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Overcoming construction constraints for the supply of new detached and high-rise housing

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Related reports and documents

Beer, A., Sharam, A., Dorignon, L., Parida, S., Fairbrother, P., Johns, B., Zolghadr, A., Horne, S., Arashpour, M., Abdi, E., Wakefield, R., Clower, T. and Lu, W. (2026) *Innovation for a more efficient, resilient and responsive housing construction industry: a technical paper in support of AHURI Final Report No. 461,* Australian Housing and Urban Research Institute Limited, Melbourne, http://www.ahuri.edu.au/research/final-reports/461, doi: 10.18408/ahuri3234101.

Gharaie, E., Zolghadr, A., Sharam, A., Mojtahedi, M., Fairbrother, P., Denham, T., Parida, S., Johns, B., Wakefield, R., and Abdi, E. (2026) *Transforming detached housing construction: a technical paper in support of AHURI Final Report No. 461,* Australian Housing and Urban Research Institute Limited, Melbourne, http://www.ahuri.edu.au/research/final-reports/461, doi: 10.18408/ahuri5334201.

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Using high quality, independent evidence and through active, managed engagement, AHURI works to inform the policies and practices of governments and the housing and urban development industries, and stimulate debate in the broader Australian community.

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Each AHURI Inquiry is supported by a panel of experts drawn from the research, policy and practice communities.

Panel members provide guidance on ways to maximise the policy and practice relevance of the research and draw together the research findings. Panel members for this Inquiry:

- Christopher Kefford, QBuild
- Darren Mew, BlueCHP
- Daniel Cooper, BCG Constructions
- Claire Krelle, Government Architect NSW
- Steven Baxas, Victorian Building Authority.

Summary

Key points

- Market volatility is the most significant factor driving constraints in the Australian housing construction sector.
- In both detached and high-rise construction, boom conditions result in supply chain pressures, cost inflation, labour shortages and extended completion times.
- Booms also result in the entry of marginal operators and under-skilled workers, pressure to cut corners, and heightened risk of insolvency.
- Downturns are similarly challenging, and result in some permanent loss of labour, wage suppression, loss of knowledge and innovation, and firm exits.
- In the detached sector, the frequency of peaks means the opportunity to clear work backlogs does not always materialise. This leaves many builders overstretched at the onset of booms.
- The risk of demand downturns in the apartment sector often leads to poor design resolution prior to construction commencement, increasing construction cost and duration.
- Inadequate enforcement of regulation in both sectors means builders may prioritise construction cost and time over housing quality, giving rise to unacceptable levels of defects.
- Market volatility also undermines the viability of volumetric offsite manufacturing, which is premised on steady, rate-driven production.

Key context

Across the developed world, there is widespread concern about the performance of the housing construction sector in general, and about sector productivity in particular. Australia is not immune from these concerns. As discussed in Chapter 1, the rate of detached housing output across the country has been largely static since at least 1980. While the output of the apartment sector has lifted substantially over time, it is increasingly volatile. Apartments are also taking longer to build now than in the past. While the COVID pandemic disrupted may aspects of housing construction, and its effects continue to be felt, there are a complex array of longer-term structural problems underlying the nation's housing construction crisis.

This AHURI Inquiry into overcoming construction constraints for the supply of new detached and high-rise housing provides the first significant examination of the Australian housing construction sector's ability to deliver housing. Its scope included analysis of housing construction workflows, markets, regulation, workforce, technologies and supply chains. The Inquiry report and its three associated projects (Beer et al. 2026, Gharaie et al. 2026 and Lee et al. 2026) considered both the detached and high-rise housing sectors. While the detached housing sector accounts for the majority of existing housing stock (70%) and new housing starts (60%) (ABS 2022, 2025), high-rise construction plays an important role. This is particularly the case in Sydney, Melbourne and Brisbane, where population growth and urban intensification policies continue to drive apartment-building.

The National Housing Accord has set an initial aspirational target to build 1.2 million new well-located homes by 2029. Existing research suggests this is a very challenging target (Rowley et al. 2023) for many reasons, including the productivity of the housing construction sector.

Key findings

The housing construction industry in Australia is dominated by small and medium enterprises, reflecting extensive use of subcontracting arrangements. Subcontracting of work enables labour flexibility and pushes risk down the supply chain. As a consequence, housing is constructed by temporary teams of builders and subcontractors who come together for projects and disperse once those projects are complete. The temporary nature of project teams means the acquisition and transfer of skills is constantly disrupted, and knowledge is sometimes lost.

Builders' margins and capitalisation are typically low. This creates cashflow risk and reduces the ability and willingness of builders to invest in training and innovation. Consumer demand for customisation also militates against standardisation, and economies of scale are therefore difficult to achieve. In the absence of pressure to adhere to building codes (see Chapter 5), cashflow constraints and low margins incentivise poor quality work and result in unacceptable levels of defects.

As detailed in Chapter 4, the Australian housing construction sector contends with very considerable volatility in demand. Booms necessitate periodic surges in capacity, while busts require some of the workforce to be stood down. Subcontracting enables the workforce to be reduced during downturns at little cost to head contractors, but exposes much of the workforce to under- and un-employment. Consequently, some of the workforce is lost during each downturn. This creates a labour and skills retention problem that constrains capacity once the market recovers. Demand for labour and materials during booms also results in inflated costs. Less skilled workers are attracted to the sector during booms, which further increases risk of rework and delays.

In both the detached and apartment sectors, project timeframes increase during booms. As construction workflows are largely linear, competition for labour and materials during booms means task 'queues' are prone to disruption. Bottlenecks emerge, and tend to cascade. Once markets peak, there is an opportunity for work backlogs to be addressed.

Detached builders, however, often cannot clear backlogs before the next boom arrives. The resultant lag in completions means queueing problems remerge earlier in the next cycle; this is discussed in Chapter 3. This dynamic limits the extent to which aggregate housing output can be increased. Adding labour or materials to a production system driven by due date sales is unlikely to increase the work rate or enable any significant and sustained overall lift in output.

The alternative is rate-driven production which, when coupled with rigorous quality assurance, can address queueing problems. In this approach, demand management can be used to stabilise production, so that work systems can be changed to accommodate increased load. This is further explored in the latter part of Chapter 4.

The high-rise sector responds somewhat differently to demand. Unlike the detached sector, apartment builders can lift production significantly in response to demand. This likely reflects the sophisticated corporate business structures and deeper pockets required for complex apartment projects. Backlogs in the apartment sector are less concerning, as apartment developers tend to exit the market earlier in downturns and re-enter later (Schmits 2000). This provides more time to address work backlogs.

Queueing problems are not the only significant issue to affect the work rate on apartment builds. Poor design resolution prior to the commencement of construction often results in rework and delays. Many developers trade the time and cost benefits of early contractor involvement in the design process against the risk of delaying the preconstruction stage and the advantages in shifting risk onto the builder.

Defects add to costs and can increase work-in-progress rates, although defects are too frequently identified only once the building is complete. Widespread defects in the detached and high-rise sectors are symptomatic of subcontracting, firm size, and time and cost pressures that are not countered by robust building code enforcement.

Volumetric offsite manufacturing (OSM) is widely promoted as the solution to the ills of the industry, and there are clear benefits to this method of production. However, as discussed in Chapter 6, there are also many barriers. The most significant barrier in Australia is, again, market volatility. Unlike in situ construction, OSM requires significant upfront investment in plant. However, market volatility creates risk there will be periods when plant is idle and cashflow low. In situ construction can be improved substantially, but it requires models of provision and greater design standardisation.

A significant contribution of this Inquiry, discussed in Chapter 7, is its conceptualisation of housing construction as a ‘system of systems’, in which behaviours emerge from dynamic interactions within, and between, subsystems. This shift in thinking enables powerful insights into industry practices and behaviours. It suggests that reform needs to focus on the system level, and has implications for policymaking that may conceive of problems too narrowly.

Policy development options

Currently, there is no single, overarching strategy aimed at addressing housing construction constraints across Australia. Policy efforts are disjointed, with a focus on isolated parts of individual subsystems.

As detailed in Chapter 8, this Inquiry provides eight interconnected policy development options arising from key research findings:

1. Develop a national strategy for efficient housing construction
2. Address market volatility
3. Modernise the regulatory framework
4. Attract and retain skilled employees
5. Include cost escalation provisions in contracts
6. Provide greater support for research and development
7. Consider onshoring to reduce supply chain risks
8. Reduce market fragmentation.

Testing, refining and delivering on these policy directions will be very challenging. There is an urgent need to establish a policymaking and industry engagement process aimed at developing an in-depth understanding of housing construction as a system of systems, with strategies to put it onto a more productive basis. It will be important for this process to reflect the wider public interest, rather than only the narrower interests of specific stakeholders or subsystems.

An important starting place is that in situ housing construction can be made much more efficient. This should be the focus in the short- to medium-term. The structure of the industry needs to change. Builders need to have greater capacity, be less vulnerable to cashflow crises, and obtain higher margins. They need to be able to retain earnings to invest in productivity and to directly employ more labour. These issues require industry consolidation and vertical integration. Full workforce utilisation should be an aim of policy, not just retention and recruitment.

Industry structure would likely change if building codes were rigorously enforced. Builders would need to manage contractors' work more closely, and this would drive greater willingness to invest in training, supervision and direct employment. Larger firms have greater capacity to develop quality assurance systems that translate the requirements of building codes. The 'regulatory burden' presented by the National Construction Code (NCC) is less about the extent of regulation than the suboptimal size of the firms being regulated.

Building quality also requires responsibility for compliance to be widened. The equivalent of the *Building Design Practitioners Act 2020* in New South Wales should be introduced in each state and territory. The importance of building code regulation cannot be overstated. The NCC must guarantee safety and, given the role of the built environment in contributing to climate change and mediating its effects, it must be a vehicle for driving change to industry practices. The NCC is also central to consumer protection and a functioning insurance market.

While there is a need to reduce the fragmentation of the industry and increase the size of firms, there is a countervailing need to ensure excessive market concentration does not occur. International evidence points to vertically integrated builders and land developers controlling regional landbanks and, through that, restricting new housing supply to lift margins. Australian policymakers can learn from this experience.

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Acronyms and abbreviations

ABCB	Australian Building Codes Board
ABS	Australian Bureau of Statistics
AHURI	Australian Housing and Urban Research Institute
APRA	Australian Prudential Regulation Authority
BIM	Building Information Modelling
BTR	Build-to-Rent
CPD	Continuing Professional Development
DBC	Domestic building contracts
DBP	Design and Building Practitioners Act (NSW)
D&C	Design-and-Construct
MMC	Modern Methods of Construction
NCC	National Construction Code
OSM	Offsite Manufacturing
PBSA	Purpose-Built Student Accommodation
SBW	Scenario-Based Workshop
SoS	System of Systems
SoW	System of Work
SRP	Supporting research projects
VET	Vocational Education and Training
WIP	Work-in-progress

Glossary

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

1. Introduction

1.1 Housing construction in Australia

This AHURI Inquiry into overcoming construction constraints for the supply of new detached and high-rise housing provides the first significant examination of the Australian housing construction sector's ability to deliver housing. In Australia, as in much of the developed world, the performance of the housing construction sector is deeply unsatisfactory. Housing is expensive and time consuming to build, and this affects housing affordability. The housing produced is often of poor quality, with defects providing a major consumer as well as business risk. Pervasive subcontracting pushes risk down the supply chain, primarily to the production workforce. A deficit of skilled trades and of unskilled labour reduces production capacity and in boom periods contributes to cost inflation.

There is a significant under-supply of housing, particularly social and affordable housing. In the detached housing sector, sharp increases in demand are accommodated through longer completion times rather than greater output. The apartment sector can bring new supply to market in response to steep increases in demand, but again completion time is slow. Downturns result in significant under-utilisation of capacity and the permanent loss of some of that capability.

The National Housing Accord has set an initial aspirational target to build 1.2 million new well-located homes by 2029. Existing research suggests this is a very challenging target (Rowley et al. 2023), for many reasons including a lack of productivity. The Productivity Commission (2025) found physical productivity (the number of dwellings completed per hour worked) has declined by more than half in the past 30 years, while labour productivity (the gross value added per hour worked) has declined by 12 per cent over that time.

1.2 Detached housing construction in Australia

Detached housing is a significant source of new housing in Australia. The characteristics of the detached housing construction sector are described in the Inquiry supporting project by Gharaie et al. (2026) and summarised here. In 2021, 70 per cent of the total 10.8 million private dwellings counted in the census were detached houses (ABS 2022). Detached housing also makes up a significant proportion of new dwelling commencements, accounting for 60 per cent of all Australian housing starts in 2025 (ABS 2025). Table 1 shows that, with the exception of the Australian Capital Territory, detached housing commencements dominate the market in all jurisdictions.

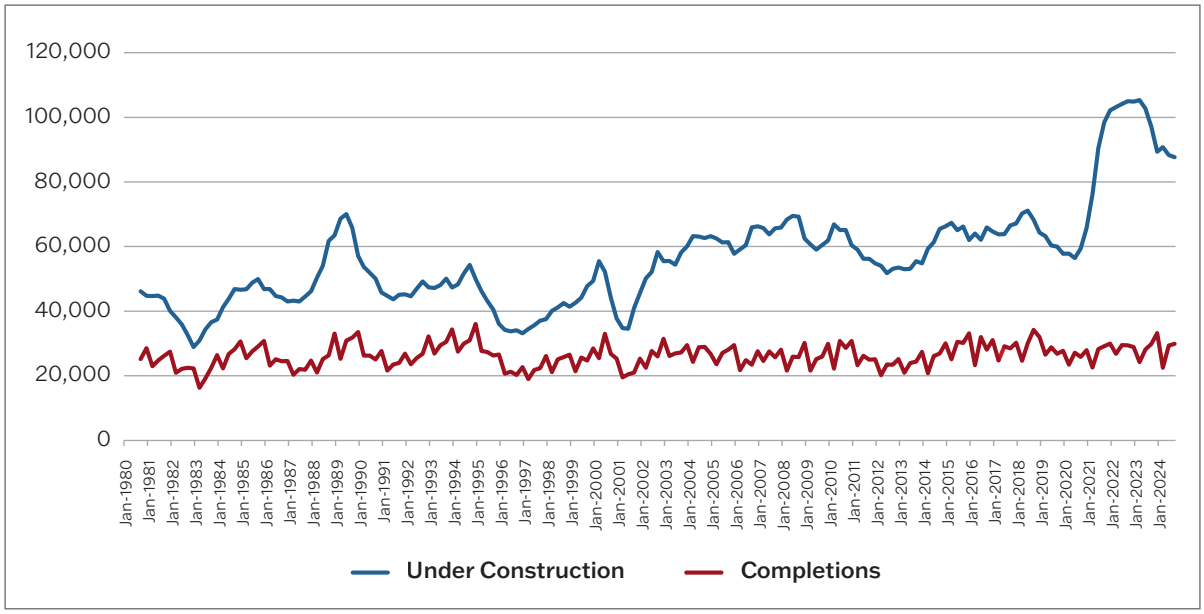
Table 1: Detached and total housing commencements 2021-2025, by jurisdiction

Jurisdiction	Detached housing commencements	Total housing commencements	Detached commencement %
ACT	5,409	21,150	26%
NSW	119,094	235,255	51%
NT	2,211	2,528	87%
VIC	176,341	27,8714	63%
QLD	115,524	17,7993	65%
SA	48,171	60,913	79%
TAS	13,060	14,066	93%
WA	79,905	9,3036	86%

Source: ABS (2025)

As shown in Figure 1, the rate of detached sector output has been largely static since at least 1980. However, the number of homes under construction has varied significantly over time. The difference between the number of homes under construction and the number of homes completed is known as the work-in-progress (WIP) rate, and is referenced throughout this report as a key indicator of housing productivity.

Figure 1: Detached homes under construction and completed 1980-2024, Australia



Source: ABS 2024

Detached house building in Australia is primarily a contract market, with only a small proportion of homes built speculatively. By law, contract prices are fixed once agreements are signed, and builders have no recourse to seek price increases should the costs of inputs increase above contingency allowances. Clients are required to make progress payments to builders at completion of key stages. Where households require mortgage finance, lenders make progress payments directly to builders.

Volume building firms are significant players in the detached housing sector, but there are many small, independent builders. Some volume builders are, in fact, several builders operating under a single umbrella. In 2019-2024 there were 52,968 firms in the detached housing industry, with an average profit $72,084 each (IBISWorld 2023). This indicates that margins are low. The four largest builders contributed less than 10 per cent of industry revenue (ibid). The Housing Industry Association (HIA) reported that the largest 100 builders accounted for 38 per cent of the new home market in 2023-24, although the top 10 builders were responsible for 44 per cent of homes built by the largest 100 builders (HIA 2024). Three of the four largest volume building firms (Metricon Homes, ABN Group and NXT Building Group) are also land developers.

