PEER REVIEWED

FINAL REPORT NO. 427

Measuring housing affordability: Scoping the real cost of housing

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Publication Date September 2024
DOI 10.18408/ahuri8128801

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Title

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ISBN

978-1-922498-95-3

Key words

housing affordability, housing conditions, energy hardship, locational advantage, spatial inequality

Series

AHURI Final Report

Number

427

ISSN

1834-7223

Publisher

Australian Housing and Urban Research Institute Limited
Melbourne, Australia

DOI

10.18408/ahuri8128801

Format

PDF, online only

URL

https://www.ahuri.edu.au/research/final-reports/427

Recommended citation

Crowe, A. and Rowley, S. (2024) *Measuring housing affordability: Scoping the real cost of housing,* AHURI Final Report No. 427, Australian Housing and Urban Research Institute Limited, Melbourne, https://www.ahuri.edu.au/research/final-reports/427, doi: 10.18408/ahuri8128801.

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Acknowledgements

This material was produced with funding from the Australian Government and state and territory governments. AHURI Limited gratefully acknowledges the financial and other support it has received from these governments, without which this work would not have been possible.

AHURI Limited also gratefully acknowledges the contributions, both financial and in-kind, of its university research partners who have helped make the completion of this material possible.

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Acronyms and abbreviations used in this report

AHCD	Australian Housing Conditions Dataset
AHURI	Australian Housing and Urban Research Institute Limited
ABCB	Australian Building Codes Board
ABS	Australian Bureau of Statistics
ACT	Australian Capital Territory
BCEC	Bankwest Curtin Economics Centre
CEFC	Clean Energy Finance Corporation
CHP	Community housing provider
CRA	Commonwealth Rent Assistance
DCCEEW	Department of Climate Change, Energy, the Environment and Water
DSP	Disability Support Pension
HILDA	Household, Income and Labour Dynamics in Australia survey
NatHERS	Nationwide House Energy Rating Scheme
NCC	National Construction Code
NEBRF	National Energy Bill Relief Fund
NRAS	National Rental Affordability Scheme
NSW	New South Wales
PAHC	Poverty after housing costs
SA	South Australia
WA	Western Australia
ZEV	Zero-emission vehicles

Glossary

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

Executive summary

Key points

- This research examines the housing-energy-transport nexus with a focus on housing quality (performance and comfort) and location in relation to housing affordability.
- Policies supporting affordability across the housing-energy-transport nexus vary by jurisdiction and intended target cohort.
- While nationwide improvements to new dwelling standards are promising, this research shows varying degrees of application across the states and territories.
- Raising the minimum standard of existing dwellings, including rental housing, is challenging without the right balance of landlord incentives and tenancy rights.
- Measures supporting the uptake of renewable energy systems tend to favour homeowners and landlords.
- Energy hardship mitigation measures prioritise short-term bill relief over addressing the core drivers of material deprivation.
- Few measures apply a spatial focus to housing affordability—and even fewer are targeted toward private renters.
- Transport-related initiatives target very-low-income cohorts through concession schemes, or higher-income cohorts through zero-emission vehicle incentives.
- The case-study findings offer a more holistic framework for measuring housing affordability in Australia.

Housing affordability is largely understood as a relationship between housing costs and household income. At its core, housing affordability is tied to the principle that households should have access to an adequate standard of housing without the cost burden impacting household wellbeing and their non-housing expenditure (Hulchanski 1995). Normative measurements of affordability include:

- the housing cost-to-income ratio approach—where the ratio of housing expenditure to household income does not exceed a specified standard (Yates 2016)
- the residual income or expenditure approach—where a housing affordability problem is evident when insufficient income remains for essential needs after housing costs are met (Burke, Stone et al. 2011).

Across Australia, policy makers typically apply a variation to the ratio approach as a measure of 'housing stress', which is signified in Australia as households in the bottom 40 per cent of the income distribution spending more than 30 per cent of their income on housing (Pawson, Milligan et al. 2020). This measure has been dubbed the 30:40 rule (Yates and Milligan 2007).

Yet, accurately measuring housing affordability—and identifying housing affordability problems in practice—remains challenging given the variables affecting households in myriad and disproportionate ways (Haffner and Hulse 2021). For example, the evidence-base shows that normative housing affordability measures remain insensitive to factors such as household size, composition and formation, housing tenure, quality, and locational and neighbourhood characteristics (Leishman and Rowley 2012).

Lower-income households pressured to consume housing in under-serviced, often outer-urban locations with limited transport access, typically commit greater costs and time to commuting and experience spatial dislocation from social and economic networks (Arunachalam, Smith et al. 2020; BITRE 2015; Makarewicz, Dantzler et al. 2020; Sabari, Wu et al. 2017). At the same time, lower-income households are also more likely to make difficult trade-offs between their energy consumption needs and meeting other essential household expenditures—which can result in energy hardship and adverse health effects (Brown, Soni et al. 2020; Chester 2013; Nicholls and Strengers 2017).

Despite energy and transport expenditure representing a considerable proportion of total household spending (Daniel, Moore et al. 2020; Sabari, Wu et al. 2017), and being directly related to overall housing affordability, the combined costs and implications are rarely considered across housing policy literature. By extension, the locational and dwelling quality aspects of housing affordability remain overlooked, despite constituting fundamental attributes of the housing bundle and household wellbeing. This scoping project responds to this research and policy gap, with the aim of establishing a framework for a more comprehensive, contemporary and nuanced assessment of housing affordability in consideration of the multiple and complex trade-offs households make in their housing decisions.

