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The uneven distribution of housing supply 2006–2016

Authored by

Steven Rowley, Curtin University
Catherine Gilbert, University of Sydney
Nicole Gurran, University of Sydney
Chris Leishman, University of Adelaide
Chris Phelps, Curtin University

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Acronyms and abbreviations used in this report

AHURI	Australian Housing and Urban Research Institute Limited
ABS	Australia Bureau of Statistics
ACT	Australian Capital Territory
AHURI	Australian Housing and Urban Research Institute
ARC	Australian Research Council
AULUPP	Australian Urban Land Use Planning Policy
CBD	Central business district
GCC	Greater Capital City
GCCSA	Greater Capital City Statistical Areas
HIFG	Housing Industry Forecasting Group
LEP	Local Environmental Plan
LGA	Local Government Area
LQ	Location Quotient
NHFIC	National Housing Finance and Investment Corporation
NT	Northern Territory
NSW	New South Wales
OLS	Ordinary Least Squares
SA	South Australia
QLD	Queensland
Tas	Tasmania
TOM	Time on the Market
UK	United Kingdom
US	United States
Vic	Victoria
WA	Western Australia

Glossary

A list of definitions for terms commonly used by AHURI is available on the AHURI website www.ahuri.edu.au/research/glossary.

Executive summary

Key points

- This study examines the quantity, composition and distribution of new housing supply across Australia 2006–2016, and seeks to explain variations in local rates of production. It builds on and extends earlier studies of housing supply in Australia by examining growth relative to base stock.

- The study finds that new housing supply is distributed unevenly between and within the Australian states. In cities such as Sydney and Melbourne, new supply has concentrated in high-value inner-city localities near transport and employment hubs (consistent with Ong, Dalton et al. 2017) but in all cities, significant amounts of new housing production are occurring in lower-value outer areas.

- Between 2006 and 2016 WA saw the greatest increase in the levels of dwelling stock (26 per cent) and NSW the least (just 12 per cent). Thirty-seven of the 489 local government areas (LGAs) analysed for this research increased stock levels by more than 50 per cent over 10 years, while 70 per cent increased stock by up to 25 per cent (on average around 2 per cent per annum).

- Across all states there has been a fall in the number of three-bedroom dwellings and a rise in the number of four- and five-bedroom+ dwellings. The number of three-bedroom dwellings fell from 47 per cent to 42 per cent of stock while the number of four-bedroom dwellings rose from 23 to 27 per cent.

- While the planning system can create opportunities for development by zoning land and ensuring that zoning and development controls allow for a range of housing types, decisions about whether and when to develop are ultimately made by the development industry and reflect market factors.

- Ultimately housing supply is driven by market conditions and the ability of a developer to deliver an acceptable return. Variations in market conditions and the availability of quality development sites drive uneven patterns of supply.

- Each level of government is able to play a stronger role in supporting residential development within established and new communities by investing in major infrastructure provision and upgrades; coordinating land-supply processes and making available developable sites; and streamlining development approval processes for projects that meet local planning requirements, including expectations for diverse, well-designed and affordable housing options.

Key findings

This study examines the quantity, composition and distribution of new housing supply across Australia 2006–2016, and seeks to explain variations in local rates of production, with reference to:

- demand-side considerations—population drivers, market cycles

- supply-side considerations—regulatory barriers, construction costs.

It builds on and extends earlier studies of housing supply in Australia by using a combination of quantitative and qualitative research methods to examine growth and compositional change relative to base stock, and to model the local price impacts of new production.

This research uses both dwelling stock and building approval data to describe patterns of housing supply over the 10-year study period, which covers three census points. Between 2006 and 2016, total dwelling stock increased by 17 per cent nationally, with WA seeing the greatest increase stock at 26 per cent and NSW the least at just 12 per cent. Thirty-seven of the 489 LGAs analysed for this research increased stock levels by more than 50 per cent over 10 years, while 70 per cent increased stock by up to 25 per cent (on average around 2 per cent per annum).

While stock has increased, the same cannot be said about diversity in terms of dwelling size. Across all states there has been a fall in the number of three-bedroom dwellings and a rise in the number of four- and five-bedroom+ dwellings. The number of three-bedroom dwellings fell from 47 per cent to 42 per cent of stock, while the number of four-bedroom dwellings rose from 23 to 27 per cent. Ninety-two per cent of LGAs saw a reduction in the proportion of three-bedroom dwellings within their jurisdiction, while around three-quarters have seen an increase in larger four- and five-bedroom dwellings (74% and 79% respectively).

Over the period 2006–2016, new dwelling supply—as proxied by building approvals—is concentrated in the inner—usually higher-value—areas in Sydney, Melbourne and Brisbane, while Adelaide and Perth see the highest number of approvals in middle and outer areas. Using a location quotient measure where a value of 1 indicates a level of supply at a level 'expected' given the base starting level (stock or population), we were able to map the relative distribution of new supply, identifying those LGAs that had grown faster than others.

Further in refining previous analyses of new housing supply, we find a variety of spatial distribution patterns within and between the Australian states and capital city regions. The cities of Sydney and Melbourne show intense supply in inner areas but also, along with the other capital cities, in outer greenfield contexts as well. Relationships between new housing supply and price change are also complex, with greenfield housing areas recording modest price growth, but areas of pronounced multi-unit development experiencing higher price inflation over the period.

Qualitative work was used to explore the reasons behind supply patterns in two states: NSW and WA. Eight case-study LGAs categorised as high supply locations were used to explore the factors behind the supply outcomes. Interviews with state and local planners and developers allowed us to identify lessons that could be learnt from these authorities and applied to other areas seeking to increase their housing supply.

Planners and developers believe that the planning system has an important role to play in allowing new housing development, by zoning land and ensuring that different housing types are permissible in locations where they are needed. However, the timing and composition of new housing supply is driven by the development industry, their reading of market conditions, and whether projects are financially viable.

In the high-growth case-study LGAs, zoning that enabled developers to respond to strong housing demand conditions when they occurred was seen to be a key factor in supporting supply growth. Other common factors that help to explain high and diverse housing supply in the case-study LGAs include:

- the presence of relatively cheap land (WA)

- large greenfield or brownfield sites conducive to larger scale, master-planned development (NSW)

- infrastructure capacity—particularly resulting from transport infrastructure investment

- proactive local planning for growth (outer ring) and or urban renewal (inner ring).

The long-term nature of the urban development processes, including infrastructure provision or augmentation, means that it can take years before rezonings and project commitments result in new housing supply. Additionally, the capacity of infrastructure and services is an important consideration for councils in planning for future growth. In some high-growth LGAs—where housing development over the study period exceeded anticipated levels— infrastructure that is at or exceeding capacity may have implications for future growth.

Policy development options

A number of potential policy development options have emerged from this study. Overall, each level of government is able to play a stronger role in supporting residential development within established and new communities by:

- investing in major infrastructure provision and upgrades

- coordinating land-supply processes

- streamlining development approvals for projects meeting local planning requirements—including expectations for diverse, well-designed and affordable housing options.

Ultimately, market conditions and the ability to deliver an acceptable return will stimulate housing development. For those LGAs looking to increase housing supply, market conditions need to be right, otherwise policy intervention is required or the public sector itself needs to lead development. While LGAs have no control over market conditions, there are some options available to deliver development that might not otherwise have occurred. There will always be an uneven supply of housing because of the different nature of locations but those LGAs chasing new development could consider the policy options outlined here.

Site availability and assembly

The availability of development sites is crucial to new housing supply. Local governments and state development agencies such as Landcom and Development WA have a role to play in assembling sites that allow developers to deliver at scale and avoid the problems associated with piecemeal infill development (Rowley, Ong et al. 2017). State development agencies have been responsible for preparing many difficult development sites for release to the private sector and should play an expanded role, especially as most of the easy-to-develop sites are gone.

While developable state and LGA land is limited, any opportunities that do arise should be maximised, while also delivering a supply of affordable housing. Greenfield development remains an important supply of housing, despite governments seeking to control urban sprawl by increasing the proportion of infill development. Efficient utilisation of such sites, with quality supporting infrastructure, can encourage high-quality development outcomes.

Further, careful staging of new development can maximise the use and availability of infrastructure for new communities in greenfield locations. Although there is often pressure to allow new projects as they are brought forward in a piecemeal approach, smaller housing developments that are isolated from major transport or social infrastructure are costly and inefficient to service, and also disadvantage new residents.

Urban regulation and the planning process

Related to site availability is the need to ensure sites are realistically zoned in order to stimulate development and maximise development outcomes. Policy makers need to take market conditions into account when zoning sites, because if they get it wrong there will be no development or, in some cases, sites and infrastructure will be underutilised. An assessment of what would be financially feasible to develop on sites should be undertaken during any zoning or rezoning process. This includes the composition and nature of new housing, with provisions to enable diverse design typologies offering a mix of smaller and larger dwellings relating to development controls over minimum lot sizes, building heights and building setbacks.

Expectations for infrastructure contributions or affordable housing need to be predictable and consistently embedded within rezoning or master-planning processes, with developers able to factor these obligations when acquiring land. Communication and consultation with the development sector is essential for state and local governments to understand patterns of land ownership and potential capacity to meet targets for new population and housing supply. Similarly, state governments can support local councils and housing developers by:

- contributing to community consultation processes
- articulating the need for all communities to accommodate population growth and change through new and diverse residential development.

Reducing the cost of development, and adjusting the timing of infrastructure obligations

While some costs of development are unavoidable, there is a certain amount of flexibility that could be employed to ensure development projects that are financially marginal could become viable and deliver housing supply. Restructuring taxes and other contributions so they are payable at the completion of the development rather than upfront would help marginal projects. In this regard, Australia's new National Housing Finance and Investment Corporation (NHFIC) could help local governments support major projects with upfront, low-cost finance for infrastructure investments. Public–private joint ventures—particularly where government supplies the land— can also deliver developments that would not otherwise have been feasible.

Further research and policy development is needed to explore the factors contributing to higher construction costs, and to ensure that planning regulations balance environmental and amenity considerations.

Alternative approaches to development

Beyond the land-use planning and development process, factors impacting on the feasibility of housing projects— such as residential construction costs and access to finance (Rowley, Costello et al. 2014), warrant further research and policy consideration. Alternative finance models and new construction technologies could alter the housing supply equation. Finally, a clear finding in this study was that market forces are strongly determinative of the quantity, distribution and diversity of new housing supply in the private market.

A more responsive housing system—attuned to changing population needs rather than dependent on property market cycles—is likely to require a more diversified system of production. This implies continued efforts to expand and sustain the social and affordable housing sector, as well as new initiatives to diversify housing products and choices, such as through the evolution of:

- purpose-built rental accommodation
- deliberative (resident-led) or cooperative forms of housing development
- low-cost / shared-equity forms of ownership.

Diversifying housing products and producers—and stronger government involvement in land and housing development, including through demonstration projects—will help offset market cycles and enable more stable patterns of new supply.

The study

The project addressed four research questions designed to deliver new evidence on patterns of housing supply across Australia and how state and local governments can generate a more even distribution of new housing.

- **RQ1:** Has new housing stock delivered between the period 2006 and 2016 been evenly distributed, by value, type and size, between and within capital cities?

- **RQ2:** Has changing planning policy had an impact on patterns of new housing supply?

- **RQ3:** What factors determine the location of new housing supply?

- **RQ4:** What lessons can be learnt from Local Government Areas that have secured a broad distribution of diverse, new housing supply?

The research project examined the distribution and drivers of new housing supply across states from 2006 to 2016. Qualitative approaches were then used to assess why supply varies at the LGA level. This included case studies of eight LGAs that secured well above their relative share of building approvals.

Australian Bureau of Statistics (ABS) data on housing diversity—or dwelling type—was supplemented with ABS data on building approvals. While the quantum of housing supply is important, the composition and diversity of this stock is also a key to delivering opportunities for a range of household types across the income range and for addressing spatial and environmental goals for higher-density accommodation near transport and services. Therefore, as well as exploring overall changes in housing stock, this work examined shifts in housing diversity over time using ABS census data to track how different broad house types have grown or contracted over the 10-year study period.

This project also explored whether it is possible with currently available data to undertake econometric analysis of the link between stock and price change. It is notable that there has been very little analysis in Australia of the temporal linkages between housing supply and prices or affordability. The economics of the development industry are particularly important as a potential explanatory factor for differential supply patterns because, in many ways, developers' behaviour and market outcomes do not fit standard economic theory.

Further information on the ways that local conditions—including local planning regulations—influence patterns of housing supply and diversity was captured through analysis of data from the Australian Urban Land Use Planning Policy (AULUPP) survey. Data from interviews with state and local government planners was also an important input to this study. Interviews captured the perspectives of state-level and metropolitan-region level planners in NSW and WA, as well as the views of local government planners with experience in eight LGAs in Sydney and Perth, who had relatively high volumes of new supply over the study period.

1. Introduction

- This research examines the distribution and composition of new housing supply 2006–2016, and the reasons for particular patterns of distribution at the local government area (LGA) level.

- The research methodology included analysis of Australian Bureau of Statistics (ABS) building approvals data (a proxy for new housing supply) and existing stock to develop a location quotient (LQ) indicating relative housing supply growth.

- Data derived from the Australian Urban Land Use Planning Policy survey (AULUPP)—which captures information on the policy content of local plans—was used to identify changes in planning controls over the study period and to identify whether these had an impact on housing supply outcomes.

- Interviews with state and metropolitan region and LGA planners explored the drivers of these housing supply outcomes and pointed to lessons that can be learnt from those LGAs delivering relatively high volumes of new supply.

- This introductory chapter sets out the research questions, methods and key data sources for the study.

1.1 Uneven distribution of supply?

There has been ongoing concern in Australia about the quantity and composition of new housing supply—particularly in the context of sustained affordability pressures. Perceived regulatory barriers have been thought to limit new housing development by pushing up prices and preventing diverse and higher-density development near jobs and transport, or constraining new growth on the urban fringes of Australia's major cities. This study examines these themes, as it:

- looks at the quantity and distribution of new housing supply over the decade 2006–2016

- examines price trends in relation to these patterns

- explores the potential regulatory or other reasons for different levels of growth.

This study builds on and extends recent AHURI research by Ong, Dalton et al. (2017), which found that new housing supply is concentrated in high-value LGAs, and has failed to increase options for low-income to moderate-income households. Identifying why uneven distribution occurs, and drawing upon lessons from LGAs—including those with low-value to moderate-value housing markets that have been successful in attracting significant quantities of diverse housing supply across a variety of location types such as infill, brownfield and greenfield—could potentially help other LGAs adopt policies that will deliver a more even supply of new housing across the value spectrum. This will deliver better social and economic outcomes.

Recent AHURI research has highlighted the link between economic productivity and housing (Gurran, Phibbs et al. 2015; Maclennan, Ong et al. 2015). The lack of housing affordable to those on low to moderate incomes has forced households to the urban periphery (van den Nouwelant, Crommelin et al 2016) where they face increased commuting times, reduced employment opportunities, or both. If new housing supply is concentrated in high-value areas, it most likely fails to deliver housing options for those on low to moderate incomes. Distribution of supply across LGAs is very important—and research to identify why some LGAs do better than others in attracting supply is also important.

Given the importance placed on housing supply as a policy tool, there has been surprisingly little research motivated by a better understanding of the spatial and temporal patterns of supply. The quantity and type of supply—such as houses, apartments and land—and its location are vital in determining what impact (if any) new supply will have on:

- local housing prices

- housing options available to households in the owner-occupation sectors

- housing options available to households in rental sectors.

Ong, Dalton et al. (2017) found that over 80 per cent of new separate housing approvals were found in LGAs with median prices in the 6th to 9th quartiles, and that the share of new housing in LGAs with the lowest house prices was falling. But why would this be the case? Why would new housing be concentrated in higher-value areas? If there is an uneven distribution, what can be done to deliver housing opportunities for households across the income spectrum? These are the key questions motivating this research.

This study addresses four research questions on patterns of housing supply and how state and local governments can generate a more even distribution of new housing:

- **RQ1:** Has new housing stock delivered between the period 2006 and 2016 been evenly distributed, by value, type and size, between and within capital cities?

- **RQ2:** Has changing planning policy had an impact on patterns of new housing supply?

- **RQ3:** What factors determine the location of new housing supply?

- **RQ4:** What lessons can be learnt from Local Government Areas that have secured a broad distribution of diverse, new housing supply?

1.2   The distribution of new housing supply and house prices

This literature review analyses Australian literature published in 2006–2016 that addresses the distribution of new housing supply and drivers of housing supply. There is conflicting literature in Australia about the distribution of housing supply by value. While the report by Ong, Dalton et al. (2017) for AHURI concludes that growth in housing supply has been located in mid- to high-price value LGAs, more recent analysis by the Grattan Institute directly disputes this analysis (Coates 2019), concluding instead that new housing supply is concentrated in cheaper than average areas.

Although various reports and articles by credible bodies cite Ong, Dalton et al. (2017), they do not conduct independent analysis of the issue. A common theme in the literature was reference to the 'filtering' theory, which applies to the relationship between new housing supply and housing affordability, and argues that new supply at the high-value end of the market results in new (better) housing opportunities flowing to all consumers in all value segments in the market. However, it is debatable whether this actually happens in practice, and it will be the subject of future AHURI research.

1.2.1 Patterns of housing supply

Ong, Dalton et al. (2017: 2) examined patterns of building approvals—which are a common proxy for housing supply—and found that:

> less than 5 per cent of approvals were in the bottom 20 per cent of the house and unit real price distribution in 2005–06, and this remains the case almost a decade later in 2013–14.

Ong, Dalton et al. (2017) argued that new housing supply has been concentrated in mid- to high-price segments of LGAs rather than low-price segments, where it is largely absent. They firstly assessed the distribution of house and unit approvals across real median price deciles, as calculated from transactions in all houses and units at the LGA level during the period July 2005–June 2014. They then:

- ranked LGAs from lowest to highest according to their real median house or unit price value

- divided the LGAs into 10 equal-sized deciles

- assigned all building approvals for each LGA to its respective decile.

Ong, Dalton et al. (2017) calculated that almost 80 per cent of house approvals can be found in the 6th to 9th deciles—a range that covered transactions between $306,000 and $795,000 in 2013–14—and that there had been little change in this supply pattern between 2005–06 and 2013–14. During 2006–14, 80 per cent of unit approvals were in the high 8th to 10th deciles, and this concentration increased from 79 per cent to 84 per cent between 2005–06 and 2013–14. The bottom two price deciles represented less than 1 per cent of unit approvals over period 2005–06 and 2013–14.

Ong, Dalton et al. (2017) concluded that there appear to be structural impediments to the trickle-down of new housing supply, but that further research was needed to establish what, if any, structural impediments are relevant.

However, not everyone is convinced. The Grattan Institute has published two articles directly disputing the findings of the research by Ong, Dalton et al. (2017). The most recent article by Coates (2019) contends that the claim that new housing built in Australia is too expensive for low- and middle-income earners is based on flawed and incorrect research.

In particular, Coates argues that when Ong, Dalton et al. grouped LGAs into deciles, it failed to weight the LGAs by the existing number of dwellings in each—and that this is problematic because LGAs have very different populations. Therefore a large number of very small LGAs at the top of the distribution skewed the results.

According to the analysis of the same data, and accounting for the different sizes of the LGAs, Coates (2019) argues that:

- most new houses are being built in suburbs on fringes of the major cities, where the prices are lower than average
- two-thirds of all new houses built in 2016–17 were located in areas with house prices lower than median
- 16 per cent of new houses were built in the cheapest 20 per cent of LGAs.

1.3 Key drivers of housing supply

There is a substantial body of international literature analysing the wide range of factors that positively or negatively impact housing demand and supply. Key factors identified in this literature include:

- price
- economic or 'demand-side' conditions:
  - wage and population growth
  - interest rates
  - housing prices
  - potential profits from non housing investments.
- 'supply-side' variables:
  - land-supply constraints
  - construction and labour costs
  - planning regulations
  - topographical factors or climatic conditions.

Supply and price

According to economic theory:

- higher levels of supply of a good or service in a given market lead to lower price levels
- a one-off boost to supply—called a supply-side shock—should result in a reduction in the price level.

Meanwhile, for a market characterised by a rising level of demand in the long run—for example, through growth in the size of the population—the price level will also rise unless expansion in supply occurs at the same rate as expansion of demand. This logic is at the root of the argument that deteriorating levels of housing affordability relate partly to the failure of the supply-side of the housing market to keep pace with rising levels of housing demand.

One of the great difficulties with this line of the argument is the relative lack of empirical evidence. Leishman's (2015) review of the literature focuses on the UK and US contexts (which are the most frequently studied nations in terms of the price elasticity of new housing supply). As Leishman points out, most studies show that new housing development is not particularly responsive to change in housing prices, but there is evidence that responsiveness varies between national contexts. For example, the UK has long been seen as particularly unresponsive.

A related strand of literature deals with the converse relationship: the influence of new housing supply on price levels (or price change). There is a long history of published housing market models that either lean heavily, or exclusively, on demand-side variables (or demand shifters). Supply shifters are generally found to be statistically insignificant. Indeed, finding empirical evidence that growth in new housing supply exerts downward pressure on housing prices is something of a 'holy grail' in applied housing economics.

Several previous studies have found some statistically significant relationships between new housing supply and housing prices, but there are often confounding factors and intervening variables at work. For example, Bramley's work in the UK (1993; 1998; 1999) emphasises the role that planning systems play in shaping the supply of land for housing development. Bramley's conclusion is that a substantial increase in land made available for development—for example, a 100 per cent increase—leads to a less than proportionate increase in new housing completions of about 30 per cent. A number of other studies also suggested that planning controls impact on factors other than price, including:

- densities

- design

- speed of development

- overall annual number of housing completions

- responsiveness of the housing development function to a change in prices (see Cheshire and Sheppard 1989; Evans 1991; Monk, Pearce et al. 1996).

This body of evidence about the non-price—or indirect impacts on the quantity, composition and timing of new housing supply, as mediated by planning controls—can be seen as central to a major rethink by housing economists in the UK in the early 2000s following the publication of the final report of the highly influential Barker Review (2004).

As mentioned earlier, there is a long-running, recurring popular argument that the general unaffordability of housing in Australia and other nations has occurred partly as the result of poor responsiveness of new supply to price changes (low-price elasticity of new housing supply). However, it is worth noting that some studies have found Australian housing supply to be more responsive than other developed countries. For example, Caldera and Johansson (2013) describe Australia as belonging to the middle of three groups of OECD nations in terms of their supply responsiveness to changes in housing prices. (The USA and Canada belong to the more responsive group; the UK belongs to the least responsive group.)

The 2004 Barker Review set out a balanced policy-orientated review of the evidence, and concluded that the UK failed to produce adequate new housing supply over a period of decades—and that this persistently low level of supply manifested in a long run rate of house price appreciation that has been higher than would otherwise be the case. The Barker Review also led to the commission of a new volume of research led by Meen (Meen, Andrew et al 2008; Meen 2011), which established that while differences in housing supply levels in the short run are difficult to link directly to evidence on house price levels or change, disparity between the size of the housing stock relative to the population of households results in higher levels of price growth in the long run.

Outside prices, there are a number of other factors considered to drive housing supply.

Economic factors

Various studies conclude that economic conditions and factors at both macroeconomic and microeconomic levels are key drivers of housing supply—for example, Leishman (2015) and McLaughlin (2011). These conditions and factors include:

- housing price and price elasticity

- regional and local economic conditions

- cost-shifters, including costs of construction and borrowing (interest rates).

1. Introduction

Price elasticity

In the Australian context, Ong, Dalton et al. (2017) employed econometric modelling to examine the key drivers of housing supply responsiveness at the LGA level, including the price elasticity of housing supply in Australian housing markets. They concluded that housing price and price elasticity is one of many key drivers of housing supply, estimating that price elasticity of new housing supply is 4.7 per cent for houses and 3.9 per cent for units. This means that an increase of 1 per cent in the level of housing prices will result in a very small expansion of between 0.05 and 0.09 per cent in housing stocks.

Lagged price variables are also cited as key drivers of housing supply. McLaughlin (2012) analysed housing supply elasticities in six Australian capital cities and concludes that substantial differences exist between new single-family and multi-family units in both the size and lags of supply elasticities, with multi-family units having a larger elasticity and longer lag periods. This suggests that longer supply lags for such units may have important consequences for lower- to medium-income households.

In the USA, Mayer and Sommerville (2000) employed an empirical model of new single-family housing supply. They concluded that housing supply has a fairly moderate response to changes in house prices, estimating a 10 per cent increase in real house prices leads to a 0.8 per cent increase in supply of housing stock.

Economic conditions

A US study by Hwang and Quigley (2006) investigates the effects of national and regional economic conditions on outcomes in the single-family housing market—including housing prices, vacancies and residential construction activity—and concludes that changes in regional economic conditions have important impacts on local housing markets. A UK study by Hilber and Vermeulen (2010) models the impact of local supply constraints on local house prices, and concludes that the effects of other constraints on housing supply are greater during boom economic periods than during busts.

Cost-shifters: Financing and construction costs

Hwang and Quigley (2006) also highlight the important effect of cost-shifters such as variations in costs of materials, labour and capital on new housing supply in the USA. Sommerville (1999) analyses the relationship between housing construction costs and housing supply, and concludes that higher construction costs reduce residential construction and housing supply.

A UK study by Leishman (2015) analyses the microeconomics of housing developers and concludes that firm-specific factors such as costs of borrowing and the size of development companies—in addition to macro-factors such as cost of borrowing and local housing market contextual factors such as vacancy rates and deprivation—affect housing supply.