Extensive competition between builders has led consumers in the detached sector to expect customisation. Even volume builders offer extensive modifications. This lack of standardisation is a barrier to gaining efficiencies that are possible through a high degree of repetition. Tract development, as it is known in the United States, where consumers choose between a limited number of home designs that cannot be modified, is virtually unknown in the private sector in Australia. Post-war suburban public housing estates, however, were premised on a limited catalogue of house designs.

1.3 High-rise housing construction in Australia

As detailed in the Inquiry supporting project by Lee et al. (2026), the apartment construction sector is highly fragmented. Small and medium sized enterprises (SMEs) deliver 50 per cent of apartments (Productivity Commission 2025), while the largest firms contribute less than five per cent of total market output (Kelly 2025). Only a small number of builders operate nationally; these include Multiplex, LendLease, J Hutchinson and Meriton Properties. Kelly (2025) reports the number of building firms has grown from 11,486 in 2007-08 to 27,700 in 2024-25. Kelly also reports multi-unit apartment and townhouse construction employment was 51,805 units in 2024, having grown from 31,111 in 2007-08 (a 60 per cent increase). While this appears to indicate significant expansion of capacity, there was an almost 55 per cent increase in population over that time. Apartment construction is concentrated in Sydney, Melbourne, and to a lesser extent Brisbane, reflecting population growth and planning policy aimed at intensification.

Understanding employment numbers in the apartment sector is difficult given market volatility. Moreover, until 2025 the ABS provided limited analysis of construction data, and it does not always distinguish between the detached and apartment sectors. ABS (2025) industry performance data indicates that employment in the residential building sector was 173,000 persons in 2023-24, or 13 per cent of the overall construction industry. Employment can be as little as one hour per week. Unionisation in the apartment sector is much higher than in the detached sector, with greater direct employment and longer project duration.

The size of apartment buildings has changed considerably over time. Table 2 shows the share of units in buildings under four storeys declined from 31 per cent in 2004-05 to less than nine per cent in 2018-19. Over that period, the proportion of units in buildings nine storeys and over increased by more than 20 per cent. Currently available ABS data does not permit equivalent analysis for recent years.

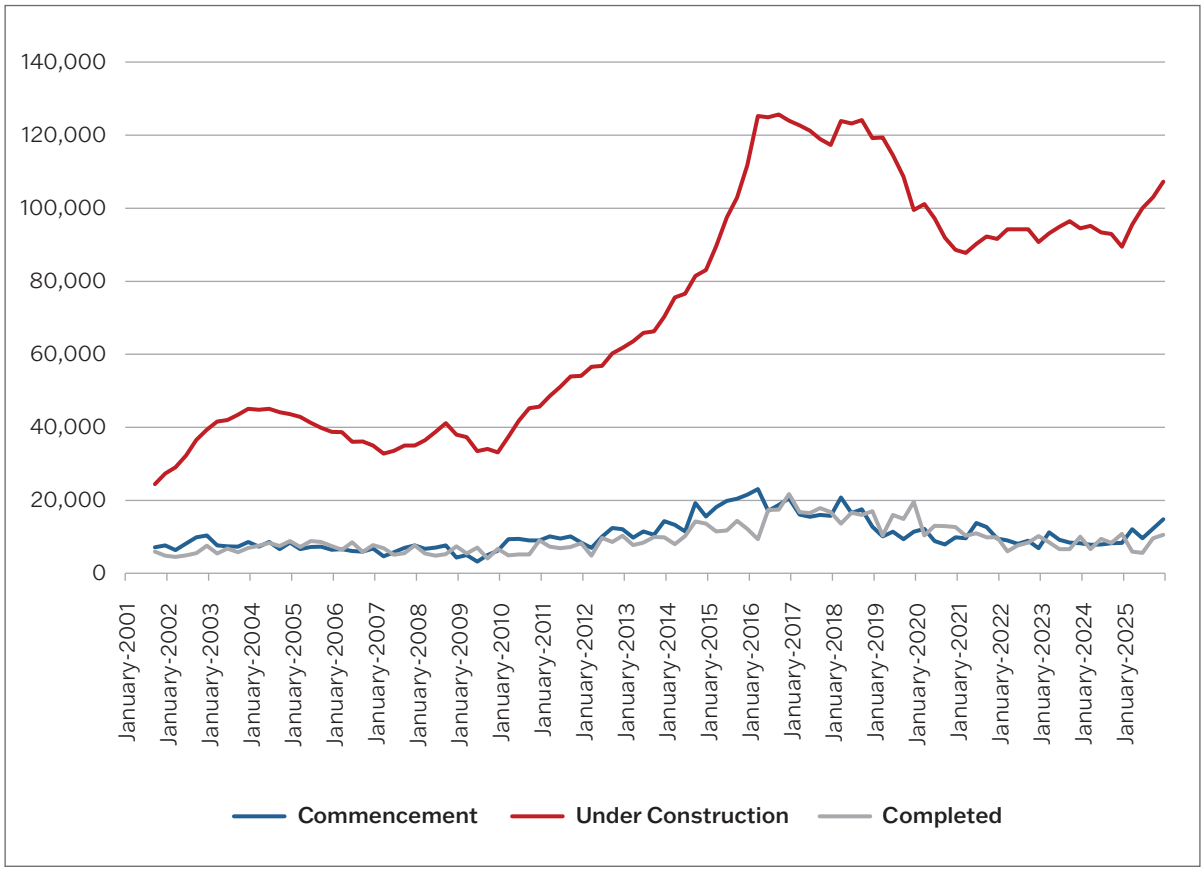
Table 2: Residential unit approvals by number of storeys in Australia

Financial year	1 to 3 storey buildings	4 to 8 storey buildings	9 to 19 storey buildings	20+ storey buildings	Total
2004-2005	9,262	12,787	4,782	2,826	29,657
2018-2019	3,966	20,617	11,060	10,467	46,110

Source: ABS (2019)

As shown in Figure 2, apartment output has lifted substantially over time. The gap between the number of apartments under construction and those being completed also indicates that high-rise housing is generally taking more time to build now than in the past.

Figure 2: Apartments under construction and completed 2001-2025, Australia



Source: ABS 2025

2. Research design

2.1 Research approach

The Inquiry and its three associated projects (Beer et al. 2026, Gharaie et al. 2026 and Lee et al. 2026) examined housing construction through six intersecting 'domains': workflow, markets, regulation, workforce, technology, and supply chains.

This Inquiry report focuses particularly on the findings related to three of these domains: workflow, markets and regulation. It also provides a detailed look at offsite manufacturing, a specific form of technology which was frequently suggested throughout the research as a way to increase the productivity of Australia's housing construction sector.

Two of the supporting research papers associated with this Inquiry report the detailed findings on workforce, technology and supply chain issues relating to detached housing (Gharaie et al. 2026) and high-rise housing (Lee et al. 2026). Chapter 4 of this report considers the interactions between market volatility and supply chain disruptions in both the detached and high-rise sectors. It also looks at the impacts of boom and bust cycles on the workforce, particularly in the apartment sector.

Importantly, the Inquiry also goes beyond the investigation of each of the six domains to consider the interconnections between them and offer a new way of conceptualising the issues facing the housing construction sector. As discussed in Chapter 7, the Inquiry proposes thinking about the sector as a 'system of systems', in which behaviours 'emerge' out of the dynamic interactions within, and between, various subsystems. This has implications for policymaking that may conceive of problems too narrowly.

2.2 Research questions

This Inquiry asks:

> How can the construction of detached and high-rise housing in Australia be improved to increase the supply of housing and speed of delivery, subject to other social, environmental, and economic goals?

The three supporting research projects addressed the following research questions:

- Project A (see Beer et al. 2026): What innovation is occurring in residential construction internationally and what are the lessons of leading international practice?
- Project B (see Gharaie et al. 2026): What is the nature of construction constraints in the detached house building sector and what changes are likely to have the greatest impact on completion times and increasing supply responsiveness?
- Project C (see Lee et al. 2026): What is the nature of construction constraints in the multi-residential sector and what changes are likely to have the greatest impact on completion times and increasing supply responsiveness?

Together, the projects examined international innovation and best practice, the nature of constraints in the Australian detached and high-rise sectors, and the changes likely to have greatest impact on completion times and supply responsiveness.

2.3 Key definitions

'Detached housing' in this Inquiry refers to standalone housing and townhouses that are classified as Class 1 dwellings in the National Construction Code (NCC). 'High-rise' is used as a shorthand for Class 2 multi-residential buildings that involve horizontal sub-division of space. The term 'high-rise' is largely used interchangeably with 'apartments'.

2.4 Research methods

In addition to a comprehensive literature review, this Inquiry used three main research methods: interviews, workshops and modelling.

2.4.1 Interviews

Across this Inquiry, 68 interviews were conducted with housing construction sector participants in Australia and internationally. Thematic analysis of interview transcripts was then undertaken.

Table 3 summarises key characteristics of the 39 interviewees who are referenced in this report. With the exception of Participants A1, 37 and 39, interviewees were Australia-based. The peak bodies interviewed as part of this work represented the perspectives of professionals working in building, architecture and standards.

Table 3: Characteristics of interview participants

Expertise	Codes	Number
Builder, construction manager or consultant	A1, 2, 4, 5, 9, 11, 13, 19, 23, 26, 29, 31, 32, 33, 35	15
Builder/developer	1	1
Builder/financier	38	1
Construction lawyer	17	1
Developer	3	1
Digital technology	6, 41	2
Education and training	10, 20, 21, 22, 23	5
Housing economist	37	1
Peak body	8, 14, 28	3
Planning	16	1
Policy	24, 34, 39	2
Regulation and co-regulation	18, 12, 27	3
Standards	7, 15	2
Total		**39**

Source: authors

2.4.2 Workshops and panel

In addition to interviews, policy testing workshops with industry stakeholders were held as part of Inquiry Projects B and C. Participants in the workshop relating to detached housing were:

- a major volume builder
- a major material supplier
- two regulators
- a policymaker.

For the workshop focusing on high-rise housing, participants were:

- an international expert in construction law and building regulation
- representatives from three industry peak bodies
- a representative from a strata owners' peak body
- a national building consultant (a former construction manager from a leading builder)
- a policymaker from an Australian Government agency.

The Inquiry research conceptualisation and findings of the projects were presented to an expert Panel convened by AHURI in 2025 for discussion and reflection. Panel members were experts drawn from the research, policy and practice communities. They provided guidance to the Inquiry on ways to maximise the policy relevance of the research and integrate findings to address key policy implications.

2.4.3 Modelling

This report also draws from the findings of hybrid systems dynamics and agent-based modelling undertaken as part of Projects B and C. Detailed descriptions of the modelling methodology and findings are provided in Gharaie at al. (2026) and Lee et al. (2026).

In summary, system dynamics allows for modelling continuous, aggregate-level behaviours, such as the gradual build-up of WIP or the depletion of shared resource pools. At the same time, the agent-based nature of the model supports a modular design that aligns with the stage-based nature of the construction process. Moreover, this agent-based design provides flexibility for experimenting with different configurations, such as changing the number of stages, modifying resource-sharing arrangements, or altering the granularity of model detail.

3. Workflow variability

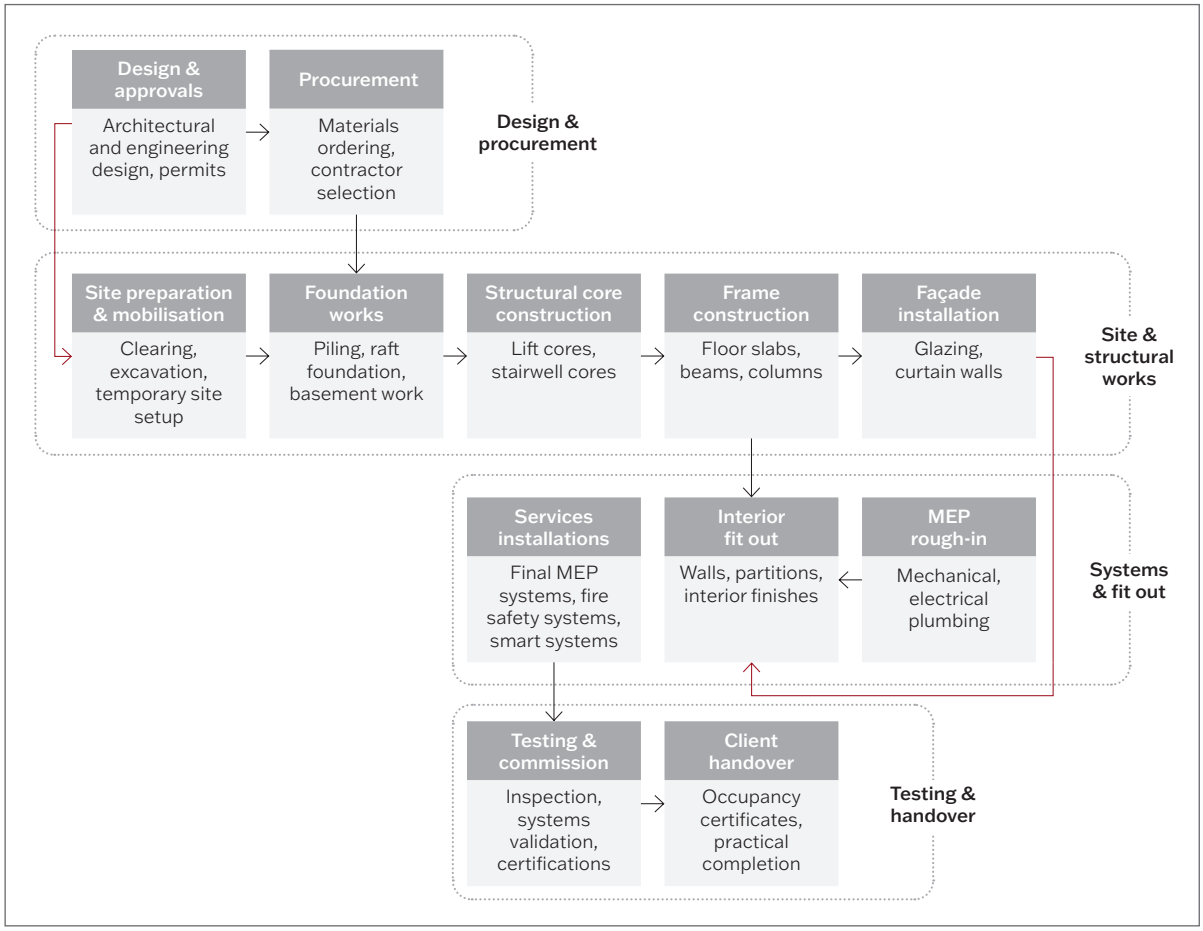
3.1 Work processes

Housing construction is organised as a sequence of defined stages that structure delivery from site preparation to completion. This is known as the 'system of work', and includes organisational processes at the project, company and industry levels.

In the Australian detached sector, delivery stages are commonly recognised as: slab (or base), frame, lock-up, fixing, and final stages. These five stages serve as practical frameworks for coordinating the involvement of over 50 different subcontractors and trades (Dalton et al. 2011). Each stage comprises a set of tasks performed by specialist workers, such as concreters for the slab, carpenters for framing, bricklayers and window installers for lock-up, and interior fit-out trades for the fixing stage.

As shown in Figure 3, and discussed in Lee et al. (2026), the process for constructing apartments is more complex, with a greater number of stages and sub-stages.

Figure 3: High-rise residential building construction process



Source: Lee et al. 2026

3.2 Queuing and bottlenecks

The stage-based organisation of housing construction introduces a high degree of interdependence between tasks, trades and suppliers, making the process particularly vulnerable to delays (Böhme et al. 2018). In addition, the linear sequencing of stages and tasks introduces complex queueing problems,[1] with scheduling of labour, materials and equipment needing to be managed. Materials and equipment may need to be ordered 12 months in advance of construction. Delivery delays may occur due to production constraints, disruption to transportation or unanticipated difficulties in accessing sites. Just-in-time delivery makes the industry especially vulnerable to supply chain disruption, as further discussed in Chapter 4. The construction management literature (see for example Hillebrandt 2000, San Santoso et al. 2003; Othman et al. 2012; Iqbal et al. 2015; Newell and Steglick 2015; Lam and Siwingwa 2017; Karkush et al. 2021; Hasib and Al-Kilidar 2021) commonly cites other onsite delay factors as including weather, geological issues and industrial action. The impact of queueing bottlenecks can be significant, as a delay in one stage can trigger delays in subsequent stages that may be more serious (Böhme et al. 2018). Bottlenecks mean that simply adding more resources or increasing the workforce is unlikely to significantly lift production (Arashpour and Arashpour 2015).