Key findings

Policy to support affordability across the housing-energy-transport nexus

A range of policy initiatives was identified that respond to housing affordability issues relating to housing quality, energy hardship and poverty, as well as locational and transportation disadvantage. The initiatives examined vary by jurisdiction and intended target cohort.

Minimum standard of housing

Although recent changes to the National Construction Code (NCC) demonstrate a significant policy shift to improve dwelling quality, the voluntary application of these changes across the states and territories has led to variations in minimum performance requirements across Australia. Moreover, as the NCC applies explicitly to new or substantially renovated dwellings, the standard of housing for households in existing dwellings is not likely to improve without additional, cross-tenure policy measures. Despite numerous Council of Australian Governments (COAG) Energy Council agreements to make existing buildings more energy efficient (Department of Climate Change, Energy, the Environment and Water [DCCEEW] 2023a; 2023b), our analysis shows that few jurisdictions have committed to implementing an improved minimum standard of housing for existing private rental properties. The Australian Capital Territory constitutes the only jurisdiction to mandate energy-efficiency disclosure requirements for the sale or leasing of residential buildings.

Energy efficiency

Our analysis identified a range of largely non-means-tested incentives, programs and supporting initiatives that seek to facilitate the uptake of renewable energy systems, thermal performance improvements and energy-efficient appliance upgrades. While some schemes are targeted toward lower-income households and social and private renters, most are geared toward property owners. Some jurisdictions have implemented schemes specifically designed to incentivise private landlords to improve the energy performance of privately rented dwellings, and a recent joint-government investment in energy performance upgrades (DCCEEW 2023d) is anticipated to improve the quality of social housing across Australia.

Energy hardship

A wide range of schemes offer financial assistance, mediation and advice to eligible households on very low incomes to mitigate the extent of energy hardship. This was particularly notable under the National Energy Bill Relief Fund (NEBRF) initiated in response to a growing cost-of-living crisis. Few measures have been implemented to address the root drivers of energy hardship, with the exception of schemes like the cross-government Community Solar Banks initiative. Recent increases to Commonwealth Rent Assistance (CRA) may provide some relief but do little to address issues relating to the costs of running energy-inefficient and thermally inefficient housing.

Locational disadvantage

Few measures apply a spatial-specific focus to addressing housing affordability issues. Our review identified South Australia as the only jurisdiction in Australia to implement a mandatory inclusionary zoning requirement that has effectively delivered well-located social and affordable housing. Soft affordability targets exist in New South Wales through a voluntary inclusionary planning framework, and to some extent in the Australian Capital Territory through an Indicative Land Release Program. Few key-worker housing programs, which attend to the spatial significance of housing affordability, have been initiated across Australia.

Transportation disadvantage

Most strategic infrastructure planning documents reviewed indicated commitments to improving accessibility, connectivity and sustainability throughout Australia's built environment. Here, Western Australia's Metronet scheme illustrates how governments are aiming to promote urban efficiency and to better connect housing with employment precincts through high-frequency public transport systems, as well as mixed-use and mixed-tenure housing developments around key transport hubs. Meanwhile, transportation hardship measures are typically geared towards very-low-income households. Few initiatives target low-to-moderate-income households with significant transportation expenditure.

Measuring the housing-energy-transport nexus

The various studies and research methodologies analysed in this report collectively offer a more comprehensive and refined understanding of housing affordability beyond the normative measure of housing stress through the 30:40 housing cost-to-income ratio. When implemented, these methodologies can provide compelling evidence about the need to improve housing conditions, including:

- improving energy-efficiency and thermal performance
- addressing and mitigating experiences of energy hardship and poverty
- reducing spatial patterns of residential exclusion and disadvantage in relation to proximity and accessibility of essential resources and services.

Given the accessibility of most datasets used, there is great potential to utilise these methodologies at a larger scale and greater frequency—including variation, adaptation and amalgamation.

Quality dimensions of housing

Through analysis of the newly developed Australian Housing Conditions Dataset (AHCD), together with supplementary data collection methods, Daniel, Moore et al. (2020) provided valuable insights into the living conditions and experiences of households facing energy hardship. Their research provides insights into the implications of living in substandard housing, and points to the need for a universally applied definition of safe and healthy housing standards across Australia. This methodology underscored the need for policy makers to identify—and subsequently develop—appropriate policy measures in response to a household's required energy expenditure, rather than their actual energy expenditure.

A series of studies using a mixed-methods approach to assessing the housing conditions of renters across Australia provided important snapshots of the thermal performance of housing across various regions, as well as the financial, health and wellbeing implications for households (Barrett, Catania et al. 2023; Dignam 2024; Dignam and Barrett 2022). The research methodologies provided compelling evidence about the deficit of large-scale housing quality information and the need to improve housing conditions across the rental sectors. There is capacity to reproduce these studies at a larger scale and potential to include data from the AHCD into the methodological approach.

Energy hardship and poverty

The development of a poverty after housing cost (PAHC) indicator enabled researchers to examine residual household income (after basic housing costs are met) at the SA2 level, and to offer a more comprehensive understanding of housing affordability beyond the normative measures of housing stress (Randolph, Liu et al. 2023). Under this methodology, the findings showed that around 3 million Australians were experiencing poverty after accounting for housing expenditure, exposing the disproportionate burden of housing costs on low-income households.

To measure the prevalence and experience of energy hardship, methodologies have been adapted using the Household, Income and Labour Dynamics in Australia (HILDA) survey data. For Dekker and Nicolls (2018), analysis using the self-reported measure of energy hardship illuminated significant experiences of persistent energy hardship, illustrating the extent of energy hardship beyond household expenditure. Meanwhile, Azpitarte, Johnson et al. (2015) integrated 30 indicators from the HILDA survey into their analysis to construct a typology of energy hardship, illustrating its multiple dimensions.