Interest rates

In Australia, Saunders and Tulip (2019) analysed the interrelationships between construction, vacancies, rents and prices in the Australian housing market, and conclude that rapid growth in housing prices and construction can be attributed to low interest rates. Sutton, Mihaljek et al. (2017) estimated the response of house prices to changes in short-term and long-term interest rates in 47 advanced and emerging market economies and found that short-term interest rates are an important driver of house prices in most countries, especially the USA. A UK study by Levin and Pryce (2009) analyses price elasticity of supply, and concludes that decline in long-term real interest rates caused increases in house prices and an inelastic supply response.

Developer returns and opportunities

Development is stimulated by the potential for development returns. Development will not occur unless developers can secure appropriate returns to compensate for the risk of development (Rowley, Ong et al. 2017). Returns are a function of what can be developed on the site and the revenue that can be achieved from subsequent sales or leasing. Therefore key components of development returns are:

- planning

- market demand

- local competing supply

- finance costs

- physical costs of construction.

Thus, a key driver of new supply is the potential to secure returns at or above the level that will compensate for the inherent development risk. For example, developers will reduce supply when market conditions are unfavourable, and increase the rate of supply during times of rising demand (Ong, Dalton et al. 2017).

Another key driver of supply is the availability of developable sites that can deliver a profit. In order for development to occur, developers need access to suitable sites that are potentially profitable to develop. It is far more difficult to deliver returns on sites that are physically difficult to develop, or that are contaminated and require expensive remediation. Sites in fragmented ownership or lacking supporting infrastructure will also be more costly to develop, and will require a type of development that can deliver the revenue necessary to outweigh these costs. Urban regulation is critical here.

Regulations, policies and controls

Planning policies—including land-use zones and other development controls—define the type and scale (or density) of development that can be undertaken. In many cases, these controls reflect and signal:

- underlying geographic constraints, such as a steep slope

- environmental constraints, such as the presence of an endangered species.

In other cases, planning controls reflect local decisions and preferences about the nature and density of new homes or businesses. The degree to which these planning controls operate to constrain or enable different types of housing development varies between jurisdictions, as does the ability of developers or community stakeholders to influence planning decisions.

Numerous studies from housing economics conclude that restrictive government planning and development regulations have a negative impact on housing supply. Planning policies—and the local planning authorities who enact them—are generally interpreted to be restrictive or constraining supply where:

- zoning and other development controls, or development permitting or rezoning decisions, limit the amount of housing that can be constructed relative to housing demand (Bramley and Watkins 2014, Jackson 2016, Cheshire 2018)

- where the time required to gain development approval significantly adds to development costs

- or where uncertainty about the outcome of development permitting or rezoning decisions increase development risk (Mayer and Somerville 2000, Ball 2011, Jackson 2016, Rubin and Felsenstein 2019).

Policies and processes that are particularly implicated in constraining overall supply and supply responsiveness are:

- extensive low-density zoning

- large minimum lot size requirements or subdivision restrictions

- low ratios of development floor space to site area

- large landscaping and open-space requirements

- the involvement of elected council members and communities in rezoning or development application decisions

- long assessment time periods (Glaeser and Ward 2009, Schmidt and Paulsen 2009, Chakraborty, Knaap et al. 2010, Ball 2011, Zabel and Dalton 2011, Jackson 2016).

While policies to support urban containment have also been identified as potentially constraining supply, research shows that impacts are minimised where housing demand is accommodated—for example, through zoning that allows for higher residential densities (Landis 2006).

In Australia, McLaughlin (2011) finds that the elasticity of total building approvals is lower in city regions that have a stronger commitment to growth management (McLaughlin 2011). However, the overall relationship of supply elasticity to metropolitan-level planning is complex. McLaughlin also finds that supply elasticity for both single houses and apartments is greatest in Adelaide and Melbourne—both cities that have enacted urban growth boundaries (McLaughlin 2012).

Focussing on Sydney only, Gitelman and Otto (2012) find that increases in the time for development approval have a small negative impact on housing supply elasticity at the local government level, but only in part of their study period (Gitleman and Otto 2012). More recent research using the same approach finds that longer development application processing times relate negatively to the supply elasticity of detached houses—but not for apartments. Factors such as population density and land-supply are also important in explaining local levels of supply responsiveness (Liu and Otto 2017).

Ong, Dalton et al. (2017) examine the relationship between planning and detached housing and unit approvals across Australian LGAs. They allow for the possibility that planning controls could be related to supply in two ways, depending on the nature of the controls themselves. They find that planning policies defined as growth constricting are negatively correlated with separate house and unit approval, but that the relationship is not statistically significant. By contrast, they find a small but statistically significant positive relationship between the use of growth-accommodation types of controls—such as high-density, mixed-use zones, and policies to permit diverse housing types—and volumes of approvals for houses and units.

Population growth

Population growth—often driven by migration—is frequently cited as having an important effect on demand for new housing supply. In relation to Australia, Ong, Dalton et al. (2017) conclude that population growth and associated demand pressures are key drivers of housing supply, with housing supply in Australia generally increasing to match population growth. Baker (2017) analyses drivers of housing demand in Australia and also concludes that population growth is important for predicting future housing demand, and that increase in demand is driven by both migration and natural increase. This study also emphasises that demographic change in population is the overarching driver of housing demand.

1. Introduction

Topographical and climatic factors

Topographical and climatic constraints are often cited as having significant impacts on housing supply in particular areas. Ong, Dalton et al. (2017) emphasise that matching housing supply with population growth will be more difficult in areas that experience topographical constraints, such as uneven terrain. McLaughlin, Sorensen et al (2016) also finds that the number of new building approvals in coastal plains in Sydney LGAs is double that of LGAs in the hills regions, which may be due to the land in the coastal plains being flatter and easier to build on. A US study by Saiz (2010) concludes that geography—particularly steep-sloped terrain—effectively curtails housing development and supply. However, a UK study by Hilber and Vermeulen (2016) concludes that uneven topography has a quantitatively less meaningful impact on housing supply compared to other drivers of housing supply such as regulatory constraints and scarcity of developable land.

Ong, Dalton et al. (2017) conclude that matching housing supply with population growth is more difficult in areas that experience climatic constraints, such as relatively high levels of precipitation. A US study by Fergus (1999) investigates the effect of abnormal weather such as precipitation and temperature on housing supply, and concludes that abnormal weather has significant effects on housing starts and supply in the first quarter of the year (winter), and that the magnitude of these effects is substantial. This study also refers to other US literature, including Goodman (1987), which concludes that unusual and abnormal weather:

- unusual and abnormal weather impedes production schedules

- reduces the willingness of potential buyers to search for a home.

1.4   Research methodology

This research project examines the distribution and drivers of new housing supply in Australia. It extends the work of Ong, Dalton et al. (2017), which found that new housing supply is concentrated in high-value locations. It explores the diversity of new supply and whether there are sufficient data available to model links between supply and prices. Finally, it uses a qualitative approach to assess how supply varies at the LGA level, and has case studies that draw out lessons that can be learnt from LGAs that secure well above their relative share of supply.

1.4.1 Distribution of housing supply

The main aim of this research is to calculate the distribution of housing supply across Australia to explore whether there is an uneven distribution and, if so, what lessons can be learnt from those LGAs successfully delivering high volumes of diverse supply. ABS data on housing diversity—such as dwelling size and dwelling type—was supplemented with ABS data on building approvals. The original intention was to use dwelling stock to map supply outcomes.

However, the way the ABS collected information on dwelling structure changed in the 2016 Census. Previously, field officers recorded the dwelling structure in the Collector Record Book when they delivered Census forms to the dwelling. But for the 2016 Census, the ABS undertook a national address-canvassing program in the lead-up to census, which formed the basis of their ABS Address Register (of which the Geospatial National Address File was the foundation). The way it worked was that the Address Canvassers classified the dwelling, which was then re-checked by Census Field Officers. While the ABS noted that the overall impact on the time series should be minimal, initial analysis of data showed significant variations in expected outcomes. For example, the Greater Perth area showed a decline in the number of small- to medium-sized apartments as a proportion of all stock and a large increase in the number of semi-detached, terraced and townhouse properties. This does not match either building approval data or evidence from the development sector. Consequently, we use building approval data to provide a consistent picture of dwelling type across the 10-year study period. Such data have been used successfully elsewhere as a proxy for housing supply—for example Ong, Dalton et al. (2017); Housing Industry Forecasting Group (HIFG; 2019).

1. Introduction

While the quantum of housing supply is important, the diversity of this stock is also key to delivering housing opportunities for a range of household types across the income range. Therefore, as well as exploring overall changes in housing stock, this work examines shifts in housing diversity over time using ABS census data to track how different broad house types have grown or contracted over the 10-year study period. Diversity is considered not only as house type but also the number of bedrooms.

Given the availability of building approval data from the 2017 Ong, Dalton et al. project, we explore the relationship between building approvals and stock outcomes at the LGA level, identifying those LGAs that have the highest and lowest conversion rates of approvals to completions.

1.4.2 Australian Urban Land Use Planning Policy survey

The analysis uses the LGA as the primary geography for analysis. This enables us to link the housing market outcomes for these areas with a unique planning dataset derived from the AULUPP survey. The survey was conducted for 2009 and 2014 and records the planning controls of over 200 LGAs. Our analysis used this data to track changes in the number and type of planning controls across represented LGAs, and to determine whether there is evidence of different housing outcomes in LGAs implementing policies to accommodate or restrict housing growth. These data provide a unique opportunity to assess whether changes to local planning controls are linked to housing supply outcomes.

The findings of the analysis of AULUPP data were used to select and frame the case studies, as well as to explore whether specific planning controls at the LGA level are important in shaping supply outcomes. Full details of the AULUPP survey are provided in Appendix 1.

1.4.3 Analysis of qualitative data on local factors influencing housing supply and diversity

For this study, information on the ways in which local factors—including local planning policy settings—influence patterns of housing supply and diversity was captured through analysis of two sets of interviews with state and local government planners. More general information about how local regulatory settings and other factors influence housing supply and affordability was derived from reanalysis of a set of 34 interviews undertaken in 2013–14 as part of a project funded by the Australian Research Council (ARC) examining evidence of the impact of planning on Australian housing markets. The interviews were conducted in four metropolitan regions: Sydney, Melbourne, Brisbane and Perth.

The reanalysis of transcripts of the 2013–14 state planner interviews particularly focussed on capturing interviewee perspectives on:

- state planning policies or strategies with the greatest impact on housing supply

- factors that were seen to impact patterns of housing supply in their metropolitan region (including those external to the planning system)

- perceived barriers to new development

- perceived differences in local planning policies and processes, and how those differences impact developer decisions about where to develop and the types of residential development to undertake.

Analysis of information provided by local government level planners focussed on:

- their perspectives of the planning policy settings that most impact developer behaviour and new housing development

- whether (and how) the stance of their council and constituents towards new housing development was impacting planning policy settings, processes or development application decisions.

Information provided in the 2013–14 interviews was reviewed and coded against these areas of interest and then analysed to draw out themes, distinguishing between the different metropolitan regions. While transcripts from interviews in all four jurisdictions were re-examined, the analysis focussed in particular on interviews in Sydney and Perth.

The second set of interviews that informed the qualitative analysis was undertaken in 2019 as part of this research study. The 2019 interviews primarily sought to identify the state and local factors driving housing supply growth in eight case-study LGAs in Sydney and Perth. Interviewees working in the selected LGAs (or who had previously worked in those LGAs) were identified based on their professional roles and experience. Prospective interviewees were sent an email invitation to their professional email address. In the event that there was no response, two follow-up email invitations were sent.

Interviews were also conducted with planners working at the state or metropolitan region level. The purpose of these interviews was to capture broader information on the factors influencing housing supply patterns in each metropolitan region, including planning variables and other local or regional factors. These interviews also provided insight on the factors driving supply growth in the case-study LGAs. State or metropolitan regional-level planners were also identified based on their professional roles and experience, and were contacted via an email invitation sent to their professional email address.

The 2019 interviews were semi-structured in nature, and sought to identify the factors behind high supply growth and supply diversity in the case-study areas. Informants working at the state or metropolitan region level were asked for their perspectives on:

- the key drivers behind patterns of supply in their metropolitan region

- the effect of state planning policies on patterns of housing supply, which included attracting development to areas experiencing little development activity

- whether there were specific areas or LGAs where more development occurred over the study period, and what made those locations attractive or viable for new housing development

- examples of best practice for attracting new supply.

- Planners in the selected LGAs were asked for their perspectives on:

- the key drivers of new housing supply in their local area over the study period

  - the nature of new housing supply:

  - concentrated or dispersed

  - structurally diverse

  - greenfield or infill.

- the key policies and planning controls that had most impacted residential development

- whether they consider their council to have a pro-development stance

- the role of large-scale sites in housing supply outcomes in their locality

- potential lessons arising from their growth experience 2006–2016.

1.4.4 Modelling housing supply

The project also explored whether it is possible to undertake econometric analysis of the link between housing stock and price change using currently available data. It is notable that there has been very little analysis in Australia of the temporal linkages between housing supply and prices or affordability. The economics of the development industry are particularly important because in many ways developers' behaviour and market outcomes do not fit standard economic theory.

At the macro or housing market scale, theory tells us that additional supply should help to stabilise prices. But in practice the statistical relationship is often very weak and, to our knowledge, has not been established robustly in Australia. This chapter explores two key issues around modelling the development sector before then exploring the results of a panel model of building approvals. Finally it discusses ideal data requirements for supply and price modelling, making suggestions for future work.

1.5 Report structure

This report first explores the patterns of housing supply between 2006–2016. This period was chosen because it includes three census dates (2006, 2011 and 2016) and covers a market cycle of supply contraction and expansion (although this cycle is not uniform across Australia). It describes patterns of stock and diversity before identifying supply patterns across the Greater Capital City Areas of Sydney, Melbourne, Brisbane, Adelaide and Perth. The report then drills down to the LGA level and examines relative supply at this spatial scale.

Chapter 3 explores approaches to modelling housing supply, identifying the type of data necessary to deliver a robust model of supply drives and to assess the impact of price on supply, as well as the impact of supply on price. Chapter 4 explores eight case-study locations, identifying reasons why these case-study LGAs delivered high levels of new supply in comparison to the average in the relevant state and examines, through qualitative data, what lessons can be learnt from these locations. Finally, in Chapter 5, the report identifies policy development options that could be adopted to deliver higher levels of housing supply at the LGA level.

2. Patterns of housing supply 2006-2016

- Between 2006 and 2016, WA saw by far the greatest increase in the levels of dwelling stock and NSW the least. Thirty-seven of the 489 LGAs analysed for this research increased stock levels by more than 50 per cent over 10 years, while 70 per cent increased stock by up to 25 per cent (on average around 2 per cent per annum).

- Across all states there has been a fall in the number of three-bedroom dwellings and a rise in the number of four- and five-bedroom+ dwellings. The number of three-bedroom dwellings fell from 47 per cent to 42 per cent of stock, while the number of four-bedroom+ dwellings rose from 23 to 27 per cent.

- Ninety-two per cent of LGAs saw a reduction in the proportion of three-bedroom dwellings across the stock, while around three-quarters (74% and 79% respively)) have seen an increase in larger four- and five-bedroom dwellings.

- Building approvals over the period 2006–2016 are concentrated in the inner—usually higher-value areas—in the Greater Capital Cities of Sydney, Melbourne and Brisbane, while Adelaide and Perth see the highest number of approvals in middle and outer areas.

- **The relative distribution of supply shows Greater Sydney has the most even distribution of supply. In contrast, Greater Melbourne saw below-expected levels of supply in its middle ring. In Brisbane, supply was concentrated in the outer areas, while Greater Adelaide saw strong growth in its inner areas while the output from middle and outer LGAs was mixed. Greater Perth saw very strong growth in its outer areas.**

- **In all Greater Capital Cities (GCCs) it was more likely high-level house supply LGAs had below average house prices. In fact, all of the high-supply LGAs in Perth and Brisbane were low-value areas. For units, supply in Perth and Melbourne was more likely to be in lower-priced areas, whereas unit approvals in Sydney were slightly more likely to be in high-value areas.**

2.1 Dwelling stock

One of the primary aims of the research was to identify dwelling stock changes over the study period 2006–2016—that is, the 10 years between two census dates. Understanding how housing stock has changed was a first step towards assessing where development has occurred and the diversity of that supply. Table 1 shows a total dwelling increase of almost 1.5 million dwellings across Australia over the 10-year period, ranging from 435,000 in Victoria (Vic) to just under 16,000 in the Northern Territory (NT). Western Australia (WA) saw the highest percentage growth at 26 per cent and New South Wales (NSW) the lowest at just 12 per cent. NSW is an interesting case, as building completions were very low until around 2014 when they started to increase, peaking around 2018. South Australia (SA), WA, Tasmania (Tas) and NT all saw an increase in the proportion of unoccupied private dwellings by over 18 per cent.

Table 1: Change in housing stock, 2006–2016

	NSW	Vic	QLD	SA	WA	Tas	NT	ACT	Total
Occupied private dwellings	304,401	372,891	283,216	63,637	180,102	20,542	12,082	27,797	**1,264,668**
Unoccupied private dwellings	26,474	62,900	43,343	22,491	41,855	4,464	3,679	4,120	**209,326**
Percentage increase on 2006 stock	12%	21%	20%	13%	26%	12%	21%	24%	**17%**
Total	**330,877**	**435,800**	**326,565**	**86,127**	**221,960**	**25,003**	**15,767**	**31,917**	**1,474,016**

Source: ABS TableBuilder Pro, using 2006 and 2016 census data.

But has new housing stock been delivered proportionally across states and territories? The answer is no. The first row in Table 2 shows the percentage of Australia's total housing stock in each state or territory in 2006; the second row shows the results for 2016. NSW had 32 per cent of total stock in 2006, falling to 31 per cent in 2016, while the proportion of total stock in WA rose from 10 per cent to 11 per cent over the 10-year period. The table also shows how, as a proportion of either 2006 population or stock, Vic, QLD, WA, NT and the ACT had a much higher level of stock change than NSW and SA. The ratio of change to 2006 stock takes the proportion across states as the starting point and then compares the proportion at the end. The location quotient (LQ) produced shows a greater share than expected, given starting level, for any location with a figure greater than 1. (A figure of 1 would mean that the proportion at the start of the period is the same as the proportion at the end). WA had by far the highest relative supply of stock compared to any other state, and NSW the lowest—and this is reflected in the increase and decrease, respectively, in the share of overall proportion of stock in both states.

Table 2: Proportion of Australian housing stock and stock change

	NSW	Vic	QLD	SA	WA	Tas	NT	ACT
Proportion of total stock 2006	32%	25%	20%	8%	10%	3%	1%	2%
Proportion of total stock 2016	31%	26%	20%	8%	11%	2 %	1%	2%
Proportion of national increase on 2006 stock	22%	30%	22%	6%	15%	2%	1%	2%
Ratio of change to 2006 stock	0.69	1.19	1.12	0.72	1.49	0.66	1.21	1.39
Ratio of change to 2006 population	0.69	1.21	1.10	0.78	1.52	0.72	0.99	1.32

Source: ABS TableBuilder Pro, using 2006 and 2016 census data.

Residential building approvals are often used as a proxy for new housing supply, particularly at the LGA level. Table 3 describes the relationship between building approvals and the increase in stock over the 10-year study period. It shows stock change as a proportion of approvals. The range is from 68 per cent in NSW—meaning that for every 100 approvals, 68 new dwellings were completed—up to 89 per cent in NT. There are a number of potential factors behind the big differences:

- the rate of demolition

- failure to act on approvals due to market conditions.

Of course, there are lags between building approvals and completions, and this lag is higher with respect to apartments—which is one reason why the ratio of approvals to new stock is lowest in NSW. In strong markets, this lag can be a number of years, which was the case in NSW during the lead-up to 2016, where there was a big increase in the number of approvals that did not feed through into dwelling stock before the end of the study period. In inner city and established suburbs, new development will often involve demolishing existing units. This will also affect completions relative to approvals, since completions data is a measure of net new housing units.

Table 3: Ratio of building approvals to stock increase

	NSW	Vic	QLD	SA	WA	Tas	NT	ACT
Total dwelling approvals 2006–2016	483,061	584,347	418,897	126,197	272,289	29,506	17,716	44,555
Ratio of approvals to stock change	68%	75%	78%	68%	82%	85%	89%	72%

Source: ABS TableBuilder Pro, using 2006 and 2016 census data.

Moving to a finer spatial scale, there are 489 LGAs across Australia where we are able to match boundaries across the 2006 and 2016 census periods. Using dwelling stock data, we calculated the proportion of LGAs falling into the various growth bands listed in Table 4. Ten LGAs more than doubled their 2006 stock level in 10 years. These include Gladstone (QLD), Serpentine-Jarradale (WA), Bundaberg (QLD) and Geraldton (WA). Nine had increases just below 100 per cent including City of Melbourne, City of Perth and Townsville. A further 18 LGAs had smaller increases that were still very strong, including Logan (QLD) and Wanneroo (WA).

The majority of LGAs had much smaller increases, between 0 and 25 per cent of 2006 stock. Forty-six LGAs suffered a reduction, virtually all of which were in regional Australia. The qualitative component of this research, discussed later, explores why some LGAs experienced such strong supply growth while the vast majority saw less than 2 per cent stock growth per annum.

Table 4: Increase in stock: LGAs

Increase in stock	Number of LGAs
Stock doubled or higher	10
Increase in stock between 75% and 100%	9
Increase in stock between 50% and 75%	18
Increase in stock between 25% and 50%	65
Increase in stock between 0% and 25%	341
Decrease in stock	46
Total	**489**

Source: ABS TableBuilder Pro, using 2006 and 2016 census data.

2.2   Dwelling diversity

This section examines whether there have been changes in the diversity of new housing supply over 2006–2016 through the use of bedroom and dwelling structure data. Tables 5 and 6 examine the number of bedrooms within a dwelling. Given that rates of new housing supply over this period were around 2 per cent per annum of total stock, we would not expect major changes to the distribution of the number of bedrooms. However, the number of three-bedroom dwellings has fallen significantly, being offset by a rise in four-bedroom dwellings.

Table 6 shows some interesting patterns at the state level. Across all areas except the ACT, there has been a fall in the number of three-bedroom dwellings and a rise in the number of four- and five-bedroom+ dwellings. It could be argued that this is an increase in diversity, as there is now a more even spread across the number of bedrooms, but the changes outside three bedrooms and four bedrooms are small. The one-bedroom category has generally fallen, as has the proportion of two bedrooms outside Tas, NT and the ACT. So, far from delivering a wider range of smaller dwellings and increasing diversity, most states have simply seen an increase in larger four- or five-bedroom+ dwellings.

Table 5: Number of bedrooms by year: Australia

	2006	2016	Change
None (includes bedsitters)	1%	1%	0%
One bedroom	5%	5%	0%
Two bedrooms	20%	19%	−1%
Three bedrooms	47%	42%	−5%
Four bedrooms	23%	27%	4%
Five bedrooms or more	5%	6%	1%

Source: ABS TableBuilder Pro, using 2006 and 2016 census data.

Table 6: Change in proportion of dwelling stock by number of bedrooms

	None (includes bedsitters)	One bedroom	Two bedrooms	Three bedrooms	Four bedrooms	Five bedrooms or more
New South Wales	−0.1%	0.9%	−0.2%	−4.2%	2.0%	1.6%
Victoria	0.0%	0.7%	−0.1%	−4.9%	3.4%	0.9%
Queensland	−0.2%	0.0%	−1.1%	−4.8%	4.4%	1.6%
South Australia	0.0%	−0.2%	−1.8%	−1.7%	2.8%	0.9%
Western Australia	−0.2%	0.1%	−1.2%	−3.0%	3.8%	0.6%
Tasmania	0.0%	0.1%	0.4%	−2.2%	1.3%	0.5%
Northern Territory	−0.9%	0.1%	0.5%	−4.6%	3.6%	1.3%
ACT	−0.1%	3.2%	2.5%	−6.2%	−0.1%	0.7%

Source: ABS TableBuilder Pro, using 2006 and 2016 census data.

Capital city level changes—which are as close a match as we can get to Greater Capital City Statistical Areas (GCCSA) using 2006 and 2016 census data—show slight spatial variations, but across the board there is a big drop in three-bedroom dwellings, as depicted in Table 7. Overall, we can conclude that new dwelling stock is larger, at least in terms of the number of bedrooms, with larger homes replacing traditional three-bedroom dwellings within new supply. Despite the high level of apartment development in Melbourne, Sydney and Brisbane, there has been little change in the proportion of one- and two-bedroom dwellings, which are being offset by house development.

Table 7: Change in proportion of dwelling stock by number of bedrooms: Capital-city level

	None (includes bedsitters)	One bedroom	Two bedrooms	Three bedrooms	Four bedrooms	Five bedrooms or more
Sydney	0%	1%	0%	−5%	1%	2%
Melbourne	0%	1%	0%	−5%	3%	1%
Brisbane	0%	0%	−1%	−5%	3%	2%
Adelaide	0%	0%	−2%	−1%	3%	1%
Perth	0%	0%	−1%	−3%	4%	1%
Greater Hobart	0%	0%	0%	−2%	1%	1%
Darwin	−1%	0%	0%	−6%	5%	2%
Canberra	0%	3%	2%	−6%	0%	1%

Source: ABS TableBuilder Pro, using 2006 and 2016 census data.

Table 8 shows the number of LGAs that have seen growth or a fall in the proportion of bedrooms within each category. For example, only 40 LGAs saw the proportion of three-bedroom dwellings grow, while 449 saw the proportion fall. So 449—or 92 per cent of LGAs—saw a reduction in the proportion of three-bedroom dwellings across the stock, while three-quarters witnessed an increase in larger four- and five-bedroom dwellings. Even two-bedroom dwellings are becoming less common, with one-bedroom dwellings remaining stable. This is a surprising finding, and at odds with the stated market preferences revealed in recent AHURI research on housing aspirations, which suggests a strong preference for three-bedroom homes (James, Rowley et al. 2019; Parkinson, Rowley et al. 2019).