The modelling undertaken in Gharaie et al. (2026) and Lee et al. (2026) considered the impact of bottlenecks. It confirmed that, for both detached and high-rise housing, workflow bottlenecks mean that increased construction resourcing is unlikely to result in significantly increased production. Moreover, the modelling suggests the primary cause of increased WIP appears to relate to the queueing impacts of taking on more projects than can optimally be handled. This aligns with system dynamics modelling of Australian residential construction undertaken by Melles (2026), which similarly suggested all key constraints 'must relax simultaneously for capacity expansion' (p.118).

For a range of reasons, 'due date driven' (i.e. sales driven) housing production is the norm in Australia. The key problem for due-date systems is that during periods of peak demand there is increased competition for resources and labour, which increases the propensity for delays. Increasing workloads also tends to increase defects and the need for rework, which adds to delays. For example, completed framing that is left exposed for extended periods due to delays in window delivery can lead to structural problems such as warped walls, which then require remediation.

Gharaie et al. (2026) found site supervisors' workloads in the detached sector are often excessive during boom periods, making it difficult to manage schedules. Lack of appropriate site supervision also allows defects to be missed. Lee et al. (2026) highlighted poor design resolution as adding significantly to delays and rework in the high-rise sector. Both projects found contractors often view quality assurance as someone else's responsibility which, when combined with inadequate building code enforcement, may result in the need for rework. Late 'callbacks' to remediate defects result in extended delays, as trades have already moved resources to other sites (Arashpour et al. 2014). Gharaie et al. (2026) and Lee et al. (2026) identified increasing trade specialisation as contributing to delays, as it increases the flow of work (also known as 'hand-offs') between trade contractors. This finding echoes those from across the literature (see Ballard et al. 2003; Yu et al. 2009; Böhme et al. 2018).

The modelling undertaken for Gharaie et al. (2026) and Lee et al. (2026) also suggests that ramping up production during booms causes the WIP rate to slip in both detached housing and apartment building, creating backlogs of work. In the apartment sector, where downturns tend to be longer and deeper, operators can mostly clear backlogs during workload declines. However, many detached housebuilders cannot clear work backlogs before the next boom arrives. The resultant lag in completions means queueing problems remerge earlier in the next cycle than they would have if there had been no backlog. This dynamic limits the extent to which aggregate output can be increased.

1 For queueing theory see Hiller and Lieberman (1990).

Arashpour and Arashpour (2015: 04015006) argue workflow variability can be improved through robust quality assurance mechanisms and 'workflow leveling strategies'. Rate-driven production is an example of workflow levelling, as it limits the number of starts to maintain a constant WIP rate. Lee et al. (2026) found rate-driven production is very unusual in the build-to-sell apartment sector in Australia, as developers rarely proceed with projects during downturns. This denies builders the certainty provided by a pipeline of work that would enable efficiency gains. The potential of build-then-sell models is discussed in Chapter 4. Gharaie et al. (2026) also found house builders rarely restrict workload to match optimal carrying capacity.

Despite current industry practices, research participants in both the detached and high-rise sectors recognised that steady production was highly desirable and would enable efficiency gains. To that end, they saw benefit in countercyclical social housing production during downturns.

3.3 Implications

The modelling undertaken in Gharaie et al. (2026) and Lee et. al (2026) suggests that reducing market volatility would be the most significant measure for improving the speed of construction and enabling a sustained increase in output. Stabilising demand would provide the opportunity for rate-driven production and greater parallelisation of repetitive tasks, which would significantly reduce total construction time.

The impact of market volatility is discussed in the next chapter.

4. Market volatility

4.1 Market volatility in 21st century Australia

Market volatility is a defining characteristic of real estate production in most countries. This volatility reflects a range of factors, including broader business cycles, policy shifts, political disruptions and economic shocks. Market volatility also reflects changes in demand, which can be driven by factors including migration, demographic change, household income and wealth, and employment patterns. As shown in Figures 1 and 2, market volatility translates into significant variability in housing construction starts.

Australia's housing market has been highly volatile over the past 25 years and has experienced several major shocks that have impacted construction starts. However, many peaks and troughs can be attributed to policy interventions. Governments in Australia often adopt Keynesian measures to stimulate housing demand during downturns, because of the known multiplier effects of construction on the economy (ABS 2002; Rowley et al. 2020). First home buyer schemes are one such measure, and have significant impact. First home buyers comprise at least half the market for new homes in Australia and have a strong preference for detached housing. Homeownership assistance has the effect of pulling forward the demand for new housing, with an amplified effect on detached homes (Pawson et al. 2020).

A key form of homeownership assistance offered in Australia is the First Homeowner Grant. This was introduced by the Australian Government in the late 1990s to offset the impact of the planned introduction of a goods and services tax in 2000. The introduction of the grant created a significant lift in demand for new homes, but construction starts subsequently slumped due to the grant pulling demand forward (Taylor and Dalton 2015). This volatility is clear in the 1999-2000 spike and then slump in construction starts shown in Figure 1.

Another major shock to Australian housing markets was caused by the Global Financial Crisis in 2008-09. Again, a 'boost' package was used to stimulate construction. One significant impact of this stimulation of demand was an increase in the WIP, as builders took on additional work regardless of whether they had capacity to increase their output (Taylor and Dalton 2015). There was also a substantial downturn in apartment starts, reflecting liquidity constraints (Bryant 2012).

Between 2010 and 2017, there was a very significant increase in house prices and a consequential construction boom. This was fuelled by a 50 per cent concession on capital gains tax, which had been introduced in 1998-99, combined with historically low interest rates. The boom and subsequent bust were the largest in Australian apartment construction history. Rapid house price inflation prompted action by prudential regulators to cool the market (APRA 2019). This action, and the imposition of strict capital export controls by China in July 2017,[2] resulted in a market correction in late 2017 which was most dramatically felt in the apartment sector.

2 The capital controls severely limit investment from China in Australian apartment developments, noting Australia's investment rules only permit foreign purchase of new housing.

Apartment sector recovery was moderate in the lead up to the COVID-19 outbreak. Pandemic control measures reduced building work and supply chain disruptions resulted in rapid inflation of material and labour costs (Malo 2024; Malo and Razaghi 2024).[3] Concerns the pandemic would put Australia into recession prompted the Australian Government to initiate another economic stimulus package in 2020, aimed at supporting housing demand. In the detached housing sector, the resultant lift in demand compounded inflation caused by supply chain disruptions. Across both the detached and high-rise sectors, builder insolvency reached unprecedented levels (Bryant et al. 2025).

When the pandemic occurred, the apartment market had a large inventory of unsold stock from the previous boom. In Melbourne, for example, there reportedly remains around 8,000 unsold units which can be purchased for $8,000 to $10,000 per metre. In comparison, new supply requires prices of $12,500 to $15,000 per metre to be feasible to build (White 2025). Consequently, many new high-rise projects have been deferred or abandoned.

Australia's long run of declining interest rates (Ong ViforJ et al. 2023) came to an end in May 2022, reflecting pandemic-related inflationary pressures. As housing starts are highly sensitive to changes in interest rates, the upwards trajectory in interest rates quickly dampened demand.

A quarter century of market shocks highlights the sensitivity of housing construction to disruption. It also brings government action into relief, with policy both stimulating and dampening demand. The following sections of this chapter look at the drivers and impacts of market volatility in the detached and high-rise sectors in greater detail.

4.2 Market volatility in the detached sector

4.2.1 Impact of boom and bust cycles

As Figure 1 indicates, the Australian detached building sector experiences frequent boom and bust cycles. For example, at the time of this research, builders remained significantly affected by the impact of pandemic-related supply chain disruptions. These disruptions were intensified by the HomeBuilder Grant stimulus introduced in 2020.

Boom periods in the detached sector introduce acute financial pressures for builders, as the cost of both labour and material escalates. Participants interviewed as part of this Inquiry consistently described how Australian Government pandemic stimulus measures triggered a boom in work, creating intense competition for limited resources. With a sudden increase in demand and no corresponding increase in supply, prices for essential building inputs rose sharply. Builders report finding themselves paying significantly more for trades and materials than anticipated in their building contracts. Timber, prefabricated frames and windows were among the materials frequently cited as becoming scarce and expensive.

As cost increases occurred after they had committed to fixed contract prices, builders bore the full brunt of rising costs without recourse to renegotiate with clients. The point made by Participant 29 illustrates this situation:

> If I'm building one house at a loss, I take the hit and I move on. If I'm building 1,200 homes at a loss, I'm [in trouble] … I had a contract agreement with you as a consumer that said, you're only going to pay $200,000. I had an agreement with all my suppliers that said, my materials are going to cost X, Y, Z. [Suppliers said] 'I don't care about the agreement. I can't supply at that rate'.

In such conditions, even well-managed building firms can become financially unviable.

3 Until that point in time the cost of construction had been falling, by 8.1 per cent between 2009 and 2020 (ABS 2020).

Cost pressures can quickly translate into acute cashflow stress (Bryant et al. 2025). Interviewees described how early stage payments, such as for slabs, failed to cover actual costs during pandemic-era cost inflations. Builders found themselves funding large portions of construction upfront, as progress payments were not aligned with expenditure requirements. For example, some builders reported slab costs exceeding 20 per cent of total project costs, while the corresponding client payment at that stage remained around 10 per cent.

Many builders opted to take on more projects as a strategy to maintain cashflow and cover ongoing overheads. Interviewees pointed to this as a risky but common response. The commencement of new projects generate deposits[4] and early payments that can support incomplete projects. However, this strategy is only viable so long as new sales continue, the cost base remains manageable, and the WIP rates are sufficient to meet contractual obligations to complete builds within 12 months. Trade and material shortages, however, meant that more projects' WIP periods lengthened, locking up financial resources and exacerbating financial pressure. Many firms quickly found themselves overextended, and insolvencies rose dramatically (Bryant et al. 2025).

Bust periods in the detached house building industry expose significant vulnerabilities in the financial viability of builders and subcontractors. Several interviewees described how demand dropped sharply following stimulus-driven booms, leaving builders with fewer sales and a diminished pipeline of work. Again, this is reflected in Figure 1. With project volumes falling, many firms were forced to scale back operations to remain viable. One builder reflected on the situation after the pandemic stimulus and noted, 'we're probably 50 or 60 per cent of what we used to do. And it's just, you know, there's not enough work' (P33).

In such conditions, fixed overheads become more difficult to cover and a business model that relies on high turnover and slim margins comes under stress. The financial impact of downturns is often more immediate and acute for trades and subcontractors. As the volume of starts declines, subcontracted trades face a sudden drop in project availability and income. The same builder observed, 'we've got bricklayers and concreters calling us, chasing work because the volume of work at the moment has sort of dropped off' (P33).

Without long-term employment contracts or buffers, in times of market downturn subcontractors must compete for a shrinking pool of work. They may also decide to leave the detached sector and move to adjacent construction sectors, such as commercial building or infrastructure projects. These conditions not only strain subcontractors financially, but also destabilise the resources required for construction work.

4.2.2 Quality and production improvements

The cyclical nature of the detached house building sector presents fundamental challenges for sustained investment in business improvement and capacity building. During boom periods, when demand is high and workloads surge, builders are primarily focused on delivery and survival.

Interviewees described how stimulus-driven peaks leave little time or capacity to invest in training, innovation or systemic reform. For example, one builder acknowledged that they 'don't do that much training' (P29), because taking trades off projects was simply not feasible when every resource was needed on site. The immediate pressure to complete a growing number of projects crowds out the longer-term thinking required for improvement. Similarly, Participant 32 asked how improvements could be funded when builders were already being pushed to 'squeeze the cost' to increase housing affordability and compensate for rising input costs.

4 Unlike presales in the apartment sector, house building deposits form working capital.

Periods of high demand place significant strain on the quality of construction work in the detached sector. Surges in workload, combined with limited access to skilled labour, means many homes are delivered with defects that require rectification or, in some cases, go unnoticed until much later. Several interviewees described how booms lead to a rush of activity that outpace workforce capacity. For example, Participant 29 noted that the scarcity of skilled trades during the pandemic stimulus period resulted in unqualified individuals entering the industry, stating 'Anyone who could hold a paintbrush [became a painter] or [who could] carry a box of tiles became a tiler'. This entrance of unskilled trades had negative consequences for workmanship. Participant 29 added that quality issues were so prevalent that builders were forced to act as 'renovators' at the end of projects, fixing mistakes and undertaking rework.

Increased supervisor workloads during booms also plays a central role in the decline of quality oversight. Participant 26 highlighted that supervisors managing more than 15 to 20 homes were effectively reduced to being schedulers, rather than active site managers. They explained, 'You're just scheduling a job. You're not actually checking it,' and pointed to this shift as a major contributor to quality lapses. Overburdened supervisors struggle to maintain site presence, limiting their ability to inspect work and engage proactively with trades. This has a knock-on effect on subcontractor relationships, as high-quality trades are less willing to work with disorganised supervisors, leading to increased reliance on less reliable or lower-skilled crews.

4.2.3 Shifting market power

Boom conditions in the detached sector significantly shift the balance of power between builders and subcontractors. As demand intensifies, the limited availability of skilled trades and materials gives subcontractors and suppliers greater leverage to dictate the terms of engagement. Even long-standing subcontractor relationships come under pressure during periods where there is a high volume of work. Trades prioritise builders who offer higher rates and more consistent workflow. Builders find themselves competing not only on price, but also on scheduling reliability and site efficiency. As one builder put it, subcontractors 'chase the highest dollar and the most work' (P35), effectively reversing the usual direction of dependency.

As an example of this dynamic, one interviewee described how a fall protection and scaffolding provider repeatedly failed to meet confirmed booking dates, halting critical site activities. They stated, '[the subcontractor] absolutely killed us… we just couldn't get them to site' (P35). With scaffolding required for essential tasks like truss installation and external cladding, such delays disrupt job sequencing across multiple builds. Builders dependent on a single supplier must either wait, or design workarounds. This shows how the supply of even basic compliance infrastructure can become a vulnerability in high-demand conditions.

This shift in dynamics between builders and subcontractors undermines builders' ability to plan and deliver consistently. While the subcontracting model theoretically offers flexibility, it leaves builders exposed when market conditions favour trades. Interviewees described situations in which delays in materials or earlier trade stages prompted subcontractors to abandon projects in favour of better opportunities. Builders who could not maintain stable and attractive site conditions were deprioritised, compounding project delays. Participant 33 recalled:

> [The framers] were taking on other works besides ours. Mainly because … we couldn't get … frame materials … [they'd be] promised one week but they didn't arrive, and they weren't arriving for four to six weeks later. That framer had to go and take on other work.

This shift in power also occurs with material and equipment suppliers. During boom times, suppliers ration materials and prioritise preferred clients, disregarding existing agreements. Participant 26 reflected, 'They dictated to me what I could and couldn't have … They could've shut our business down in five minutes'. In these moments, builders lose control over key project inputs while remaining contractually obligated to deliver. When suppliers favour larger clients or more profitable arrangements, smaller builders are sidelined.

4.2.4 Potential of standardised housing

Internationally, 'tract housing' (also known as 'spec' housing), is an estate where a limited catalogue of standardised home designs are offered. Unlike in Australia, much of this housing is built speculatively. The great advantage of tract building is that it enables a rate-driven production approach. Providing builders with a steady pipeline of work offers the opportunity to lock in subcontractors and material suppliers and improve the workflow. It may also facilitate the growth of larger builders with greater capacity.

Currently, tract housing is not practised at scale in Australia. As discussed in Chapter 6, it is commonly argued that Australian consumers will be highly resistant to standardised designs. Presumably, it is believed buyers will not be prepared to purchase this form of housing, or will require financial inducement to do so. Falling housing affordability, supply deficits and risk of defects could be expected to drive a change in sentiment. Given the existing under-supply of housing in Australia, it is difficult to see buyers refusing to purchase standardised housing. Standardisation, moreover, should deliver savings that could act as a financial incentive. The popularity of some former public housing estates suggests that standardisation, in of and of itself, may not be a significant barrier to consumers.

The most significant difficulty for tract development is debt financiers' concern about the risk of market volatility. The use of equity financing could play a role in overcoming this barrier. Some large volume builders operating in Australia are publicly listed and consequently have equity they could deploy. However, public companies also have shareholders who would need to endorse a change in approach.

This dynamic is shown in the case of a volume builder who attended the detached housing workshop. The participant disclosed that their company had wanted to shift production towards build-then-sell, however, could not obtain finance. The company used internal resources to build duplexes and test the market, and then undertook a 12-dwelling project. The homes sold very quickly, suggesting standardisation may not meet as much consumer resistance as is often assumed. The company was able to introduce efficiencies, reduce defects and capture the difference between cost and dwelling value, improving its margin.

