Wage growth	Sydney	0.33%	0.48%	0.39%	0.31%	0.25%
	Rest of NSW	0.07%	0.09%	0.08%	0.07%	0.05%
	Rest of Australia	0.01%	0.01%	0.01%	0.01%	0.01%
Investment	Sydney	$4,458	$567	$390	$336	$328
	Rest of NSW	$651	$83	$57	$47	$44
	Rest of Australia	$641	$82	$63	$44	$29

TABLE 25 ROUND 3 RESULTS

		NPV/Average	2029	2039	2049	2059
GRP	Sydney	$31,107	$3,200	$3,565	$3,818	$3,932
	Rest of NSW	$1,010	$86	$135	$158	$168
	Rest of Australia	$862	$71	$120	$139	$136
Household Consumption	Sydney	$14,781	$1,370	$1,828	$2,176	$2,504
	Rest of NSW	$1,360	$129	$172	$190	$197
	Rest of Australia	$874	$80	$119	$126	$113
Employment	Sydney	2,576	2,495	2,926	3,351	3,181
	Rest of NSW	161	185	196	185	163
	Rest of Australia	99	112	128	115	88
Wage growth	Sydney	0.22%	0.17%	0.25%	0.31%	0.25%
	Rest of NSW	0.06%	0.08%	0.08%	0.07%	0.05%
	Rest of Australia	0.01%	0.01%	0.01%	0.01%	0.01%
Investment	Sydney	$4,298	$538	$384	$341	$329
	Rest of NSW	$627	$79	$56	$48	$45
	Rest of Australia	$618	$78	$61	$46	$30

Table 33 shows the potential impact of a strategic rescheduling of construction of 2,500 dwellings, brought forward to take advantage of a temporary, hypothetical downturn in the housing construction market in 2024. The results show the anticyclical incentive increases GRP in 2024, with a long run return to the core scenario levels. In 2024, however, the government saves approximately $1 million in policy costs for the 2,500 dwellings moved forward.

TABLE 26 THE IMPACT OF ANTICYCLICAL INVESTMENT

	2024	2025	2026	2027	2028
Commencements – Round 4	15,000	10,000	12,500	12,500	12,500
Commencements – Round 3	12,500	12,500	12,500	12,500	12,500
GRP – Round 4, Sydney	$1,555	$1,879	$2,205	$2,534	$2,866
GRP – Round 3, Sydney	$1,619	$1,880	$2,206	$2,536	$2,867

3.5 Sensitivity of results to policy costs

To allow for possibly higher development costs per dwelling under better housing outcomes, it was assumed that dwellings under the better housing outcomes scenario are $100,000 higher than BaU. The sensitivity analysis allowed for a higher subsidy (of $25,000 per dwelling) and higher construction costs of $75,000 per dwelling.

This 'Round 5' sensitivity analysis is undertaken relative to the Round 3 results, with results shown in Table 34.

TABLE 27 ROUND 5 SENSITIVITY ANALYSIS RESULTS VERSUS ROUND 3 RESULTS

		NPV/Average	2029	2039	2049	2059
GRP – Round 5	Sydney	$30,921	$3,167	$3,546	$3,815	$3,930
	Rest of NSW	$1,004	$85	$134	$158	$168
	Rest of Australia	$857	$70	$119	$139	$136
GRP - Difference to Round 3	Sydney	-$186	-$33	-$19	-$3	-$2
	Rest of NSW	-$6	-$1	-$1	-$0	-$0
	Rest of Australia	-$5	-$1	-$1	-$0	$0
Household Consumption – Round 5	Sydney	$14,691	$1,357	$1,814	$2,172	$2,500
	Rest of NSW	$1,352	$128	$171	$190	$197
	Rest of Australia	$868	$79	$118	$126	$113
Household Consumption - Difference to Round 3	Sydney	$90	$14	$14	$4	$4
	Rest of NSW	$8	$1	$1	$0	$0
	Rest of Australia	$5	$1	$1	$0	-$0
Employment – Round 5	Sydney	2,488	2,249	2,831	3,350	3,180
	Rest of NSW	160	184	195	185	163
	Rest of Australia	99	111	127	115	88
Employment - Difference to Round 3	Sydney	-88	-246	-95	-1	-1
	Rest of NSW	-1	-2	-1	-0	-0
	Rest of Australia	-0	-1	-1	-0	0