Table 8: Number/proportion of LGAs with growth/fall in number of bedrooms

	None (includes bedsitters)	One bedroom	Two bedrooms	Three bedrooms	Four bedrooms	Five bedrooms or more
Growth	167	242	135	40	364	386
Fall	292	245	354	449	124	101
Same	30	2	0	0	1	2
Growth	34%	49%	28%	8%	74%	79%
Fall	60%	50%	72%	92%	25%	21%
Same	6%	0%	0%	0%	0%	0%

Source: ABS TableBuilder Pro, using 2006 and 2016 census data.

Dwelling structure data are problematic due to a change in the way they were collected between the 2006 and 2016 census counts. In the 2016 census there was a change in the way the ABS collected information on dwelling structure. Previously, field officers recorded the dwelling structure in the Collector Record Book when they delivered census forms to the dwelling. But for the 2016 Census, the ABS undertook a national address-canvassing program in the lead-up to the census, which formed the basis of their ABS Address Register (of which the GNAF was the foundation). The way it worked was that the Address Canvassers classified the dwelling, which was then re-checked by Census Field Officers.

Although the ABS has stated that the impact should be minimal, the data generally show an increase in the number of semi-detached townhouse-style dwellings, and a reduction in flats, units and apartments, particularly in low-rise versions of the product. Table 9 shows the proportion of each dwelling type in 2016, and Table 10 shows the change in dwelling structure 2006–2016.

The data show a fall in the proportion of flats, units and apartments across almost all states and big increases in semi-detached, row, terrace house etc. dwellings. This runs contrary to the analysis showing a big increase in four- and five-bedroom dwellings and a decline in three-bedroom dwellings.

Table 9: Dwelling structure by state, 2016

	Separate house	Semi-detached, row or terrace house, townhouse etc.	Flat or apartment	Other
New South Wales	65%	12%	21%	1%
Victoria	72%	14%	13%	1%
Queensland	74%	11%	13%	2%
South Australia	77%	15%	7%	1%
Western Australia	77%	15%	7%	2%
Tasmania	87%	6%	6%	1%
Northern Territory	61%	12%	18%	9%
Australian Capital Territory	65%	18%	17%	0%
Other territories	82%	7%	10%	2%

Source: ABS TableBuilder Pro, using 2006 and 2016 census data.

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supply 2006-2016

Table 10: Change in the proportion by dwelling structure, 2006–2016

Change 2006 to 2016	Separate house	Semi-detached, row or terrace house, townhouse, etc.	Flat or apartment	Other
New South Wales	−4%	2%	2%	0%
Victoria	−1%	3%	−1%	0%
Queensland	−4%	5%	−1%	0%
South Australia	−2%	4%	−2%	0%
Western Australia	−2%	4%	−2%	0%
Tasmania	1%	2%	−3%	0%
Northern Territory	−3%	2%	2%	−1%
Australian Capital Territory	−9%	4%	5%	0%

Source: ABS TableBuilder Pro, using 2006 and 2016 census data.

Table 11 shows GCC data, with again an increase in semi-detached etc. dwellings and falls in separate houses. The ABS data on house structure would indicate an increase in diversity, in the sense that there is a shift from separate houses—but the bedroom analysis suggests otherwise. For example, in Western Australia there has been a significant new supply of apartments with multi-residential development at historic highs at the end of the 10-year study period (HIFG 2017), yet the data show just 25 additional flats, units or apartments with big increases in semi-detached dwellings. The only explanation is a reallocation of low-rise apartment dwellings into the semi-detached category because we are not seeing this type of pattern reflected in building approval data (HIFG 2017).

Table 11: Dwelling structure change by capital city, 2006–2016

	Separate house	Semi-detached, row or terrace house, townhouse etc.	Flat or apartment	Other
Greater Sydney	−6%	2%	4%	0%
Greater Melbourne	−5%	5%	0%	0%
Greater Brisbane	−3%	3%	1%	0%
Greater Adelaide	−2%	5%	−3%	0%
Greater Perth	−2%	4%	−2%	0%
Greater Hobart	2%	0%	−2%	0%
Greater Darwin	−3%	0%	4%	−1%
Australian Capital Territory	−9%	4%	5%	0%

Source: ABS TableBuilder Pro, using 2006 and 2016 census data.

2.3 Distribution of new supply

As a result of the issues with dwelling structure described earlier, we have undertaken analysis on building approval data—which has the advantage of being a monthly dataset, with a consistent methodology across the study period.

We examined 135 LGAs across the GCC regions which have consistent boundaries across the period 2006—2016. Some states are better represented than others because of changes to LGA boundaries. Table 12 sums all building approvals for each dwelling structure and provides the proportion for each. It is clear to see the difference between the approval data and the ABS stock data from the census. Flats, units and apartments form a very significant proportion of approvals, higher than semi-detached dwellings in all states apart from SA and Tas. Given the relationship between 2016 dwelling structure and the proportion of approvals, there will be a gradual shift in dwelling structure over time, although it will be much quicker in some states than others. For example, in WA 75 per cent of building approvals are separate houses, which is slightly below the 77 per cent of separate houses currently in stock.

Table 12: Building approvals by dwelling structure: Cumulative 2006–2016

	Separate house	Semi-detached, row or terrace house, townhouse etc.	Flat or apartment	Total	Number of LGAs
NSW	37%	12%	51%	347,068	34
NT	48%	13%	39%	14,171	3
QLD	52%	17%	31%	215,139	7
SA	69%	19%	12%	94,251	20
Tas	81%	11%	7%	12,376	6
Vic	53%	16%	32%	467,925	32
WA	75%	11%	14%	214,512	32
ACT	37%	17%	46%	45,622	1

Source: ABS building approval data, table no. 8731

Figures 1–5 map building approvals over the 2006–2016 period. The number of approvals is divided into five bands, with the same bands used for each Greater City area. This analysis concentrates on capital cities, as the drivers of housing supply are very different in regional and rural locations (Beer, Tually et al. 2011), and approvals can be very volatile. Due to the different sizes of LGAs (in both population and stock), an LGA with a low number of approvals over 10 years did not necessarily deliver low stock growth—to identify such growth we need to calculate a relative measure, which is discussed later in this report. The dark red shading indicates more than 20,000 dwellings over a 10-year period, with the lightest shading being under 2,000 dwellings. Building approvals appear to be concentrated in the inner areas in Sydney, Melbourne and Brisbane (which are usually higher-value areas), while Adelaide and Perth see the highest number of approvals in middle and outer LGAs.

Figure 1: Building approvals Greater Sydney, 2006–2016
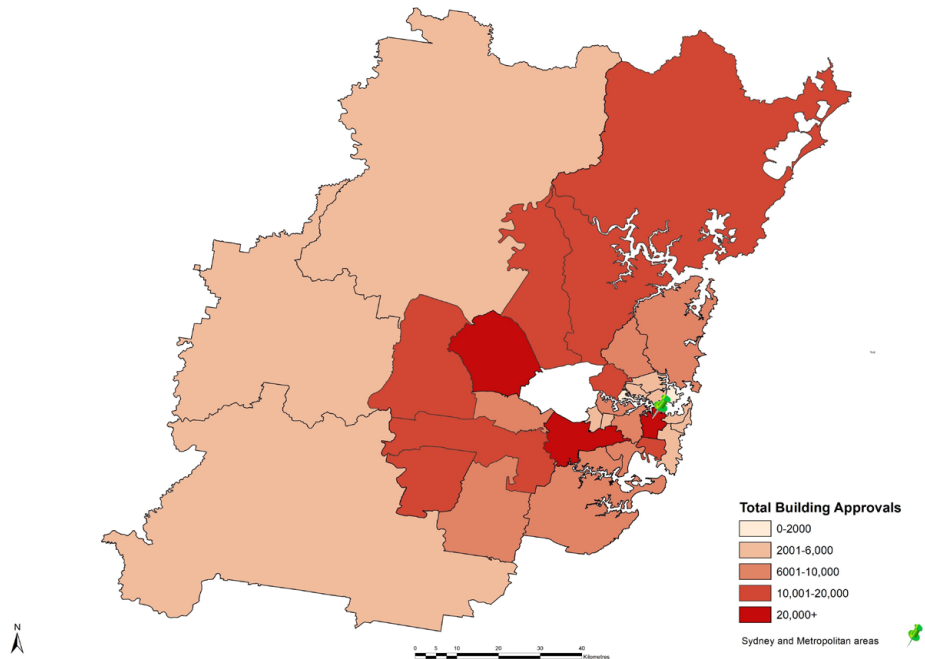
Source: Author calculations from ABS census, population and building approval data.

Figure 2: Building approvals Greater Melbourne, 2006–2016
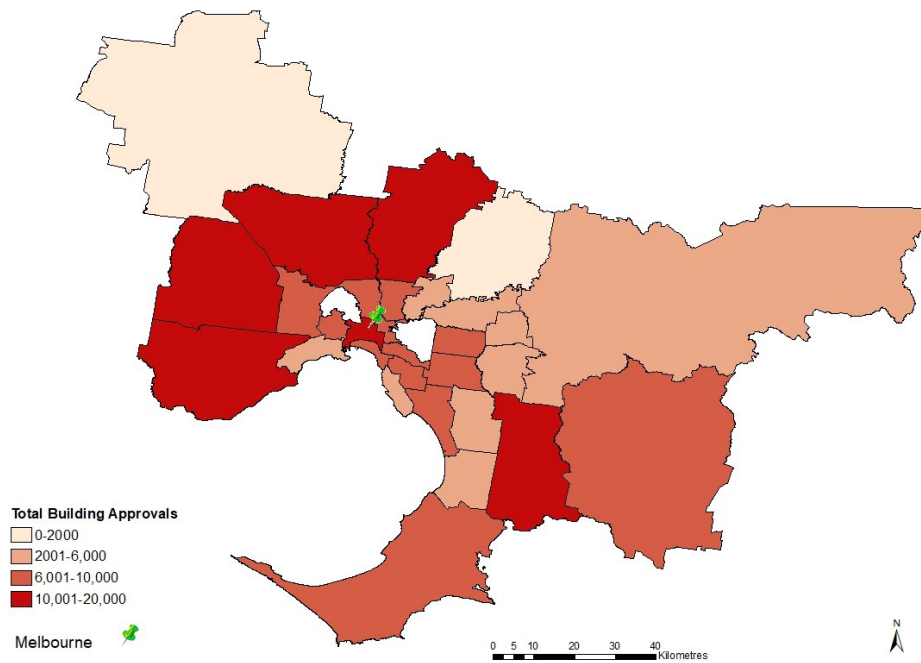
Source: Author calculations from ABS census, population and building approval data.

Figure 3: Building approvals Greater Adelaide, 2006–2016

Source: Author calculations from ABS census, population and building approval data.

Figure 4: Building approvals Greater Perth, 2006–2016

Source: Author calculations from ABS census, population and building approval data.

Figure 5: Building approvals Greater Brisbane, 2006–2016
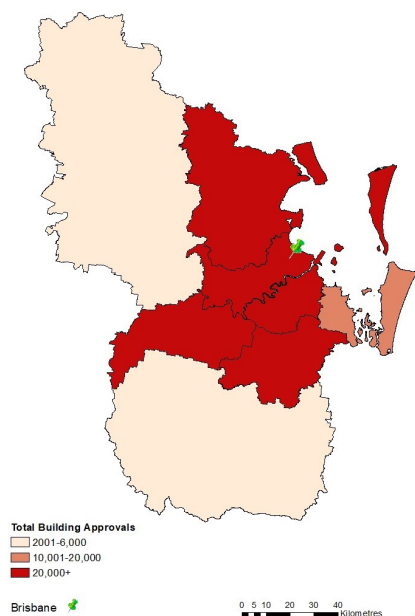
Source: Author calculations from ABS census, population and building approval data.

All five capital cities show a spread of dwelling approvals across the five size bands. Brisbane is slightly different; it consists of only eight LGAs, so approvals are more concentrated. Within the city regions, there appears to be a concentration of approvals around the LGA that encapsulates the central business district (CBD), with the city LGAs of Sydney, Melbourne and Brisbane seeing high quantities of approvals, consistent with the findings of Ong, Dalton et al. (2017). However, there are also many examples of LGAs on the city fringes that saw high volumes of approvals during the 10-year period.

Building approvals were used in the 135 LGAs to calculate whether new supply—as proxied by approvals—has grown disproportionally to starting level of stock and populations.

For example, if an LGA had 10 per cent of the total GCC population in 2006 and still had 10 per cent in 2016, it would be allocated a score of 1. If its proportion fell to just 5 per cent of the population in 2016, it would be allocated a score of 0.5. LGAs that are growing faster than the average rates across the GCCA can be identified by a score of 1 or more. Figures 6 and 7 show the results spatially, dividing each GCCA into inner, middle and outer rings. Of the 133 LGAs, two had an LQ of 1, 53 had LQs above 1, and 80 had LQs below 1, which suggests that some LGAs have a very high level of supply as the overall sum has to even out.

The results using population and stock as the base for growth expectations are very similar. This can be seen in Figure 6 and Figure 7, which use population as the base for determining which LGAs deliver their 'fair share' of new dwelling supply, concentrating on the five mainland state capitals.

In Greater Sydney, the inner-ring LGAs are split between those with an LQ of above 1 and those under 1, while there is also a fairly even split between middle LGAs. In outer LGAs five deliver an LQ above 1 and 9 below 1. From this it seems that the distribution of building approvals is quite even across Greater Sydney. In contrast, Greater Melbourne saw five of its seven inner-city LGAs delivering a strong level of supply, but none of its middle LGAs maintained their share of supply. Six out of 17 of the outer LGAs showed stronger than expected growth, resulting in strong supply in the inner and outer parts of the city. In Greater Brisbane, supply was concentrated in the outer areas, with all three of the seven high-growth LGAs on the fringes. In Greater Adelaide, new supply in four of the six inner areas delivered higher than expected supply, while the output from middle and outer areas was mixed.

However, Greater Perth saw only two out of its 13 inner LGAs deliver strong levels of supply, while eight of its 11 outer LGAs had an LQ greater than 1. Middle LGAs failed to deliver above expected supply.

In summary, patterns of supply relative to people vary quite significantly across GCCAs, and certainly do not appear to be solely concentrated in inner, high-value areas—at least in the cities of Greater Perth and Greater Brisbane.

Figure 6: Number of LGAs with total approvals above expectations, 2006–07 to 2016–17
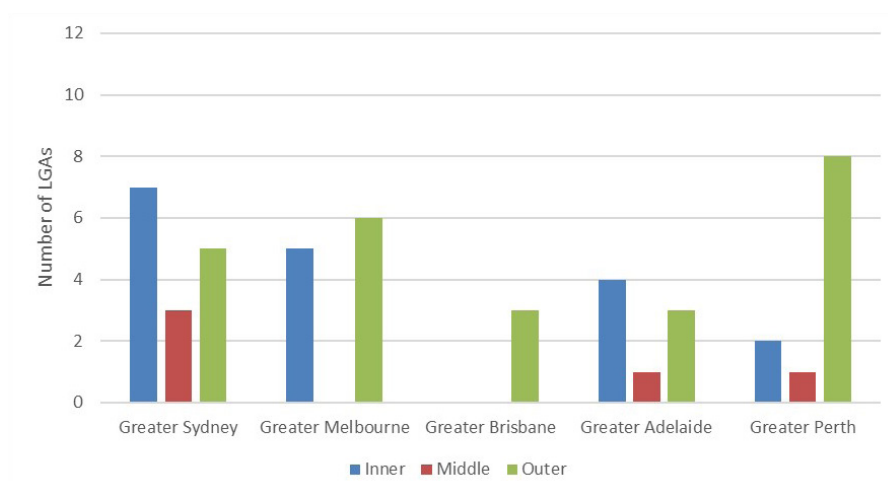
Source: Author calculations from ABS census, population and building approval data.

Figure 7: Number of LGAs with total approvals below expectations, 2006–07 to 2016–17
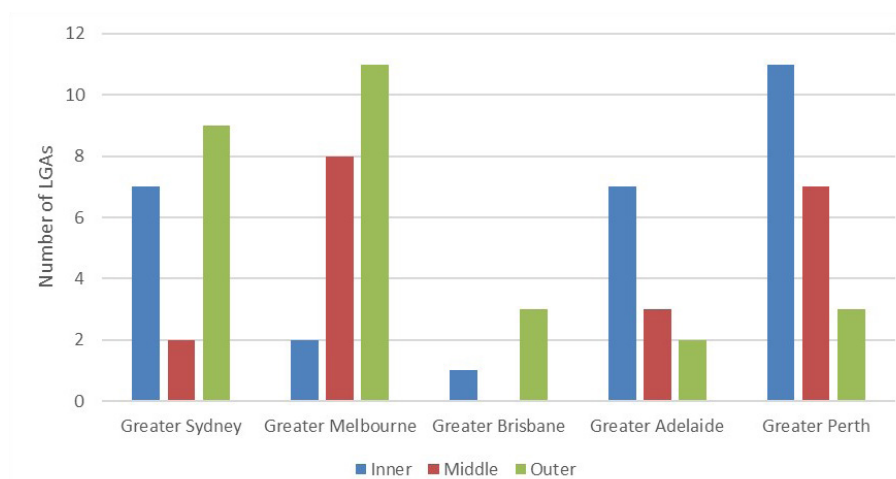
Source: Author calculations from ABS census, population and building approval data.

Figures 8–12 map the relative distribution of building approvals over the 10-year period for Greater Sydney, Melbourne, Adelaide, Perth and Brisbane.

Figure 8: Relative distribution of building approvals: Greater Sydney
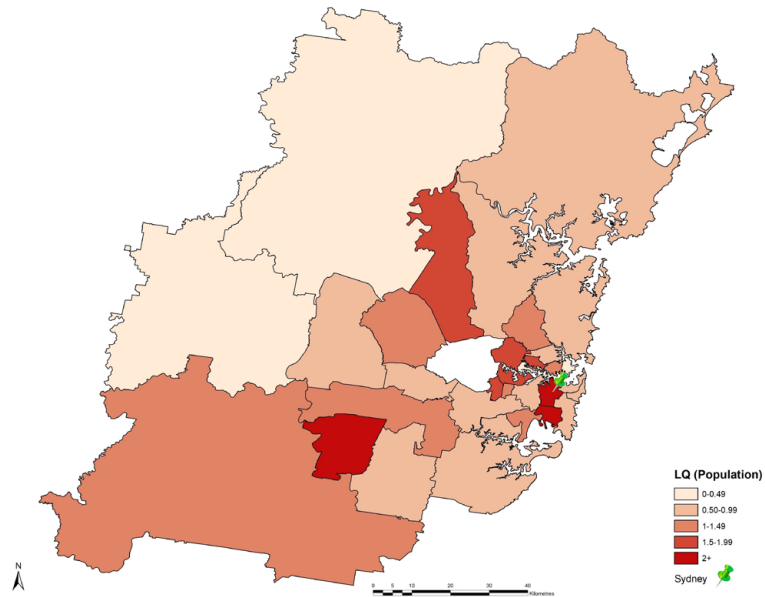
Source: Author calculations from ABS census, population and building approval data.

Figure 9: Relative distribution of building approvals: Greater Melbourne
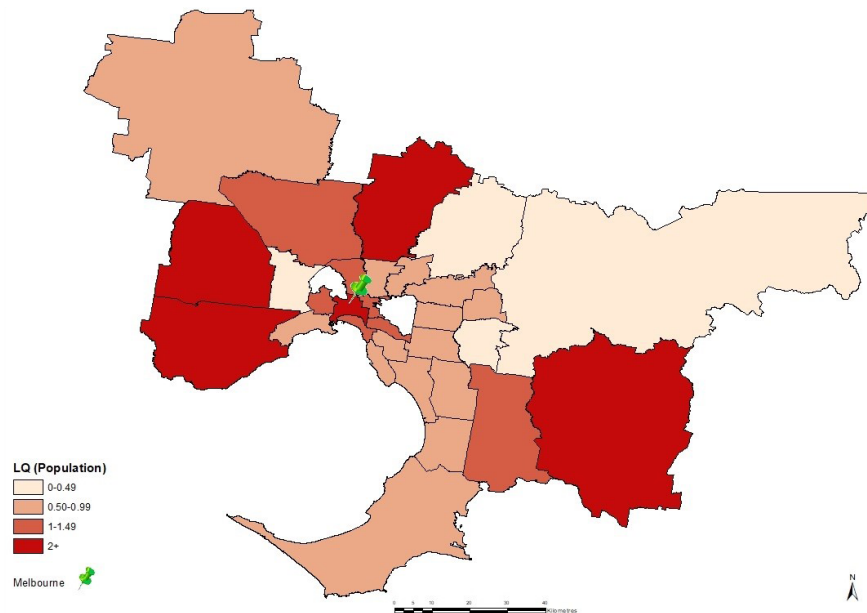
Source: Author calculations from ABS census, population and building approval data.

Figure 10: Relative distribution of building approvals: Greater Adelaide
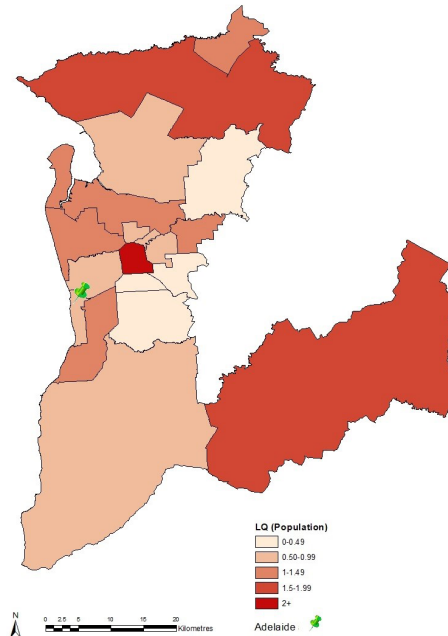
Source: Author calculations from ABS census, population and building approval data.

Figure 11: Relative distribution of building approvals: Greater Perth
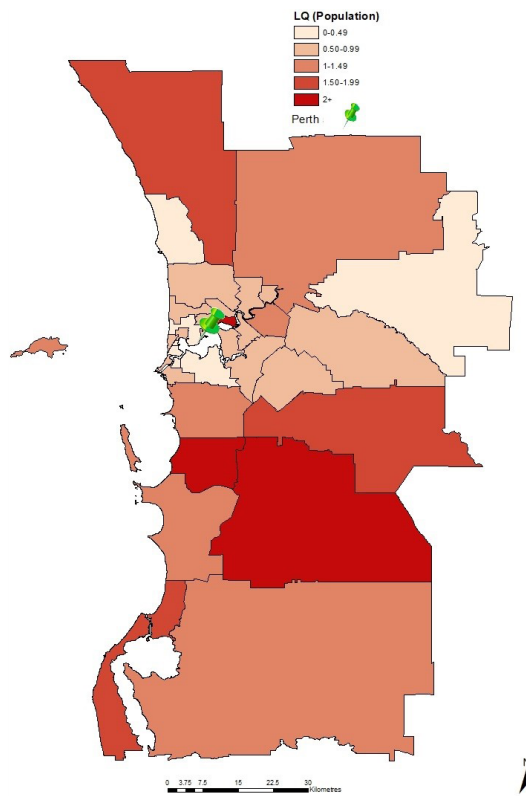
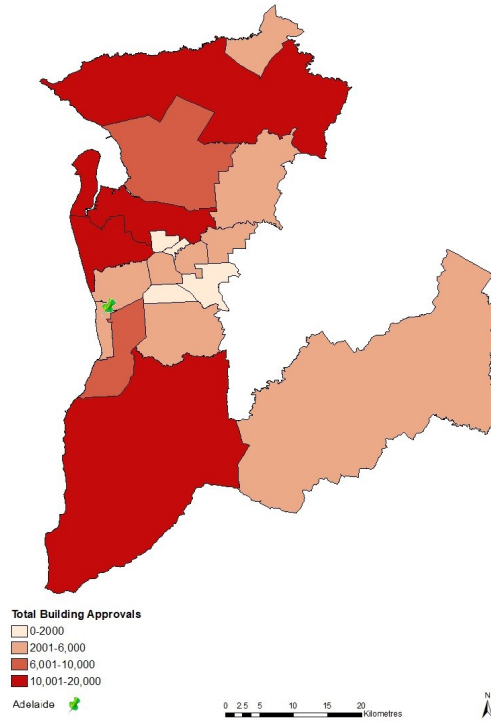Source: Author calculations from ABS census, population and building approval data.