Governmental measures to reduce market volatility could increase confidence in build-then-sell housing and help derisk this form of development. Firstly, governments could ensure the delivery of public infrastructure. Infrastructure such as schools and public transport strongly influence buyer decisions in greenfield estates, and faster rollout would give tract estates a competitive edge. Secondly, first homeowner grants could be redirected to this form of supply. In addition, governments could also underwrite tract housing developments or undertake demonstration projects.

4.3 Market volatility in the apartment sector

4.3.1 Impact of boom and bust cycles

While all sectors of the housing market are impacted by volatility, longer lead times and larger project sizes means market cycles are more significant for the apartment sector. Long development times in apartment building create risk that market conditions will deteriorate. Accordingly, project proponents pay careful attention to local absorption rates. Apartment projects are typically initiated only when there is a market upturn, and new are projects abandoned or postponed as soon as a downturn is apparent (Schmits 2000; Kelly 2024). Any oversupply of apartments created by a sudden reduction in demand affects the time it takes for new projects to launch once the next upcycle occurs.

As could be expected given the extent of market volatility in recent years, interviewees reported developers deferring or abandoning high-rise projects during downturns. Participant 3, a developer, stated 'If the market is not good, the developer would hold it, the site, a bit longer'. This participant argued that the limited financial capacity of smaller developers makes it difficult or impossible to pivot to alternative project types, such as build-to-rent (BTR), which are less sensitive to changing market conditions.

As in the detached sector, market volatility generally means apartment builders have less work during downturns. Participant 1, a builder and developer, said their company had diversified to reduce this risk:

> We look at what's coming up … in the next five years. Government work, such as hospitals and affordable housing projects, is important when there is a downturn in private work.

This participant noted, however, that diversification into other construction sectors reduces efficiencies, saying 'You don't have people that just specialise full time in these types of projects, which would bring efficiencies' (P1). Participant 21 argued that an 'army of subcontractors' moves between construction and other industries in line with fluctuations in demand. Indeed, they believe 'construction has the highest responsiveness of labour inflows and outflows with respect to an increase or a decrease in construction output' (P10).

Interviewees reported that the most immediate consequence of inflated labour costs, as well as the material costs and delays which accompany booms, is a decline in margins. As one builder put it:

> The challenge we've got is [margins] are only on around 1 to 2 per cent, maybe 3 per cent … We can burn through our … margins very quickly … [it means we have] a sustainability problem. (P5)

Participant 38, a builder and financier who had worked in Australia and the US, argued that during boom periods, project proponents were prepared to pay builders anything to get projects done quickly. However, 'in quiet times, it's like "right, hang on. No, no, no, we're not prepared to pay that. We need to bring that down"'.

As work dries up in downturns, there are fewer projects available to support the same level of overheads, and many firms will work for little or no profit to ensure longer-term survival. As one builder noted, 'The supply chain gets nervous [if they think a firm is in trouble] … they restrict [supply]. When you do that, you choke the business' (P32). Pressure on margins then typically results in an increase in insolvencies.

Of particular concern is competition from other construction sectors, such as government infrastructure projects and mining (P17). These sectors have better pay and conditions, which adds to cost inflation in the residential sector during booms. As Participant 19 emphasised, 'it's very hard [for workers] to come back and swallow lower [pay] rates'. As in the detached sector, Participant 12 noted the pandemic 'saw a significant influx [of people who] lost jobs … [in] hospitality, retail and different areas. They start[ed] up as … small sole traders in the construction industry'.

Mark Farmer, in his influential review of the UK construction industry, highlighted how the entry of less productive workers during boom periods adversely affects productivity (Farmer 2016). The entry of sole traders also contributes to the high number of insolvencies and firm exits (P12). A workshop participant argued many subcontractors are simply too small, and lack business acumen. This was also a conclusion of Bryant et al.'s (2025) investigation into builder insolvencies. The ease with which subcontractors can enter the housing construction market puts downward pressure on contract pricing, which in turn drives a lack of business sustainability. As Participant 17 put it, 'any vacuum is going to be filled by fly-by-night and poorly resourced marginal operators', which has implications for the quality of work. Participant 12 argued the sustainability of the sector requires a 'level playing field' in which good operators are not undercut by bad operators. It was also thought that policymakers need to consider the nature of building firms and their business model, given the consumer risk involved in defects and business failures (P18). This links to the importance of regulatory compliance discussed in Chapter 5.

Participant 27 noted that an increasing number of Class 1 builders were moving into construction of Class 2 buildings without understanding relevant code requirements. Another regulator (P18) was particularly concerned about the governance structures of small developers and builders, and believed poor governance allows non-compliance with building codes to flourish. Participant 19 underlined that 'it's always about … how can we activate the market mechanism but ensure that the public good is maintained'.

Reflecting on the capacity of the apartment sector to respond to boom conditions, research participants noted that volatility constrains innovation and system of work improvements:

> The apartment boom. So that was a high intensity effort … So, the industry got quite good at putting up those towers, but [it] really didn't embrace a whole lot of innovation. (P21)

This is not a uniquely Australian phenomenon. Beer et al. (2026) found that market volatility is a significant barrier to change in the United States and elsewhere. Participant 37, a US-based commentator on housing economics, argued the acceptance of the booms and busts has created path dependency:

> … [the industry says] we don't really need to take care of these chronic issues. Because we're just going to ride the next boom, the tide that will lift all the boats. That tide has worked so predictably for so many decades … many of these firms say why would I be motivated to start changing things if all I have to do is wait for time to go by and then I'm going to start going back up again … so that's really a big resistance point in some way or other to a cultural transformation around capability.

A successful US and Australian volume builder argued market volatility mitigates against industry consolidation and the benefits of economies of scale, as merging different systems requires resources that are not available. They stated, 'None of … [the legacy systems] talk to each other … they will never fix it in a boom, because they haven't got time. They will never fix it in a bust, because they haven't got the money' (P38). Echoing the sentiments of many interviewees, Participant 17 suggested many of the industry's problems could be addressed by greater stability, stating a 'pipeline of work is exactly the way to address the boom-and-bust cycles'.

4.3.2 Design and procurement

The most significant procurement decision for the high-rise construction process is the appointment of the builder. In Australia, the 'design and construct' (D&C) approach is typical (Easthope et al. 2023). In this approach, developers are responsible for initial project design. Builders then tender competitively for construction work and, if successful, are paid a lump sum fee. D&C requires the builder to be the single point of responsibility for design resolution and construction, transferring risk down the supply chain (Gruneberg and Francis 2018). In theory, all the construction risk is shifted to the builder for a lump sum payment.

Competition, and the imperative to have a pipeline of projects to shore up cash flow, means builders' margins are typically very low (Gruneberg and Francis 2018). This, in turn, means D&C approaches incentivise builders to extract savings to achieve a positive financial return. As construction is essentially a trade-off between time, cost and quality, quality is often compromised to ensure profitability.

In examining the system of work for apartments, Lee et al. (2026) found the risk of a change in market conditions influences the developer's decision to forego early contractor involvement (ECI), as ECI adds time and cost to the preconstruction phase of development. While ECI enables early design resolution, which is likely to reduce construction duration, defects and costs, developers trade off potential gains against the risk of losing much of their equity investment should there be a downturn in the market. Given their equity is limited, they are also avoiding expenditure.

4.3.3 Institutionalisation of risk

It is important to understand how the risk of market downturn has been institutionalised in the high-rise development process, and the constraints this imposes on construction. In Australia, build-to-sell apartments account for most apartment supply, with projects underpinned by debt financing. The build-to-sell market can be regarded as a contract market, as a presales quota is used by financiers to confirm demand and cover the construction loan (Wilkinson and Reed 2008; Bryant 2012; Rowley and Phibbs 2012).

Presales (also known as 'buying off the plan') address market volatility as the 'the biggest risk factor' for development (Rowley 2022: 13). When the market is weak, the presale quota is often more than 100 per cent of the debt commitment. This allows for failed settlements. During a boom, the presale quota typically falls substantially. Purely speculative developments, in which apartments are only offered for sale after a building is completed, are very unusual in Australia, as the developer and their financiers are totally exposed to changes in market conditions.

Following the Australian Consumer Law, presale contracts can only be offered by developers once a planning permit has been obtained. Presales campaigns therefore initially occur while the developer is also seeking to appoint the builder. Achieving the presale quota is the trigger for financiers to release the first tranche of construction funds, but presale campaigns continue until a project is sold out, at which point project revenue is locked in (Forlee 2022). Changing consumer preferences may, however, necessitate design modifications as the presales campaign progresses. Design changes can occur even as the building goes up, though this is likely to delay construction. The challenge in obtaining presales militates against ECI and design resolution. The Australian Consumer Law also locks in the presale price. This means controlling costs is paramount, and for the developer this is managed by shifting construction risk to the builder.

Presale approaches mean apartment buyers take the capital gains (or losses) that developers would obtain if apartments were sold post-completion. Presale deposits are 10 per cent or less of the purchase price and held in escrow. In a rising market, precontracting thus provides the opportunity for buyers to make windfall profits with little outlay. Buyers can cut their losses if prices fall below the purchase by defaulting at settlement. The legal costs of pursuing breaches of contract are high and disincentivise developers from pursuing defaulting buyers, while foreign buyers can remain out of reach of the Australian legal system (Bryant 2012). Buyers may also have little choice but to default if a price fall means mortgage lenders are unwilling to lend.

The opportunity for capital gains and limitation of potential losses mean buying off the plan is attractive to investors. Foreign investors are particularly important in the high-rise market and, as investment laws restrict their purchases to new housing. Apartment development has therefore become highly reliant on investors. Consequently, most apartment product is 'investor-grade'; that is, of lower quality, amenity and design than owner-occupiers typically seek. This dynamic reinforces owner-occupiers' preference for detached housing over apartments, and apartment developers' reliance on investors (Sharam et al. 2015). So, while presale contracts are intended to derisk apartment development, overreliance on speculative investors makes projects highly vulnerable to investor flight during market downturns. Downturns see early-stage projects deferred or abandoned, and also threaten returns on completed projects. In this context, high development margins are justified.

Builders are always under pressure to reduce project duration and costs, but the conditions that would permit them to be more efficient are constrained by the system in which they operate (Böhme et al. 2018). Changing the system of work also involves risk. Many builders prefer to 'leave money on the table', as they believe the certainty of a smaller reward is better than the greater uncertainty of a larger reward (Gruneberg and Francis 2018).

The system in which builders operate currently provides little scope for them to pursue significant measures that would reduce project duration and costs while assuring quality (Böhme et al. 2018). In booms, builders have insufficient time for changes, while in busts they have insufficient resources. There are two pools of funds in the development process that builders could potentially access to resource systems changes. The first is the capital gains extracted by apartment presale buyers and the second is developer profit. If market risk could be reduced, the rate of required return on development could be lower, easing pressure on contract prices. Redistribution of capital gains, however, requires a shift of a different nature.

4.3.4 Potential of build-then-sell

Build-then-sell models are not unheard of in the Australian high-rise context and not uncommon in the United States. A shift from presales to a build-then-sell model would transfer capital gains from buyers to developers. This would provide additional funds that developers could share with builders, such as through ECI and cost and risk sharing contractual models. The ability to more fairly allocate cost and risk would address many design problems that impede construction and result in defects, as well as the pressure to cut corners. Build-then-sell models would also permit greater standardisation, which is a key means by which production efficiencies can be gained.

Offering apartments only once they are constructed also provides the opportunity for buyers to assess the quality of builds prior to purchase. This would increase pressure for quality assurance. Reduced defects and improved design would encourage more owner-occupiers into the market, providing for greater market stability. Abandoning presales would also deter speculative investors, helping reduce market volatility. Changes to capital gains tax and negative gearing, as well as use of prudential levers (Quintero 2022), could assist in shifting the market away from current investment models to more stable models, such as institutional BTR and purpose-built student accommodation (PBSA). Stabilising demand would, in turn, shift the sector from due-date to rate-based production.

If the BTR and PBSA sectors became the dominant market rental providers, and the proportion of social housing was increased, demand for investor product would be radically reduced. This would provide system stability, as non-market housing acts 'as a buffer against wild and extreme swings' in the property market (Kemeny et al. 2005: 871). Growth of institutional models of private rental housing would flip the current investor-dominated apartment provision model to an approach dominated by owner-occupiers.

BTR, PBSA and build-then-sell models also offer the opportunity for vertical integration and/or alliancing of firms, which would assist in resolving tensions in allocating construction risk. Stable demand would allow vertically integrated firms to build and retain capacity and provide the opportunity for reforming systems of work and supply chain relationships. Workforce stability and greater direct employment would also encourage investment in training and encourage labour retention.

A critical risk in the build-then-sell model is the potential completed apartments will fail to sell quickly at project completion. This presents a challenge to debt financing and developer cash flow. The risk of low sales requires developer capitalisation to weather revenue delays. This suggests a shift from debt to equity financing. A developer (P3) interviewed as part of this Inquiry provided an example of the impacts of this approach. This developer mostly internally funds its projects, which enables it to have a pipeline of work that continues during downturns. This stability enables ECI and the maintenance of stable contractor alliances, which reduces the risk of labour and material shortages during booms. Unsold product goes into the rental market, providing revenue. Once the market enters the next upswing, sales capture the full capital gain.

A key challenge for the presale model is the difficulty in finding buyers. Demand forecasting using economic data provides a general understanding of the level of demand, but finding this demand has been described by Sharam et al. (2019) as looking for needles in a haystack. Consequently, presales campaigns are expensive and can be very lengthy (Ganguli 2022). This is known as a 'matching problem' in the literature. Lisi (2021: 261) argues 'search-and-matching models have become the new economic approach to the analysis of real estate markets'. Matching theory has attracted considerable attention in relation to public housing allocations (see for example Ferdowsian 2023; Çelebi and Flynn 2022; Lee et al. 2023). There is also significant work in relation to private rental (Mammadova et al. 2020), refugee settlement (Andersson and Ehlers 2020; Delacretaz et al. 2016) and private home swaps (Yuan 1996).

In addition, there is an extensive matching market literature relating to Airbnb and US dormitory allocations. In both these cases, market managers were created to provide a centralised platform to bring supply and demand together. In the case of housing sales and rental, housing platforms (such as realestate.com.au) perform this function, although these platforms fail to exploit the potential to more fully understand demand. Sharam (2019) has argued that, in Australia, the 'waiting list' of social enterprise developer Nightingale acts a proto matching market platform, giving Nightingale the capacity to communicate and interact with potential buyers. The earliest Nightingale financiers backed the model on the basis that the waiting list reduced settlement risk, and this has been borne out in practice (ibid). Creating a matching market for apartment developers would reduce build-then-sell developer risk. Such a platform could include the BTR market, with which there are natural synergies.

4.3.5 Land availability

Another market issue impacting on industry structure and builder capacity in the high-rise sector is land availability. The size of land parcels, distribution of sites and form of permitted development drives industry structure and ability to grow. As discussed in Chapter 1:

> Market share concentration is low in the industry, with the four largest builders contributing less than 20 per cent of revenue. The industry is fragmented, with many small-scale enterprises operating in narrow geographic markets (Kelly 2024: 16).

Nevertheless, there is some consolidation activity among the largest companies (ibid). De Valence (2023) argues firm size is significant for productivity, with larger firms generally more efficient than small ones. This appears to be borne out by Bryant and Sharam's (2025) study of development stage durations, which found very large projects are often delivered in the same time as small development projects. The authors suggest differences in corporate capacity could provide an explanation for this phenomenon. As noted previously, the corporate capacity of smaller builders was also raised as a concern by participants in this Inquiry.

While low market concentration and a plethora of small enterprises reflect extensive subcontracting, they are also likely to be impacted by land availability and distribution. Planning policy in major cities over the past 30 years has encouraged significant intensification of existing inner urban areas, providing the opportunity for major redevelopment of brownfield sites. More recently, higher density precincts have been promoted in some suburban and greenfield areas (e.g. New Epping in Melbourne's north). This pipeline of larger-scale development opportunities has promoted the emergence and growth of large builders. However, while facilitating aggregation of land parcels to enable larger projects would increase supply (Ruming et al. 2024), land availability for large builds remains relatively limited. On the other hand, there is a much larger supply of sites where planning controls restrict development size.

The relative lack of 'larger' development sites translates into a relatively small pool of builders with the capacity to manage large projects. As lower capacity is required for smaller projects, a larger pool of small builders exists. Large builders are uninterested in small projects because of the geographical distribution of sites and lack of economies of scale. The economics of building suggests there is a case for industry consolidation. This would promote greater capacity, but is very challenging in the small-scale project sector. Standardisation, enabled through build-then-sell approaches, provides a possible solution.