Table 34 shows household consumption is the macroeconomic variable most sensitive to policy cost assumptions. Despite this, the net present value increase in household consumption is still $14.7 billion dollars. The relative stability of GRP versus household welfare is a function of the constant increase in labour productivity and supply between the Round 3 and Round 5 scenarios, compared to the increase in funding requirements that fall on households as the ultimate owners of the factors of production.

3.6 Conclusions

The direct impacts on human capital, travel time savings, and public funding requirements have large and sustained impacts on all relevant macroeconomic indicators in the Sydney economy, with associated indirect impacts in the remainder of the state of NSW and the rest of Australia.

The main mechanism through which these impacts are experienced is the improvement in human capital associated with affordable housing, both in terms of the size of the direct shock, and the impact that each dollar of human capital has on the economy.

The policy costs are comparatively low in direct terms. If funded through taxation mechanisms that approximately reflect the economic efficiency of the existing taxation base, the deadweight cost of the policy is small in relation to the modelled benefits of the scenarios.

4. TOWARDS A CBA FOR BETTER HOUSING OUTCOMES

Better housing outcomes generate a range of important benefits and economic impacts as illustrated in previous sections. For policy makers to make a case for investment in better housing outcomes against other public policy agenda items it is important to carefully assess these benefits and costs.

Disclaimer: This technical report considers key economic impacts that could be used for building a CBA for better housing outcomes. This section brings together the results of the analysis in a cost benefit framework. It is noted the analysis does not necessarily include all benefits and costs. The results merely show how the results of this study could be used, and what the results would look like, in indicative terms.

4.1 Cost Benefit Analysis – Method Overview

The aim of CBA is to measure whether the project or initiative in question will make society as a whole better off, compared to what would have happened without the project (i.e. without investment in better housing outcomes).

CBA is different to other traditional project analysis methods, such economic impact analysis. Economic impact analysis (including CGE modelling) looks at the flow-on effects or an initial shock into the economy.

A CBA is undertaken from a community perspective and considers all impacts on community welfare, whether priced or unpriced in a market. For example, the benefits that affordable housing provide in terms of welfare and mental health are not directly priced in the market but they can be monetised and included in a CBA.

The CBA is an effective tool to assess the merit of proposed projects, investment decisions or management approaches. A CBA:

- Recognises that the world is not static. That is, even under the status quo (or do-nothing scenario) certain costs and benefits arise
- It takes a society wide perspective
- It includes the gamut of economic, social and environmental costs

The methodology adopted by CBA is summarised in Figure 11.