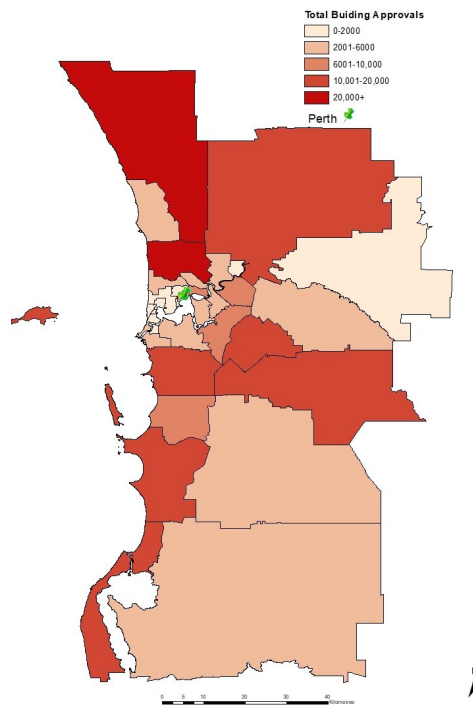Figure 12: Relative distribution of building approvals: Greater Brisbane
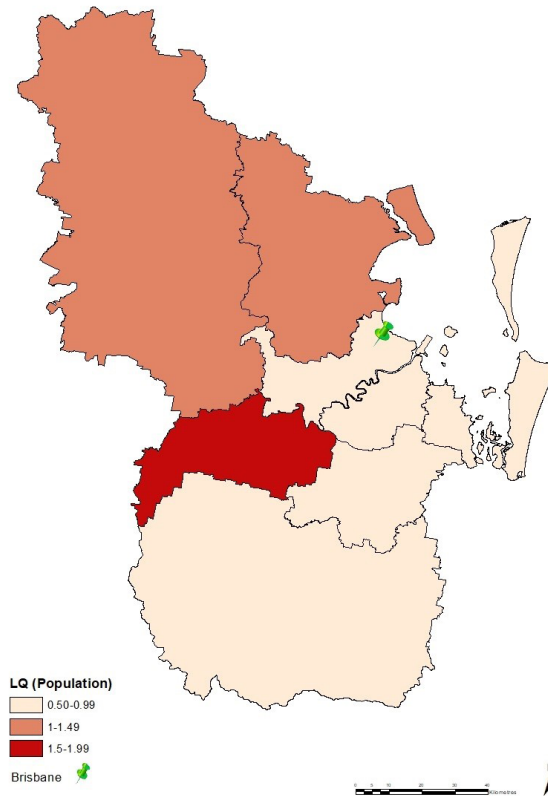
Source: Author calculations from ABS census, population and building approval data.

Table 13 looks in further detail at the relationships between supply outcomes—as proxied by building approvals—and other key outcomes over the 10-year period. These include:

- the starting level of stock—to identify if stock levels are associated with new approvals

- the average LGA house price and unit price over the 10-year period—to determine if prices are related to supply

- the price growth over the period—to examine whether new supply moderates prices.

In Table 13, the percentages represent the proportion of high-supply LGAs—where the LQ is greater than 1—that meet specific criteria. The first row reflects the evenness of the supply distribution, with an even distribution being half of LGAs above 1 and half below—which is the position in Sydney. In the other capital cities, figures below 50 per cent indicate that supply is concentrated in less than half LGAs—and in Perth and Melbourne supply is concentrated in just a third of LGAs. It can therefore be stated that there is an uneven distribution of supply in all Australian mainland capital cities, with the exception of Sydney.

In Sydney, Melbourne and Brisbane, more LGAs with a starting stock below the average for the GCCSA area received strong supply, while in Adelaide and Perth it was quite even.

The most interesting finding is around average house prices over the 10 years. In all cities, it was more likely the high-level supply LGAs that had below city average house prices. In fact all of the high-supply LGAs in Perth and Brisbane were low-value areas. The outlier was Sydney, but even there 40 per cent of high-supply LGAs had a price below the city average.

Supply of units was more likely to be in lower-priced areas in Perth and Melbourne, while there were no differences in Adelaide or Brisbane, and unit approvals were slightly more likely to be in high-value areas in Sydney. These findings reflect the relative growth indicator used in this study and highlight that, relative to base populations (and starting stock), higher rates of new housing supply tend to occur in planned, greenfield areas nearer the urban fringe. These areas have lower land and property prices than redevelopment and infill contexts of the inner and middle ring.

Table 13: High-supply LGAs and stock/price variables

	Sydney	Melbourne	Adelaide	Perth	Brisbane
Proportion of LGAs with LQ >1	52%	34%	40%	34%	43%
Proportion of LGAs with LQ >1 and above average level of 2006 stock	33%	36%	50%	55%	33%
Proportion of LGAs with LQ >1 and above average house price	40%	27%	13%	0%	0%
Proportion of LGAs with LQ >1 and above average house price change	53%	36%	38%	45%	0%
Proportion of LGAs with LQ >1 and above average unit price	60%	36%	50%	11%	50%
Proportion of LGAs with LQ >1 and above average unit price change	47%	0%	50%	22%	50%

Brisbane note: One of the LQ >1 LGAs did not have sufficient price data available for units

Perth note: Two of the LQ >1 LGAs did not have sufficient price data available for units.
Source: Author calculations from ABS census, population and building approval data. RP CoreLogic price data through SIRCA

2.4   Supply and price

Figures 13 and 14 show the relationship between total building approvals and price for our two main case-study cities: Greater Sydney and Greater Perth. These two locations were chosen to leverage previous relevant research in the cities conducted by the authors.

The maps plot the LQs with an overlay of price. There is one map for houses (separate and attached) and one map for units and apartments. The overlay 'A' represents the lowest price band and 'E' the highest. It is clear from the map of Sydney that there are high-supply LGAs in the 'A' to 'C' bands for houses, while units appear in higher-priced areas. In Greater Perth, however, the high-supply LGAs are concentrated in outer areas, all within the lowest two bands. There is certainly an uneven distribution of supply in Perth, in particular with supply concentrated in lower-value, outer-suburb areas dominated by separate houses.

2. Patterns of housing
supply 2006-2016

Figure 13: Relative housing supply and price: Greater Sydney

	Sydney house price categories	Sydney unit price categories
A	0–$600,000	$0–$400,000
B	$600,001–$1m	$400,001–$500,000
C	$1,000,001–$1,500,000	$500,001–$600,000
D	$1,500,001–$2,000,000	$600,001–$700,000
E	$2,000,000+	$700,000+

Source: Author calculations from ABS census, population and building approval data. RP CoreLogic price data through SIRCA.

Figure 14: Relative housing supply and price: Greater Perth
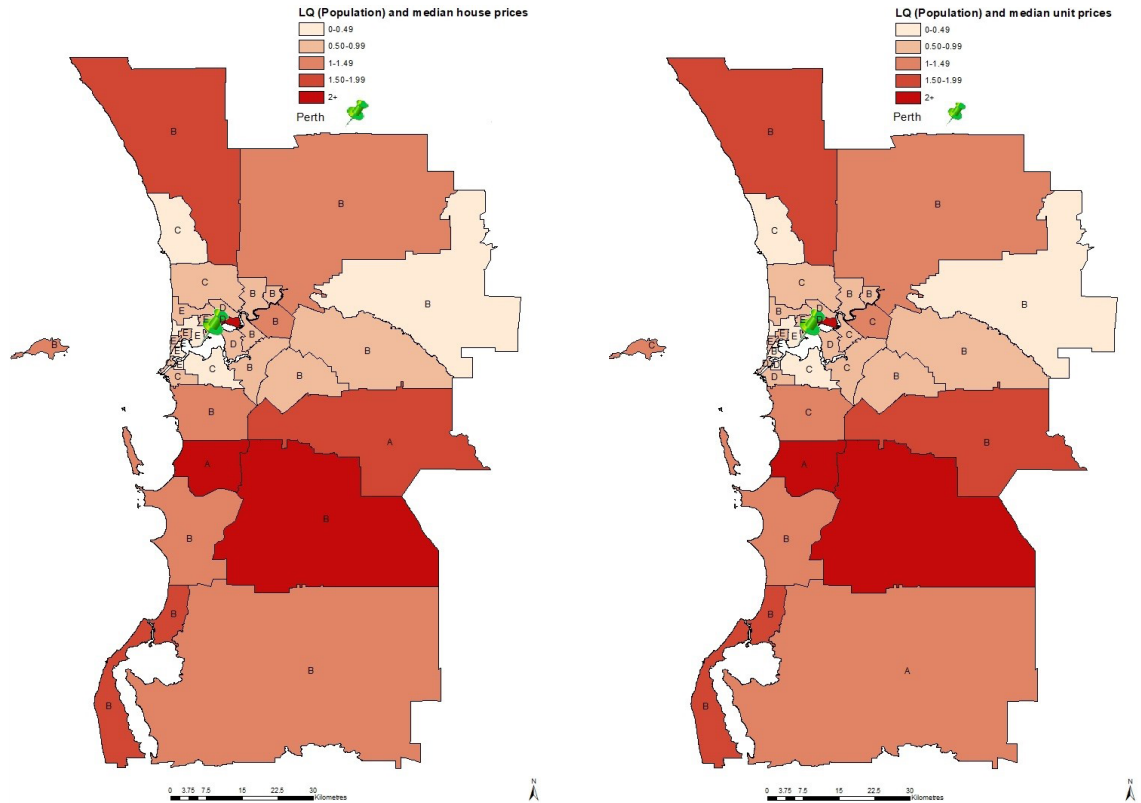
	Perth house price categories	Perth unit price categories
A	$0–400,000	$0–$300,000
B	$400,001–$600,000	$300,001–$400,000
C	$600,001–$800,000	$400,001–$500,000
D	$800,001–$1,000,000	$500,001–$600,000
E	$1,000,000+	$600,000+

Source: Author calculations from ABS census, population and building approval data. RP CoreLogic price data through SIRCA.

Tables 14 and 15 quantify supply in a different way, by looking at approvals as a proportion of 2006 stock. These percentages are then compared with median prices and price change. Table 14 focusses on houses, and Table 15 focusses on units and apartments. The tables take the top 15 and bottom 15 supply LGAs using this measure. There is a relatively strong, negative correlation between supply and price for all 135 LGAs, which suggests that an increase in housing supply has a dampening impact on price change for houses, with the relationship weaker for units. Chapter 3 addresses these relationships using a more sophisticated modelling approach.

The data confirm that high-supply LGAs tend to be in lower-value areas with an average price across the 15 LGAs of just $412,000, which is similar to the findings of Coates (2019). In stark contrast, the low-supply LGAs have an average price of $1.36m. Price growth in low-supply LGAs is 69.5 per cent on average, which is five times higher than the high-supply LGAs. This finding is consistent with rising demand for housing in locations where there are constraints on new supply. In the following sections, we examine whether these constraints:

• are likely to be regulatory

• reflect the existing composition of the locality—for example, built-up communities with few sites for infill, redevelopment or greenfield housing

• are associated with local market conditions.

The supply–price relationship between houses and units in LGAs is very different. Our analysis revealed that higher-growth LGAs—in which new units predominated—saw price growth of 31 per cent compared to 21 per cent for lower growth LGAs with an average price higher by $80,000. This finding is inconsistent with predicted relationships between new housing supply and price, which expect increased supply to moderate price increases.

However, as discussed further in later chapters, this finding is likely to reflect market conditions in which housing located in well-established and accessible locations—which have seen the highest increase in apartment development—are also likely to record ongoing price rises that further stimulate new growth in these desirable locations, but fail to significantly improve affordability.

2. Patterns of housing
supply 2006-2016

Table 14: LGA supply and price: Houses

State	LGA	Separate house approvals % of stock	Real house price change 2006–2016 (%)	Median house price 2006–2016
High supply				
Vic	Wyndham	106.37	48.91	$380,000
NSW	Camden	86.77	50.79	$550,000
WA	Kwinana	84.31	–7.54	$350,000
Vic	Cardinia	81.97	32.66	$380,000
WA	Wanneroo	81.56	–10.51	$470,000
Vic	Melton	80.62	28.03	$380,000
WA	Armadale	77.39	1.07	$380,000
Vic	Whittlesea	72.78	44.14	$430,000
WA	Swan	58.08	–9.34	$450,000
WA	Mandurah	57.06	–28.73	$430,000
WA	Rockingham	55.40	–18.11	$430,000
SA	Playford	45.61	9.55	$270,000
Vic	Casey	45.38	52.95	$410,000
QLD	Ipswich	45.05	1.47	$350,000
WA	Cockburn	43.73	–1.91	$530,000
		68.14	**12.89**	$412,667
Low supply				
NSW	Strathfield	7.10	104.58	$1,520,000
NSW	Ryde	7.08	103.35	$1,140,000
NSW	Blue Mountains	7.00	46.09	$480,000
NSW	Waverley	6.80	76.54	$1,960,000
NSW	Randwick	6.75	76.94	$1,540,000
NSW	Canada Bay	6.60	105.73	$1,350,000
NSW	Ku-ring-gai	6.55	72.81	$1,510,000
NSW	Sutherland Shire	6.53	67.51	$910,000
NSW	Rockdale	6.37	93.94	$940,000
SA	Unley	6.35	26.77	$790,000
Tas	Hobart	5.61	28.57	$510,000
NSW	Burwood	5.09	102.75	$1,190,000
NSW	Hunters Hill	5.00	54.93	$2,100,000
NSW	Mosman	4.72	46.05	$2,780,000
NSW	Willoughby	4.70	81.96	$1,700,000
		5.92	**69.54**	$1,361,333
Total		**21.55**	**37.67**	
Correlation		–0.330		

Source: Author calculations from ABS census, population and building approval data. RP CoreLogic price data through SIRCA.

2. Patterns of housing
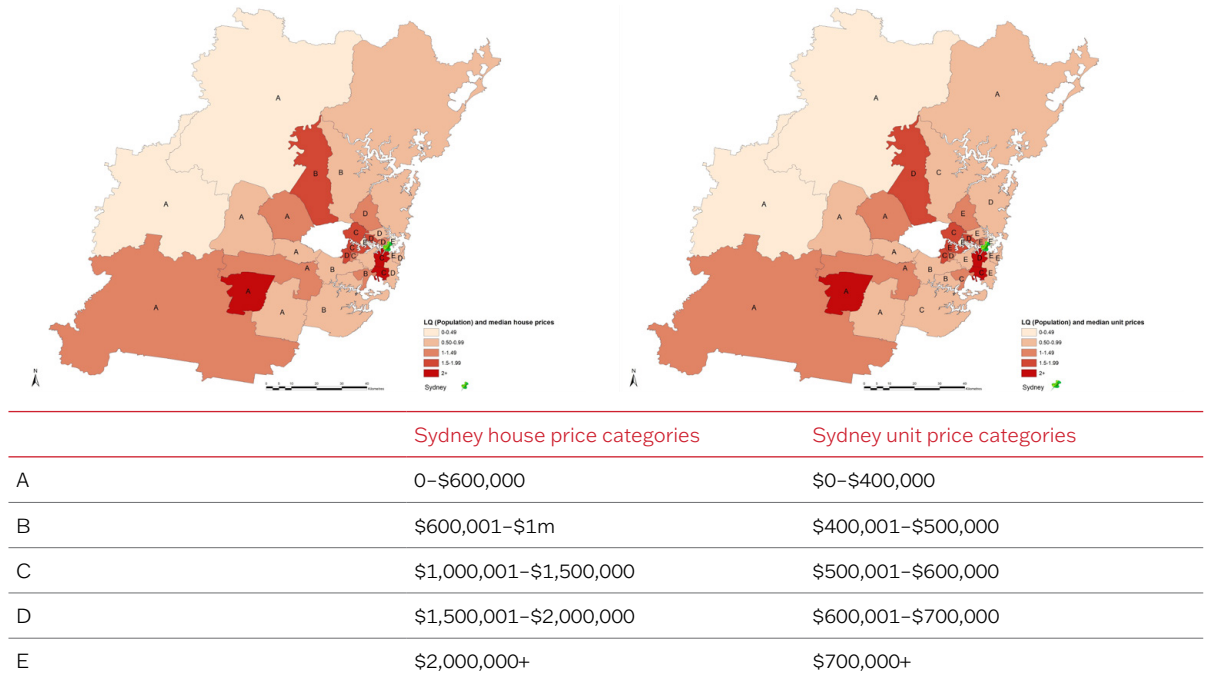supply 2006-2016

Table 15: LGA supply and price: Units/apartments

State	LGA	Flats, units and apartment approvals as % of 2006 stock	Real unit price change 2006–2016 (%)	Median unit price 2006–2016
High supply				
NSW	The Hills Shire	507.46	51.35	$620,000
WA	Cockburn	308.81	4.98	$410,000
WA	Belmont	201.86	−3.44	$420,000
NSW	Ku-ring-gai	179.03	34.66	$760,000
Vic	Melbourne	166.37	11.42	$520,000
Vic	Manningham	162.74	30.97	$580,000
NSW	Botany Bay	154.14	97.64	$560,000
NSW	Camden	150.55	66.08	$400,000
NSW	Campbelltown	138.00	74.12	$330,000
SA	Adelaide	134.61	11.71	$470,000
WA	Swan	130.73	−17.65	$370,000
WA	Perth	127.35	−15.59	$540,000
Vic	Maribyrnong	114.66	21.20	$430,000
Vic	Whitehorse	109.36	54.56	$550,000
NSW	Hornsby	93.37	50.73	$560,000
		178.61	**31.52**	$501,333
Low supply				
Tas	Kingborough	8.91	5.83	$310,000
SA	West Torrens	8.72	22.01	$310,000
Tas	Hobart	8.40	16.00	$360,000
NSW	Mosman	8.37	71.62	$810,000
Tas	Glenorchy	8.25	5.43	$230,000
Vic	Macedon Ranges	7.98	16.04	$340,000
NSW	Woollahra	7.28	73.08	$880,000
SA	Marion	7.17	26.54	$380,000
SA	Playford	4.55	−3.06	$160,000
QLD	Scenic Rim	4.10	36.85	$270,000
SA	Burnside	1.75	35.46	$410,000
SA	Mitcham	1.65	22.44	$340,000
SA	Tea Tree Gully	0.89	4.79	$290,000
WA	Mosman Park	0.80	−0.47	$400,000
WA	Cottesloe	0.31	−25.31	$870,000
		4.42	**21.95**	$424,000
Total		**52.11**	**22.43**	
Correlation		0.109		

Source: Author calculations from ABS census, population and building approval data. RP CoreLogic price data through SIRCA.

2. Patterns of housing
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2.5 Summary

This chapter has examined variations in the distribution, quantity and composition of new housing supply in Australia between 2006–2016, and trends in house and unit prices over the same period. It finds an overall trend towards larger (four- and five-bedroom dwellings) rather than smaller units, which appears to be inconsistent with policy aspirations to diversify Australian housing in line with demographic changes towards smaller and older households.

Further in refining previous analyses of new housing supply, we find a variety of spatial distribution patterns within and between the Australian states and capital city regions. The cities of Sydney and Melbourne show intense supply in inner areas but also, along with the other capital cities, in outer greenfield contexts as well. Relationships between new housing supply and price change are also complex, with greenfield housing areas recording modest price growth but areas of pronounced multi-unit development experiencing higher price inflation over the period. We turn to potential explanations for these findings in the next two chapters.

3. Modelling the impacts of new dwelling supply

- There have been very few studies of the relationship between housing supply and prices in Australia, in general, and none to our knowledge that examine the long-run relationship between the size of the housing stock and the price level.

- There is growing interest, but very little evidence currently, in the dynamics of Australian housing markets. This includes the relationships between supply to high-value market segments and outcomes in middle- to low-value segments (filtering theory). But it also includes behavioural studies. Not enough is known about the decision-making behaviour of housing developers.

- The relationship between settlement size and density and the supply level is complex, and appears to be non-linear. Supply increases with population but falls with density, and falls as the share of housing rather than apartments rises.

- **New supply is positively affected by rising prices, and negatively affected by rising construction costs. These findings are in keeping with economic theory. But there is considerable variation in these relationships between states and LGAs.**

- **The ability of Australia's research and policy community to effectively model and understand new housing supply is frustrated by the lack of good quality data, as well as by inconsistency in the quality of data among states.**

- **Given the perennial problem of weak or statistically insignificant relationships between supply and demand shifters and new housing supply in econometric models, we highlight the need for an alternative approach. We suggest that using time on the market (TOM) approaches could be fruitful, as TOM may act as an intervening influence between second-hand housing market conditions and new housing supply responses.**

It is notable that there has been very little analysis in Australia of the temporal linkages between housing supply and prices or affordability. The economics of the development industry are particularly important because, in many ways, developers' behaviour and market outcomes do not fit standard economic theory.

At the macro or housing market scale, theory tells us that additional supply should help to stabilise prices. But in practice, the statistical relationship is often very weak and, to our knowledge, has not been established robustly in Australia. This chapter first looks at two key issues around modelling the development sector, before exploring the results of a panel model of building approvals. Finally, it discusses ideal data requirements for supply and price modelling, and makes suggestions for future work.

3.1 Behavioural studies

There is a longstanding tradition of undertaking behavioural studies in the context of the residential development sector, including land markets and interactions with planning systems. Such studies date back to the 1970s or earlier in the UK, but enjoyed a recent resurgence in the wake of the UK's Barker Review and the generally disappointing impacts of major planning reform on the supply of new-build housing. The UK government was directly responsible for commissioning a number of behavioural studies, and instrumental in encouraging others. Of particular note are Adams, Leishman et al. (2009) and Leishman (2015).

Housing developers do not face uniformly competitive conditions, but the extent of competition depends partly on the national, regional and local context, as well as on the question of which market we are considering:

• housing

• serviced land

• land with (possibly distant) future hope value or development potential.

Adams, Leishman et al. (2009) demonstrated that when UK developers are faced with intense competition to acquire land suitable for immediate development—which means paying aggressive and optimistic purchase prices—they then build slowly to allow rising housing prices to offset those bullish positions. Leishman (2015) takes this further, showing that housing developers are 'price-takers' in the overall housing system because they are competing against second-hand housing suppliers who make up 80–90 per cent of market volume, depending on national context. Leishman shows that housing developers are in a uniquely difficult position because they:

• must compete aggressively in land markets

• have little or no power in the market for newly constructed housing.

Leishman argues that this position ultimately reduces the prospects of using the planning system and housing development / supply function as a tool to control affordability or housing prices.

3.2 Housing market hierarchies and the place of new-build

The new-build sector of the housing market can be seen as the most policy-accessible sector of the system, as the planning system and building code apparatus:

• offers many opportunities for scrutiny

• brings together developers and the government sector in negotiations.

The planning system and building code apparatus has featured in numerous policy contexts, including:

• driving up sustainability and energy efficiency standards

• widening access to home ownership

• acting as a tool to aid urban renewal.

However, there is a largely unanswered question about the extent to which the pricing of new-build housing is independent of second-hand housing prices, and this is important to the goal of understanding the sector's place in the housing hierarchy.

At one extreme, if new-build housing were widely recognised as superior to second-hand alternatives, then we could predict that policies designed to raise quality—such as building standards, energy efficiency and sustainability—would not divert much demand from the new-build to the second-hand sector. At the other extreme, if new-build housing were widely seen as an inferior substitute for second-hand alternatives, this would greatly limit the ability of such policies. This is precisely why it is necessary to consider where the new-build sector sits within Australia's private housing hierarchy.

Some insights are offered by the theory (or concept) of 'filtering'—a theory that is currently gaining political interest in Australia and elsewhere. Filtering refers to the expansion of higher-quality housing opportunities that occur when the relative price of housing declines at a greater pace than physical obsolescence. Whether or not this actually occurs in practice has important implications for the ways in which new-build housing supply helps to mediate prices or growth in prices.

Although the origins of filtering can be traced back to the 1930s, most housing economists point to the work of primarily US-based economists in the 1960s and beyond. In particular, Grigsby (1963) put forward filtering as one of the housing market dynamics that could break down spatial housing submarket boundaries, and there are a few published empirical studies that demonstrates that this might be the case—for example, see Jones, Leishman et al. (2004).

In theory, filtering occurs when new-build housing supply creates new housing stock that is recognised to be of the highest quality available to home purchasers with the highest income—that is, the highest income and social stratum in society. Assuming that this stratum will seek to occupy and consume the best-quality housing opportunities of the time, these households naturally move from the previous best-quality housing opportunities available to the newly constructed dwellings. This causes them to release the second-best housing opportunities for the next highest stratum, and so on. The natural conclusion is that new-build housing supply at the most expensive end of the housing market results in an expansion of housing opportunities for all households in society, across the income and social strata.

However, the filtering theory is by no means unanimously empirically proven—there is mixed evidence about whether such housing dynamics occur or, if they do, how widespread they are. There is also no real consensus in Australia about the position of new-build housing in the hierarchy, so it is difficult to convincingly argue that new-build housing truly occupies the top stratum of housing quality and thus causes better housing opportunities to filter down through the housing system.

A particular problem in transferring the filtering theory from the USA to a nation like Australia is that the theory focuses only on dwelling qualities, rather than on neighbourhood and place. In Australia, housing markets, particularly in metropolitan areas, strongly reflect access to employment, services and amenities—both natural and cultural—which are difficult to replicate in new development areas. Similarly, the filtering notion assumes that homes are infinitely substitutable—that is, one home can be easily substituted for another. This assumption holds true in relation to greenfield housing development and major apartment projects, but it is demonstrably false when it comes to the unique properties of established homes and neighbourhoods, which often accrue historical or other subjective values over time.

3.3   Panel model of building approvals

Tables 16 and 17 summarise several econometric estimations for a model of building approvals measured at LGA level. (See Appendix 6.4 for equations.) The time period is 2006–2016 and the model includes the following numbers of LGA observations:

- NSW 33

- NT 3

- QLD 7

- SA 20

- Tas 6

- Vic 32

- WA 32.

The dependent variable is defined as natural logarithm (LN) of building approvals. This is regressed on a set of locational, structural and supply-shift variables, including:

- proportion of prior year building approvals that were for houses

- LGA share of state population

- population

- population density

- distance and squared distance from the CBD

- real house prices

- prior year change in the real house price level

- prior year change in the construction cost index.

There are five estimations in all. The first two are shown in Table 16, and are straightforward panel estimations using Stata's 'xtreg' command. The second variant of the model includes state dummy variables.