While market volatility delivers sub-optimal construction processes, it is important to consider how the broader development market might evolve in response to cycles of boom and bust. Beer et al. (2026) found that, internationally, market volatility is associated with a trend towards horizontal and vertical integration of builders and developers. This integration does not result in productivity gains, but rather sees a focus on speculative land development. Firm consolidation enables monopolisation of local land banks, where restricted release of housing drives housing values above residual land valuations. This increases margins for developer/builders, but also drives house price inflation. Furthermore, horizontal and vertical integration of firms is associated with a focus on low-risk, high-return housing markets as a means of improving development profitability.

4.4 Implications

Across upturns and downturns, builders find themselves locked into cycles that discourage long-term investment in skills, technology and process innovation, even when these are essential to improving capacity. Incentives to invest dissipate entirely in downturns. With falling demand, fewer projects underway, and a shrinking pipeline of future work, builders face uncertainty that makes capacity building appear both risky and unnecessary. Firms are reluctant to commit resources to initiatives that might not pay off. Slowdowns in activity reinforce caution and short-term survival thinking, rather than creating space for reflection and planning. Booms are also fraught periods where the introduction of change is risky. This paradox of being too busy to invest during booms, and too uncertain to invest during busts, creates a persistent barrier to industry-level improvement. Subcontracted labour, thin margins and fragmented delivery amplify this effect.

This situation is the outcome of risk being shifted down the supply chain and also reflects the way in which market volatility structures the development process more broadly. Government intervention remains significant as a source of volatility and in shaping responses to volatility.

Globally, there have been numerous strategies for improving construction productivity. Many measures have been implemented, but these seemingly fail to have a significant impact, especially in Anglophone countries where housing is highly financialised. This suggests a need to look to causes and solutions beyond the construction industry itself, and to consider the way in which broader economic systems shape demand. This is taken up further in Chapter 7.

5. Compliance with regulation

5.1 Sector regulation in Australia

Since 1994, the National Construction Code (NCC) has been Australia's primary source of technical design and construction provisions for buildings. The code sets minimum requirements for the safety, health, amenity, accessibility and sustainability of certain building types (ABCB 2025), including detached and high-rise housing. The NCC consists of the Building Code of Australia and the Plumbing Code of Australia, and references about 60 Australian Standards. The NCC is produced and maintained by the Australian Building Codes Board (ABCB), on behalf of the Australian, state and territory governments. Government relations with the ABCB are managed via an Inter-Governmental Agreement and the Building Ministers' Meeting, which oversees policies affecting Australia's construction industry. Code changes are undertaken via a three yearly review cycle that is independently managed by the ABCB. The change process involves formal proposals, expert review and stakeholder and public consultation.

State-based building commissions administer buildings codes and, where required, oversee licensing of practitioners. States and territories also have various regulations concerning insurance provision and practitioner liability. As noted earlier, domestic building contracts govern the relationship between builders and clients in the detached housing sector, while Australian Consumer Law establishes the requirements of presale contracts in the apartment sector.

5.2 Performance-based regulation

The NCC takes a performance-based approach, with the aim of enhancing design flexibility and efficiency (Armstrong et al. 2017). The performance-based approach means builders are not required to adopt any specific material, component, design factor or construction method. The NCC provides a choice of compliance pathways and is intended to support innovation (ibid). Performance requirements can be met using either a 'performance solution' or a 'deemed-to-satisfy solution' (ABCB n.d.).

There is industry scepticism about the effectiveness of the performance-based approach. As one regulator put it, the performance-based pathway is a 'wonderful idea and concept, but three quarters of our industry … [have] never looked at or done any performance-based solutions' (P27). Another interviewee noted that 'many people are just not familiar with performance-based laws … and some people just don't have the competence to be able to exercise it' (P7). Similarly, a policymaker argued 'The NCC is performance-based and technically allows innovation … but builders and surveyors often avoid using [performance solutions] due to risk, complexity, or lack of understanding' (P34).

This scepticism is also present in the literature. Johnston and Reid (2019) have observed that, 'there has been a dearth of research aimed at investigating the effectiveness of performance-based codes generally' (p.16). More specifically, performance-based building regulations have been perceived as seeking innovation, while not providing 'a safe space' for those willing to introduce new construction techniques (Gharbia et al. 2023). Armstrong et al. (2017) argue that a more precise quantification of performance requirements is necessary to increase confidence in using performance-based approaches.

While financial assistance and regulatory support are provided to small firms to encourage innovation in complying with the codes (Manley 2008), Participant 27 argued there was little industry training to support innovation. They used the combustible cladding crisis as an example of what can happen when operators try to be innovative, but do not adequately understand what they are doing. The sense from this participant was that, 'most people with a trade background want prescription. "Just tell me what I have to do. Tell me what's right and what's wrong"'.

Other participants were similarly concerned about the regulatory gap between product testing and product certification in a performance-based system. A product manufacturer can opt to obtain tests showing how the product performs in relation to its intended usage. Formal certification, such the 'CodeMark' issued by the ABCB or a certificate issued by an accredited certification body, requires the proposed application of the product to be tested. The difference between the two pathways means tested materials can be used for purposes that are not approved or intended. Participant 27, for example, highlighted buildings in Melbourne using solar panels as part of a wall system, which was not a certified application and that had created a fire hazard.

Performance-based codes provide the opportunity for innovation; however pursuing innovation can involve lengthy and costly processes to ensure compliance. Lack of innovation, and diffusion of new products and processes that could improve performance, need to be seen in the context of an industry operating in a volatile market. As discussed previously, margins are thin, as are firm resources during downturns. In boom times, competition for resources deters innovations that may involve risk.

5.3 Regulatory uniformity and change

A primary intention of the NCC was to harmonise building codes across Australia. This was intended to reduce the costs of operating across state borders and promote economies of scale. However, in recent years national uniformity has been undermined by state-based code derogations and deferrals of code updates. As one peak body commented:

> We have this situation now in Australia where some states are having a moratorium [on updates]. Others are implementing the new one. Others are implementing … in six months' time. (P14)

A regulator concurred, noting 'We've got five different versions of the National Construction Code' (P18).

Highlighting the distinction between firm-level impact and industry and economy-wide impact, Participant 14 argued that state-based derogations to the NCC undermined economies of scale and introduced uncertainty. This view was shared by Participant 17, who believes the lack of consistency across jurisdictions:

> leads to less certainty in the pricing and the risk structures … there is and there always has been enormous wastage; mainly through the need or the perceived need for builders to take on more risk and apply contingencies for that risk through the contracts.

The de-harmonisation of the NCC reflects the way in which state and territory governments have responded to industry arguments, which have emphasised the regulatory burden in accommodating periodic updates and cost of new requirements. The Master Builders Association, for example, is reported to have argued 'builders and certifiers do not know how to apply the NCC correctly, and the need to interpret the code adds costs and delays to consumers' (Lui 2025). This argument suggests there is a capacity deficit which, given the dominance of small firms, is perhaps unsurprising. The inference of much industry advocacy is that the NCC be stripped back, so that the least capable trade or builder can achieve a 'pass grade'.

In contrast, a policymaker argued that while the regulatory and cost impost of the NCC has grown, the benefits are significant:

> The consumers need to be confident in what they're buying … [and want homes that] hold their value … there are … whole of economy consideration[s]. The costs of poor housing have a bearing on the economy, they have a bearing on the government, and so obviously they need to be considered holistically. (P24)

While this perspective might be expected from a policymaker, builders interviewed as part of this Inquiry did not argue that standards should be not be subject to change or codes changed less frequently. They were also cognisant of public interest. For example, Participant 19 argued code changes to provide for disability accessibility were 'necessary' even if they added to costs.

Increasing sustainability requirements are also accepted as often adding operational challenges and costs (Lawania et al. 2015). Participant 2, for example, estimated code changes to lift the energy performance of dwellings added '$40,000, $50,000 per build'. New standards often require changes to the supply chain. Participant 1 said the higher energy rating introduced in 2022 meant 'you can't use half the products you used to'. Substitution may not be straightforward, as alternative products may not be available or require certification. Participant 13 said chasing 'sustainable certifications … adds months to procurement timelines'. Many new standards require specialised knowledge, and this too can create bottlenecks. Until the appropriate skills and knowledge are brought to bear, new sustainability requirements can increase the risk of defects and rework (Daniel et al. 2024b).

Despite these challenges, a veteran of the industry said regulation sprang from an 'infamously … sloppy' industry in which unqualified, unlicensed people undercut builders trying to do the right thing. Regulation, in effect, creates a level playing field. 'So, getting back to your regulations … [I] don't really have a problem with it … it means that we can get rid of the stupidity and get some common sense' (P9).

Code changes that lift standards create the risk of rising procurement costs and delays, which can erode already thin margins when increases cannot be passed through to buyers. To help mitigate this risk, code changes typically have long lead-in periods which permit adjustments. Over time, economies of scale in procurement should result in reduced input costs. Importantly, code changes occur in the context of market volatility. Providing greater industry stability would mean builders and supply chains would be better placed to adjust to code changes.

5.4 Contracts, insurance and defects

The complex web of regulation across federal, state and local levels is a significant contributory factor in what has been referred to as a 'defect crisis' (Randolph et al. 2024). Regulating for quality assurance involves codification, coregulation and insurance. The NCC establishes requirements for safe construction and minimum building performance. This is complemented by consumer protection systems and processes. Insurance is an additional mechanism for managing risk. More recently, the industry has embraced coregulation in the form a new ratings system (discussed further below). Nevertheless, reviews by the Victorian Auditor-General's Office (2015), Ombudsman New South Wales (2018) and Shergold and Weir (2018) each found consumer protections fail to effectively regulate builders.

State sanctioned domestic building contracts (DBC) apply in the construction of detached houses. DBCs are fixed price contracts that provide a framework for deposits, progress payments, and build duration. The prohibition on cost escalation during the build poses a significant risk for builders if the contingency allowance is insufficient to meet unanticipated cost increases (Bryant et al. 2025). In the absence of robust building code enforcement (see below), DBC cost pressures encourage builders to cut corners, which has implications for build quality and defects. However, DBCs also do not protect builders when clients fail to make the final progress payment.

As noted in Chapter 1, the Australian Consumer Law governs presale contracts in the apartment sector. Presale contracts give the developer considerable scope to change design, which they may do if market sentiment changes during a sales campaign and/or if the builder seeks changes to improve constructability or reduce costs. In some states, such as New South Wales, buyers can opt out of the contract or can potentially claim compensation where designs change. The 2010s apartment boom reportedly saw developers cancelling contracts or delaying projects to trigger sunset provisions, so buyers would opt out of their contracts. Developers would then offer the apartments to new buyers at a higher price. This tactic allows developers to capture capital appreciation in rising markets.

Domestic builders' insurance remains subject to criticism, as it does not provide genuine coverage for common detached housing building problems, such as non-completion or poor-quality work (Consumer Action Law Centre 2021). Domestic builders' insurance only provides relatively short-term protection, unlike 10-year liability insurance for apartments. Introduced in New South Wales and anticipated in Victoria, decennial liability insurance enables owners' corporations to have serious defects rectified up to 10 years after an apartment building is first occupied.

As noted previously, rectification work erodes already thin margins and drives up insurance premiums (Panton-Cole and Aibinu 2021). One regulator (P12) said the defect crisis had engendered a 'real crisis of confidence' in the apartment sector. Another regulator (P18) argued high-rise towers with serious defects were uninsurable, which meant they were 'untransactable'. The scale of defects has resulted in the exit of some insurers.

Insurance provision reflects confidence in builders and the broader regulatory system and simultaneously acts as a form of coregulation. As a policymaker stated:

> It's really important to … think that without all of that sort of trust and risk management and liability kind of being – and insurance – all those things in place, then the whole thing falls apart … an insurer is not going to offer money to someone who's not registered and doesn't have some capacity to be regulated by like a regulator; you know, monitored by a regulator. (P24)

Participant 18 highlighted insurers' technical inspection services are comprehensive and form an important component of a coregulatory regime, stating 'If you can't get insurance, it's got to tell you something'.

As highlighted in Chapter 4, builders will take on more work during booms, often as cashflow measure, although it is risky. Insurers recognise sharp workload increases present a risk. The Victorian Managed Insurance Authority,[5] for instance, permits only incremental increases in work unless insurance coverage is lifted substantially. As a regulator recognised:

> If I were the insurer, I wouldn't give them the insurance either. Why? Because you're going from 200 to 400 [house builds]. If you went from 200 to 220, I'll give it to you. If you go from 220, and next year to 250, I'll give it to you. It's that incremental increase to show that you can actually cope and manage and not fall [over]. (P27)

One of the outcomes of mitigating the risk of builder failure in this way is the restriction of firm growth. This reinforces the highly disaggregated nature of the industry, which ironically contributes to financial vulnerability.

5 The scheme is now the responsibility of the Victorian Building and Plumbing Commission.

To address the loss of confidence in builders, the Independent Construction Industry Rating Tool (iCIRT) was recently established to rate builders, developers and construction professionals. Rating provides third party assessment of quality assurance frameworks, supporting 'good players' and helping to eradicate 'bad' actors (P12). Such market coregulatory mechanisms are, however, symptomatic of failing building control.

5.5 Non-compliance with building codes

Non-compliance with the NCC is a critical area of concern (Panton-Cole and Aibinu 2021). In recent years there has been increased scrutiny over the build quality of housing in Australia, particularly new apartments, and over the accountability of builders (Crommelin et al. 2021; Oswald et al. 2021; Sandanayake et al. 2021). While builders are required to warrant their buildings are compliant with the NCC, the government-sponsored inquiry into building compliance and enforcement by Shergold and Weir (2018) found lack of regulatory oversight of the high-rise sector permits non-compliance to flourish.

Participant 27 said most builders 'want to comply, and as a whole … they don't want to get into trouble'. Other research participants were less sanguine:

> Regulatory compliance [is] weak in Australia and the [United Kingdom] reflecting poor regulatory oversight, lack of consumer protection, [and] dishonest product manufacturers. (P7)

> Each site is required to have a licensed person in charge of the site supervising the work … That doesn't always happen. (P18)

> Non-compliance with legislation, contracts, not delivering fit-for-purpose buildings. (P13)

Participant 12 highlighted the financial pressures on builders, stating 'There's an acknowledgement that … unfortunately, when people are really strapped into stress, they sometimes cut corners and do the wrong [thing]'.

While a cultural shift was identified as important in improving build quality, regulatory enforcement was viewed as critical. Participant 7 argued that:

> … in addition to training practitioners in the use of codes and standards and building a culture around that, there was a need to equip building authorities with the means to enforce and seek compliance with those codes and standards.

Participant 16 suggested non-compliance in the apartment sector starts with the development process, when developers will not fund full design documentation early in the process. The planner stated, 'You don't want to spend your money on the detailed design until you know that you've got a planning permit … because it is a huge expense'. A builder also pointed out the complicity of design consultants in non-compliance:

> Everyone's pointing at the builders going, oh, you should be compliant … No one wants to talk about the design consultants … I've audited them, enough of them to know that we have massive issues with the way they operate and how profit-driven they are. (P5)

In New South Wales, the Design and Building Practitioners Act 2020 (DBP Act) is intended to address some of the defect problem and imposes multiple new obligations on building design practitioners, including:

- owing a statutory 'duty of care' to landowners and subsequent land owners;
- ensuring design practitioners are properly qualified and recognised by professional bodies, adequately insured and registered with the NSW government; and
- that design practitioners issue compliance declarations that confirm their work complies with the building code (Chew et al. 2020).

Participant 3, a high-rise developer, said the DBP Act added cost with 'a lot of smaller developer [and] builders … [are] already gone', but acknowledged it improved quality and kept 'the good builders [and] developers in the market'. A peak body agreed the DBP Act was 'weeding out' unprofessional builders, but that it had caused a short-term capacity problem, 'now there's … a bit of a headache going on here because you've lost a lot of contractors' (P9).

Another peak body challenged the view that code enforcement adds to costs, arguing 'shoddy workmanship' simply shifts costs. They stated, 'I'm of the view you need a strong regulator … Because that's the only way you get decent construction quality' (P14). A regulator also suggested the DBP Act created savings:

> … jobs are going up faster and more compliantly than they ever have. [Builders and designers] are now walking around in complete amazement. "How quickly these buildings are going up!" Because simply, they're starting with a full kit of resolved documentation. (P18)

Participants 7 and 27 identified how a shift in planning policy had inadvertently increased defects. They said detached housing builders were increasingly taking the opportunity presented by increasing intensification to venture into apartment construction:

> there are many domestic building builders who have chanced their arm at mid-rise construction because [they believe] it can't be that much more complex than building a domestic building. (P7)

Participant 7 also said the issue was not so much 'bad people', but rather builders 'who haven't got had the experience, training and competence to build mid-rise, which are … more complex buildings'.