Locational dimensions of housing

A range of methodologies have been used to examine the relationship between housing affordability and locational advantage or disadvantage. A combined analysis of datasets derived from the Australian Bureau of Statistics (ABS) census data, housing market datasets, and the Bankwest Curtin Economics Centre (BCEC) Housing Affordability Survey enabled the research team to map the variations of housing affordability at a granular scale and capture the individual trade-offs households made to afford their home (Burke, Pinnegar et al. 2007; Cassells, Duncan et al. 2014). Meanwhile, Hulse, Pawson et al. (2014) developed a measure of locational disadvantage through the combination of longitudinal ABS census data and secondary housing market datasets, which showed that 1.7 million Australians were experiencing socio-spatial disadvantage.

Similarly, Sarkar, Gurran et al. (2024) demonstrated the further potential of ABS journey-to-work data through their development of a neighbourhood porosity-exclusion index. Gurran, Gilbert et al. (2018b) showed how a multi-method qualitative research approach can be designed to both clarify critical perspectives from key government and industry stakeholders on affordable housing policy, and to examine inclusionary zoning outcomes across various locations.

Transportation disadvantage

The housing and transportation affordability index developed by Saberi, Wu et al. (2017) constitutes a significant methodological contribution that captures a granular understanding of housing and transportation affordability across different subregions and housing markets. Lastly, Gilbert, Nasreen et al. (2021) developed a valuable methodology for examining the relationship between housing affordability and commuter hardship patterns among key workers across Australia's largest cities.

Policy development options

A range of opportunities exist to improve housing affordability outcomes in relation to the quality, performance, comfort and locational dimension of housing across Australia.

Minimum standard of housing across the continuum

There is a strong need to increase the minimum standard of housing across the continuum in order to improve household living conditions and address the challenges posed by climate change. This includes measures to ensure homes meet basic standards of safety, accessibility, health and comfort. The recent changes to the NCC 2022 (Australian Building Codes Board [ABCB] 2022a) demonstrate a significant policy shift in this direction. However, as identified in this research, the voluntary application of these changes across the states and territories has led to variation in minimum performance requirements across Australia. Moreover, as the NCC 2022 applies to new or substantially renovated dwellings, the standard of housing for households in existing dwellings is not likely to improve without additional policy measures. In this context, there is a need to ensure that the energy-efficiency and liveable housing provisions of the NCC 2022 are adopted by all states and territories. Measures that seek to improve the housing performance of existing residential dwellings—particularly in the private rental sector—should also be explored, such as those implemented across Queensland and the Australian Capital Territory.

Enhance energy-efficiency measures in rental housing

This research also underscored the need to introduce minimum standards for rental housing across the states and territories to enhance housing conditions and affordability. This should include:

- mandating minimum rental energy-efficiency standards
- facilitating targeted energy-efficiency upgrades
- empowering renters to make minor modifications without requiring landlord approval or fear of retaliation.

At the same time, overcoming initial financial hurdles for social and private housing providers to partake in retrofitting and renewable energy initiatives were identified as paramount—for example, fitting solar panels.

The recent introduction and expansion of energy-efficiency retrofit schemes across the social-housing sector represents a key step in this direction, as does the establishment of long-term energy-efficiency programs for low-income households such as the Community Solar Bank. By a similar token, several small-scale renewable energy incentive schemes that target private rental housing have been effectively administered across some jurisdictions, demonstrating a potential avenue for improving household energy performance.

Expand proactive responses to energy hardship

In addition to increasing the energy and thermal performance of housing, policy considerations arising from the research emphasise the need for a better understanding of the linkages between housing affordability and energy hardship. Energy assistance programs are required to cater to the diverse types of households facing energy poverty, acknowledging the varied causes and dimensions of the problem. Policy responses should consider a household's required energy expenditure—rather than their actual energy expenditure—to adequately capture households that ration energy to lessen financial hardship.

Although energy hardship assistance can provide short-term relief to vulnerable households, there is a need for proactive intervention that targets the core drivers of energy hardship. There is a clear consensus across the evidence-base to increase income support payments such as JobSeeker, Disability Support Pension (DSP) and Commonwealth Rent Assistance (CRA) to help lower-income households manage their energy costs. Moreover, policy settings that improve landlord responsiveness to maintenance requests have potential to improve dwelling standards and reduce tenants' energy costs—thus benefitting all stakeholders.

Addressing locational and transportation disadvantage

The need for well-located social and affordable rental options was identified to mitigate risks of displacement and offer increased proximity and accessibility to key resources and services. Further integration of housing, planning, transport and employment policies is critical. The Metronet infrastructure program in Western Australia provides an example of such inter-governmental support. More broadly, residents' choices and experiences in relation to housing were essential for effective policy formulation.

The evidence-base has demonstrated the effectiveness of inclusionary zoning to address both housing affordability issues and spatial disadvantage. There is great potential to extend inclusionary planning approaches. Planning incentives can be mechanised to encourage affordable housing inclusion within existing frameworks, through the likes of density bonuses. Barriers faced by private sector development—such as balancing the physical cost of development with affordable housing delivery—could be addressed through policy intervention addressing cost issues, including taxes, developer contributions to infrastructure, and exploring alternative construction technologies proven to cut costs, build times, and ultimately deliver greater housing affordability. To this end, there is also a need to increase planning certainty, to reduce developer risk and enhance affordable housing delivery outcomes.

The study

Funded as part of the AHURI National Housing Research Program, this scoping study examines housing quality and locational dimensions of housing affordability.