Table 16: Panel model of LGA-level building approvals

LN(approvals)	Coef.	P>z	Coef.	P>z
constant	−3.923442	***	−4.422586	***
LN (proportion houses) (t-1)	−0.2400855	***	−0.2727346	***
Share population	−1.900207	*	−1.81691	
Dist CBD	−0.0076509		−0.0085953	
Dist2 CBD	−0.000274	**	−0.000358	***
LN(population)	1.114511	***	1.134642	***
LN(pop density)	−0.3255595	***	−0.3715922	***
LN(rhp) t-1	0.1011373		0.1330792	**
dLN(rhp) t-1	0.1012094		0.5655201	***
dLN(ccost) t-1	−3.503878	***	−2.092179	***
state_qld			0.708875	**
state_sa			0.0982665	
state_vic			0.470383	***
state_tas			−0.278913	
state_wa			0.4946889	***
state_nt			1.25773	**
Overall R sq	0.6991		0.7458	
N	1072			
Groups	123			

*Notes: *** 1% significance, ** 5% and * 10%*
Sources: ABS, CoreLogic.

The results suggest that the level of building approvals falls as the share of houses—rather than units or apartments—rises. Higher population is associated with a higher level of approvals, but population density has a negative effect. This suggests a non-linear relationship between settlement size and the building approval rate—that is, building approvals rise with population but at a decreasing rate as population density rises. Distance from the CBD is not significant in either estimation, but squared distance is significant—and negative. This suggests that the building approval rate is not affected greatly by distance until distance becomes very large—that is, quite remote LGAs have a lower building approval rate when other factors are controlled for.

In the first estimation, house price levels or growth rates have no statistically significant impact on building approvals—which is, of course, contrary to prior expectations. However, lagged construction-cost inflation does have a very strong and negative effect. In the second estimation, the house price variables are statistically significant and 'correctly' signed. This is at least suggestive that the relationship between housing market variables and the building approvals rate varies within Australia. The state-level dummy variables also indicate quite substantial differences in typical LGA building approval levels among states and territories. (The model does not include the ACT, for which there was insufficient data.)

3. Modelling the impacts
of new dwelling supply

Estimations 3 through 5 are summarised in Table 17. These are estimated using Stata's 'xtmixed' command, and are therefore multilevel panel models. The innovation in this approach is that state effects can be isolated in more detail, to follow up the notion that housing market effects on building approvals vary within Australia. The 'xtmixed' command estimates a model that contains both fixed effects and random effects. Variables with parameters that are not thought to vary spatially are estimated as fixed effects. The coefficients can be seen as being broadly equivalent to the coefficients that would be obtained using an ordinary least squares (OLS) estimation approach. The advantage of defining random effects is that certain variables can be defined as having an overall coefficient, plus a second coefficient (or random effect) that varies spatially. Thus, the 'multilevel' model has coefficients relevant at two (or more) spatial scales. In this case, the majority of the variables have coefficients relevant for Australia overall, and a smaller number of variables with both national-level and state-level effects.

Table 17: Results for a multilevel state and LGA model of building approvals

l_ba	Coef.	P>z	Coef.	P>z	Coef.	P>z
constant	−2.310943	***	−3.074259	***	−3.295743	***
LN (proportion houses) (t-1)	−0.3243186	***	−0.3213194	***	−0.30711	***
Share population	−1.056896	*	−1.238195	**	−1.137002	*
Dist CBD	−0.0087286	***	−0.0102293	***	−0.0097509	***
Dist2 CBD	−0.0003831	***	−0.00038	***	−0.0003857	***
LN(population)	1.103241	***	1.122998	***	1.119783	***
LN(pop density)	−0.4129453	***	−0.4239476	***	−0.4260894	***
LN(rhp) t-1	0.056259	**	0.1083784	**	0.1227292	**
dLN(rhp) t-1	0.6173353	***	0.6114584	***	0.5926874	***
dLN(ccost) t-1	−2.347044	***	−2.30444	***	−2.190688	***
Random effects						
State	0.4377657	0.128209	1.164581	0.6559539	1.428045	0.6473481
State LN(rhp) (t-1)			0.0910804	0.0483995	0.1057292	0.0463431
State LN(proportion houses) (t-1)					0.061827	0.0303678
Wald chi-sq	2353.65	***	2380.37	***	2347.89	***
LR test vs linear model	183.47	***	189.7	***	195.2	***

*Notes: *** 1% significance, ** 5% and * 10%*
Sources: ABS, CoreLogic.

The main coefficients (or fixed effects) show very similar results compared to the panel model summarised earlier. For example, as the proportion of houses rises, the building approval rate falls, and the elasticity is around −0.30. Similarly, higher populations are associated with higher approval levels, but population density works in the opposite direction. The magnitude of the elasticities is quite large (around 1.00 and −0.40 respectively). However, the multilevel model also shows a weak relationship between LGA share of state population and the building approval level. This coefficient is somewhat unstable between the three estimations. Real house price levels and growth in prices are both statistically significant and positive drivers of the building approval level, while construction cost inflation is a negative influence. The behaviour of these three housing market variables appears to be stable between estimations, and the effects are in keeping with expectations based on economic theory.

In examining the 'random effects' in Table 17, bear in mind that it is not conventional to report significance levels. This is because the coefficients are not estimated directly, but are obtained by disaggregating the residual. For each random effect, the mean and standard error are shown, rather than a significance level. More importantly, the statistical significance of the likelihood ratio test provides support for the inclusion of the random effects in these models.

All three models include a state-level intercept term that can be thought of as analogous to including state-level dummy variables in an OLS model. These random effects show that there are quite substantial variations in LGA-level building approvals from state to state (column 4 table 16). The second estimation also shows that the relationship between the house price level and the building approval rate varies between states. The third estimation adds share of houses to the multilevel specification, and the results suggest that this relationship also varies from state to state.

Overall, the results show that while orientation towards houses, population and housing market variables are all important influences on the building approval level, the relationships are sufficiently complex within Australia to suggest that it would be inappropriate to fit a single model for all LGAs without allowing for some flexibility in these parameters from state to state (or spatially).

3.4   Data requirements

Future work in this area would benefit from more detailed data at the level of the individual dwelling, and the individual development site. The CoreLogic data used for NSW appears to be of good quality, but this could not be replicated in Western Australia. We therefore hope that additional resources can be found to make sure that it is possible to monitor TOM (between advertisement and sale) for every state. For data at the level of the development site, the following variables would be ideal:

- Size of each development site (in square metres).
- Geocoded records, or detailed addressing—which is better than LGA, suburb or postcode.
- Number of dwellings constructed on site.
- Split between property types constructed—for example, villas, apartments, etc.
- Date of planning approval.
- Date construction commenced.
- Date construction completed.
- Links to planning or zoning records applicable to each site.

A dataset such as this would be invaluable in modelling decisions about development timing, scale and development offering at site level, and would give researchers the ability to include planning and economic variables, and to consider a fuller range of demand-side variables. Then it would be possible through analysis of site level data to:

- examine spatial interactions between individual development sites
- consider questions such as the impact of competition between developers
- ascertain whether or not filtering actually occurs.

3.5 Future strategies for modelling new housing

Conceptualising, explaining and finding the empirical evidence to support such approaches to understanding the price effects of new housing supply represents one of the major outstanding challenges in housing economics research. Researchers and policy makers have not given up on finding connections between higher levels (or responsiveness) of housing supply and price effects. This is partly because economic theory tells us that there must be a connection, and partly because to argue otherwise is illogical and would suggest that new housing supply cannot play a role in tackling the housing affordability crisis.

Yet we must also acknowledge the repeated and systematic failure of most previous studies to find convincing empirical linkages. The behavioural studies of new housing developers and their activities in the land and housing markets, and the planning system, highlight the potential importance of factors other than simple price signals (price levels and price growth).

There is growing recognition in the UK and USA that the economics of the housing development industry is poorly understood, and that part of the reason for this generally poor understanding can be traced to a failure to appreciate not just the behaviours of developers, but also the underlying reasons for those behaviours.

To help understand how future research could deliver results by moving in a new direction, it is helpful to reiterate the broad conclusions of previous sections:

- Studies of supply effects on housing prices generally show insignificant or very weak effects.

- Behavioural studies emphasise the importance to housing developers of 'being on the inside'—that is, it is important to their continuity of business to be involved in development site identification and the subsequent stages of the planning process.

- The importance of participation in planning for housing processes depends partly on the type of landowner or developer, with a very broad distinction between passive and active residential landowners.

- The housing development industry is often described as being subject to 'cutthroat' competition, but it is clear that developers face a variety of competitive conditions depending on which market we are considering:

  - market for development land

  - market for finished housing

  - market for construction skills

  - market for materials.

Taking these facts and conclusions together, it seems clear that a new approach is needed to begin to develop an understanding of the connections between the new-build and second-hand sectors of the housing market, as well as the connections among housing developers, land developers and the planning system.

One potentially fruitful line of inquiry would be to examine the indirect relationship between the volume of choice facing prospective housing purchasers, and pricing outcomes for new housing developers. For example, this could be explored by adopting a TOM empirical approach. Such studies have a long history in real estate and housing markets, but have not hitherto—to our knowledge—been used to help understand and explain the dynamics of housing development, or the interactions between new-build and second-hand sectors of the housing market. TOM studies have been used to examine the impact of the degree of overpricing (DOP) on marketing times and, conversely, the influence of longer marketing times on eventual sale price.

Such an empirical approach would deal with the reality that housing developers are unlikely to ever increase the supply of new-build housing in a given housing market to the extent that housing prices actually fall in that location. Instead, they will logically seek to trickle-feed supply to the market at the rate that ensures that target sales rates and profit expectations are met. Thus, the developer's price signal is not the level or change in market price of housing per se, but the rate of sale.

4. Local factors driving housing supply

- This chapter draws on interviews with planners and developers in case-study areas of NSW and WA to examine their perspectives on the drivers of new housing supply.

- Both planners and developers believe that the planning system has an important role to play in allowing new housing development by zoning land and ensuring that different housing types are permissible in locations where they are needed.

- However, the timing and composition of new housing supply is driven by the development industry, their reading of market conditions, and whether projects are financially viable.

- In the high-growth case-study LGAs, zoning that enabled developers to respond to strong housing demand conditions when they occurred was seen to be a key factor in supporting supply growth.

- Other common factors that help to explain high and diverse housing supply in the case-study LGAs include: the presence of relatively cheap land (WA), or large greenfield or brownfield sites conducive to larger scale, master-planned development (NSW); infrastructure capacity, particularly resulting from transport infrastructure investment; and proactive local planning for growth (outer ring) or urban renewal (inner ring).

- **The long-term nature of the urban development processes, including infrastructure provision or augmentation, means that it can take years before rezonings and project commitments result in new housing supply.**

- **The capacity of infrastructure and services is an important consideration for councils in planning for future growth. In some high-growth LGAs, where housing development over the study period exceeded anticipated levels, infrastructure that is at or exceeding capacity may have implications for future growth.**

- **Having explored the distribution of housing supply and the potential for accurately modelling the drivers of such supply, this chapter switches to a qualitative approach using case studies and interviews to explore local factors driving supply. The research has so far described an uneven distribution of supply, with some LGAs delivering far greater quantities of supply than others.**

Here we use eight case-study LGAs—four in NSW and four in WA—to explore the reasons why this is the case. Each of our case-study LGAs has delivered supply well above the level expected, given their starting levels of population and stock.

In Sydney the case-study LGAs are:

- Blacktown
- City of Sydney
- Liverpool
- Botany Bay.

In Perth the LGAs are:

- Cockburn
- Belmont
- Kwinana
- Armadale.

Each of these LGAs has an LQ well above 1, which reflects a level of supply significantly beyond the expected benchmark. A brief profile of each case study appears in Appendix 6.5.

The assessment of local factors was based on a variety of qualitative data. To begin, we re-analysed previous research by members of the research team as part of an ARC discovery project. This involved over 30 interviews with state and local planners and developers in Sydney and Perth, as well as Melbourne and Brisbane, conducted in 2013 and 2014.

Further interviews were conducted in 2019 with state- and metropolitan-level planners in NSW and WA, and with planners who had experience in the eight case-study LGAs, to understand what factors drove local level supply. The interviews also explored what lessons could be learnt from each LGA and applied elsewhere to deliver supply.

We also used data from the AULUPP planning survey to identify:

- relative differences in regulation between areas
- changes to planning controls during the study period.

The first AULUPP survey was conducted in 2009 and the second in 2013, so there is sufficient scope to explore the extent of change to planning controls during the study period, and whether that might help to explain supply outcomes in addition to pre-existing differences in regulatory constraint.

4.1 State-based drivers of supply

According to state planning interviewees, the planning system has an important role in enabling housing development by ensuring sufficient land supply and development opportunities in a range of locations. Having sufficient supplies of zoned land was also seen to support competition in the market so, as one planner pointed out, 'you don't have a monopoly' of land held by a single landowner or small group of landholders that are able to drip feed sites to the market (NSW state planner). However, as state-level planners in WA noted at the time of the interviews, although the Perth metropolitan region had an approximate 25-year supply of zoned land, there was limited supply of residential lots.

Therefore, while the planning system can create residential development opportunities by zoning land, decisions over whether, where and when to subdivide this land for housing development sit with the industry.

In NSW, a state-level planner emphasised the importance of the development industry in the timing and volume of new housing supply, pointing out that while housing supply is a key interest of state government, the planning system has limited capacity to drive housing delivery.

Nevertheless, state-level planners spoke about a range of policies and strategies that their governments were using to support residential development. These ranged from more direct state government involvement in the planning of strategic sites (predominantly infill sites) in established areas, to regulatory reforms intended to reduce regulatory barriers or incentivise housing development by the private development sector.

The NSW state government has initiated a series of strategies for 'activating' particular precincts in established urban areas for redevelopment and densification based on transport accessibility and accessibility to other services and amenities. While outcomes were not yet apparent at the time of the interviews, the intention was that the NSW state government would take the lead on determining appropriate future development for those areas and working with local governments to have land rezoned.

Separately, the independent Greater Sydney Commission—which sits at arm's length from the NSW government but has strategic overview of metropolitan planning—has progressed affordable rental housing targets for new development and redevelopment areas. However, the NSW government has not moved to require or demonstrate diverse housing typologies or price-points in private development, unlike other state examples such as the former Urban Land Development Authority (ULDA) in Queensland (Davison, Gurran et al. 2012).

More common were policy settings and ongoing regulatory reforms to the planning system, focussed on reducing the time (and cost) of obtaining residential development approval and on providing developers with greater certainty as to the permissibility of different types of residential development in different locations or land-use zones.

Reforms in WA were also targeted at reducing complexity and increasing certainty.

In NSW, a key change was the 2008 and 2009 introduction of statewide codes that specified 'as of right' development rights for those dwelling types. This change was intended to offer greater certainty of development rights, and to speed up and reduce the cost of gaining development approval for single and secondary dwellings. The policies also allowed for private certification—as opposed to council approval. As the codes are embedded in state policy and override any conflicting local policy, they also had the effect of creating greater uniformity across the state.

Overall, NSW state government planners believed that the approach was having a positive impact on development assessment speeds, and that it was stimulating development of single and secondary dwellings because compliant applications are guaranteed approval within a very short timeframe.

In WA, the residential codes (R-codes) provide a degree of uniformity in residential development policy across LGAs. At the time of the interviews, state government planners spoke about trying to foster increased opportunities for more diverse —that is, higher density—housing development, and lower cost forms of market housing through a multi-unit code. The multi-unit code was described as 'an attempt to deregulate to promote more built form on a block' (WA state planner) and as a mechanism to get 'more affordability in certain areas' (WA state planner). In 2019, Residential Design Codes Volume 1[1] was released, which includes guidance on single, group and multiple dwellings. Volume 2, included as part of Design WA[2] released in May 2019, focuses on apartment design, with further guidance to come on medium-density development.

Planners emphasised the importance of the market in understanding patterns of housing supply. In NSW, interviewees emphasised that even if development controls are in place to support residential development, 'if there isn't a market … no one's going to develop' (NSW state planner).

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1 https://www.dplh.wa.gov.au/getmedia/b439cf06-45b1-4856-9c5c-116ee2bce0e1/SPP_7-3_Residential_Design_Codes_Vol_1
2 https://www.dplh.wa.gov.au/designwa

4.1.1 Perspectives of state- and metropolitan-level planners in Sydney and Perth in 2019

The long-term nature of urban development processes was emphasised by metropolitan-level planners in Sydney, where recent housing output reflects rezonings and development approvals over a much longer period.

Planners in both Sydney and Perth explained patterns of supply growth between 2006 and 2011 with reference to market conditions. In Sydney, the market was sluggish over that time, on the back of a sustained boom; whereas in Perth, economic expansion associated with the mining sector was beginning to take effect by 2011. Subsequently, rapid house price growth in NSW—particularly in the latter part of the study period (i.e. from 2011), coupled with high housing demand stemming from years of comparatively low housing supply outputs— worked to significantly change development viability in many parts of Sydney. In particular, it became viable to develop many sites that had previously been zoned for residential development and higher-density residential development, in particular, but were not developed under weaker housing market conditions. This was particularly the case for higher-density types of residential development such as mid-rise apartment buildings in middle- and outer-ring town centres and areas with historically weaker housing markets, such as Liverpool.

In contrast to NSW, new supply in WA reached a peak in 2014/15 and has been declining ever since. The peak resulted from the economic growth driven by the mining sector from 2011 to 2013, which drove population growth and fuelled demand. However, contraction of mining activity from 2013 saw a big decline in housing demand, which has yet to recover in many areas of the state. State planners said they have few tools available to deliver supply if the development industry pulls back from development because of market conditions. Only the prime sites where profits are assured will be developed, and even so, some firms may wait or stagger output to maximise returns over time. In Perth, the contraction in separate dwelling construction in outer urban areas since 2013 has been quite dramatic.

In NSW, improvement in the financial viability of higher-density development—particularly in middle-ring and outer-ring suburbs—was supported by rising prices and changing buyer preferences. As a state planner explained, a key change in demand drivers over the study period was the increased value placed on accessibility to jobs, and proximity to amenities and services. While there has been a longer-term trend in Sydney of housing demand concentrating on inner-city areas with good public transport connections and access to jobs and services, the planner explained that preferences for accessibility are now also apparent in middle- and outer-ring areas as well. High housing costs—which have made detached houses unaffordable for many first homebuyers— combined with household preferences for access to public transport and proximity to services. increased demand for apartment developments in suburban town centres, making these projects viable for the first time. While many outer suburban local governments had strategies and policies to support redevelopment and densification of their town centres prior to the late 2000s, the rising market and increased demand for town-centre living catalysed development in the latter part of the study period.

In greenfield development areas in particular, the size of development holdings was identified as an important factor in explaining development viability and supply patterns over the study period. In NSW, the planner explained that where developers can get large greenfield development sites, they can incorporate the services that buyers are looking for, for example, by creating lots for retail, schools and other community services. Those amenities, in turn, attract buyers, which enables lot development and housing construction to move forward at a steady pace. By contrast, in greenfield areas characterised by small, fragmented lots, land assembly processes can be drawn out, and developers struggle to coordinate and incorporate the services and amenities that buyers are looking for, which can lead to poorer viability. In Sydney, these factors help to explain the relative volumes of housing supply coming forward in the north-west growth centres rather the south-west growth centres, which are characterised by more fragmented holdings. However, across all major greenfield development areas, the planner noted that preferences among Sydney buyers for accessibility has meant that developments in proximity to planned or existing public transport lines are generally in high demand and development can progress more quickly.

In WA, the focus since the housing market downturn has been delivering infill development in those areas where demand still exists. The state government has been working with industry on overcoming some of the barriers to quality infill development (see Rowley and Phibbs 2012)—which is still dominated by single-lot subdivisions by small 'mum and dad' investors that do not deliver the precinct-type outcomes desired by the state. As mentioned earlier, the focus has been on design guidance to ensure quality development outcomes. Community opposition to higher-density housing remains a problem for local councils seeking to encourage more diverse housing types in Perth, but has been increasingly managed in Sydney by state planning reforms to limit local political involvement in decision processes.

Thus, while factors beyond the planning system—particularly the housing market and the size and location of development sites—played an essential role in patterns of housing supply, state-level planning policies and planning reforms have also played a role (albeit a more minor role) in explaining housing supply patterns across NSW and WA.

In NSW, new policies from 2006 that brought development assessment for major development projects to the state level enabled some major residential and mixed-use projects to be approved despite inconsistencies with prevailing planning controls. Interviewees expressed the view that special assessment processes for major projects in NSW did not seem to have specifically incentivised housing development, because the large sites in high-demand areas that came under the policy were attracting developer interest prior to the change in assessment processes, but the reform likely expedited approval processes.

It is a similar story in WA, where the introduction of development assessment panels designed to make decisions less political reduced determination times and improved project certainty, rather than necessarily bringing forward development that would not have happened at all.

The introduction of complying development codes in NSW, giving as-of-right development rights for single dwellings, was also seen to be impacting housing development. This was particularly the case for secondary dwellings, with some middle-ring suburbs—particularly in Sydney's central west—experiencing a boom since the introduction of the policy. However, as the planner noted, data on secondary dwelling development as a component of new housing supply remains inconsistent and unclear.

4.2 LGA-based drivers of supply

Both state and local planners were asked about local-government-level drivers of supply in both 2013/14 and 2019. The following discussion reports state planners' perspectives, then moves on to each LGA case study to report local planners' perspectives.

4.2.1 State planner perceptions of local factors impacting housing supply

The state planners interviewed in 2013–14 generally agreed that there were differences between local governments in their stance towards growth and new residential development. This was predominantly seen to reflect demographics, with:

- councils and citizens in wealthier, established suburbs tending to object to new development—particularly infill development

- councillors and constituents in lower-value areas and on the urban fringe tending to support development—or to at least take a neutral stance.

As planners in NSW and WA explained, in lower-value areas—particularly those characterised by high volumes of public housing or lower-quality housing—councils tend to see new development as bringing positive investment to the area. New development is also support by local communities, as it is seen to improve amenity. In LGAs that have not historically been targeted for new development and investment, councils were perceived to have a more proactive approach to accommodating new development. As one NSW planner explained, money historically has not flowed into the western suburbs of Sydney, so incentives have had to be created to attract investment. It is a similar story for many of the LGAs on the outer fringes of Greater Perth, particular those older LGAs within large greenfield sites that are easy to develop, such as Armadale.

Differences in the stance of councils towards new development were seen to play out in:

• local planning policies—such as rezonings and density controls

• development assessment processes—for example, triggers for development applications to be determined by councillors rather than professional council planners under delegation.

It is also evident within community consultation processes that some councils are very supportive and work with developers to get the local community on board, while others are less enthusiastic.

Rather than describing some councils as 'anti-development', state-level planners across the metropolitan regions diplomatically distinguished between councils that:

• are trying to enable development

• are trying to manage growth pressures in a way that is feasible from a servicing standpoint, and is acceptable to established community.

State-level planners tended to distinguish between outer urban councils, and greenfield development generally, and inner-city councils and established urban areas. As they pointed out, inner-city councils often have to contend with:

• small lots

• complicated building sites

• heritage and infrastructure capacity limitations.

The Sydney metropolitan-level planner we spoke to in 2019 explained that while there are some special areas where, in comparative terms, approval volumes have been especially high over the study period, there are no areas in Sydney where housing development is not occurring. The planner pointed out that limitations on the number of dwellings that a local government can approve often relate more to infrastructure capacity constraints, including the road network, than to council sentiment or constituent preferences. Councils are typically trying to align redevelopment with the capacity of the infrastructure in their area.

Infrastructure was also an issue in Greater Perth, where developers were often put off developing in certain areas because of:

• potential infrastructure costs

• requirements imposed by utility companies to upgrade whole networks.

The capacity of infrastructure is not something state planners can control—but it is an impediment to infill housing supply.

When asked about the regulatory settings that most constrain residential development, planners in both states tended to distinguish between greenfield and infill contexts.

In greenfield contexts, planners identified 'constraints' as:

- the need for environmental approvals—often from the federal government

- the need for environmental management plans

- the time required for rezoning greenfield sites to allow for lot creation for residential development.

In infill development contexts, planners identified the main barriers to new residential development—particularly higher-density housing—as:

- height limitations

- density limitations

- subdivision restrictions.

However, planners also pointed out that specific development controls impact potential development of a site varies on a case-by-case basis. Rather than any specific planning policies constraining residential growth in all instances, planners suggested that more important factors are whether:

- development controls are applied consistently—that is, they are known to developers and landowners upfront

- controls are outdated and no longer reflect current demand or higher-level planning strategies.

State-level planners also pointed to the importance of challenges arising from factors beyond local development control. One factor was land assembly, and the related issue of inflated landowner price expectations during strong market conditions. For example, state planners in WA explained that landowner price expectations during the boom conditions had become highly inflated with the announcement of a light rail network—the MAX, which ultimately did not proceed—leading to challenges for developers in acquiring and assembling sites in proximity to the proposed rail network.

Factors in greenfield areas of Sydney were fragmentation and difficulty in amalgamating sites.

Another factor was the structure of the development industry itself. In tough market conditions, the restriction of developer finance—particularly in WA—led to the loss of small and medium-sized developers and became very conservative. Larger, corporate developers are generally risk-averse and in tough times pull back to core business, such as greenfield subdivision. This has left few developers to deliver more innovative infill development. Developers are very quick to turn off the housing supply tap in tough conditions, but it takes time to turn it back on when market demand recovers.

4.3 Lessons from LGAs

This section reports findings of the 2019 interviews with local government planners in each of the eight case-study locations. Each case study is discussed in turn, with a brief summary of AULUPP planning data describing whether there were key changes to planning controls during the 2006–2016 period that may help to explain the high level of housing supply. Then the findings of the interviews are reported, with a number of key lessons from the LGA distilled at the end of each case study.