Drawing attention to the tendency for the building industry to be 'a race to the bottom', Participant 7 said builders noticed 'what the others were doing and because that was a cheaper form of construction, they all started copying it because otherwise they were out of business'. That is, there is a market failure which results in a lowering of standards and creates significant negative externalities. As noted in Chapter 4, a workshop participant argued there are too many small contractors who lack basic business capacity, and thus often underprice their work to the detriment of their own margins and cashflow. However, these contractors inadvertently undercut other firms who are pressured to drop their rates, but then they need to find savings, and this leads to defects. Participant 18 said:

> Policy should start to put some criteria around about what a viable business would look like … So, we've got to start at least the narrative that says what are the appropriate entry points? What are the criteria to enter the industry? And I think it's got to be around capability, capacity and capital.

A major issue in reducing defects is the conflict of interest in builders engaging and paying for private certifiers or building surveyors in some jurisdictions (Victorian Auditor-General's Office 2015, Shergold and Weir 2018, Panton-Cole and Aibinu 2021). Surveyors conduct mandatory inspections, and issue building and occupancy permits. Participant 18 recalled that before the privatisation of certifiers, municipal inspectors were often very unresponsive to the needs of builders, which created delays. However, while opening the role to market competition cleared that blockage, it also gave rise to conflicts of interest (P24). Participant 7 suggested that while private certification enables a faster and more responsive system, it requires:

> [a] more consistent interpretation of the code for the purposes of building approvals …. you could … have [private] building surveyors being allocated [work] through a public register but charging their own fees, so you still keep that private sector competitive environment, but you have a … closer association with the public regulator. To ensure that building surveyors or certifiers are reporting consistently back to the regulator … so that they're more accountable.

This comment draws attention to regulatory monitoring systems. One regulator (P27) highlighted that building authorities were reliant on secondary data, such as defect claims, to understand where problems were occurring. This means building authorises are only aware of problems once they occur in significant numbers, and well after the damage is done.

Code non-compliance has led some state governments to introduce other mechanisms. One builder pointed to the Victorian and NSW Governments' requirement for a third-party structural review by an independent engineer. They stated, 'It feels like that's the easier way to solve some of the issues, just make it legislative' (P5). Participant 7 pointed to the German system, where independent engineering reviews are publicly funded, with the state being reimbursed by the developer. This creates a clear separation 'that the client is not directly paying for the peer reviewer's salary'.

Some participants were concerned about the level of paperwork required for regulatory compliance. Others believe there is an opportunity for technologies, such as Building Information Modelling (BIM) and design software, to be integrated with quality systems to reduce non-compliance and regulatory burden. Participant 5 suggested the benefits of these technologies go beyond supervising WIP and compliance. They suggested new technologies provide clients with the opportunity for digital oversight, which could build client confidence and contribute to a less adversarial relationship between builders and clients.

Participant 12 argued that improved regulatory oversight was desperately required to address the 'significant [public] erosion in [the] confidence in the quality of built assets'. While regulators were seen as needing additional resources, participants were keen to see oversight maximised through new approaches such as independent market mechanisms, ratings agencies, and better utilisation of data and market intelligence. Moreover,

> … if there's an understanding and a viable threat to incompetent builders that they may get inspected at any time in the same way that you know, if we go over the speed limit when we're driving, then we know that that's sort of credible threat. [It] can change behaviours for the better. (P12)

Integrating BIM with quality assurance and other digital technologies could also provide regulators and certifiers with the opportunity for remote, and potentially automated, inspections.

The participant summed up the problem of non-compliance and resistance to robust regulation:

> Surely, it's in your self-interest to have greater regulatory controls putting in place penalties on your competitors [who are] cutting corners, compromising your capacity to continue to operate as sustainable during business. Surely by levelling the playing field and ensuring there is a fair playing field, it's actually in your own interest and assures a sustainable industry for tomorrow, an industry with a significantly elevated reputation to really help support confidence in construction. (P12)

5.6 Building practitioner licensing

There is a lack of uniformity in the approach to licensing of building practitioners across Australia. State-based building authorities are responsible for administering the Building Code of Australia in their jurisdiction. States and territories may require builders and building practitioners, such as designers, building surveyors, quantity surveyors and project managers, to be licensed. This licensing is intended to establish practitioners as qualified, competent and a 'fit and proper' person. Under the Plumbing Code of Australia, plumbers must also be suitably qualified and registered in each jurisdiction. Other state-based regulations require electricians and architects be licensed and registered, while the need for engineers to register varies across jurisdictions. The requirement for other trades, such as tilers, plasterers and painters, to be licensed depends on the jurisdiction and the value of work undertaken.

Building certifiers in Victoria and Queensland must be qualified surveyors. In Victoria, surveyors have a statutory role in issuing building permits, conducting mandatory inspections and issuing occupancy permits. Most operate in a private capacity (Law 2021). Building certifier requirements differ in other states. For example, in New South Wales, other professions, including construction managers, engineers and architects, can become certifiers. Across states the level of qualification varies considerably. Lack of uniformity has obvious pitfalls. For example, building surveyors can be registered in Western Australia, where requirements are less stringent, and then transfer to Victoria without meeting that state's higher requirements (Rooney 2025).

Research participants generally viewed the licensing of trades and other practitioners as part of a fit-for-purpose regulatory regime. As a regulator put it, 'We need to have licenced people performing licenced work, and there needs to be a licenced supervisor or manager on a site that's got the credential to be that person' (P18). Participants often thought licensing would result in fewer defects and quality problems. Some, however, saw difficulties in trades being pulled off projects to undertake training, as there are significant costs associated with doing this. Others saw opportunities in continuing professional development (CPD) as it 'forces you to be in the room' (P24). Beyond compliance, this CPD create a space for builders to take notice of things that could improve their business and reduce insurance costs.

Professional standard schemes were also regarded as desirable. As the Professional Standards Council (n.d.) states on its website:

> Occupational associations with professional standards schemes are required to continuously improve the standards of members by implementing robust regulatory systems and detailed risk management strategies designed to protect the consumer.

Architects have long embraced such professional recognition. However, one regulator said, 'engineers are still running from the possibility of … [being] brought into the professional standard schemes range' (P18), despite litigation over defects highlighting the need for culture change.

Another builder argued the issue goes beyond licensing, as they regularly encountered consultants who claimed to be licensed, but were not:

> … I look at compliance more than anything else at the moment. So, I look at the document, and I've got your signature on it. So, I can't read your signature. So, I don't know it's you. I said, well, you're supposed to sign. You're supposed to print your name underneath your signature … [and] put the licence number alongside it …To some degree, I blame the government for this because they've allowed it to happen. (P9).

This lack of uniformity in practitioner licensing requirements was seen by one peak body (P14) to exacerbate workforce shortages, as it impedes labour moving between states in response to booms and busts.

5.7 Implications

Concerns about housing supply and affordability are driving worrisome changes to building regulation. Regulation of buildings and of builders and trades is narrowly viewed by some commentators as simply being about production costs. This ignores the huge cost poor building quality imposes on consumers, the general community and the planet.

The idea that there is an excessive regulatory 'burden' needs to be viewed in the context of how risk has been shifted down the supply chain – to the tradesperson with a utility truck, whose training provides little in the way of business administration skills, in an industry where market volatility exacerbates the burden of excessive competition, low margins and cashflow vulnerability. At the present time, the small size of most firms militates against the effective control of the many risks involved in building. The solution is not to reduce standards but to build capacity through industry restructuring to foster firm growth. Enforcement of the building code – desperately required to address the continuing defect crisis – is a way government can, through modifying the behaviour of the smallest actors in housing construction, drive industry restructuring.

6. Potential of offsite manufacturing

Offsite manufacture (OSM) has frequently been suggested as a way of improving the productivity of Australia's housing construction industry. This chapter explores this potential, particularly from the perspective of industry insiders who participated in interviews and workshops as part of this Inquiry.

OSM is a process that facilitates greater use of factory and manufacturing facilities to produce building components, while minimising onsite construction (Weththasinghe and Wong 2024). OSM can involve entire structures, such as whole dwellings or bathroom pods, being built in a factory. This is known as '3D volumetric construction'. Flat components, such as wall panels, can also be produced via OSM. This is known as '2D panelised construction'. OSM is encompassed by modern methods of construction (MMC), which has been broadly shown to support the delivery of higher-quality buildings while increasing productivity in the construction sector (Dedeu Dunton et al. 2024).

In recent years, OSM has become a significant area of policy attention in Australia. In March 2024, the Building Ministers' Meeting agreed to progress changes to the NCC to facilitate OSM. The Australian Building Codes Board (ABCB) (2024) has since released guidance on the use of prefabricated, modular and offsite construction. The Australian Government also announced a $54 million funding package to accelerate the adoption of OSM. States have introduced their own programs. In New South Wales, for example, a Modular Housing Taskforce was established to support a trial of modular methodologies for the delivery of social housing. The NSW 2023-2024 budget also allocated $10 million for a MMC program. Queensland's QBuild MMC program, established in 2024, aims to address a severe shortage of housing for government workers, particularly in rural and remote parts of Queensland. Despite this significant policy focus, the use of OSM in detached and high-rise housing construction in Australia remains limited. Market penetration of OSM in the new housing market in Australia is estimated to be around 5 per cent (Betram et al. 2019).

Establishing financially sustainable OSM housing is challenging. OSM requires significant infrastructure and up-front investment, which necessitates a consistent pipeline of orders to ensure the financial viability of manufacturers (Saad et al. 2023). Manufacturing relies on high levels of standardisation, requires fully pre-established and resolved design, the adoption of specific standards to support building code compliance pathways (Gad et al. 2022), and quality assurance. In addition, certification of OSM products at the factory gate is required (Gharbia et al. 2023). This is challenging for global supply chains (Tennakoon et al. 2024, Wuni et al. 2022) and requires independent certifier bodies. In Australia, self-certification of products is currently the only option. The distance between major housing markets in Australia is a significant barrier to local production, as is the lack of uniform road transport regulations. At the builder level, the uptake of OSM faces barriers in terms of economic justification, especially given the low confidence and negative perception that prevails among Australian consumers (Zolghadr et al. 2022).

These challenges highlight the extent to which in situ production has evolved to address issues such as market volatility and supply chain challenges. A system 'lock in' has occurred, meaning OSM is unlikely to incrementally replace traditional construction methods (Lovell and Smith 2010).

Australia-based participants in this research indicated that use of prefabricated elements, such as glass facades, precast concrete, bathroom pods and cabinetry, are common in the apartment sector. In the detached housing sector, prefabrication appears to be limited to roof trusses and frames. Overall, research participants supported OSM in theory. However, they struggled to see how a transformation could be achieved.

6.1 Offsite manufacturing in nations with high take-up

Before looking more deeply at OSM in Australia's detached and high-rise construction sectors, it is worth briefly considering the circumstances of countries such as Sweden and Japan, where OSM makes up a significant share of the market.

In Sweden, rapid industrialisation and urbanisation after World War II resulted in a severe housing shortage and political demands for state intervention. The response was the Swedish Million Homes Programme, which commenced in the mid-1960s (Hall and VidÉN 2005). Given the urgent need for housing and the rising cost of construction flowing from labour shortages, the Swedish Government and industry favoured standardisation and prefabrication. Large-scale industrialised construction was supported by generous state loans (ibid). A countrywide, performance-based construction code was adopted, along with standard contract law, which increased efficiency (Freed 2022). While vast tracts of highly standardised housing designs attracted criticism (Hall and VidÉN 2005), prefabrication as a technology was widely accepted (Freed 2022).

In Japan, housing shortages were already evident prior to World War II, and the war destroyed both existing housing and construction capacity. This provided the opportunity for change. Prefabrication companies were incentivised to establish factories through firm contracts with the public Japan Housing Corporation. Firms were also supported by material suppliers seeking new markets. Companies were able to establish prefabricated housing as a commodity market (Yashiro 2014). Over time, a system of mass customisation emerged. Housing consumers could choose from a wide range of alternative subsystems, such as bathroom and kitchen modules, which still permitted economies of scale. State-backed research and development, robust independent certification and consumer protections were also instituted.

6.2 Offsite manufacturing in the detached sector

Research participants indicated a range of 'locked in' practices as favouring in situ construction in the Australian detached sector. Consumer choice and lack of standardisation were nominated as impeding uptake. Project home buyers have extensive choice in Australia, and design modifications are typical. This is contrasted with the Japanese mass customisation model, in which there is limited choice, and only over certain elements (P8 and P21). A peak body summarised the situation thus:

> I think the project home market in Australia has caused a lot of problems because everybody has been told they can have anything they want, and I can guarantee you that if you go to one of those project home builders, their standard range of homes, they've never built a single one of them because that standard home always gets changed. (P8)

As noted in Chapter 4, low margins and competition among builders encourages customisation, but lack of standardisation reduces the opportunity for efficiencies.

Lack of savings were also identified as a challenge in implementing OSM in the detached sector (P28 and P29). Participant 32 pointed out that cheap apprentice labour for onsite builds makes the value proposition difficult to achieve, while Participant 28 argued the potential financial savings were not worth the risk that products 'might fail in two years or three years'. Participant 26 found the quality of prefabricated elements was an associated risk, with components not always being 'absolutely right. Now, most of it is. But there's plenty of it that's not'. Changing the supply chain also entails risk. Participant 32, for example, had adopted a new prefabricated wall system, but found that during the pandemic their supplier could not deliver because of upstream supply issues. The participant noted that their supplier was not 'getting favourable supply like some of the bigger players were. It cost us' (P32). However, the builder was unable to pivot back to traditional 'stick' builds, as the entire house design relied on the prefabricated component.

Mortgage lending for detached housing presents another barrier. A peak body argued that consumer demand for custom builds using volumetric, modular construction was muted by lack of a lending product that could replace traditional progress payments for onsite construction. They explained:

> So, what … happens is someone will go to a modular builder, they want to buy a home. There's not a standard form contract, there's not a bank product and so it all gets too hard and they kind of walk away. (P8)

In 2025, the Commonwealth Bank of Australia agreed to facilitate modular custom builds in the detached housing sector by developing a new contract type that recognises this problem (Barbosa et al. 2017, Commonwealth Bank of Australia 2025). However, at least one participant was sceptical of the new approach, suggesting the contractual risks had not been fully addressed.

The structure of the detached industry, and its reliance of small subcontractors, was identified as another key barrier to OSM:

> [commercial builders] building the 90-storey building, they totally control it. They can do really distinct, focused process improvements and get real improvement. But if you're talking the detached dwelling market across the country, God knows how many builders it is, it'll be thousands, let alone all the [subcontractors]. (P34)

Participant 28 captured sense of the inertia in the detached industry, explaining 'I haven't got time this week [to think about prefabrication]'.

Detached housebuilders and their contractors are locked into a specific delivery system. As Beer et al. 2026 highlights, innovation is most likely to occur in situations where a material or process is directly substituted. The uptake of prefabricated roof trusses and frames accords with this observation. Any innovation beyond substitution involves interface risk. The policy challenge is that transformation of the sector is reliant on the mobilisation of the smallest actors in the system – subcontractors – for whom innovation must be risk free and frictionless.

6.3 Offsite manufacturing in the high-rise sector

As in the detached sector, participants in the high-rise sector saw potential in the use of OSM, but were cautious about the many disincentives to its widespread uptake. The commercial structure of the industry was again identified as a barrier to OSM. As Participant 21 said, 'the whole [OSM] paradigm is just frankly impossible within the current commercial structures of the industry', noting that 'plenty of companies' had 'died on that hill' trying to make it work. Factory-based manufacturing requires 'economies of scale on a national basis' (P19) and a firm pipeline of orders:

> I need to see my pipeline before I work out what my risk is in terms of is that enough of a pipeline for me to mobilise capital, build a plant for $100 million and then get my return over that capital for a period of time. There's a significant amount of risk … And you've probably seen a number of these guys with very good intentions all go broke. Because they just can't get the pipeline to justify the financial cost. (P19)

Participant 8 also emphasised this risk, noting that many offsite manufacturers in other countries had failed due to inadequate demand. They stated, 'People set up these factories with their fancy … automated assembly lines … [and expected to] be flooded with work', but often are not. Demand needs to be high and stable to support the necessary level of capital investment. A lack of demand has consequences such as insolvency risk, negative cashflow and the need to store components and units. An additional risk identified by one of the international participants (P39) is that clients turn to traditional construction when factory capacity is reached during booms – and then do not return.

In Australia, modular builders currently address demand risk through diversification into sectors such as aged care and schools. Participant 8 noted that 'government spending [also] … goes up and down', posing its own risk. Delivery of social housing was seen by some participants as providing the necessary scale to support factory-based production and address demand volatility (P5 and P8).