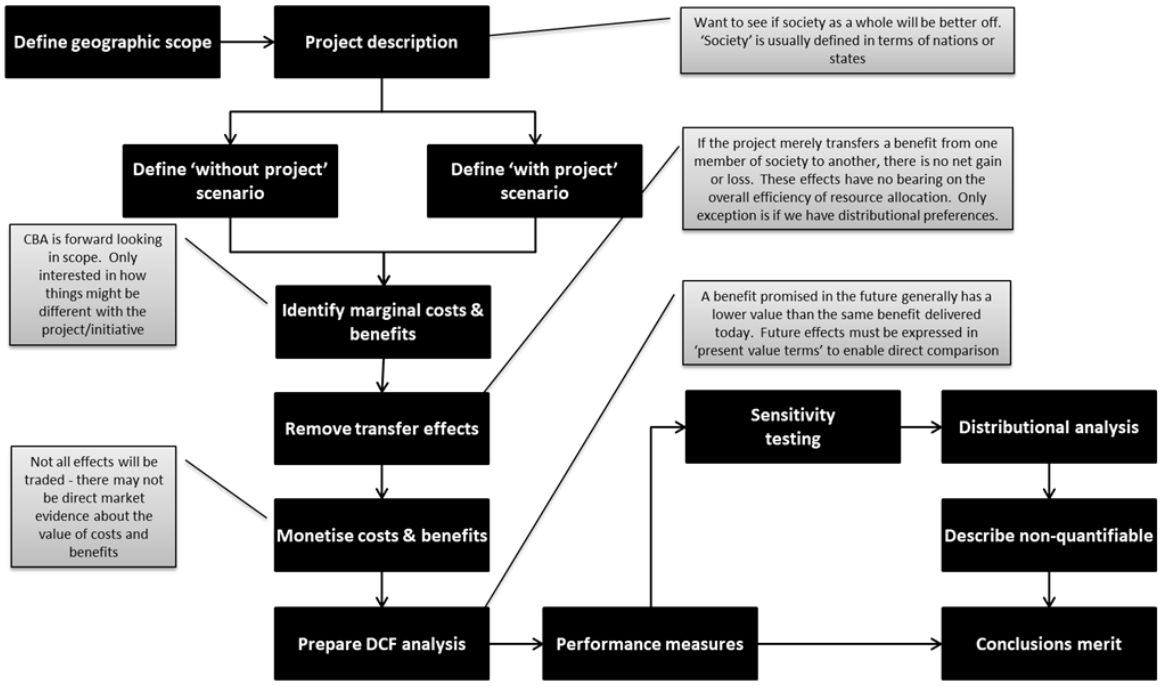
The methodology first involves defining and describing the project and study area. Scenarios are then developed to describe the consequences of doing nothing (i.e. continued underinvestment in social and affordable housing in well accessible locations) in comparison to a situation with housing investment. For these scenarios a range of costs and benefits are identified and quantified (Section 2).

These costs and benefits are then compared using a discounted cashflow analysis (DCF). DCF involves comparing all the costs and benefits over time, with future costs and benefits converted using a discount rate to today's dollar values. The DCF produces performance measures which allow the project options to be considered in terms of the benefits generated in comparison the costs.

A range of further analyses are performed to test the sensitivity and equity of the results. Costs and benefits that could not feasibly be monetised are then considered and combined

with the quantified performance measures. A final conclusion on the merit of the project is then given, based on whether the project option increases the overall welfare of the community.

FIGURE 8: COST BENEFIT ANALYSIS FRAMEWORK



The DCF was undertaken using a discount rate of 7% per annum. This is in line with Treasury guidelines.

4.2 Costs

Over the lifetime of the project (40 years), the policy incentive for improved housing outcomes equals $7.2 bn.

When raising taxes there is a distortion of economic behaviour which carries a cost, generally referred to as the deadweight cost of tax. The government raises tax and recycles it back through the mechanisms of the policy, for every dollar they raise and recycle there is an additional cost of 20 to 30 cents. The indirect costs, as derived from the analysis in Section 3, are $1.2 bn. The present value of the cost of the policy incentive (direct and indirect) is $8.5 bn.

TABLE 28 COSTS OF BETTER HOUSING OUTCOMES

Costs:	Present value ($m)
Better housing incentive	
- **Direct**	$7,273
- **Indirect**	$1,183

4.3 Benefits

Better housing outcomes generate a range of benefits. This analysis has focussed on 'big ticket items' in terms of benefits: travel time savings, human capital accumulation and reduced rental stress. There are other benefits that have not been quantified as part of this study and therefore the results are conservative. These include: reduced domestic violence, keyworker retention, reduced homelessness and associated benefits (reduced crime, reduced health costs, social justice and property alleviation. A conservative approach was also taken regarding the assumptions made for quantifying the marginal values.

Travel time savings are an important benefit. The average per worker travel time savings per annum ($2,554, including the $1,277 productive travel time savings) add up to a direct benefit of $2,259 m over the lifetime of the incentive. The indirect benefit of travel time savings, i.e. the productivity flow-on effects, are $1.4 bn. The total benefit of travel time savings is $3.7 bn (present value).