Very few studies have collectively examined how households trade off housing (size, tenure, quality and location), energy and transport expenditures against each other when making housing decisions. While vast literatures exist across each theme, they remain largely siloed within specific scholarly, policymaking and public discourses. In turn, there is a need to consider the housing-energy-transport nexus, with a focus on housing quality and location in relation to affordability.

This research seeks to better understand how these factors affect household expenditure and wellbeing, to examine the policy response to address these issues, and to explore how a more robust approach to housing affordability could be developed to help improve household wellbeing outcomes across the housing continuum.

The research used a multi-phasal in-depth document analysis. Federal, state and territory policies and practices were reviewed to identify the existing measures to:

- facilitate an adequate standard of housing across the continuum
- support households experiencing energy hardship
- promote housing affordability with a specific spatial focus
- seek to address transportation disadvantage (directly or indirectly).

Additionally, a wealth of cross-disciplinary academic and grey literature from the fields of housing, poverty, health and wellbeing, urban planning, transportation and energy across Australia was thematically analysed. Eleven qualitative case studies were developed to highlight methodologies and datasets that have demonstrative potential to strengthen current housing affordability measurements, along with policy considerations to help improve household outcomes across the housing continuum.

1. Introduction

- **Housing affordability is largely understood as a relationship between housing costs and household income.**
- **Housing costs that exceed a certain share of income, or that compromise essential non-housing expenditure, represent 'housing stress'.**
- **Such normative measurements of affordability are insensitive to factors such as housing tenure and quality, as well as locational and neighbourhood characteristics.**
- **The trade-offs households make to access housing are largely omitted from housing affordability metrics in Australia.**
- **Through a multidimensional approach to housing, this scoping study explores the housing-energy-transport nexus, with a focus on housing quality and location in relation to housing affordability.**
- **The findings indicate how a more robust policy approach to housing affordability could be developed to help improve household health and wellbeing outcomes across the housing continuum.**

1.1 Why this research was conducted

Housing affordability is largely understood as a relationship between housing costs and household income. At its core, housing affordability is tied to the principle that households should have access to an adequate standard of housing without the cost burden impacting household health, wellbeing and their non-housing essential expenditure (Heylen 2023; Hulchanski 1995; Rowley and Ong 2012; Stone 2006; Stone, Burke et al. 2011). When housing costs exceed a certain share of income, or compromise essential non-housing expenditure, there is broad recognition that the subsequent 'housing stress' experienced is detrimental to household wellbeing and requires policy intervention (Acolin and Reina 2022; Anacker 2019; Beer, Kearins et al. 2007; Bentley, Baker et al. 2011; Lee 2024; Meen and Whitehead 2020; Pawson, Milligan et al. 2020).

As Pawson, Milligan et al. (2020: 69) contend *'if policies are to address housing affordability problems, it is important to know not only which groups are most in need of assistance, but also the underlying causes of such problems and their growing incidence'*. In practice, accurately measuring housing affordability and identifying housing affordability problems is particularly challenging, given the many interrelated variables affecting households in diverse and disproportionate ways (Haffner and Hulse 2021).

The definition and measurement of housing affordability—including the prevalence and type of housing affordability problems—has multiple interpretations, and remains a subject of debate across scholarly, policymaking and public discourse (Anacker 2019; Beer, Kearins et al. 2007; Friedman and Rosen 2019; Haffner and Hulse 2021; Kutty 2005; Meen and Whitehead 2020; Murphy 2014). Galster and Lee (2021: 3) refer to the lack of a single, globally recognised measure of housing affordability as a significant *'policy dilemma'*.

The housing cost-to-income ratio approach, where the ratio of housing expenditure to household income does not exceed a specified standard (Yates 2016), constitutes one of the most prevalent measurements of affordability (see for example ABS 2023a). The residual income or expenditure approach represents another, where a housing affordability problem is evident when insufficient income remains for essential needs—such as food, transport, energy and healthcare—after housing costs are met (Burke, Stone et al. 2011). Housing stress is typically indicated when housing costs exceed a specific affordability threshold—for example, in excess of 30 per cent of household income under the traditional ratio approach (Abelson 2009; Yates and Gabriel 2006).

While these measures can offer valuable and accessible insight into *descriptions* of housing expenditure and predictions of household capacity to pay rent or mortgages across varying scales (Hulchanski 1995; Pawson, Milligan et al. 2020), their simplicity is frequently cited as partial, subject to biases and lacking validity (Leishman and Rowley 2012; Meen and Whitehead 2020). Such simplistic measures can mask real housing affordability problems where households experience considerable economic and social hardship (Burke, Pinnegar et al. 2007; Rowley and Ong 2012). Conversely, they can also signal housing affordability problems where they do not exist, such as higher-income households that spend a large proportion of their income on housing without incurring shortages in non-housing consumption (Acolin and Reina 2022; Galster and Lee 2021).

To address this issue, Australian policy makers typically apply a variation to the ratio approach as a measure of 'housing stress'. Dubbed the 30:40 rule, housing stress is defined as households in the bottom 40 per cent of the income distribution that spend more than 30 per cent of their income on housing (Yates and Milligan 2007).

However, research shows how housing affordability measured through the 30:40 'housing stress' calculation narrowly focuses on predicting financial constraints and underestimates the wider implications to household health and wellbeing (Bentley, Baker et al. 2011; Coley, Leventhal et al. 2013; Lee 2024; Rowley and Ong 2012) as well as dwelling and life satisfaction (Acolin and Reina 2022). The inflexibility of these measures has been further problematised, as different household sizes, compositions and preferences *'produce different utility maximising housing expense-to-income ratios within the same income group'* (Galster and Lee 2021: 11). Thus, the evidence-base shows that normative housing affordability measures remain insensitive to factors such as household size, composition and formation; housing tenure, quality, locational and neighbourhood characteristics; household savings, wealth and equity; as well as household choices and preferences (Leishman and Rowley 2012; Rowley and Ong 2012).