As in the detached sector, there are also risks associated with the new financial models necessitated by OSM in the high-rise sector. Participant 19 highlighted that financing has evolved to address the risks in traditional construction. Project financiers take security over the site and make progress payments to ensure the contractor has cash flow, while minimising their potential losses. However, with volumetric OSM, 'how do you take security over it?' (P19). A peak body explained that:

> The normal model is they take security over the asset value [that] gets added to the asset. The quantity surveyor goes to site says yes, there's value added to the asset and pays the builder and that's how it works. So, when you have that work predominantly being done in a factory … that requires a completely different approach, and there isn't a contract in place that recognises that and … progress payments off site. Unless you bank guarantee against it, which means you've got to have the money anyway, which means it's very difficult for you to grow your business. Bank guaranteeing against all of the work devalues your business because you've basically got all your cash tied up in bank guarantees. (P8)

While being highly supportive of developing MMC, Participant 19 agreed financing is a critical barrier, stating 'I don't think that it's financially viable in Australia'.

Another barrier reflects the way in which apartment development is organised. Participant 8 said the 'design and construct contract is not suited to offsite construction', as the head contractor only joins the process after planning permits are approved and initial design is completed. Volumetric OSM requires design to be fully resolved early in the development process. Participant 1 said, for example, that glass facades need to be 'made a year in advance … because they can't make them in three days'. Participant 3 noted that even using bathroom pods in a conventional build was problematic, as design is changed as the building goes up: 'We change apartment … layout[s] as we go up to appeal to new buyers or to address costs'.

Other barriers noted by participants included a lack of standardisation, the need for certification, and a lack of uniform transportation regulations. As Participant 7 explained, prefabrication involves turning an onsite process into a product that is manufactured offsite. This necessitates a different approach to certifying compliance with the NCC. As OSM creates a product, warranty and insurability are critical elements in providing market confidence (P8).

Several participants pointed to international examples of government support for OSM uptake. Participant 7 highlighted the work of the International Code Council in developing offsite construction standards for the United States. Participant 8 called out the Japanese and New Zealand programs, where products are pre-approved. They stated:

> Preapproval systems require inspectors to spend time … auditing the factory and signing off on the plans, the … design … and that way we should all have a high degree of confidence that … [what's] coming out at the end is the same every single time and it and it meets our requirements. (P7)

Developing a sub-clause of the NCC for offsite construction was seen as a way to advance OSM and gain national consistency. Standardisation measures are also required to build the market. Participant 14 highlighted that Australian standards, some of which are incorporated into the NCC, are not freely available and are expensive to obtain. This constitutes another barrier in the supply chain.

The global supply chain can create the volume of OSM components required for financial viability. However, as noted previously, global manufacturers face challenges in meeting the legal requirements of each country. China is the biggest exporter of modular housing in the world, yet importation of volumetric modules into Australia would require a Chinese manufacturer 'to have a building license in Australia and [they] would have to be the head contractor and deliver the whole building … [as few builders would take] the risk of assembling their modules and providing a 10 year defect liability insurance' (P8). It was emphasised that:

> When you're starting to get buildings that are coming from long chains of input from distant places, then [insurers] want to see what that looks like. (P18)

> As a developer and a deliverer of these buildings [you] better be bloody sure that you know everything that's in it where it came from, you know, otherwise you are never going to get an occupancy permit in Australia with that product. (P8)

As noted above, the use of prefabricated elements in a hybrid construction model is common. A lack of recognised product certification means users need to satisfy themselves that prefabricated elements comply with the NCC and Australian standards. This can involve considerable effort:

> When it's overseas, we like to go once and then we contract an inspector, usually, for example with facades made in China, our facade consultant has a team over there that goes around and inspects facades in production as a control measure and we get a written report and pictures, videos and the like. (P1)

Participant 1's company had experimented with manufacturing bathroom pods in Australia. However, continuing problems with leakage meant the company had abandoned pods altogether. Despite believing offsite construction generally leads to better quality outcomes, so 'as long as you're inspecting it' (P1), the company had returned to in-situ construction.

Participant 4 also imported glass facades and joinery from China, but purchased bathroom pods from an Australia subsidiary. This had worked well, although the subsidiary was still struggling to obtain the sales volume required to make the approach profitable. This participant felt there is a case for onshoring prefabrication, as this addresses some supply chain risks and problems with rework, and is better environmentally. According to Participant 4, Chinese manufacturers were being supported by state loans to buy equipment from Europe to support automation. It was noted that equivalent government support does not exist in Australia, despite government enthusiasm for MMC.

While some state governments support MMC and have identified social housing provision as a way to underpin demand, some participants noted this policy support does not always translate into implementation. For example, Participant 5 observed that one housing agency would not countenance bathroom pods in a large social housing project, despite lifecycle benefits. Participant 8 also said government needs to mandate changes, such as prefabrication and BIM, on its own projects. This approach has been successful in Singapore and other countries. It was also thought that intellectual and skill development needs to be embedded in relevant university courses to support the adoption of OSM. Lack of coherent industry policy in Australia was contrasted with countries such as Japan and Sweden, where successful OSM has 'been catalysed by very significant government intervention' (P21).

6.4 Implications

There is broad industry support for OSM as a pathway to improving construction productivity, quality and sustainability. However, there is also considerable pessimism about the potential to overcome persistent structural, market, financial and regulatory barriers that limit its adoption in Australia. This is particularly the case in volumetric OSM.

Key challenges include a lack of at-scale stable demand, lack of design standardisation, and financing models that are incompatible with factory-based production. As discussed in Chapter 5 more generally, there are also regulatory gaps, including the absence of clear NCC provisions and product certification pathways. While regulatory issues are being addressed, larger system issues such as the role of private demand remain under-explored.

7. Housing construction as a system of systems

As shown in the preceding chapters, the Australian housing construction industry is characterised by complexity, fragmentation and dynamic behaviour. In this chapter, it is argued that the industry should be understood not as a singular system, but as a 'system of systems' (SoS).

A SoS is an evolving system in which heterogenous and autonomous interrelated subsystems are integrated (Keating et al. 2008), yet independently managed and operated. In SoS, subsystems voluntarily cooperate towards an agreed goal (Maier 1998), even as they pursue diverse and potentially conflicting interests (Bahadorestani et al. 2020). Accordingly, the subsystems do not necessarily behave in accordance with the goal of the SoS, which can lead to suboptimal system-level solutions (Axelsson 2018). As a result, behaviours are 'emergent' rather than planned.

The SoS approach recognises networks of autonomous yet interdependent actors as populating components of systems that operate within, or interact with, larger systems. These actors include individuals, teams, organisations and institutions whose interactions give rise to emergent system-level outcomes. SoS reflect bottom-up dynamics, rather than the top-down structures found in monolithic systems. A SoS is heavily influenced by the behaviour of smaller actors.

The SoS provides a lens through which to examine how diverse goals, operational independence and evolving institutional settings shape behaviour over time. The basic characteristics of SoS, as compared to more traditional systems thinking, are shown in Table 4.

Table 4: Differences between 'systems' thinking and 'system of systems'

Systems thinking	System of systems
Purpose-built	Evolutionary development
Designed to achieve a goal	Voluntary cooperation towards an agreed upon goal
Behaviour intentional	Emergent behaviour
Centralised, monolithic management structure	Subsystems managerially independent
Operationally dependent subsystems	Subsystems operationally independent
Boundaries defined and static	Geographical distribution, dynamic and undefined subsystem boundaries
Feedback loops are intra-system: loops are often explicit and mappable therefore influenceable	Feedback loops cross subsystems boundaries: loops are often implicit and hidden and rarely controllable

Source: authors

7.1 Housing construction as a system of systems

According to Zolghadr (2023), a SoS has five distinguishing characteristics. Drawing on the literature and evidence provided in Beer et al. (2026), Gharaie et al. (2026) and Lee et. al. (2026), housing construction in Australia satisfies these distinguishing characteristics:

- **Operational independence:** Subsystems in Australia's housing construction industry are operationally interrelated. However, they are not operationally dependent on each other. Clients, builders, developers and suppliers – as distinct subsystems – work together to deliver housing. The multiplicity of the players means a builder, for instance, is not dependent on any specific client or supplier. This contrasts with a monolithic system, such as a factory production line, where the subsystems are tightly coupled and the absence or dysfunctionality of one subsystem severely affects the functionality of others.
- **Managerial independence:** Housing construction subsystems do not sit within a central management structure. Builders, developers, suppliers, trade contractors and transportation companies are usually owned and managed separately. Managerial independence does not only occur at the organisational level. Extensive subcontracting, in many cases, extends managerial independence to each worker.

  In the context of a highly disaggregated industry with a large number of players, the autonomy of operationally and managerially independent actors results in an abundance of subsystem 'interfaces'. These interfaces are interactions that are not managed and cannot be controlled by any of the actors.
- **Geographical distribution:** Actors in the residential construction industry are usually involved in multiple projects at different locations, with supply chains stretched over regions or countries (Maqbool et al. 2023). Factors such as regulations, norms of behaviour, systems of work, and availability of skilled labour and material may be different in different locations, adding greater uncertainty to the interactions of the actors.
- **Evolutionary development:** A SoS evolves over time, with autonomous actors both affected by, and affecting, the behaviour of the SoS (Sage and Cuppan 2001). In the housing construction industry, one key source of change is the short-term collaborations among actors (Da Rocha et al. 2015) that epitomises project work and subcontracting. Organisations, teams and individuals compete and collaborate in countless combinations, with relationships continuously forming and dissolving. Firms expand, downsize, shift their focus to other areas of construction, or cease operations altogether, reshaping the system's internal and external boundaries and interfaces.

  New products and processes change the ways in which the industry and its actors function. Innovations such as OSM necessitate new work arrangements, equipment and skills. The purpose of the industry also evolves in response to changes in regulations or cultural norms. Such change may not necessarily align with the purposes of the actors. For example, a regulatory requirement to improve energy efficiency might increase the cost of construction, which conflicts with a builder's purpose of maximising profit.
- **Emergent behaviour:** 'Emergent behaviour' is the result of operational and managerial independence of actors and lack of central management (Gorod et al. 2008). System-level properties of the homebuilding sector are not controlled by any of the actors. Instead, they emerge from the bottom-up. This is because of the interactions of operationally and managerially independent actors, each pursuing their own goals in their own way. Changing any system-level behaviour, such as constrained industry output, requires identifying actor interactions that affect underlying mechanisms leading to the behaviour. In the housing construction SoS, extensive subcontracting has resulted in there being a large number of small actors, and these actors have an outsized impact.

7.2 Emergent behaviours in housing construction

As indicated in Table 4, a key characteristic of a SoS is its emergent behaviours. These behaviours reflect the lack of a central management structure, as well as the autonomy of subsystem actors (Zolghadr et al. 2022). Housing construction issues that have come to concern policymakers recently can be understood as emergent behaviours. They are the outcome of independent, autonomous actors pursuing their own interests. As Axelsson argues, individual actors in subsystems seeking to maximise their own utility can undermine other actors, which 'comes to the cost-benefit balance of the SoS as a whole' (2018: 1). One consequence is that participation in the SoS can be disincentivised, which can then undermine 'the existence of the SoS as a whole' (ibid).

The Australian housing construction SoS exhibits a considerable list of emergent behaviours. These cascade to deliver one overriding behaviour that can be said to characterise the industry: flexibility. Flexibility is implicated in many of the emergent behaviours described below. It is created through subcontracting of labour, equipment hire and just-in-time material supply. Contracting enables construction resources to be increased and decreased as market conditions change, with costs passed down the supply chain. However, instability contributes to permanent loss of construction resources and inhibits changes to work processes that could improve productivity.

Housing price inflation is a significant emergent behaviour which contributes to affordability constraints that affect demand. As it affects the land value component of the development cost stack, housing price inflation creates pressure for builders to reduce their costs to compensate. In what becomes a vicious cycle, rising house prices drive speculation, which increases land prices, further adding to building cost pressure.

Another significant feedback loop is the use of housing demand as a tool for national economic management. The Reserve Bank of Australia (RBA) has a mandate to ensure price stability (that is, control inflation) and maintain full employment. This mandate is largely affected through adjusting the official cash rate, and by extension housing demand (RBA 2025). As AHURI (2022) notes, price inflation has increased the sensitivity of housing demand to changes in interest rates. Declining interest rates directly stimulate housing demand, while increases dampen demand. Changes to interest rates may accelerate a boom or bust or deliver a shock. Either way, building firms and the supply chain do not cope well with the instability. Such instability is managed via flexibility and induces another emergent behaviour: conservatism.

As shown in Gharaie et al. (2026) and Lee et al. (2026), industry output reveals a divergence between detached and high-rise sector behaviours, with constrained output in the former and highly asynchronous output in the latter. Output constraints relate to another emergent behaviour: limited build-then-sell (speculative) supply. Widespread use of home building contracts and apartment presale contracts mean the bulk of new housing supply in Australia is reliant on confirmed demand. This reflects the dynamics of the financing subsystem and the need of capital to reduce risk exposure. As the National Housing Supply and Affordability Council argues (2024: 30), precontracting limits the 'industry's ability to expand because it subjects the availability of finance to the vagaries of household confidence. It reduces the extent to which builders can pre-empt demand through speculative building.'

Demand volatility requires a high degree of construction sector flexibility, as booms and busts generate significant financial risk for builders and the supply chain more broadly. The primary method of achieving flexibility is extensive subcontracting that allows labour to be retrenched at little cost. This gives rise to temporary work as another emergent behaviour. Temporary work results in periodic workforce shortages and labour redundancy, both of which involve excessive costs which are distributed differently at different points in the boom/bust cycle. Recurring recessions contribute to workforce shrinkage (Farmer 2016). Temporary work and the project-based nature of construction result in a high incidence of temporary teams, which contributes to low adoption of innovation and high rate of defects.

Flexibility is also enabled by a lack of trade licensing provisions and poor regulatory oversight of builders. This means there is a reserve labour pool of unqualified or otherwise undesirable contractors. This has several implications. Firstly, it manifests as another emergent behaviour: excessive competition. As Gibb et al. (1997) observe, competitiveness in the house building industry 'does not appear to work unambiguously to improve long-term consumer welfare'. Following Lipsey and Lancaster's (1956) 'The General Theory of Second Best', Kolsen argues:

> There will be some industry conditions in which there is economic inefficiency because there is too much competition. Competition policy directed at economic efficiency thus must be able to provide mechanisms for reducing competition as well as for increasing it, depending on the nature of the constraints in particular industry sectors. (1996: 85)

Lindblad et al. (2016) argue, for example, that 'perfect' competition in the Swedish market for wooden single-family houses results in a very significant welfare loss, as only 38 per cent of firms were needed to satisfy demand. In considering the impact of competition, Stanley argued 'it is essential that some industries be managed as systems' (2017: 8), rather than simply as markets.

Excessive competition does not work for the construction industry and by extension does not work for housing consumers. Excessive competition reflects low firm concentration, which again relates to extensive subcontracting. The Productivity Commission (2025) argues that the industry structure is a barrier to economies of scale and scope and affects capacity to innovate. Melles (2026) identifies firm transience as one of three key constraints to lifting output. Industry fragmentation, however, reflects market volatility (Siebert 2023) and the shifting of risk down the supply chain. In the United Kingdom and United States, for instance, market shocks have promoted consolidation, demonstrating how a SoS can evolve in response to changes. However, as actors pursue their own interests, the wider SoS has not benefited. Instead, excessive market concentration and focus on shareholder returns has constrained supply, lifting house prices, while little effort has been expended on achieving construction efficiencies.

The ease with which new entrants in Australia can enter the housing construction industry contributes to undercutting and low margins. Pressure on margins and lack of building code enforcement encourages cost cutting, giving rise to another emergent behaviour: quality compromise. This manifests as an unacceptably high defect rate, the risks of which are often shifted to consumers and taxpayers. Excessive competition also encourages a high level of customisation as a means of maintaining market share. The resulting lack of standardisation results in poor economies of scale and affects code compliance, while contributing to low innovation adoption.

Low industry profit is another key emergent behaviour. Low margins undermine the capitalisation that would enable investment in capital stock as a productivity measure. Low margins also leave firms highly vulnerable to cashflow crises. This induces conservatism while contributing to low innovation adoption, limited research and development and resistance to societal demands to improve housing performance. As Siebert (2023: 49) argues 'in many cases [small and medium sized builders] just haven't got the ability to change course'.

Housing affordability constraints mute the market signal that should exist for sustainability improvements, but lack of sustainability uptake also reflects the impact of other subsystems. For instance, to increase their returns, banks have been exerting considerable downwards pressure on the fees charged by residential property valuers (Elliott and Warren 2005). According to one of the Panel members for this Inquiry, this has led to highly generic, automated 'desktop' or 'kerbside' valuations that do not recognise sustainability features which reduce household operating costs.