New South Wales

4.3.1 City of Sydney

In 2012, just prior to the second AULUPP survey, the City of Sydney adopted a new local environmental plan (LEP). The 2012 plan complied with the standard format for local plans in NSW that was rolled out from 2008. Between the two surveys—which encapsulated the plan change—there was a significant change in the number of surveyed planning controls present. The 2013–14 survey had 64 more planning controls than in 2007–09.

4. Local factors driving
housing supply

In the 2013–14 survey, 11 of the 16 most significant planning controls for potentially accommodating or constraining residential growth were present in the plan. This suggests a relatively comprehensive approach to residential growth management. There is also evidence of a comparatively strong commitment to seeking diverse and affordable housing, with objectives for housing diversity and new affordable housing, and a policy to seek affordable housing contributions when land is rezoned or planning controls are varied in both the 2007–09 and 2013–14 survey. Also captured in the 2013–14 survey were incentives for affordable housing development and other incentives and requirements for affordable housing.

Table 18 lists the most significant planning controls present in 2007–09 and then those present in 2013–14. The same table format is repeated for all eight case-study locations.

Table 18: Commonalities and differences in plan content between surveys: City of Sydney

Planning data	
Year plan adopted (2013–14 survey)	2012
Year plan last updated (2013–14 survey)	2013
Change in number of surveyed controls	+64

2007–09	2013–14
• Height controls on general, detached and medium-density residential • Objective for housing diversity • Objective to promote new affordable housing opportunities • Accessory dwellings permitted—residential development generally • Signal that contributions for affordable housing will be sought when applications for residential rezoning / variation of residential development standards are lodged	• Targets or objectives for infill housing development (introduced in 2013–14 survey) • High- and medium-density residential development in proximity to public transport • Height controls on general, detached and medium-density residential • Height controls on high-density residential • Other controls to regulate the density of general, detached, medium- and high-density development • Objective for housing diversity • Objective to promote new affordable housing opportunities • Accessory dwellings permitted—residential development generally • Incentives for affordable housing developments • Signal that contributions for affordable housing will be sought when applications for residential rezoning / variation of residential development standards are lodged • Other requirement or incentive for affordable housing

Source: AULUPP survey, 2007-09 and 2013-14.

New housing supply in the City of Sydney has predominantly been in the form of apartment developments on infill sites. An important factor in the City of Sydney's high volume of housing supply over the study period was land-supply, coupled with strong housing demand. As one planner explained, the decline of inner-city manufacturing several decades ago resulted in a large supply of formal industrial sites in the city that needed to be redeveloped. The nature of the former industry located in the City of Sydney also meant that many of the former industrial sites were large lots in single ownership, making them conducive to large-scale redevelopment.

The development of former industrial sites for housing has been fuelled by two main factors:

• a general shift in preferences towards accessible, inner-city locations, accompanied by growing demand for apartment living

• the state and local government support for urban containment and inner-city revitalisation.

As one planner explained, this has included significant infrastructure investment, particularly in the southern part of the LGA, including:

- Airport line extension to the rail network (opened in 2000)

- new rail station at Waterloo

- council-led rezoning of former industrial sites to allow for high-density residential.

When asked about the council's stance towards new development, a planner explained that the council has generally been supportive of development but will consistently seek to enforce planning policies and residential design guidelines to ensure appropriate, high-quality development.

Reforms in NSW from 2006 to the development assessment process for large-scale projects —including residential and mixed-use projects—were seen by the planner to have resulted in slightly higher project densities than would have been permitted by the council. Ministerial approval powers—first under the 'Part 3A' legislation and, more recently, through the state significant sites legislation—have not necessarily enabled large-scale residential developments in the LGA, but have likely impacted the timing and overall volume of housing approvals for applicable sites.

Key lessons:

- Large-scale redevelopment made possible by large allotments in single ownership (stemming from industrial heritage).

- High-density residential infill supported under state policy and made possible through council-led rezonings.

- High-density residential infill supported and made viable by major infrastructure projects—particularly transport infrastructure.

- Growing demand for inner-city and apartment living important in viability of high-density residential and explaining new supply.

4.3.2 Liverpool

Liverpool was one of the first local governments in NSW to adopt the new standard instrument LEP in 2008. At the time of the 2013–14 survey, the plan adopted in 2008 had recently been updated. Between the first and second survey, there was a significant increase in the volume of surveyed planning controls present in the plan. A total of 47 additional surveyed planning controls were present in 2013–14.

There was also an increase in the presence of the 16 planning controls thought to have the greatest impact on residential growth between the two surveys. Policies apparent in 2013–14 that were not captured in the earlier survey included:

- height controls applicable to high-density residential development

- other (unspecified) controls to regulate the density of residential development

- policies enabling accessory dwellings (or 'granny' flats) to be developed as part of residential development generally.

Consistent across both surveys were:

- high- and medium-density residential development zones in proximity to public transport

- height controls on general, detached and medium-density residential

- a plan objective for housing diversity.

Table 19: Commonalities and differences in plan content between surveys: Liverpool

Planning data	
Year plan adopted (2013–14 survey)	2008
Year plan last updated (2013–14 survey)	2013
Change in number of surveyed controls	+47

2007–09	2013–14
• High- and medium-density residential development zones in proximity to public transport • Height controls on general, detached and medium-density residential • Objective for housing diversity	• Targets or objectives for infill housing development (introduced in 2013–14 survey) • High- and medium-density residential development zones in proximity to public transport • Height controls on general, detached and medium-density residential • Height controls for high-density residential • Other controls to regulate the density of residential development generally • Objective for housing diversity • Accessory dwellings permitted as part of residential development generally

Source: AULUPP survey, 2007-09 and 2013-14

As the planner explained, new housing supply in Liverpool between 2006 and 2016 has come from a combination of:

• greenfield development—mainly detached single dwellings

• infill development—mainly in the form of apartments.

In the greenfield growth areas, policies are in place to encourage medium-density townhouses and apartments. However, developers have tended to propose apartments only—and because development controls proscribe a range of densities, those applications have typically not been approved by the council.

The planner attributed Liverpool's comparatively high supply volume over the study period to a combination of planning factors and strong housing market conditions. In 2008, Liverpool was one of the first councils in NSW to adopt the new standard format LEP (mandated by the state government from 2008). Preparation of the new LEP involved a detailed land study. As the council planner explained, the plan's adoption resulted in significant 'upzoning' of land within the council area, which included:

• rezoning rural land to allow for residential use

• rezoning land in established areas to allow for higher densities.

These rezonings occurred at a time when house prices were rising in Liverpool and across the region. As the planner explained, this upzoning in the context of strong housing market conditions resulted in a spike in residential development applications, particularly for apartments, as developers sought to respond to market conditions. These were met by an increase in approvals under the new higher-density zoning.

Interest in other forms of infill housing development has increased following the introduction of the *State Environmental Planning Policy (Affordable Rental Housing) 2009*. The policy gives a density bonus for residential developments where a proportion of floor area is dedicated for affordable rental housing—to be offered at up to 80 per cent of market rent for 10 years. The policy also makes boarding houses—single-room occupancy accommodation—permissible in most residential zones across the state. The planner explained that the provisions for a density bonus in exchange for including affordable rental units has been taken up by both affordable housing providers—constructing entirely affordable schemes and private developers operating in the area.

There has been comparatively limited interest in boarding-house development.

When asked about their council's stance towards new development, the planner suggested that Liverpool Council has a pro-development stance, with fewer barriers to getting a development approval than some other council areas. Where there are limitations on the volume of residential development applications that can be approved, the main limiting factors are infrastructure capacity and serviceability rather than community opposition or council assessment processes.

The planner noted that in greenfield growth areas, the use of minimum-density targets—rather than upper-limit density targets—has resulted in dwelling application volumes exceeding the dwelling volumes council has planned for, and is generating concerns about infrastructure capacity and servicing.

Overall, housing market conditions continue to be a key factor in the volume of residential development applications and dwelling completions coming forward in Liverpool. The council planner said that as the Sydney housing market has slowed, the volume of applications has reduced from previous years—particularly for apartments. There are also development approvals for apartments that have not been acted upon.

Key lessons:

- Increased residential land-supply and development capacity as a result of rezonings.
- Rezonings aligned with market demand, and enabled developers to take advantage of a rising housing market.
- Planning of infrastructure and services to support population growth is important in enabling development—particularly in greenfield areas.

4.3.3 Botany Bay

City of Botany Bay[3] adopted a new local plan in 2013—the year the second survey opened—and the plan had recently been updated when the second survey was completed in 2014. Overall, data from the second survey shows that an additional nine surveyed planning controls were present in the new plan compared to the plan at the time of 2007–09 survey, suggesting a small overall change.

Analysis of the 16 planning controls with the greatest potential impact on housing supply and diversity found that comparatively few of the applicable controls were found to be present at the time of either survey. Moreover, in the 2013–14 survey, fewer of the 16 planning controls were found to be present than in 2007–09. Objectives for housing diversity and the promotion of new affordable housing opportunities that were present in 2007–09 were not apparent at the time of the second survey. Other, unspecified controls to regulate the density of medium-density housing development appear to have been removed in the new plan. However, in 2013–14, the survey captured use of height controls to regulate the density of residential development.

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[3] The City of Botany Bay was merged with Rockdale City Council to form Bayside Council, as part of the 2016 NSW council amalgamations. The analysis for this project focussed on the former City of Botany Bay. While a planner working at the current Bayside Council was interviewed as part of this research, the interview focussed on the planner's long-time experience in the former Botany Bay LGA.

4. Local factors driving
housing supply

Table 20: Commonalities and differences in plan content between surveys: Botany Bay

Planning data	
Year plan adopted (2013–14 survey)	2013
Year plan last updated (2013–14 survey)	2014
Change in number of surveyed controls	+9 additions

2007–09	2013–14
• High- and medium-density residential development zones in proximity to public transport • Other controls to regulate the density of medium-density housing development • Objective for housing diversity • Objective to promote new affordable housing opportunities	• Targets or objectives for infill housing development (introduced in 2013–14 survey) • High- and medium-density residential development zones in proximity to public transport • Height controls on general, detached, medium- and high-density residential

Source: AULUPP survey, 2007-09 and 2013-14

Both the council planner and the regional-level planner we spoke to explained that while Botany Bay has an industrial heritage and has historically been less desirable as a location to live, its coastal location and proximity to the Sydney CBD has driven housing demand in recent years. Botany Bay is now considered to be part of the high-demand eastern suburbs. As the council planner explained, residential demand has been strengthened by deliberate council efforts to make the area more attractive as a place to live. In particular, landscaping and noise-minimisation projects have sought to improve the liveability of the area—for example, a new road project to accommodate industrial traffic and move it away from residential areas. Strong housing demand has contributed to the viability of residential projects in the area over the study period. This demand has arisen from:

• longer-term shifts in preferences for accessible and inner-city areas

• council efforts to improve the quality of residential areas.

As in the City of Sydney, significant new housing supply has been enabled in the LGA as a result of rezoning, especially the rezoning of former industrial sites to allow for high-density residential. The 2013 adoption of a new LEP, following the new standard format, resulted in significant rezoning.

However, rezonings were also occurring prior to 2013, partially driven by the need to address state-housing supply targets for the area. As the planner explained, the LGA's industrial heritage meant that there were large former industrial sites in single ownership. These sites have been particularly conducive to large-scale urban renewal and high densities of residential development, partly because no site amalgamation was necessary.

When asked about the stance of the council towards new development, the planner commented that the council is generally very supportive of development in specific areas—for example, where land has been rezoned—but has a conservation focus when it comes to some established residential areas. In particular, the council is seeking to minimise the impact of higher-density development on lower-density areas, which can impact the location and design of new infill development.

The planner explained that the council has also generally sought larger apartment sizes—that is, minimum floor area—and more car parking than is required under state policy. They have also been reluctant to accept proposals for studio apartments. However, in order to achieve the outcomes of larger, higher-quality units, they have been willing to accept higher overall densities. This trade-off has generally appealed to developers.

While a planner working at the current Bayside Council was interviewed as part of this research, the interview focussed on the planner's long-time experience in the former Botany Bay LGA.

Key lessons:

- Large-scale redevelopment to high densities made possible by large allotments in single ownership (stemming from industrial heritage).

- High-density residential development made possible through council-led rezonings throughout the study period.

- Demand for inner city and coastal living, coupled with council projects to improve the residential amenity of the area have contributed to housing demand and the viability of residential projects.

4.3.4 Blacktown

At the time of both AULUPP surveys, Blacktown Council had a local planning scheme in place that was originally adopted in 1988. However, at the time of the 2013–14 survey the plan had recently been updated (2013). The results of the 2013–14 survey showed a significant increase in the use of surveyed planning mechanisms, with an additional 24 surveyed controls present in the plan compared to the 2007–2009 survey.

As shown in Table 21, at the time of both surveys, Blacktown's local plan included relatively few of the 16 surveyed planning mechanisms thought to be most significant in potentially constraining or accommodating housing supply growth. However, a small increase is apparent between the two surveys. Additional mechanisms captured in the later survey included specific height controls for:

- residential development generally

- detached and medium-density development specifically.

Other controls to support new housing development remained consistent across the two surveys, including:

- medium- and high-density residential zones in proximity to public transport

- a plan objective to achieve housing diversity.

Table 21: Commonalities and differences in plan content between surveys: Blacktown

Planning data	
Year plan adopted (2013–14 survey)	1988
Year plan last updated (2013–14 survey)	2013
Change in number of surveyed controls	+24

2007–09	2013–14
• High- and medium-density residential zone in proximity to public transport • Objective for housing diversity	• Targets or objectives for infill housing development (introduced in 2013–14 survey) • High- and medium-density residential zone in proximity to public transport • Height controls for general, detached and medium-density residential • Objective for housing diversity

Source: AULUPP survey, 2007-09 and 2013-14

In Blacktown, significant new housing supply over the study period has come from greenfield development in Sydney's North West Growth Area. Development has been enabled under the NSW government's State Environmental Planning Policy (Sydney Region Growth Centres) (Growth Centres SEPP), which came into force in 2006 at the commencement of the study period.

The Growth Centres SEPP has encouraged dwelling diversity in the greenfield growth centres by setting minimum-density targets for precincts. However, in practice—and under strong housing market conditions—the council planners we interviewed explained that developments have generally exceeded the minimum densities by 20–25 per cent. In the absence of maximum-density caps, the scale of development on specific lots is being determined by other controls, such as:

- minimum lot-size requirements
- height limits.

However, these controls still enable densities that are above the precinct minimums. The planners explained that even in low-density contexts, single detached houses are often being constructed with a secondary dwelling at the back, since secondary dwelling development was made complying development in 2009 under state policy. Consistent with the state-level planner interview, the planners explained that development has been able to progress more quickly in greenfield areas where landholdings are large and in single ownership.

The planners explained that the tendency for growth centre development to exceed the minimum-density targets in practice is generating issues for servicing of new development because the planning of infrastructure and services in the greenfield growth centres was based on the minimum-density targets. They explained that the council has historically had a very pro-growth stance and, while that continues to be the case, new concerns are emerging about infrastructure and service capacity following a period of extensive growth.

Despite flexible development controls that allowed for infill development, comparatively little development occurred in Blacktown town centre until late in the study period. As one of the council planners explained, under the more flexible development controls, some development applications were approved but developments did not go ahead. However, in 2015, the council adopted a new LEP that set clear height and density limits for the town centre. Since that time, two mixed-use infill projects have been completed. The certainty around development controls under the new LEP was seen to be a factor in the sites coming forward for development. Changes in the housing market were also identified as a factor in the more recent development of town centre apartments.

Council planners explained that while new buyers in Blacktown have tended to purchase in new-release areas, declining housing affordability in Parramatta, Westmead and other locations in the central west in the latter part of the study period pushed households interested in purchasing apartments further west to areas like Blacktown.

State-level planning reforms to enable the development of secondary dwellings and boarding houses through consistent statewide permissibility and development standards were also seen to have contributed to new infill housing supply. Although not adding to the stock of independent new dwellings, planners in Blacktown explained that there has been significant development of secondary dwellings (or 'granny flats') in established residential areas since the introduction of the statewide policy in 2009. This has particularly been the case in established low-density areas where lot sizes are large enough for the statewide complying development pathway for secondary dwellings to apply. There has also been minor interest in boarding-house development.

Key lessons:

- Greenfield land-supply, including larger allotments, has been an important factor in overall supply.
- Strong housing market conditions supported the viability of higher-density greenfield development and infill apartment development.
- Clearer development controls around maximum height and density seem to support mixed-use infill apartment development in the town centre.
- State planning policies to permit diverse forms of infill housing—particularly secondary dwellings—have impacted on rates of development

Western Australia

4.3.5 Armadale

The 2005 town planning scheme is still in place, although there have been regular updates to certain elements, and a local planning strategy was endorsed by the council and Western Australian Planning Commission (WAPC) in late 2016. Between the two AULUPP surveys, state policy has meant the introduction of infill targets, and there has been work around residential development density.

Table 22: Commonalities and differences in plan content between surveys: Armadale

Planning data	
Year plan adopted (2013–14 survey)	2005
Year plan last updated (2013–14 survey)	2013
Change in number of surveyed controls	+15

2007–09	2013–14
• High- and medium-density residential development zones in proximity to public transport, major nodes or corridors • Height controls or controls on the number of storeys (Residential development generally) • Other controls to regulate the density of residential development (choice='Residential development generally') • Objective for housing diversity	• Targets or objectives for infill housing development (introduced in 2013–14 survey) • High- and medium-density residential development zones in proximity to public transport, major nodes or corridors • Other controls to regulate the density of residential development • Objective for housing diversity

Source: AULUPP survey, 2007-09 and 2013-14

New housing supply in the City of Armadale has been predominantly in the form of separate houses, with some group dwellings. In greenfield areas, almost 95 per cent of housing supply has been in the form of separate houses, with 5 per cent in the form of group dwellings (or townhouses), while infill areas have delivered group dwellings (townhouses) rather than apartments, which are not feasible to develop given the balance between costs and values. The planner explained that the City of Armadale clearly did not achieve a lot of housing diversity during the study period.

When asked about the key factors driving the City of Armadale's housing supply growth, the planner emphasised that the main driver was housing affordability, with cheap land prices drawing developers and homebuyers to the area. Development costs are quite high because the land is low-lying, but these costs were able to be incorporated as the land was so cheap.

Housing supply was also driven by increased land availability, with large areas of land being rezoned for urban development and available when demand increased. There was a high demand for housing during the study period due to economic conditions—particularly in greenfield areas. Improved transport infrastructure supported the increased housing supply in the area, with the extension of major roads and introduction of high-frequency public transport making greenfield and infill areas more accessible to the city.

When asked about the stance of the council towards new development, the planner explained that the council is pro-development and is very supportive of facilitating development to increase the population of the City of Armadale. Certain processes and groups have been put in place to support development and make it easier for developers to deliver housing in the area. Community consultation is also important, particularly in the more established areas.

Key lessons

- Increased land availability and development capacity as a result of rezoning that aligned with market demand.

- Improved transport infrastructure made greenfield areas more accessible, with extension of major roads and introduction of high-frequency public transport.

- Central coordination of processes and agencies ensure processes work more efficiently.

- Working or steering groups of key stakeholders established to resolve issues in a collaborative and transparent manner.

- Engage and consult with the community through forums early in the process.

4.3.6 Belmont

Local planning scheme 15 was introduced in late 2011. Since that time, there have been various minor amendments. While numerous new controls were introduced between the two surveys, the number of key controls remained the same but changed in nature—with a significant addition being incentives for development of affordable housing.

Table 23: Commonalities and differences in plan content between surveys: Belmont

Planning data	
Year plan adopted (2013–14 survey)	2011
Year plan last updated (2013–14 survey)	2014
Change in number of surveyed controls	+19

2007–09	2013–14
• High- and medium-density residential development zones in proximity to public transport, major nodes or corridors • Height controls or controls on the number of storeys • Height controls or controls on the number of storeys • Other controls to regulate the density of residential development • Accessory dwellings/granny flats	• Targets or objectives for infill housing development (introduced in 2013–14 survey) • High- and medium-density residential development zones in proximity to public transport, major nodes or corridors • Height controls or controls on the number of storeys • Other controls to regulate the density of residential development • Objective for housing diversity • Incentives for affordable housing developments

Source: AULUPP survey, 2007-09 and 2013-14

New housing supply in the City of Belmont between 2006 and 2016 was varied by type and density. While housing supply was previously mainly in the form of separate houses with some group dwellings, it has seen a significant influx of development of apartments and therefore an increase in density since 2011—for example, the major Springs development. This was largely due to:

- changes in existing residential coding (R-codes)
- introduction of more flexible coding
- new 2011 planning scheme
- policies to promote higher density.

The planner attributed the City of Belmont's housing supply growth to changes in residential coding that:

- removed restrictions for multiple dwellings
- stimulated development of group or multiple dwellings (apartments).

Flexible coding was also introduced for some areas near the town centre and allowed for infill and higher-density development in existing low-density residential areas—provided developers complied with high standards and criteria. As the planner explained, these standards and criteria ensured:

- better housing outcomes

- more control over development.

The 2011 scheme changed densities in certain areas and gave rise to medium-density development in outer suburbs and high density around the town centre.

Population growth and overseas migration is a key driver of housing supply growth in the City of Belmont, with the planner explaining that the City depends heavily on overseas migration for its population increase. Demographic factors were also important, with an influx of people in the age group 18–24 during the study period, and a range of suitable housing types being available for those people.

When asked about the stance of the council towards new development, the planner explained that the council has generally been pro-development and welcomed infill development because of a desire to increase population, but is also focussed on ensuring guidelines are in place to support better housing outcomes.

Key lessons:

- Changes to residential coding and flexible coding stimulated higher-density development.

- Imposition of high standards and criteria for high-density housing leads to better outcomes.

- Household sizes and types should reflect local demographics, and consequently demand, and the needs of the population.

4.3.7 Cockburn

The local planning strategy for the City of Cockburn received a major update in 2017, outside the study period. Between the two AULUPP surveys, the number of controls actually decreased. However, the major controls around development outcomes remained consistent, apart from an objective to increase housing diversity.

Table 24: Commonalities and differences in plan content between surveys: Cockburn

Planning data	
Year plan adopted (2013–14 survey)	2002
Year plan last updated (2013–14 survey)	2014
Change in number of surveyed controls	−3

2007–09	2013–14
• Height controls or controls on the number of storeys • Accessory dwellings/granny flats	• Targets or objectives for infill housing development (introduced in 2013–14 survey) • High- and medium-density residential development zones in proximity to public transport, major nodes or corridors • Height controls or controls on the number of storeys • Other controls to regulate the density of residential development • Objective for housing diversity • Accessory dwellings/granny flats

Source: AULUPP survey, 2007-09 and 2013-14

4. Local factors driving
housing supply

New housing supply in the City of Cockburn has been varied during the study period. Interviews found that while housing supply in the City was mostly in the form of multiple dwellings around Cockburn Central, changes in residential zoning and upcoding (R-codes) increased the development of some group dwellings and smaller housing types elsewhere in the city. While the City of Cockburn had an objective of obtaining smaller housing types to provide more diversity and affordability, larger dwellings continued to be developed, and not much diversity in housing sizes has been achieved outside the central area in the period 2006–16.

When asked about the key factors driving the City of Cockburn's housing supply growth between 2006 and 2016, the planner emphasised that the housing market and demand is a key factor. The value of land in some areas is not very high and demand for housing in the City is very sensitive to changes in the market, unlike in higher-value areas where demand is steadier. Thus development—particularly greenfield development—suffers when the housing market stagnates. High costs of development and developer contributions in some areas also means that developers cannot make a profit from development, which affects housing supply.

The planner explained that changes in residential zoning and upcoding in the City were also a major driver of housing supply and development of group dwellings, reducing development of multiple dwellings in infill areas and allowing development of smaller dwelling types to occur. Three revitalisation strategies were produced in 2009, 2012 and 2014 that increased residential zoning/upcoding outcomes.

Key lessons:

- Changes to residential zoning and upcoding increased development of smaller housing types.

- Measures and incentives required to minimise density and encourage diversity in density and housing types.

- Actively consult with communities and provide advice and resolve issues upfront to ensure smoother and quicker processes.

4.3.8 Kwinana

Kwinana is currently preparing a new local planning strategy. Since the two AULUPP surveys, a number of new planning controls have been introduced, including:

- permitting of accessory dwellings

- targets relating to infill development.

Table 25: Commonalities and differences in plan content between surveys: Kwinana

Planning data	
Year plan adopted (2013–14 survey)	1992
Year plan last updated (2013–14 survey)	2012
Change in number of surveyed controls	+9

2007–09	2013–14
• High- and medium-density residential development zones in proximity to public transport, major nodes or corridors • Height controls or controls on the number of storeys • Objective for housing diversity	• Targets or objectives for infill housing development • High- and medium-density residential development zones in proximity to public transport, major nodes or corridors • Height controls or controls on the number of storeys • Other controls to regulate the density of residential development • Accessory dwellings/granny flats

Source: AULUPP survey, 2007-09 and 2013-14

New housing supply in the City of Kwinana has mainly been in the form of single houses, with a small amount of apartment development around the town centre. The planner explained that development has primarily occurred in greenfield areas, with some further development in established areas.

When asked about the key factors driving housing supply between 2006 and 2016, the planner said that two critical factors were:

• rezoning of land along the Kwinana freeway and railway line for urban development

• development of greenfield areas.

This rezoning opened up land to urban development and attracted big developers and buyers because of its location and affordability. The construction of train infrastructure also contributed to growth in housing supply, making these areas more accessible and desirable.