Specific to the residual income measure of housing affordability, expenditure indicators alone can also be misleading (Meen and Whitehead 2020). Further difficulty arises when attempting to determine what qualifies as a minimal basket of essential goods and services (Heylen 2023).

There is also considerable debate about whether other housing-related costs should be included in measures of housing affordability, such as utilities, maintenance and taxes (Acolin and Reina 2022; Kontokosta, Reina et al. 2020; Saberi, Wu et al. 2017), as well as intergenerational wealth transfers (Galster and Lee 2021; Ong ViforJ, Clark et al. 2023).

Furthermore, whether to differentiate between tenure is an area of considerable discussion when assessing housing affordability (see Meen and Whitehead 2020). For example, Randolph, Liu et al. (2023) demonstrated how poverty rates after housing costs can vary significantly by tenure. Here the limitations of the housing cost-to-income ratios are underscored, with private and social-housing renters much more likely to experience poverty after housing costs (PAHC) than homeowners with or without a mortgage. Echoing these tenure-specific findings, Yates (2019) showed that although the incidence of before-housing poverty has been declining in recent decades among public housing tenants, after-housing poverty has actually increased across this tenure.

In relation to home ownership and housing affordability, Meen and Whitehead (2020: 32) argue for a greater distinction between:

- purchase affordability—borrowing capacity and access to credit, and
- repayment affordability—proportion of income required for mortgage repayments.

Further, Galster and Lee (2021) problematise how asset appreciation and equity growth among owner-occupiers omit a vital wealth component from tenure-neutral housing affordability metrics and subsequent policy directions (Abelson 2009; Heylen 2023).

A growing body of literature argues for a more nuanced and multidimensional approach to measurements of housing affordability (Anacker 2019; Meen and Whitehead 2020; Pawson, Milligan et al. 2020), including greater consideration of the multiple and complex trade-offs households make in their housing decisions (Burke, Pinnegar et al. 2007; Rowley and Ong 2012). For example, evidence shows how lower-income households pressured to consume housing in under-serviced locations with limited transport access often commit greater costs and time to commute, and experience spatial dislocation from social and economic networks (Gilbert, Nasreen et al. 2021; Gurran, Hulse et al. 2021; Hulse, Pawson et al. 2014; Nouwelant, Crommelin et al. 2016; Sabari, Wu et al. 2017).

Similarly, evidence shows that lower-income households routinely make difficult trade-offs between their energy consumption and meeting other essential household expenditures, which can result in energy hardship and adverse health effects (Brown, Soni et al. 2020; Chester 2013; Daniel, Moore et al. 2020). Research shows that experiences of energy hardship are often compounded by the fact that lower-income households typically reside in housing of lower quality and poorer energy-efficiency outcomes compared to their higher-income counterparts (ACOSS 2023; Dekker and Nicholls 2018), thus either requiring additional energy consumption to maintain minimal thermal comfort, or choosing to practise energy rationing (Azpitarte, Johnson et al. 2015; Barlow, Daniel et al. 2023; Barrett, Catania et al. 2023; Dignam 2024; Dignam and Barrett 2022).

These housing-related costs and trade-offs intersect, compound and impact households unevenly in relation to household income, size, composition and tenure, as well as housing quality and neighbourhood quality. Yet the decisions households—particularly lower-income households—make to manage their housing costs, and the subsequent experiences, remain largely unaccounted for in normative housing affordability metrics used in Australia (Pawson, Milligan et al. 2020; Rowley and Ong 2012).

Although energy and transport expenditure represent a considerable proportion of total household spending and directly relate to housing affordability, the combined costs are rarely considered collectively in housing affordability policy. For instance, recent AHURI research found that commuting burdens for lower-income households across Australia's largest metropoles are rising and can comprise up to 9.4 per cent of household income (Dodson, Li et al. 2020). At the same time, greenfield housing development across the periphery of many Australian cities continues to outpace development in inner-urban, amenity-rich areas.

Subsequently, commentators argue that ignoring transportation costs exaggerates housing affordability in low-amenity, spatially dislocated areas—particularly on the urban periphery (Hulse, Pawson et al. 2014; Litman 2022). Similarly, research on energy expenditure shows that the cost to maintain thermal comfort in the home is increasingly difficult for lower-income social and private renters living in poor-quality housing (Azpitarte, Johnson et al. 2015; Barlow, Daniel et al. 2023; Daniel, Moore et al. 2020; Nicholls and Strengers 2017).

Very few studies have collectively examined how households trade off housing (size, tenure, quality and location), energy and transport expenditures against each other when making housing decisions. While vast literatures exist across each theme, they remain largely siloed within specific scholarly, policymaking and public discourses. There is a need to bring together the housing quality and locational aspects of housing affordability.

This research seeks to:

- understand how the housing-energy-transport nexus affects household expenditure, health and wellbeing
- examine existing policy responses to address housing affordability issues
- explore how a more robust approach to housing affordability could be developed to help improve household health and wellbeing outcomes across the housing continuum.