Human capital accumulation ($19,865 per worker per annum on average) is the most significant benefit of $17.6 bn. The indirect flow-on effects of human are significant too, at $12.2 bn. The total benefit of human capital accumulation is $29.9 bn (present value).

Alleviation of housing stress adds to a present value of $7.2 bn. From a productivity point of view, there are likely flow-on effects as a result of an improvement. This has however not been modelled and for this report the total benefit has conservatively been estimated to equal $7.2 bn (present value).

The total benefits add up $40.6 bn (present value).

TABLE 29 BENEFITS OF BETTER HOUSING OUTCOMES

Benefits:	Present value ($m)
Travel time savings	
- **Direct**	$ 2,259
- **Indirect**	$1,355
Human capital accumulation	
- **Direct**	$17,570
- **Indirect**	$12,235
Reduced rental stress	$7,205

4.4 The case for housing as economic infrastructure

The benefits of generating better housing outcomes outweigh the costs. The Net Present Value of better housing outcomes as described in the scenario is $32.2 bn with a benefit-to-cost ratio (BCR) 4.80. These outcomes demonstrate that investment in better housing outcomes is a worthwhile economic investment from a whole of society point of view.

TABLE 30 SUMMARY COST BENEFIT ANALYSIS, THE ECONOMIC CASE FOR HOUSING

Benefits:	Present value ($m)
Travel time savings	
- **Direct**	$ 2,259
- **Indirect**	$1,355
Human capital accumulation	
- **Direct**	$17,570
- **Indirect**	$12,235
Reduced rental stress	$7,205
Costs:	**Present value ($m)**
Better housing incentive	
- **Direct**	$7,273
- **Indirect**	$1,183
Net present value	**$32,169**
Benefit to Cost Ratio	**4.80**

Source: SGS (2019), based on SGS and Cadence (2019)

Sensitivity test

As discussed in Section 2.7, development cost of higher density affordable housing does not have to be higher than the costs of development of lower density, larger dwellings in outer urban areas. The sensitivity test shows that even if a premium is paid for well-accessible locations ($100,000 per dwelling), the investment is worthwhile and at least comparable to many transport infrastructure projects.

TABLE 31 SUMMARY COST BENEFIT ANALYSIS, THE ECONOMIC CASE FOR HOUSING

Benefits:	Present value ($m)
Travel time savings	
- **Direct**	$ 2,259
- **Indirect**	$1,355
Human capital accumulation	
- **Direct**	$17,570
- **Indirect**	$12,235
Reduced rental stress	$7,205
Costs:	**Present value ($m)**
Better housing incentive/subsidy	
- **Direct**	$8,727
- **Indirect**	$1,597
Higher dwelling construction costs	
- **Direct**	$6,541
- **Indirect**	$1,197
Net present value	**$23,760**
Benefit to Cost Ratio	**2.25**

Source: SGS (2019), based on SGS and Cadence (2019)

Distributional analysis

The benefits of better housing outcomes primarily accrue to the households experiencing the better housing outcomes, and secondly the employers. The costs would largely be borne by Government or the tax payer.

If the housing outcomes generate additional development costs as is explored in the sensitivity analysis, this cost would be borne by developers. This cost would at least partially be offset by the government subsidy. Additional analysis would be required to assess any impacts on the feasibility of development.

TABLE 32 DISTRIBUTIONAL ANALYSIS SUMMARY

Benefits	Beneficiary/Contributor
Travel time savings	Working households experiencing better housing outcomes
Human capital accumulation	Working households experiencing better housing outcomes & employers
Reduced rental stress	Households experiencing better housing outcomes
Costs	
Better housing incentive	Government, tax payer (benefit to developers)
Increased development cost	Developers

Source: SGS (2019), based on SGS and Cadence (2019)

4.5 Conclusions

Affordable housing close to jobs and services generates significant economic benefits that outweigh the costs. The results of this impact assessment provide building blocks for a complete and robust CBA. The results in the CBA framework presented here show how these results can be used and what the possible outcomes would look like.

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