Excessive competition, temporary work and low industry profits reduce firm willingness to invest in people, with training highly dependent on government support. However, widespread privatisation of Australian vocational education and training (VET) providers in the 1990s severely impacted the role these institutions have as training organisations for industry. From the late 1980s, a more market-based approach to VET was adopted, introducing contestability to create greater choice. While competition increased, these changes have been widely criticised for their impact on quality and user costs. Zoellner argues the system is now 'mature' and exhibiting an inevitable decline in the number of providers and choice, necessitating investigation of 'how to create and maintain public value' (2022: 15). He states:

> Markets were successfully implemented but their age and limitations are becoming increasingly visible as they approach the end of their life cycle. VET needs to be re-problematised to assist the governments that created the markets to consider more modern means of vocational skills acquisition and transfer to meet the requirements of the contemporary Australian economy by harnessing government and private sectors to create and increase public value by optimising the benefits of both market and non-market contributions to society (ibid).

Another issue to emerge from excessive competition and VET markets is the increasing specialisation of trades. Specialisation increases the number of occupations without a corresponding increase in the number of subcontractors. This feedback loop increases the coordination burden and introduces new bottlenecks, which contribute to production delays. Further, the size of subcontracting firms is reduced, increasing the number of contractors. Suboptimal firm size contributes to an inability, for example, to price projects at the marginal cost of the service. This in turn means price signals are distorted.

7.3 Disincentivisation of participants in housing construction

In a SoS, 'the cost-benefit balance of the SoS' can be affected by subsystem actors acting rationally to maximise their own utility (Axelsson 2018: 1). This can result in a disincentivisation of participants that undermines the SoS as a whole.

This disincentivisation of participants is evident in the Australian housing construction SoS and is explored below. The focus is on the workforce, as this has not yet been explored in detail. Disincentivisation of participants discussed in earlier chapters are also briefly considered.

7.3.1 Workforce disincentivisation

Infrastructure Australia (2024) suggests there will be a shortage of 300,000 construction industry workers by 2027. Workforce shortages reflect disincentives to participate, many of which are well known (Construction Industry Culture Taskforce 2025). The impact of market volatility and contribution of subsystem interfaces is less well understood.

Australian housing booms inevitably see calls to boost training or skilled migration to increase the size of the workforce and reduce wage inflation. Labour shortages, however, also reflect poor utilisation of existing labour. As indicated in Chapter 3, housing construction labour is often idle because of queueing bottlenecks. The geographical spread of work also means trades spend a lot of time in transit rather than on site.[6]

Adding to the labour supply introduces greater competition and thus eases pressure on wages. However, it also results in thin margins which encourages undercutting and work practices that negatively affect quality, driving the need for rework and hence delays.

6 A factor in the efficiency of tract development is that trades work on a single site for an extended time.

Wage inflation during booms is a significant problem, but the impact of downturns does not attract the same level of concern. Many construction workers periodically experience un- or under-employment as building slows during downturns. Temporary work and below average wages encourage the exit of some of the workforce during downturns, with workers retiring or moving into other industries or occupations that provide better renumeration and conditions. As evidenced in Lee et al. (2026), workers, and especially younger workers, are increasingly rejecting 50+ hour working weeks. Builders report a cultural shift in which younger workers are uninterested in working long hours, given the additional income does not compensate for house price inflation. This is an example of a SoS feedback loop impacting participation. Interfaces also matter. While the masculinist culture of construction is a known barrier to female participation, standard working hours in the high-rise industry (commonly 12 hour shifts, six days a week) do not provide the flexibility required by parents with care responsibilities.

VET is another critical subsystem, and apprenticeships are a critical pathway for ensuring skilled workers. Acquisition of skills takes years; but downturns reduce the opportunity for apprenticeship completions. Trainee renumeration, moreover, is lower than unskilled service sector jobs with which the construction industry competes. In many cases, apprentices are used as cheap labour for menial tasks rather than given work that develops their skills. In addition, the temporary nature of projects means many apprenticeships are disrupted, which in turn delays completions.

The housing construction SoS also exhibits participation disincentives in relation to training more broadly. Building firms struggle to capture the benefits of investment in training when the workforce is largely comprised of subcontractors, and when the cost of training reduces their competitiveness. Continuing professional development (CPD) is under-subscribed, as trade subcontractors find it difficult to justify the time and cost of lifetime learning. Lack of CPD is implicated in the high rate of defects. In addition, as discussed in earlier in this chapter, privatisation of Australian VET providers has severely impacted the ability of these institutions to provide affordable, high quality training for the housing construction industry.

In focussing on labour shortages, the industry fails to consider the effectiveness of participation. Labour productivity is low. One of the international research participants (PA1) found their trades spent only about 30 per cent of their time working on tasks. The remaining time was spent waiting for bottlenecks to clear. To lift time on tasks to 70 per cent, the company instituted significant changes to ordering and delivery of materials. To do this, many other interface problems had to be addressed (see the Project Velocity case study below).

Finally, as discussed in Chapter 4, not all workforce participation is desirable. Booms attract a reserve pool of labour that often lacks skills, which impacts duration and the defect rate.

7.3.2 Consumer and insurer disincentivisation

Chapter 5 highlighted that defects are a very significant problem across the housing market, but particularly in the high-rise sector. Research participants argued that apartment buyers, particularly owner-occupiers, have been disincentivised to participate due to defect risk.

Relatedly, the extent of defect liabilities has seen insurers for both apartments and detached housing withdraw from the market, leaving some state governments as insurers of last resort.

7.3.3 Investor and financier disincentivisation

As outlined in Chapter 3, the participation of investors is integral to the production of apartments in Australia. Investor and debt financier participation and withdrawal is a significant accelerator of boom and bust cycles. The risks engendered by market volatility caused by the entry and exit of investors, and by extension of debt financing, lock in inefficient construction delivery.

Equity investment, on the other hand, can draw in different participants and can change the nature of investment and construction. Equity investment, for example, is important for institutional build-to-rent (BTR). BTR also offers scope for early contractor involvement (ECI) that is typically absent in build to sell projects.

7.3.4 Offsite manufacturer disincentives

Chapter 6 describes the way in which use of OSM is limited in the current housing construction SoS. Lovell and Smith (2010) argue volumetric OSM is locked out by the 'agencement' of in-situ masonry construction. Agencement can be interpreted as another way of describing a SoS.

The many barriers to scalable and sustained OSM highlight a large number of subsystem interfaces. Existing construction approaches have evolved to accommodate interfaces, which OSM cannot simply be retrofitted into. Volumetric OSM therefore requires the development of an alternative SoS.

7.4 Implications

Understanding housing construction as a SoS provides powerful insights into industry practices and behaviours. It suggests the focus of reform needs to be at the system level, rather the responding in a disjointed way to problems evident in parts of individual subsystems. Problems manifesting in components of subsystems often reflect the individual goals of actors and many proposed solutions do not meet wider system or societal needs.

Box 1: Case study: Kāinga Ora's 'Project Velocity'

Kāinga Ora is Aotearoa's (New Zealand's) largest social housing provider, with 68,000 dwellings under management. In 2020, Kāinga Ora launched 'Project Velocity', a program aimed at transforming the organisation's housing delivery system. The $11.2 million project was tasked with developing a detailed construction system that would improve the speed, predictability, reliability, quality and productivity of the sector (McKenzie 2023). The project involved 1,200 interviews and numerous time and motion studies.

Project Velocity confirmed some fundamental issues were holding the sector back. These included the fragmentation of labour and materials, siloed technical knowledge, and tacit acceptance of poor-quality work. Commercial arrangements were also adversarial, with an unbalanced focus on risk allocation and an acceptance of poor behaviours (McKenzie 2023).

A new housing delivery system was introduced, which is expected to deliver over 9,500 homes between 2023 and 2027. These homes are estimated to be built for at least $820 million less than if traditional procurement methods were used. Fundamental elements in the new system include transparent processes and detailed, to-the-minute project planning. There is also a focus on training and an acceptance of variance as an opportunity to learn, as well as project coordinators who are present and supportive.

A pilot of the new system was undertaken, and the project then moved to a testing phase. As of May 2023, 19 houses had been completed with 600 in progress. The average build time for pilot projects was just over three months, compared to a standard of eight months. Financial savings were 13 per cent per home. This is expected to increase over time to 30 per cent, through joint work with labour and materials suppliers.

Many of the reforms look to transform systems of work and supply chains. For example, Project Velocity has trialled a 'Relational Agreement' which will see the organisation take a more active role in shaping interactions between their supply contractors. Another example is the streamlined delivery of building materials via the use of 'room kits'. Packages of materials, containing exact quantities of items required for each task in each room, are delivered to workspaces. Items are packed in reverse order of scheduled tasks, so each item is available as it is required. This system achieves economies of scale in purchasing, maximises productive time available to skilled workers, and reduces waste and theft. Overall, the use of room kits contributed to improving trade utilisation time onsite from 30 per cent to 70 per cent.

Monitoring of practices has continued to reveal constraints. For example, when bullying was identified as contributing to labour turnover and time delays, a new 'zero tolerance' policy was introduced. Technological improvements are only being considered when the system of systems can accommodate change.

Project Velocity suggests productivity improvements are possible and highlights the importance of the public sector in generating change. It demonstrates that systemic changes to housing construction require a bottom-up approach that considers the autonomy of contractors, subcontractors and suppliers. Importantly, Project Velocity incorporated changes to cost and risk sharing, as well as extensive research and development, with learnings being made freely available to developers and builders.

8. Policy development options

The housing construction industry in Australia is at a crisis point. As discussed in Gharaie et al. (2026) and Lee et al. (2026), pandemic induced cost input inflation and workforce shortages have disrupted 'normal' operations in both the detached and high-rise sectors. To focus on the impact of the pandemic, however, is to ignore underlying structural problems.

AHURI's Inquiry into overcoming construction constraints for the supply of new detached and high-rise housing finds that the most significant risk for builders, and for construction output and quality, is market volatility. This Inquiry report discusses the impacts of boom and bust cycles in Chapter 4; these underpin this summary of findings and policy options.

Prevailing orthodoxy indicates that the solutions to housing construction productivity are to cut 'red tape' (to reduce costs) and increase migration of construction workers (to address skills shortages). As explored in Chapter 5, regulatory burden is particularly experienced by sub-optimally sized firms which lack business capacity. Rather than focus on regulation as a single business cost, it is better to consider why firms leave 'money on the table'. Similarly, before demanding sector-specific migration, it is important to understand how it is that, even at the busiest times, labour is under-utilised.

As recognised by the Productivity Commission (2025), there is a need to build the size and capacity of builders though greater horizontal and vertical integration. Margins need to increase to provide the financial capacity to make the efficiency improvements required to ensure quality, resilient housing. But it will require a national reshaping of the construction industry and housing policy.

Fixing housing construction capacity constraints, while addressing rising costs and poor building performance, will be very challenging. The policy development options canvassed here will require further investigation that is outside the scope of this research.

8.1 Develop a national strategy for efficient housing construction

Australia lacks a comprehensive strategy to foster efficient housing construction

As discussed in Chapter 7, transforming the housing construction system of systems (SoS) to improve productivity requires a focus on the system level, rather than isolated parts of individual subsystems. Incremental improvements applied system-wide are likely to have a more substantial impact on overall performance than major enhancements confined to subsystems.

Australia therefore needs to develop national coordinated strategies that integrate construction, housing, manufacturing, and technology and innovation policy to enable the residential construction sector to meet demand for new housing while enhancing sustainability, resilience, and housing affordability.

There is simultaneously an urgent need to decouple the housing system from the broader economy to reduce exogenous shocks, but also the limit the extent to which housing destabilises the economy.

8.2 Address market volatility

Market volatility is the key barrier to putting housing construction on the path to efficiency

As discussed in Chapter 4, stimulating housing construction has often been used in Australia as a tool to mitigate economic shocks. This bringing forward of demand should be avoided, as it simply creates a later trough in demand. Recent stimulus measures assume capacity in the detached housing construction sector that does not exist. Counter cyclical social housing investment by government can help smooth demand, however uneven funding of social housing undermines the efficiency of provision. It is also preferable to have stability across the supply of all housing types by addressing the causes, rather than the symptoms, of market volatility.

In situ housing construction has evolved in response to market conditions and system dynamics (Lovell and Smith 2010). Significantly, this includes dealing with market volatility. As an alternative system of provision, Offsite manufacturing (OSM) requires market stability as a precursor for success. The level of demand required for factory-based production necessitates demand from the private sector. Public sector procurement, however, has a critical role in stabilising the residential construction sector. Social housing projects should adopt a programmatic approach that emphasises standardisation, replication and greater use of prefabricated components. Achieving this may require reforms to funding models and tendering processes, particularly within the community housing sector. Strategic investment in social housing—especially during market downturns—can help smooth construction cycles, reduce industry volatility, and support long-term sector capacity.

Australia could also follow the 56 European nations which have adopted measures to reduce the financialisation of housing. However, as in many of those countries, countervailing policies which support financialisation would need to be removed (Norris and Lawson 2022).

8.3 Modernise the regulatory framework

Inadequate building code enforcement supports inefficiency and risk shifting

As discussed in Chapter 5, Australia has widespread non-compliance with building codes. Despite recent moves in the opposite direction, policymakers should aim to harmonise the National Construction Code (NCC) across jurisdictions and ensure a high level of compliance. This would be achieved by ensuring, as outlined by Lovegrove (2018), a functioning building control regime comprised of:

- A dedicated Building Act with clear permit regimes and accountability structures
- Independent, building certifiers empowered to inspect, approve, and enforce compliance
- A nationally consistent practitioner licensing framework, including mandatory audits, continuing professional development (CPD) requirements, and clear powers to prosecute
- Design professionals warranting NCC compliance, and licensing extended to all trades
- A national, independent product accreditation body to ensure safety and fitness for purpose
- Digital tools such as Building Information Modelling (BIM) and real-time surveillance technologies being mandated to improve quality assurance and compliance.

8.4 Attract and retain skilled employees

Extensive subcontracting shifts risk down the supply chain

There is a need to grow labour capacity in line with economic growth. Migration is an option. However, migration increases housing demand, which in turn increases labour demand. To escape this feedback loop, a national construction training board needs to be established. This should comprise TAFE, universities and industry representatives and focus on workforce development, including ways to attract people into the industry. Further, the apprenticeship system needs to reflect regulated and sustained pathways into the industry and involve appropriate remuneration. Consideration needs to be given to increasing multiskilling.

There is also a need to retain skills to avoid the need for constant skill replacement. Market stability would encourage workforce retention and reduce the entry of unqualified and under-skilled workers, which places downwards pressure on wages.

Policymakers should encourage economic conditions to change the industry structure, promoting larger firms and reducing the number of very small firms. This would reduce the extent of subcontracting. In a more stable market, firms could invest in employment and reduce job instability. Various taxation incentives currently encourage self-employment over salaried employees and under reporting of income, while payroll tax thresholds discourage hiring (Wilson and Brooks 2025). This not only impacts industry structure, and thus performance, but also represents foregone tax revenue.

8.5 Include cost escalation provisions in contracts

Adversarial relationships and unfair contracting arrangements undermine best practice

As discussed in Chapter 4, design and construct (D&C) contracting is the dominant procurement method in the high-rise residential sector. This form of contracting shapes the broader system of work that governs roles, responsibilities and risk allocation across the construction process. However, the absence of cost escalation clauses in many D&C contracts poses significant challenges. Without mechanisms to accommodate rising material and labour costs, contractors are often forced to absorb unexpected increases. This leads to underpriced bids, reduced quality, disputes and insolvencies which, in turn, weaken project delivery, disrupt supply chains and undermine overall industry resilience. Embedding fair and transparent cost escalation provisions within D&C contracts is therefore critical, not only for better risk sharing and sustainable procurement, but also for strengthening the system of work by promoting more stable, efficient and collaborative industry practices.

8.6 Provide greater support for research and development

Technological innovation and uptake are limited

Australia lacks a well-developed construction research and development system. Both government and industry need to provide financial support for research and development to drive productivity and facilitate a transition to net zero. The industry will be able to afford to support research and development to a greater extent if industry restructuring reduces pressures on margins and leads to growth in firm size. While many different types of technology are worthy of development, digitalisation should be a priority. Digitalisation needs to be an industry strategy aimed at universalising adoption.

8.7 Consider onshoring to reduce supply chain risks

Supply chain risk requires strategic review

The global supply chain is vulnerable to significant disruptions, increasing the risk for just-in-time delivery. Onshoring manufacturing of construction products and prefabricated elements can reduce sovereign risk and supply chain risk. However, this requires collaborative strategies among manufacturers, suppliers, builders, and policymakers. Automation offers an opportunity to compete with low-cost labour countries, but it requires stable demand and a sufficiently large market. The costs and benefits of onshoring require analysis that extends beyond this Inquiry.

8.8 Reduce market fragmentation

Firm growth is essential but not without risk

Finally, while there is a need to reduce the fragmentation of the industry and grow the size of firms, care is needed to ensure excessive market concentration does not occur. Of particular concern is vertically integrated builders and land developers, with the potential to control landbanks.

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