1.2 Existing research

Reconceptualising housing affordability measurements

Quigley and Raphael (2004: 191–192) argued that the term 'housing affordability' conflates a number of complex and disparate issues, including *'the distribution of income, the ability of households to borrow, public policies affecting housing markets, conditions affecting the supply of new or refurbished housing, and the choices that people make about how much housing to consume relative to other goods'.* In recognition of this complexity, Galster and Lee (2021: 8) contended that, regardless of the choice of measurement, any definition of housing affordability for an individual household should make reference to:

- *'the prices of housing and non-housing goods*
- *the household's financial resources available to pay for these goods*
- *some normative standard specifying minimally acceptable quantities of housing and non-housing goods that a household should consume'.*

While the crux of Galster and Lee's proposition is echoed across the housing affordability literature, the practical application is not without its challenges. For instance, the separation of housing standards from measures of, and policy responses to, housing affordability issues is well problematised (Leishman and Rowley 2012; Meen and Whitehead 2020; Stone 2006). However, without a universally accepted and implemented minimum standard of housing across Australia, factoring dwelling quality into any measurement of housing affordability remains difficult and open to interpretation (Galster and Lee 2021). Regarding a measurable quantity of non-housing goods, Leishman and Rowley (2012) questioned what sorts of food, clothing, transportation and healthcare *should* represent a minimally acceptable basket of appropriately weighted commodities.

Other scholars have interrogated how local resources and soft infrastructure such as environmental quality and safety, public transport, recreation, education and employment opportunities should be considered when assessing housing affordability (Galster and Lee 2021; Rowley and Ong 2012). Regarding access and proximity to key amenities, including job-rich centres, Abelson (2009: 30) contended that *'the cost of housing should also include costs of commuting to work as this increases when house costs decrease with distance from employment centres'.*

Understanding household trade-offs

Evidence shows that lower-income households routinely make trade-offs to meet their housing costs. Households facing high housing costs in relation to household budgets typically make compromised adjustments in the consumption of essential housing and non-housing goods and services (Gabriel and Painter 2020).

Such trade-offs can result in:

- material deprivation, including financial hardship, food insecurity and energy poverty (Chester 2013; Moore 2012; Nicholls and Strengers 2017)
- health, wellbeing and life-satisfaction implications (Acolin and Reina 2022; Bentley, Baker et al. 2011; Rowley and Ong 2012)
- socio-spatial exclusion and isolation (Burke and Hulse 2015; Sakar, Gurran et al. 2024; Rerat 2018; Pawson, Hulse et al. 2015; Soja 2010; Watt 2022).

As the proportion of income dedicated to housing increases, challenges associated with poor affordability typically become more pronounced and severe (Burke, Pinnegar et al. 2007; Gabriel and Painter 2020; Meen and Whitehead 2020).

At the same time, most of these trade-offs and their implications are not accounted for in normative affordability metrics used by policy makers. For instance, under current measurements, housing can appear affordable due to under-consumption, when a household occupies poor-quality housing or a dwelling that is 'too small' (Galster and Lee 2021: 21). At the same time, housing can appear unaffordable because of over-consumption, when a household occupies a dwelling that is 'too big' or 'too expensive' relative to household size, or allocates a higher share of their budget to maximise housing quality and proximity to high-amenity locations. Such examples underscore the inflexibility of housing cost-to-income ratios, which assume households are 'rational utility maximisers' (Leishman and Rowley 2012: 6). A corpus of housing affordability research has highlighted how household choices and preferences can distort normative assessments of housing affordability (Acolin and Reina 2022; Haffner and Heylen 2011; Hancock 1993; Whitehead 1991).

Housing affordability issues can also constrain household formation and expansion. Several studies show that a lack of affordable accommodation can delay young adults from leaving the family home (Chan, O'Regan et al. 2019; Lee, Kemp et al. 2022; Newman, Holupka et al. 2018) or shared housing settings (Bentley, Baker et al. 2022; Cassells, Duncan et al. 2014) to form their own household, and presents a strong barrier to having more children (Crowe 2021; Galster and Lee 2021).

Housing quality

Housing affordability challenges may force some households to reside in physically inadequate housing (Galster and Lee 2021; Rowley and Ong 2012; Stone 2006). This includes housing with:

- poor or no insulation (Cornwell, Hejazi et al. 2016)
- insufficient heating and cooling systems (Dekker and Nicholls 2018)
- exposure to mould and damp, with insect and vermin issues (Galster and Lee 2021)
- structural defects (Barrett, Catania et al. 2023; Dignam 2024; Dignam and Barrett 2022).

The subsequent health implications of poor housing conditions are well established (Haffner and Hulse 2021; Keall, Baker et al. 2010; Meen and Whitehead 2020). They span a range of physical illnesses and mental health conditions (Bentley, Baker et al. 2022), as well as instances of family and domestic violence triggered and exacerbated through the occupancy of substandard housing (Brown, Soni et al. 2020).

Australian homes have been shown to achieve significantly lower thermal energy performance than comparator countries (Daniel, Moore et al. 2020; Horne and Hayles 2008). Although the World Health Organization (WHO) recommends a minimum healthy indoor temperature of 18ºC and an ideal indoor temperature range of 18ºC–22ºC (Barnard, Howden-Chapman et al. 2018), research has shown that Australian homes can reach average minimum temperatures as low as 7.5ºC during winter months, suggesting that up to half of excess winter mortality across particular regions is linked to substandard housing conditions (Dignam and Barrett 2022). By a similar token, Barrett, Catania et al. (2023) and Dignam (2024) found that average indoor temperatures across Australia exceeded 25ºC during the summer months.

Across Australia, research illustrates that in comparison with owner-occupied housing, social and private rental properties tend to be of poorer quality and less energy efficient (Australian Institute of Health and Welfare 2019; Barrett, Catania et al. 2023; Daniel, Moore et al. 2020; Dekker and Nicholls 2018). Unlike comparator countries across the European Union (see European Commission 2023), most Australian state and territory governments have not implemented adequate minimal rental housing standards or mandatory energy performance disclosures on sale or rent.