Affordability of land and houses also fuelled growth in housing supply, with the planner explaining that demand was high in greenfield areas where land is relatively cheap, but lower in existing areas near the town centre. However, this has also resulted in low quality of built form in certain locations.

When asked about the stance of the council towards new development, the planner explained that while the council was originally focussed on facilitating new urban growth in development, as time has passed it has been more focussed on the quality of built form outcomes. This has resulted in the introduction of policies that aim to improve streetscapes, make areas more attractive to live in, and ensure better longer-term built outcomes. The planner explained that the council will reject development if it does not meet policy.

Key lessons:

• Rezoning to increase residential land-supply and development of greenfield areas were both critical to housing supply growth.

• Engage with and maintain strong relationships with industry and developers.

• Establishing processes for developer contributions ensures that funds are properly managed.

5. Conclusions and policy development options

- There are a number of explanations about why we see an uneven distribution of housing supply across LGAs, including the characteristics of the local housing market and the availability of sites. But crucially it is the ability of the private sector to secure acceptable returns that drives supply.

- The capacity of an LGA to deliver supply growth will depend on the nature of available land, the extent of local demand, and whether there is political appetite for new supply.

- Some LGAs may be unwilling to accept new development, instead wanting to maintain the existing characteristics of the area. Unless a state government is willing to impose development on these areas through the planning system (as has occurred in NSW), large-scale development opportunities will not be available. In contrast, LGAs may actively seek new development to increase the rate base, economic activity and the level of amenities within an area.

- State and local planning interventions can create the conditions for housing supply—but ultimately it is the development industry that take the risk. Sites must deliver a return that compensates for that risk before development occurs.

- Each level of government is able to play a stronger role in supporting residential development within established and new communities by investing in major infrastructure provision and upgrading; coordinating land-supply processes and making available developable sites; and streamlining development approval processes for projects meeting local planning requirements, including expectations for diverse, well-designed and affordable housing options.

In this final chapter we start by discussing whether the supply of housing in Australia has been unevenly distributed, before summarising the lessons that can be drawn from our LGA case studies. We then go on to explore policy development options for increasing the quantity and diversity of housing supply in response to population growth and change.

5.1   Uneven dwelling supply

The data presented in this study confirms that rates of new dwelling supply have been uneven in Australia, with marked differences between and within state jurisdictions. Between 2006 and 2016, total dwelling stock increased nationally by 17 per cent. However:

- WA saw the greatest increase: 26 per cent

- NSW saw the smallest increase: 12 per cent.

- We analysed 489 LGAs for this research. Of those:

- 37 LGAs increased stock levels by more than 50 per cent over 10 years

- 70 per cent of LGAs increased stock by up to 25 per cent—roughly 2 per cent per annum.

Over the period 2006–2016, new dwelling supply—as proxied by building approvals—was concentrated in the inner (usually higher-value) areas in Sydney, Melbourne and Brisbane, while Adelaide and Perth saw the highest number of approvals in middle and outer areas. The relative distribution of supply shows that:

- Greater Sydney has the most even distribution.

- Greater Melbourne saw below-expected levels of supply in its middle ring.

- Brisbane supply was concentrated in the outer areas.

- Greater Adelaide saw strong growth in its inner areas, while the output from middle and outer LGAs was mixed.

- Greater Perth saw very strong growth in its outer areas and little in inner and middle locations.

- There are a number of explanations for this uneven distribution of housing supply across LGAs.

5.1.1 Market conditions

Market conditions are critical. Between 2006–2016, dwelling price growth in NSW was flat until towards the end of the study period, and this lack of price growth dampened development activity. By contrast, WA saw a price boom on the back of expanding mining activity that stimulated development activity up until 2014, with a short fall during the GFC (HIFG 2017).

The different market conditions meant different levels of profitability, hence different supply outcomes. Market conditions vary across LGAs, so it is possible to get different supply outcomes within LGAs in the same GCCs. For example, LGAs containing suburbs with good schools and other amenities may grow in price, while less desirable suburbs may fall in price. Even within LGAs there can be variations because of suburb characteristics.

5.1.2 Development costs and the availability of finance

Development costs and the availability of finance are important issues. While demand may exist, there will be no development if the:

- cost of development is too high

- developers are unable to obtain development finance.

Costs such as land taxes, stamp duty, infrastructure costs and developer contributions all add to the overall cost of development, and can mean the difference between profitable development and no development at all.

If a developer builds these costs into their initial feasibility modelling, they will not proceed if it becomes clear the development is unprofitable. Clarity around such costs is vital to enable developers to make accurate decisions. The appetite of banks to lend for development is also a major determinant—and the finance tap can quickly be turned off if lenders are worried about their exposure to property risk. Sometimes this risk is location-specific if banks believe there is an oversupply in a particular market.

5.1.3 Site availability

The availability of sites and existing housing market characteristics also play a major role. LGAs contain many suburbs, often with different housing market characteristics. Some suburbs may be older, established areas that are already built out and have very limited capacity for new dwelling supply. Others may be new greenfield suburbs with plenty of land available for new house building. Different characteristics will deliver different supply outcomes. The capacity of an LGA to deliver supply growth will depend on:

- the nature of available land
- whether there is a political appetite for new supply.

5.1.4 Political stance

Political stance is important. Some LGAs may be unwilling to accept new development because they want to maintain the existing characteristics of the area. Large-scale development opportunities will not be available unless a state government is willing to impose development on these areas through the planning system. Similarly, upzoning may be restricted, allowing little development of scale. In contrast, some LGAs may actively seek new development to increase the rate base and the level of amenities within an area. The significant variation between planning schemes, permissible development and political will mean that uneven supply is inevitable without state intervention.

5.1.5 Population needs and preferences

In addition to finding that patterns of new housing supply have been geographically uneven, this study has shown that new production has tended towards larger (four- and five-bedroom) homes, rather than smaller dwelling units. This finding suggests that there is an ongoing mismatch between the composition of Australia's housing stock and the nation's changing population needs—and expressed preferences—for smaller homes. Further, the finding is consistent with an ongoing reliance on outer, greenfield locations for new residential development. Due to their distance from inner-city employment areas and public transport networks, these greenfield housing development contexts tend towards lower-density, detached and larger dwelling typologies.

All of these points can be summarised thus: the availability of profitable development sites dictates the types of dwellings that will be built, in the absence of other policy intervention. Planners do what they can to create the conditions for new and diverse housing supply but it is ultimately the development industry that takes the risk, so sites must deliver a return that compensates for that risk before development occurs. Market conditions are beyond the control of an LGA. However, there are some options available for those LGAs seeking to increase and diversify new housing supply, and for state governments seeking to improve the distribution of new homes across a metropolitan region.

5.2   Lessons from LGAs

Data derived from qualitative research methods—including analysis of the policy content of local plans (AULUPP survey), and interviews with state-, metropolitan- and local-level planners—suggest that the factors explaining patterns of housing supply are nuanced and are the result of complex interactions. Nevertheless, a number of key lessons emerge from the case-study research of LGAs delivering high levels of supply and diversity.

5.2.1 Development control

Data from the AULUPP survey show that over the study period, the eight case-study LGAs adopted and maintained policies that in the planning and housing literature have been considered to be growth-constraining, as well as policies seen to enable diverse housing. This suggests that the extent to which zoning and development controls allow for development that meets demand—and that is financially viable in particular market contexts—is more important for understanding supply outcomes than the presence of any specific controls. In a counterpoint to many studies of the impact of planning on housing markets, one planner in Sydney explained that redevelopment opportunities in the LGA's town centre were taken up only when more flexible development controls were replaced by clearer development controls for key sites. This suggests that the way in which specific development controls impact housing development is highly nuanced.

5.2.2 Rezoning

Across the eight case-study LGAs, the rezoning of land to allow for residential development or higher densities of residential development was seen as an important factor in enabling housing supply. However, as planners across the LGAs explained, it was only under the right market conditions that development opportunities created through rezoning—and through state-level planning reforms to enable particular types or densities of residential development—were taken up. Under weak housing market conditions, development has not occurred, despite being permitted. Strong housing market conditions in Sydney in the latter half of the study period made higher-density zoning that was put in place in earlier years—particularly in suburban town centres—financially viable to develop. Likewise, state-level planning reforms to enable diverse forms of residential development and higher densities of development worked to support diverse housing supply—but only when and where market conditions supported their development.

5.2.3 Infrastructure

The capacity of key infrastructure and services to support population growth was identified as an important factor in supporting and sustaining growth. In many of the case-study LGAs, infrastructure investment by state and local government, particular transport infrastructure upgrades, were seen to be a key factor in enabling population growth and higher densities of development.

5.2.4 Availability of large sites

The nature of the land-supply in specific locations is also important. In WA, where the majority of new housing supply has been in the form of detached houses, the presence of easy-to-develop greenfield sites was an important factor in determining the location of new supply over the study period. In Sydney, the presence of large sites in single ownership—both greenfield and brownfield—was seen as an important factor in levels of housing supply. As the planners explained, large sites are conducive to large-scale, master-planned development as they:

• are not delayed by the need for site amalgamations

• can incorporate the amenities that buyers look for.

5.2.5 Policy reforms

What is the role of government in enabling housing supply? The case-study findings suggest that policy reforms have played a small, but not insignificant, role in overall housing supply and supply diversity. This includes policies to:

• support the permissibility of particular types of development

• simplify or expedite development approval processes.

Investment in infrastructure and services to support population growth was seen to have played a more significant role in enabling supply in high-growth areas. Related to this, interviewees, particularly in Sydney, regarded infrastructure and services nearing or exceeding capacity to be a significant issue for further growth. This suggests that a significant way that governments can support housing supply is by investing in infrastructure and services. Planning-based incentives or concessions to enable higher densities of development could also be geographically targeted to areas with infrastructure capacity but limited development activity.

5.3   Policy development options

A number of potential policy development options have emerged from this study. Overall, each level of government is able to play a stronger role in supporting residential development within established and new communities by:

• investing in major infrastructure provision and upgrading

• coordinating land-supply processes

• streamlining development approval processes for projects meeting local planning requirements—including expectations for diverse, well-designed and affordable housing options.

Housing development is ultimately stimulated by market conditions and the ability to deliver an acceptable return. For those LGAs looking to increase housing supply, market conditions need to be correct, otherwise policy intervention is required or the public sector itself needs to lead development. While LGAs have no control over market conditions, there are some options available to deliver development that might not have otherwise occurred. There will always be an uneven supply of housing because of the different nature of locations, but those LGAs chasing new development could consider the following options.

5.3.1 Site availability and assembly

The availability of development sites is crucial to new housing supply. Local governments and state development agencies such as Landcom and Development WA have a role to play in assembling sites that allow developers to deliver at scale and avoid the problems associated with piecemeal infill development (Rowley, Ong et al. 2017).

State development agencies have been responsible for preparing many difficult development sites for release to the private sector, and should play an expanded role—especially as most easy-to-develop sites are gone. While developable state and LGA land is limited, any opportunities that do arise should be maximised, while also delivering a supply of affordable housing. Greenfield development remains an important supply of housing, despite governments seeking to increase the proportion of infill development to control urban sprawl. Efficient utilisation of such sites—along with quality supporting infrastructure—can encourage high-quality development outcomes.

Further, careful staging of new development can maximise the use and availability of infrastructure for new communities in greenfield locations. Although there is often pressure to allow new projects as they are brought forward, smaller housing developments that are isolated from major transport or social infrastructure are costly and inefficient to service, and disadvantage new residents.

5.3.2 Urban regulation and the planning process

Related to Section 5.3.1 is the need to ensure sites are realistically zoned, in order to:

• stimulate development

• maximise development outcomes.

Policy makers need to take market conditions into account when zoning sites; if they get it wrong, there will be no development—or in some cases, sites and infrastructure will be underutilised. An assessment of what would be financially feasible to develop on sites should be undertaken during any zoning or rezoning process. This includes the composition and nature of new housing, with provisions to enable diverse design typologies offering a mix of smaller and larger dwellings relating to development controls over:

• minimum lot sizes

• building heights

• building setbacks.

Expectations for infrastructure contributions or affordable housing need to be predictable and consistently embedded within rezoning or master-planning processes, with developers able to factor these obligations when acquiring land.

Communication and consultation with the development sector is essential for state and local governments to understand patterns of land ownership and potential capacity to meet targets for new population and housing supply. Similarly, state governments can support local councils and housing developers by:

• contributing to community consultation processes

• articulating the need for all communities to accommodate population growth and change through new and diverse residential development.

5.3.3 Reducing the cost of development, and adjusting the timing of infrastructure obligations

Some costs of development are unavoidable. However, there is a certain amount of flexibility that could be employed to ensure development projects that are financially marginal could become viable and deliver housing supply. For example, restructuring taxes and other contributions so they are payable at the completion of the development rather than upfront would help marginal projects. In this regard, NHFIC could help local governments support major projects with upfront, low-cost finance for infrastructure investments. Public–private joint ventures—particularly where government supplies the land—can also deliver developments that would not otherwise have been feasible.

Further research and policy development is needed to explore the factors contributing to higher construction costs, and to ensure that planning regulations balance environmental and amenity considerations.

5.3.4 Alternative approaches to development

Beyond the land-use planning and development process, factors impacting on the feasibility of housing projects—such as residential construction costs and access to finance—warrant further research and policy consideration. Alternative finance models and new construction technologies could alter the housing supply equation.

5. Conclusions and policy
development options

A clear finding in this study was that market forces are strongly determinative of the quantity, distribution and diversity of new housing supply in the private market. A more responsive housing system—attuned to changing population needs rather than dependent on property market cycles—is likely to require a more diversified system of production. This implies continued efforts to expand and sustain the social and affordable housing sector, as well as new initiatives to diversify housing products and choices, such as:

• purpose-built rental accommodation

• deliberative (resident-led) or cooperative forms of housing development

• low-cost or shared-equity forms of ownership.

Diversifying housing products and producers—and stronger government involvement in land and housing development, including through demonstration projects—will help offset market cycles and enable more stable patterns of new supply.

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Appendices

Appendix 1: Australian Urban Land Use Planning Policy survey (AULUPP)

The Australian Urban Land Use Planning Policy survey (AULUPP) was designed to capture information on the content of local plans across Australia. Using a matrix design to compress and group policy areas and key regulatory mechanisms, the survey instrument enabled detailed data collection through a short (seven-screen) survey. It was designed for online administration via a secure URL. The survey for each LGA could be completed by any qualified planning professional (either in local government or a researcher) referring to a publicly available local planning instrument.

Survey questions pertain to the regulatory mechanisms used by local governments in their planning schemes to:

* manage land use and residential densities

* manage the diversity of new housing—for example, by permitting diverse dwelling types

* manage the location of new housing—for example, its proximity to public transport

* address other key policy issues, including:

* environmental sustainability

* provision of affordable housing.

Further details on the survey content are available in Gurran, Gilbert et al. (2014) and Gilbert and Gurran (2020). The design and content of the AULUPP survey was inspired by surveys of local planning controls demonstrated internationally (Lewis and Neiman 2000, Pendall 2000, Pendall, Puentes et al 2006, Knaap, Meck et al. 2007).

However, AULUPP survey questions were tailored to the Australian context. This was achieved by first analysing a sample of local planning instruments from each Australian state and territory to identify the breadth of regulatory measures used:

* to address environmental sustainability goals

* to manage housing development across Australia's planning systems.

The survey's coverage of regulatory mechanisms and its logic and usability was then reviewed by an expert group of planning professionals with experience across the different Australian jurisdictions, and was piloted by local practicing planners.

The first survey was open between 2007 and 2009. All local governments across Australia were invited to participate in the survey. A second survey was open from 2013 to 2014. The form and content of the second survey was kept consistent with the first survey to enable direct comparison of responses. The only difference was the addition of seven questions capturing additional regulatory mechanisms related to:

• managing the density of residential development

• supporting new development in proximity to public transport

• allowing for diverse housing types.

The same approach was used to invite local government planners to participate in the survey. Once again, additional returns were completed by the researchers. This combined approach resulted in 200 responses. As researcher returns focussed on the largest capital cities, near complete coverage was achieved of the Sydney, Melbourne, Perth and Brisbane metropolitan regions.

Analysis of survey data

Previous research undertaken by members of the research team trialled a number of approaches to quantifying differences in local plan content using the AULUPP survey data, focussing in particular on the potential implications of those differences for residential growth. One approach was to calculate a simple cumulative score based on the number of surveyed planning mechanisms found to be present in each plan. This captured differences in the volume of surveyed planning controls across different plans and over time. However, it says little about the extent to which the controls that are in place may constrain or accommodate new housing development, as a high volume of controls may not necessarily indicate a restrictive regulatory framework.

Recognising that planning controls may have very different potential impacts on growth, in research undertaken by Ong, Dalton et al. (2017) on the impact of local planning on housing supply, each planning control was weighted based on its potential to accommodate or constrain residential development (Ong, Dalton et al. 2017). The surveyed planning controls were classified as either:

• growth accommodating

• growth restrictive.

They were then weighted on a scale of one to three (with three being those perceived to be most impactful in terms of either accommodating or restricting growth) (see Appendix 3 in Ong, Dalton et al. 2017 for a explanation of how planning controls were classified and weighted). This enabled two weighted scores to be calculated by multiplying each present control by a factor of one to three, and then calculating:

• a total score for growth-restrictive controls

• a total score for growth-accommodating controls (Ong, Dalton et al. 2017, p. 40–41).

Using this approach, modelling by Ong, Dalton et al. found that the weighted score for growth-accommodating measures was positively correlated with dwelling approvals. The growth-restricting cumulative score was negatively correlated, but not statistically significant (Ong, Dalton et al. 2017, p. 48). This finding suggests that the attitude of LGAs to development can have an impact on supply outcomes; we will return to this theme later in the report.

Elements of both of these approaches were used for this study to examine whether changes in planning policy have impacted patterns of housing supply, and to undertake more detailed analysis of planning policy changes in LGAs experiencing diverse housing growth over the study period.

To compare the extent of policy changes across LGAs in the Perth and Sydney metropolitan regions between the two surveys, cumulative scores were calculated for each LGA for each survey. The cumulative score for the 2013–14 survey was then subtracted from the cumulative score for the 2007–09 survey to identify whether there was a significant change in the volume of surveyed controls between the two surveys:

- A negative score indicated a decline in the volume of surveyed controls between the two surveys.
- A positive score indicated increased use of the surveyed controls.

The score also provided a relative indication of the extent of planning policy change compared to other LGAs in the metropolitan region.

LGAs were identified for more detailed case-study analysis, using the data on changes in the cumulative volume of surveyed controls, as well as information from the 2013–14 survey on the date each plan was adopted and last updated, together with the findings of the housing supply analysis.

The case studies focussed on examining potential factors to explain high-supply growth and diverse housing delivery in selected LGAs, including the role of planning policy changes. Recognising that many planning controls may be relatively benign in terms of their impact on new housing supply, a decision was made to focus on ten policy areas (covering 16 survey fields) that were considered most significant in terms of potentially enabling or constraining new housing supply generally, and diverse housing forms and price-points specifically (including affordable housing). The selected controls are outlined in Table 26.

The majority of controls were considered significant in potentially enabling diverse and affordable housing. Height controls and other (unspecified) controls to regulate the density of residential development were selected, owing to their potential to constrain residential densities. Other types of density controls—such as beyond height and floorspace ratio limitations, minimum lot size requirements and setbacks—were considered to potentially be development-constraining in signifying an additional commitment to density management. They are also most often locally specific controls that developers may be less familiar with.

Table 26: AULUPP planning control variables: Potential impact on supply

Targets or objectives for infill housing development
High- and medium-density residential development zones in proximity to public transport, major nodes or corridors
Height controls or controls on the number of storeys (choice='Residential development generally')
Height controls or controls on the number of storeys (choice='Detached residential development')
Height controls or controls on the number of storeys (choice='Medium density residential development')
Height controls or controls on the number of storeys (choice='High density residential development')
Other controls to regulate the density of residential development (choice='Residential development generally')
Other controls to regulate the density of residential development (choice='Detached residential development')
Other controls to regulate the density of residential development (choice='Medium density residential development')
Other controls to regulate the density of residential development (choice='High density residential development')
Objective for housing diversity
Objective to promote new affordable housing opportunities
Accessory dwellings/granny flats (choice='residential development generally')
Incentives for affordable housing developments
Signal that contributions for affordable housing will be sought when applications for residential rezoning / variation of residential development standards are lodged
Other requirement or incentive for affordable housing

Source: AULUPP survey, 2007-09 and 2013-14

To examine planning policy changes across the two surveys, data for the selected LGAs were extracted from the main dataset. The analysis focussed on the 16 fields outlined in Table 26 that captured information on planning policy settings determined by the researchers to have the greatest potential to either constrain or accommodate new housing supply, particularly diverse and affordable housing forms. Results from each survey were compared to identify where policy had remained consistent or changed between the two surveys. To support the analysis, tables were constructed setting out which of the selected policies were present in the 2007–09 and the 2013–14 survey data.

Appendix 2: Supply data

Table 27: Sydney

LGA name	Level of stock 2006	Median house price 2006–2016	Real house price change 2006–2016 (%)	Median unit price 2006–2016	Real unit price change 2006–2016 (%)	LQ all approvals
Camden	15,548	$550,000	51	$400,000	66	3.66
Botany Bay	11,689	$1,060,000	99	$560,000	98	3.57
Sydney	61,876	$1,080,000	105	$680,000	57	2.24
Lane Cove	11,428	$1,640,000	67	$630,000	65	1.83
Strathfield	10,448	$1,520,000	105	$540,000	43	1.73
Canada Bay	23,234	$1,350,000	106	$740,000	38	1.72
Ryde	31,979	$1,140,000	103	$600,000	58	1.68
The Hills Shire	38,358	$920,000	78	$620,000	51	1.66
Burwood	9,773	$1,190,000	103	$630,000	70	1.48
Liverpool	46,826	$560,000	66	$370,000	51	1.34
North Sydney	25,401	$1,770,000	72	$790,000	60	1.24
Blacktown	78,788	$520,000	70	$400,000	60	1.21
Rockdale	30,369	$940,000	94	$600,000	59	1.19
Ku-ring-gai	32,749	$1,510,000	73	$760,000	35	1.15
Wollondilly	12,953	$540,000	58	$320,000	29	1.04
Penrith	53,622	$480,000	67	$360,000	52	0.98
Hornsby	41,595	$930,000	83	$560,000	51	0.95
Canterbury-Bankstown	90,670	$820,000	93	$440,000	83	0.87
Campbelltown	39,873	$440,000	64	$330,000	74	0.81
Woollahra	17,567	$2,410,000	60	$880,000	73	0.70
Randwick	41,363	$1,540,000	77	$710,000	60	0.58
Willoughby	23,151	$1,700,000	82	$730,000	51	0.55
Fairfield	49,920	$550,000	80	$320,000	79	0.53
Waverley	22,597	$1,960,000	77	$800,000	76	0.52
Sutherland Shire	67,088	$910,000	68	$570,000	60	0.51
Hawkesbury	18,968	$540,000	59	$370,000	48	0.42
Hunters Hill	4,003	$2,100,000	55	$880,000	75	0.41
Blue Mountains	27,281	$480,000	46	$390,000	30	0.36
Mosman	9,908	$2,780,000	46	$810,000	72	0.34
Average	**32,725**	**$1,170,000**	**76**	**$578,966**	**59**	**32725**

Source: ABS census data, Corelogic data accessed through SIRCA

Appendices

Table 28: Melbourne

LGA name	Level of stock 2006	Median house price 2006–2016	Real house price change 2006–2016 (%)	Median unit price 2006–2016	Real unit price change 2006–2016 (%)	LQ all approvals
Melbourne	31,000	$850,000	54	$520,000	11	5.04
Wyndham	36,019	$380,000	49	$300,000	25	2.75
Cardinia	19,110	$380,000	33	$300,000	18	2.25
Melton	24,812	$380,000	28	$300,000	13	2.05
Whittlesea	38,825	$430,000	44	$340,000	18	2.00
Maribyrnong	22,215	$650,000	83	$430,000	21	1.34
Yarra	17,808	$930,000	81	$560,000	16	1.30
Stonnington	33,759	$1,430,000	68	$570,000	25	1.23
Casey	68,337	$410,000	53	$330,000	26	1.18
Hume	43,581	$380,000	40	$330,000	18	1.13
Moreland	47,075	$620,000	70	$450,000	30	1.03
Port Phillip	33,486	$1,170,000	67	$570,000	27	0.99
Moonee Valley	35,447	$790,000	73	$480,000	18	0.90
Mornington Peninsula	49,092	$540,000	53	$400,000	29	0.82
Macedon Ranges	13,270	$430,000	38	$340,000	16	0.79
Darebin	44,076	$680,000	78	$430,000	33	0.78
Glen Eira	43,070	$1,030,000	77	$540,000	32	0.75
Whitehorse	47,880	$820,000	104	$550,000	55	0.74
Bayside	28,000	$1,340,000	55	$690,000	33	0.71
Monash	53,239	$830,000	103	$550,000	38	0.68
Boroondara	49,187	$1,500,000	80	$600,000	26	0.66
Kingston	44,183	$680,000	73	$470,000	52	0.61
Greater Dandenong	41,137	$470,000	89	$340,000	49	0.61
Hobsons Bay	27,510	$630,000	81	$460,000	46	0.59
Manningham	34,549	$880,000	88	$580,000	31	0.59
Frankston	41,367	$420,000	62	$330,000	32	0.58
Maroondah	32,505	$580,000	85	$420,000	65	0.51
Banyule	38,583	$620,000	69	$480,000	35	0.50
Brimbank	50,646	$430,000	80	$330,000	40	0.47
Knox	46,957	$550,000	85	$420,000	47	0.40
Yarra Ranges	47,992	$470,000	62	$390,000	53	0.40
Nillumbik	18,404	$580,000	25	$480,000	46	0.31
Average	**37,598**	**$696,250**	**67**	**$446,250**	**32**	**37598**