Because of this lack of legislation, Australian renters are more likely to reside in substandard housing and spend more on energy than equivalent owner-occupiers (Barrett, Catania et al. 2023; Dekker and Nicholls 2018; Nicholls and Strengers 2017). Recent studies found that two-thirds of private renters had trouble maintaining comfortable temperatures in their home (Barlow, Daniel et al. 2023) and up to 40 per cent of renters were experiencing energy hardship (Azpitarte, Johnson et al. 2015; Daniel, Moore et al. 2020). Regarding the cost of heating and cooling an energy-inefficient home, Dignam and Barrett (2022: 1) observed that Victorian renters were spending up to 400 per cent more on energy compared to owner-occupiers, despite their homes rarely exceeding a healthy minimum temperature. Barrett, Catania et al. (2023) noted reluctance among private renters to use the entirety of the home in an attempt to reduce energy consumption, or because only parts of the home could be thermally regulated.

At the same time, social and private rental tenants have few legal rights to make modifications to improve the material conditions of their home, including thermal performance and energy efficiency (Longview and Pexa 2023; Pawson, Milligan et al. 2020). Under current tenancy laws, renters are largely denied agency to make changes that would make their homes healthier and less expensive to heat and cool. Moreover, fear of retaliation by landlords or property managers often deters renters from requesting that repairs, maintenance or improvements be carried out. Retaliatory action has often included rent increases or evictions. Such retaliation is argued to have perpetuated a culture among private renters to accept substandard housing conditions and to wear both the financial and health costs (Barrett, Catania et al. 2023).

Despite an increasing evidence-base showcasing the implications of low-quality housing, dwelling conditions remain poorly monitored across Australia (Daniel, Moore et al. 2020; DCCEEW 2015; 2023a). Haffner and Hulse (2021) describe an absence of large-scale data to rigorously assess housing adequacy and dwelling quality, coupled with relatively few policy measures to address dwelling performance issues (Barrett, Catania et al. 2023). Thus there remains a need for new types of measurements and assessment tools to consider the housing quality dimensions of housing affordability.

Housing and non-housing goods and services

Related to both housing affordability and housing quality, research has shown how experiences of housing stress can limit a household's capacity to consume essential housing-related goods and services, the outcome of which can lead to material deprivation, including food insecurity, medical care hardship and energy hardship (Acolin and Reina 2022; Azpitarte, Johnson et al. 2015). At the same time, it is critical to emphasise that while the challenges of material deprivation can be brought on or worsened by low-quality housing, the problem is more than just substandard housing. Namely, household income is not enough to cover basic essential goods and services (Dignam and Barrett 2022).

This predicament can push households, particularly those on lower incomes, to make difficult trade-offs, such as deciding between heating or cooling their home to stay healthy, buying groceries or paying their rent or mortgage on time (Barrett, Catania et al. 2023). Correspondingly, the concept of energy hardship—when a household experiences payment difficulty or difficulty maintaining indoor thermal comfort—has received growing attention in recent years, as energy prices have risen well beyond inflation, wages and income support payments (ABS 2023b; Dekker and Nicholls 2018; Nicholls and Strengers 2017).

Azpitarte, Johnson et al. (2015: 2) identified three types of energy-related hardship:

1. Being unable to pay energy bills
2. Rationing energy to the detriment of health and wellbeing
3. Spending a high proportion of income on energy to the detriment of consuming other essential goods and services.

Importantly, households can experience all three forms of hardship simultaneously.

However, there is very little data on the extent of energy hardship in Australia. Nor are the characteristics of households in energy hardship, and their subsequent experiences, well known (see for exception Azpitarte, Johnson et al. 2015; Barrett, Catania et al. 2023; Dignam and Barrett 2022). Excluding utility bill underpayment, experiences of energy hardship can often 'fly under the radar' of policy makers and beyond the scope of normative housing affordability metrics and policy measures (Nicholls and Strengers 2017: 3).

Locational disadvantage

Housing affordability challenges are also tied to the quality of local amenities, as well as proximity and accessibility to essential resources—such as employment, education, transportation, facilities and services. Across Australia's urban environment, accessibility to essential resources is spatially varied and unevenly concentrated within inner-urban areas (Abelson 2009; Hulse, Reynolds et al. 2019; Leishman and Rowley 2012). Rerat (2018: 1) describes the choice of a place of residence *'as a strategic decision that enables individuals or households to gain locational advantages'.*

Yet, as housing in accessible central areas increasingly caters to the higher end of the income spectrum (Ong, Dalton et al. 2017), lower-income households often enter housing stress to reside in amenity-rich locations (Hulse, Reynolds et al. 2019; Rerat 2018), or seek less-expensive housing on the urban periphery and travel long distances by private vehicle to participate in economic and social activities (Blumenberg and Wander 2023; Cassells, Duncan et al. 2014; Dodson, Li et al. 2020; Gilbert, Nasreen et al. 2021).

Referred to by Soja (2010: 47) as *'discriminatory geographies of accessibility',* studies have illustrated how lower-income households are pressured to consume housing in under-serviced locations with lower-quality schools, poorer transport access and higher crime rates. This means they often commit greater costs and time to commuting and experience spatial dislocation from their economic and social networks (Galster and Lee 2021; Gilbert, Nasreen et al. 2021; Randolph and Tice 2014; Sabari, Wu et al. 2017). Consequently, the household implications of spatial dislocation have been described as a 'double disadvantage' (Sarkar, Gurran et al. 2024: 35), where local neighbourhood amenities are limited, and principal nodes of employment and essential services require an investment in time and cost to access.