Source: ABS census data, Corelogic data accessed through SIRCA

Table 29: Adelaide

LGA name	Level of stock 2006	Median house price 2006–2016	Real house price change 2006–2016 (%)	Median unit price 2006–2016	Real unit price change 2006–2016 (%)	LQ all approvals
Adelaide	4,421	$900,000	39	$470,000	12	3.40
Mount Barker	9,411	$400,000	18	$290,000	7	1.76
Playford	22,433	$270,000	10	$160,000	–3	1.75
Gawler	6,784	$330,000	8	$210,000	1	1.47
Port Adelaide Enfield	37,218	$420,000	21	$300,000	21	1.36
Charles Sturt	35,755	$500,000	24	$370,000	23	1.25
Campbelltown	16,860	$510,000	23	$350,000	34	1.16
Marion	27,630	$450,000	20	$380,000	27	1.15
Walkerville	2,503	$190,000	32	$480,000	2	0.99
Onkaparinga	54,437	$360,000	15	$270,000	18	0.96
Salisbury	40,338	$320,000	15	$250,000	13	0.94
Norwood Payneham St Peters	11,762	$690,000	37	$400,000	18	0.88
West Torrens	20,296	$510,000	27	$310,000	22	0.83
Holdfast Bay	12,679	$650,000	26	$420,000	1	0.74
Prospect	7,090	$610,000	36	$330,000	28	0.65
Unley	12,299	$790,000	27	$400,000	20	0.46
Mitcham	22,220	$570,000	22	$340,000	22	0.43
Adelaide Hills	13,403	$530,000	17	$330,000	8	0.42
Burnside	14,263	$840,000	18	$410,000	35	0.39
Tea Tree Gully	33,531	$390,000	17	$290,000	5	0.38
Average	20,267	$511,500	22	$338,000	16	

Source: ABS census data, Corelogic data accessed through SIRCA

Table 30: Perth

LGA name	Level of stock 2006	Median house price 2006–2016	Real house price change 2006–2016 (%)	Median unit price 2006–2016	Real unit price change 2006–2016 (%)	LQ all approvals
Perth	5,415	$850,000	15	$540,000	−16	4.05
Serpentine-Jarrahdale	4,215	$450,000	−12	.	.	3.13
Kwinana	8,246	$350,000	−8	$230,000	−41	2.10
Armadale	17,540	$380,000	1	$300,000	−20	1.95
Wanneroo	35,413	$470,000	−11	$370,000	−17	1.92
Mandurah	20,122	$430,000	−29	$390,000	−33	1.59
Swan	30,423	$450,000	−9	$370,000	−18	1.46
Belmont	10,971	$520,000	−8	$420,000	−3	1.45
Cockburn	25,176	$530,000	−2	$410,000	5	1.42
Murray	3,895	$430,000	−20	$290,000	.	1.40
Rockingham	28,940	$430,000	−18	$320,000	−26	1.34
Victoria Park	10,032	$600,000	3	$470,000	−1	0.90
Vincent	10,186	$870,000	−4	$510,000	−7	0.90
Stirling	56,400	$630,000	−7	$420,000	−7	0.84
Gosnells	31,494	$410,000	−10	$340,000	−12	0.82
Claremont	3,067	$1,460,000	−19	$710,000	−29	0.80
Fremantle	8,920	$740,000	−13	$600,000	−13	0.76
Subiaco	6,283	$1,240,000	−10	$630,000	−24	0.72
Bayswater	20,687	$570,000	−10	$370,000	−3	0.67
Bassendean	4,768	$500,000	−7	$390,000	−16	0.63
Canning	26,057	$560,000	0	$410,000	−12	0.61
Cambridge	8,160	$1,280,000	−9	$360,000	23	0.61
Cottesloe	2,698	$1,990,000	−7	$870,000	−25	0.60
Kalamunda	17,235	$510,000	−9	$370,000	0	0.55
South Perth	12,199	$930,000	−7	$540,000	−4	0.52
Nedlands	6,730	$1,730,000	−18	$780,000	−44	0.41
Peppermint Grove	464	$3,760,000	5	$690,000	.	0.41
East Fremantle	2,143	$1,140,000	−8	$570,000	−5	0.39
Mundaring	12,041	$550,000	−14	$300,000	.	0.35
Melville	30,775	$780,000	−3	$500,000	−7	0.31
Mosman Park	3,072	$1,430,000	−22	$400,000	0	0.25
Joondalup	49,940	$610,000	−5	$430,000	−19	0.24
Average	**16,053**	**$861,875**	**−8.53**	**$461,290**	**−13**	

Source: ABS census data, Corelogic data accessed through SIRCA

Table 31: Brisbane

LGA name	Level of stock 2006	Median house price 2006–2016	Real house price change 2006–2016 (%)	Median unit price 2006–2016	Real unit price change 2006–2016 (%)	LQ all approvals
Ipswich	47,022	$350,000	1	$310,000	16	1.50
Moreton Bay	109,003	$440,000	6	$360,000	4	1.13
Somerset	6,702	$340,000	−1	$270,000	.	1.09
Brisbane	341,960	$600,000	24	$460,000	3	0.99
Redland	41,341	$510,000	5	$390,000	15	0.77
Logan	78,543	$410,000	5	$290,000	3	0.72
Scenic Rim	11,968	$450,000	1	$270,000	37	0.65
Average	**90,934**	**$442,857**	**6**	**$335,714**	**13**	

Source: ABS census data, Corelogic data accessed through SIRCA

Appendix 3: Building approvals and price
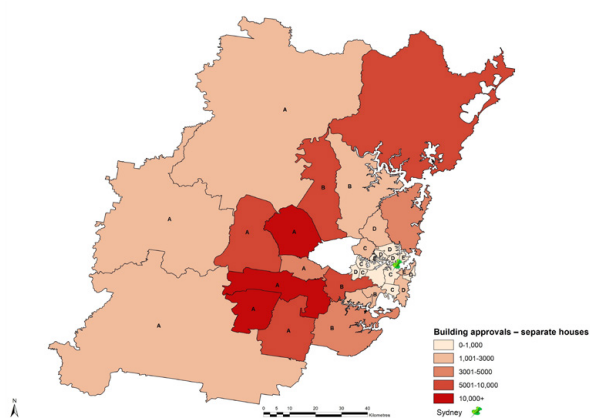
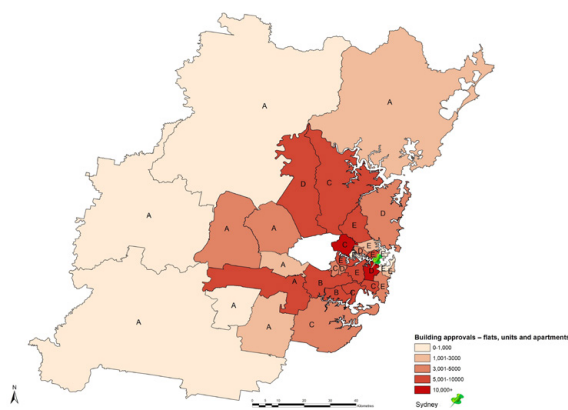|	Figure A16: NSW House price categories	Figure A17: NSW Unit price categories
A	0–$600,000	$0–$400,000
B	$600,001–$1m	$400,001–$500,000
C	$1,000,001–$1,500,000	$500,001–$600,000
D	$1,500,001–$2,000,000	$600,001–$700,000
E	$2,000,000+	$700,000+
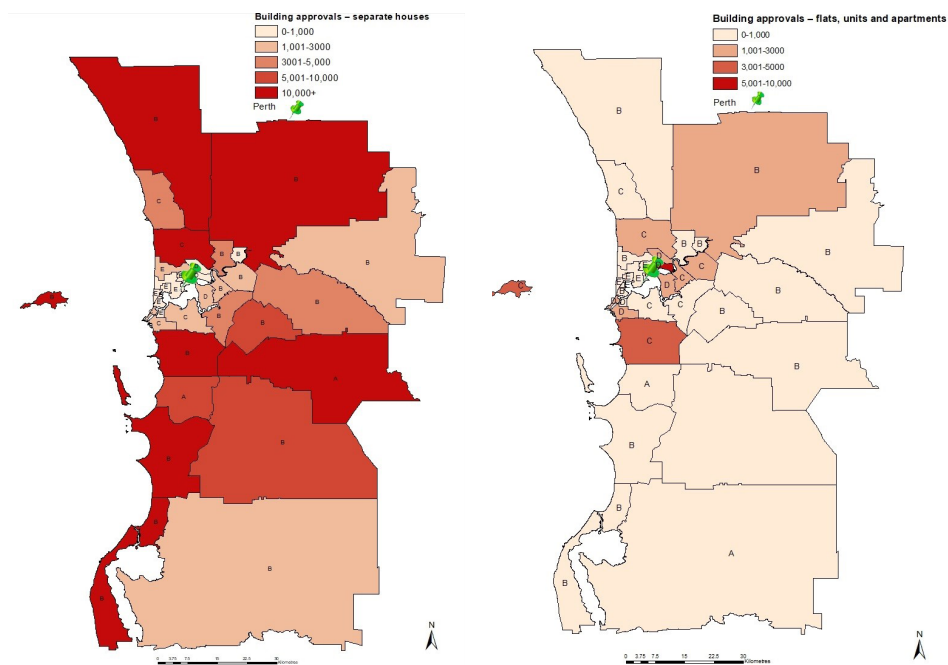
	Figure A18: WA House price categories	Figure A19: WA Unit price categories
A	$0–400,000	$0–$300,000
B	$400,001–$600,000	$300,001–$400,000
C	$600,001–$800,000	$400,001–$500,000
D	$800,001–$1,000,000	$500,001–$600,000
E	$1,000,000+	$600,000+

Appendix 4: Equations

Model 1

$$\ln(B_{jt}) = \beta_0 + \beta_1 shh_{jt-1} + \beta_2 d_j + \beta_1 d_j^2 + \beta_3 \ln(pop_{jt}) + \beta_4 \ln(pdens_{jt}) + \beta_5 \ln(ph_{jt})$$
$$+ \beta_6 [\ln(ph_{jt-1}) - \ln(ph_{jt-2})] + \beta_7 [\ln(cc_{jt-1}) - \ln(cc_{jt-2})] + u_{jt}$$

Model 2

$$\ln(B_{jt}) = \beta_0 + \beta_1 shh_{jt-1} + \beta_2 d_j + \beta_1 d_j^2 + \beta_3 \ln(pop_{jt}) + \beta_4 \ln(pdens_{jt}) + \beta_5 \ln(ph_{jt})$$
$$+ \beta_6 [\ln(ph_{jt-1}) - \ln(ph_{jt-2})] + \beta_7 [\ln(cc_{jt-1}) - \ln(cc_{jt-2})] + \sum_{k=8}^{13} S' \beta_k + u_{jt}$$

Model 3

$$\ln(B_{jst}) = \beta_0 + \beta_1 shh_{jt-1} + \beta_2 d_j + \beta_1 d_j^2 + \beta_3 \ln(pop_{jt}) + \beta_4 \ln(pdens_{jt}) + \beta_5 \ln(ph_{jt})$$
$$+ \beta_6 [\ln(ph_{jt-1}) - \ln(ph_{jt-2})] + \beta_7 [\ln(cc_{jt-1}) - \ln(cc_{jt-2})] + u_s + \varepsilon_{jst}$$

Model 4

$$\ln(B_{jst}) = \beta_0 + \beta_1 shh_{jt-1} + \beta_2 d_j + \beta_1 d_j^2 + \beta_3 \ln(pop_{jt}) + \beta_4 \ln(pdens_{jt}) + \beta_5 \ln(ph_{jt})$$
$$+ \beta_6 [\ln(ph_{jt-1}) - \ln(ph_{jt-2})] + \beta_7 [\ln(cc_{jt-1}) - \ln(cc_{jt-2})] + u0_s$$
$$+ u1_s \ln(ph_{jt}) + \varepsilon_{jst}$$

Model 5

$$\ln(B_{jst}) = \beta_0 + \beta_1 shh_{jt-1} + \beta_2 d_j + \beta_1 d_j^2 + \beta_3 \ln(pop_{jt}) + \beta_4 \ln(pdens_{jt}) + \beta_5 \ln(ph_{jt})$$
$$+ \beta_6 [\ln(ph_{jt-1}) - \ln(ph_{jt-2})] + \beta_7 [\ln(cc_{jt-1}) - \ln(cc_{jt-2})] + u0_s$$
$$+ u1_s \ln(ph_{jt}) + u2_s shh_{jt-1} + \varepsilon_{jst}$$

Where

j	subscript denoting *j*th LGA
t	subscript denoting *t*th observation year
s	subscript denoting *s*th State
shh	share of completions that are houses
d	distance to CBD
d²	square of distance to CBD
pop	population
pdens	population density
ph	real housing price
cc	real construction cost index
S	vector of State-level dummy variables
u_{jt}	panel model error term
ε_{jst}	multilevel model error term
u_s	State-level random intercept (random effect)
$u1_s$	State-level coefficient (random effect)
$u2_s$	State-level coefficient (random effect)

Appendix 5: Case-study profiles

Blacktown

Blacktown is a large local government area located in the north-west of Sydney. Its population at the time of the 2016 Census was over 336,000 people. Blacktown encapsulates the south-eastern part of Sydney's North West Growth Area. It is serviced by the Western and Richmond to Leppington rail lines which, respectively, connect the LGA to the CBD and to the north-west and south-west of the Sydney metropolitan region.

The southern and eastern parts of the LGA are characterised by established suburbs and newer infill development around rail stations, service centres and other transport nodes. Parts of the north and west of the LGA (which form part of the North West Growth Area) are characterised by newer suburbs—at predominantly low, but also medium densities—and ongoing greenfield development.

At the time of the 2016 Census, Blacktown had a larger average household size (3.2 persons) and a younger median age (33) compared to the broader Sydney metropolitan region—which suggests the presence of younger families. Overall, median household income is just slightly below the average for the region. The majority of houses are detached (78 per cent), and the largest proportion (42 per cent) are owned with a mortgage. The number of homes owned outright is lower than the regional average, which likely also reflects the younger demographic profile. The proportion of households renting is also slightly below the average for the metropolitan region.

Table 32 shows key Blacktown data over the study period. Total dwelling stock increased by 18 per cent in 10 years, while house prices more than doubled over the same period. With an LQ of 1.21, Blacktown received building approvals 21 per cent higher than expected given its starting share of population.

Table 32: Overview of housing supply and price data: Blacktown

Housing supply and price data	
Location	Outer
Dwelling stock 2006	74,610
Dwelling stock 2016 (growth on 2006)	88,275 (18%)
LQ (Share of accumulated building approvals relative to share of population)	1.21
Median house price (2016)	$750,000
Median unit price (2016)	$551,000
House price change (2006–16)	114%
Unit price change (2006–16)	84%

Source: ABS census data, Corelogic data accessed through SIRCA

City of Sydney

The City of Sydney LGA encloses the Sydney CBD and its surrounding suburbs to the south and west. The LGA is characterised by newer high-rise apartments and older medium-density neighbourhoods—predominantly characterised by terraced housing, some of which is heritage-listed. Detached houses make up just two per cent of the dwelling stock in the LGA. The majority of dwellings (77%) are apartments.

Compared to the broader Sydney region, the City of Sydney has a younger population, with an average age of 32, as opposed to 36. It has a smaller average household size, with a median household income that is significantly above the regional median. However, while couple and single-person households make up a significant share of the population, there is also a significant proportion of group households. Groups of unrelated adults sharing accommodation make up just over 15 per cent of households.

In contrast to the broader metropolitan region—where there is a more even distribution of outright ownership, ownership with a mortgage and renting—households in the City of Sydney are more heavily concentrated in the rental sector. Just over 62 per cent of households in the City of Sydney are renters. Approximately 20 per cent are purchasing with a mortgage.

Table 33 shows key City of Sydney data over the study period. Total dwelling stock increased by 25 per cent in 10 years, while house prices increased by 174 per cent over the same period and unit prices more than doubled. With an LQ of 2.24, City of Sydney received building approvals 124 per cent higher than expected given its starting share of population.

Table 33: Overview of housing supply and price data: City of Sydney

Housing supply and price data	
Location	Inner
Dwelling stock 2006	77,809
Dwelling stock 2016 (growth on 2006)	96,164 (25%)
LQ (Share of accumulated building approvals relative to share of population)	2.24
Median house price (2016)	$1,630,000
Median unit price (2016)	$858,000
House price change (2006–16)	174%
Unit price change (2006–16)	110%

Source: ABS census data, Corelogic data accessed through SIRCA

Liverpool

Liverpool LGA is located in the outer western part of the Sydney metropolitan region. The eastern part of the LGA, which is serviced by rail lines that connect to the CBD, Parramatta and north-western Sydney, is characterised by established neighbourhoods and higher-density development around rail stations and service centres. The western part of the LGA is semi-rural in nature. Western parts of the LGA form part of the metropolitan region's South West Growth Area. The western part of the LGA around Badgery's Creek will be the site of Sydney's second airport, with the surrounding area now identified by the state government as a priority growth area.

In comparison to the broader metropolitan region, Liverpool LGA has a lower median age, a larger median household size and a lower median household income. Like Blacktown LGA, the majority of the dwelling stock is detached housing (76 per cent). Similarly, owning with a mortgage is the most common housing tenure, accounting for 40 per cent of households. The proportion of households in the rental sector is just below the regional median at 32 per cent.

Table 34 shows key Liverpool data over the study period. Total dwelling stock increased by 20 per cent in 10 years, while house prices increased by 107 per cent over the same period and unit prices by 88 per cent. With an LQ of 1.34 Liverpool received building approvals 34 per cent higher than expected given its starting share of population.

Table 34: Overview of housing supply and price data: Liverpool

Housing supply and price data	
Location	Outer
Dwelling stock 2006	52,023
Dwelling stock 2016 (growth on 2006)	62,387 (20%)
LQ (Share of accumulated building approvals relative to share of population)	1.34
Median house price (2016)	$795,000
Median unit price (2016)	$499,225
House price change (2006–16)	107%
Unit price change (2006–16)	88%

Source: ABS census data, Corelogic data accessed through SIRCA

Botany Bay

Botany Bay is an inner-ring LGA local government area located south-east of Sydney's CBD (which is now incorporated into Bayside Council following 2016 amalgamations). Bordering on Botany Bay itself, the LGA has a large amount of waterfront—although much of it is industrial in nature, encapsulating the Sydney airport and the container terminal at Port Botany. Given its proximity to the airport and container terminal, the LGA has a large amount of land in industrial use, including warehousing. However, this warehousing is interspersed with older residential areas, characterised by detached and medium-density housing (including low-rise apartments), as well as some newer infill development. Detached houses account for about a third of the dwellings in the LGA, and over half of all dwellings are apartments.

Botany Bay LGA has a median household size and median age that is broadly consistent with the metropolitan region as a whole. However, the median income of households is lower than the metropolitan region average. At the 2016 Census, incidences of renting were higher in Botany Bay (44 per cent) than the metropolitan region as a whole (34 per cent). Conversely, the proportion of households either owning their home outright or purchasing with a mortgage is lower than the average for the region.

Table 35 shows key Botany Bay data over the study period. Total dwelling stock increased by 26 per cent in 10 years, while house prices increased by 148 per cent over the same period and unit prices more than doubled. With an LQ of 3.57 Botany Bay received building approvals over three times higher (3.57) than expected given its starting share of population—but because of the existing level of dwelling stock growth many of these approvals have not yet delivered stock.

Table 35: Overview of housing supply and price data: Botany Bay

Housing supply and price data	
Location	Inner
Dwelling stock 2006	13,744
Dwelling stock 2016 (growth on 2006)	17,249 (26%)
LQ (Share of accumulated building approvals relative to share of population)	3.57
Median house price (2016)	$1,600,000
Median unit price (2016)	$780,000
House price change (2006–16)	148%
Unit price change (2006–16)	117%

Source: ABS census data, Corelogic data accessed through SIRCA

Armadale

Armadale is located 28 kilometres to the south-east of the CBD. It has a population of around 90,000, and is expected to grow rapidly at around 5 per cent per annum. The city is designated a Strategic Metropolitan Activity Centre and contains 19 suburbs, covering 560 square kilometres. It is served by a train station that runs to the main Perth station. Employment is concentrated in health, education and retail serving the local community—however, in 2016 the unemployment rate was 9 per cent. Median incomes are typically lower than Greater Perth, partly due to a young median age of 33.

The housing stock is primarily separate houses, although there have been some alternative housing forms developed around the town centre in recent years. The proportion of non-separate dwellings is now 12.9 per cent, with the majority of dwellings being semi-detached and townhouses. Half of dwellings have four bedrooms or more, with a very high proportion of households owning with a mortgage (52.5 per cent).

Table 36 shows key Armadale data over the study period. Total dwelling stock increased by 56 per cent in 10 years, while house prices increased by 63 per cent over the same period and unit prices 43 per cent. With an LQ of 1.95, Armadale received building approvals 95 per cent higher than expected given its starting share of population.

Table 36: Overview of housing supply and price data: Armadale

Housing supply and price data	
Location	Outer
Dwelling stock 2006	18,482
Dwelling stock 2016 (growth on 2006)	28,874 (56%)
LQ (Share of accumulated building approvals relative to share of population)	1.95
Median house price (2016)	$399,500
Median unit price (2016)	$250,000
House price change (2006–16)	63%
Unit price change (2006–16)	43%

Source: ABS census data, Corelogic data accessed through SIRCA

Belmont

Belmont is an inner area LGA situated seven kilometres east of the CBD and contains both the domestic and international airports, including the significant commercial and industrial development on the airport site. It will be connected to rail as part of the new airport link. In 2016, the population was around 40,000, with a median age of 34. It has one of the most diverse housing markets in Greater Perth, with a third of dwellings either semi-detached, townhouse or units. Under 26 per cent of dwellings have four or more bedrooms. Density has been increased through a number of new developments, such as the Springs with its mix of apartments and medium-density dwellings. It has a very large rental market compared to other LGAs in Greater Perth at 41 per cent, due to its proximity to employment opportunities.

Table 37 shows key Belmont data over the study period. Total dwelling stock increased by 22 per cent in 10 years, while house prices increased by 48 per cent over the same period and unit prices 25 per cent. With an LQ of 1.45 Belmont received building approvals 45 per cent higher than expected given its starting share of population.

Table 37: Overview of housing supply and price data: Belmont

Housing supply and price data	
Location	Inner
Dwelling stock 2006	13,238
Dwelling stock 2016 (growth on 2006)	16,209 (22%)
LQ (Share of accumulated building approvals relative to share of population)	1.45
Median house price (2016)	$472,250
Median unit price (2016)	$375,000
House price change (2006–16)	48%
Unit price change (2006–16)	25%

Source: ABS census data, Corelogic data accessed through SIRCA

Cockburn

The City of Cockburn is a diverse LGA around 20 kilometres south of Perth on the Mandurah train line. It contains coastal suburbs such as Coogee and a number of popular beaches, as well as Cockburn Central, a major mixed-use development containing a shopping centre, commercial uses and apartment developments. The LGA also contains the Australian Marine Complex, as well as a number of other industrial employment centres. There are some fast-growing, low-density suburbs such as Success and Treeby supporting employment around the expanding Jandakot airport. Population in 2016 was around 104,000, with a median age of 35. Due to development around Cockburn Central, 82 per cent of dwellings are separate houses, which is lower than comparable LGAs a similar distance from the CBD. Forty-six per cent of households own their home with a mortgage.

Table 38 shows key Cockburn data over the study period. Total dwelling stock increased by 41 per cent in 10 years, while house prices increased by 54 per cent over the same period and unit prices 65 per cent. With an LQ of 1.42 Cockburn received building approvals 42 per cent higher than expected given its starting share of population.

Table 38: Overview of housing supply and price data: Cockburn

Housing supply and price data	
Location	Middle
Dwelling stock 2006	27,252
Dwelling stock 2016 (growth on 2006)	38,315 (41%)
LQ (Share of accumulated building approvals relative to share of population)	1.42
Median house price (2016)	$510,000
Median unit price (2016)	$388,000
House price change (2006–16)	54%
Unit price change (2006–16)	65%

Source: ABS census data, Corelogic data accessed through SIRCA

Kwinana

Kwinana is a coastal LGA located 38 kilometres south of the CBD. Its population in 2016 was around 39,000. It is predominantly an industrial area, and is home to the state's largest heavy-industry zone, including port facilities. The LGA has grown rapidly in recent years and is a mix of low-density residential development, service and industrial sectors. Separate houses make up 82 per cent of dwellings, but there has been an increase in alternative dwelling types in recent years. Over half of all dwellings have four or more bedrooms, and 46 per cent of households own their home with a mortgage.

Table 39 shows key Kwinana data over the study period. Total dwelling stock increased by 60 per cent in 10 years, while house prices increased by 51 per cent over the same period and unit prices just 4 per cent. With an LQ of 2.1 Cockburn received building approvals 110 per cent higher than expected given its starting share of population.

Table 39: Overview of housing supply and price data: Kwinana

Housing supply and price data	
Location	Outer
Dwelling stock 2006	8,544
Dwelling stock 2016 (growth on 2006)	13,676 (60%)
LQ (Share of accumulated building approvals relative to share of population)	2.10
Median house price (2016)	$347,500
Median unit price (2016)	$165,000
House price change (2006–16)	51%
Unit price change (2006–16)	4%

Source: ABS census data, Corelogic data accessed through SIRCA