Similar to the issues discussed regarding housing quality, tenure also plays an important role in locational advantage and disadvantage. For example, Cassells, Duncan et al. (2014: 71) found that private renters were less likely to secure a dwelling in their first-choice location compared to purchasers. Their findings showed that 37 per cent of renters ended up choosing housing more than 10 kilometres away from their first-choice location. Notably, more than one-third (34%) of those who stated they were able to select their first-choice location disclosed that they had to compromise on the neighbourhood to access housing, and one-quarter (26%) had to compromise on the dwelling itself (Cassells, Duncan et al. 2014: 71). Other studies have shown how the spatial dimensions of housing choice become more pronounced for low-to-moderate income key-worker households (Benedict, Gurran et al. 2022; Gilbert, Nasreen et al. 2021; Gurran, Gilbert et al. 2018b; PWC Australia 2019). These dynamics have likely intensified in recent years given the significant decrease in rental affordability among lower-income households (Anglicare 2023).

It is also worth noting that research on the locational attributes of housing affordability in Australia have largely examined the relationship between housing and employment location (Dodson, Li et al. 2020; Gilbert, Nasreen et al. 2021; Gurran, Gilbert 2018b; Randolph and Tice 2014; Sabari, Wu et al. 2017; Sarkar, Gurran et al. 2024). Less attention has been paid to the non-employment locational attributes of housing affordability, such as:

- proximity to natural features—parkland, rivers, lakes, ocean
- cultural, retail and recreational amenities
- place-based social networks—friends and family
- transportation accessibility—public transport, connective roads, footpaths and cycleways.

Despite the implications for household wellbeing, spatial inequalities are rarely considered in Australian policy literature on housing affordability—particularly when cost-to-income ratio metrics are applied. Spatial inequalities, among the other key housing-related factors discussed, distort normative measurements of housing affordability. Critical commentators have stressed the need for policy makers to consider the spatial dimensions of housing affordability issues beyond housing cost-to-income ratios (Haffner and Hulse 2021; Rowley and Ong 2012), and to recognise the health, social and economic implications related to the spatial diffusion of housing that is both affordable and accessible to lower-income households (Burke, Stone et al. 2011; Freemark and Steil 2022; Gabriel and Painter 2020; Galster and Lee 2021; Leishman and Rowley 2012; OECD 2021; Pawson, Milligan et al. 2020; Sarkar, Gurran et al. 2024).

1.3 Research methods

Our approach

This project is a scoping study, which is part of the AHURI National Housing Research Program. Scoping studies aim to analyse the evidence-base on an existing or emerging policy issue in order to pinpoint existing gaps, to produce and extend knowledge, and to inform future research directions and policy considerations.

As little research on the housing-energy-transport nexus has been published in the AHURI evidence-base, the core aim of this scoping project is to underscore the multiple factors informing housing affordability. This involves highlighting the significance of housing quality and location, housing-related poverty (such as energy, transportation and commuting hardship), and the ways in which the geographies of housing affordability shape the capacity of lower-income households to access essential resources and services. Specifically, the project seeks to:

1. Better understand how these factors affect household expenditure, health and wellbeing.
2. Examine the policy responses relating to these issues.
3. Explore how a more robust housing affordability approach could be developed to help improve household outcomes across the housing continuum.

To address these aims, the project is guided by three research questions:

- To what extent are housing affordability, accessibility and quality factors integrated into policy?
- How is housing quality and location considered in the literature, and how do these factors intersect with housing affordability?
- How might available household and dwelling data be used to better inform housing affordability policy?

The research was conducted through a multi-phasal in-depth document analysis.

Scoping government policy and practice

Federal, state and territory policies and practices were reviewed, including housing strategies and strategic-planning frameworks (see Table 1), transportation, infrastructure and renewable energy plans. Additionally, a suite of online government resources and websites was reviewed and analysed, which included various programs, schemes and data-driven toolkits.

Income-eligibility thresholds of reviewed policies and programs were documented in order to determine the extent that lower-income households can access these schemes, as defined under the 30:40 affordability measure typically used to identify Australian households in housing stress. Regarding housing quality, policies and programs were reviewed that aim to ensure an adequate standard of housing, as well as those that have been explicitly designed to support households experiencing energy hardship.

On the spatial dimension of housing, the policy review was twofold (albeit overlapping).

First, policy and programs that included a spatial dimension in the assessment of housing affordability were identified, reviewed and analysed. This included analysis of inclusionary zoning policies, key-worker housing programs, and strategically located redevelopments with social and affordable housing requirements.

Second, policy and programs that sought directly or indirectly to address transportation disadvantage were reviewed. While inclusionary zoning policies seek to provide well-located housing to lower-income households, this part of the review aimed to analyse support mechanisms in place that could assist households experiencing transportation disadvantage. For example, transport assistance programs, vehicle concession schemes, and fuel subsidy schemes.

Table 1: Reviewed housing, planning and infrastructure strategies, by jurisdiction

State/territory	Housing and planning strategies
New South Wales (Department of Planning, Industry and Environment)	Housing 2041: NSW Housing Strategy Greater Sydney Regional Plan
Victoria (Department of Families, Fairness and Housing)	Homes for Victorians: Affordability, Access and Choice 2017 Plan Melbourne 2017–2050: Metropolitan Planning Strategy
Queensland (Department of Communities, Housing and Digital Economy)	Queensland Housing Strategy 2017–2027 Shaping SEQ: South East Queensland Regional Plan 2023 Brisbane's Future Blueprint
Western Australia (Department of Communities)	WA Housing Strategy 2020–2030 Perth and Peel @ 3.5 million 2018–2050
South Australia (SA Housing Authority)	Our Housing Future 2020–2030 30 Year Plan for Greater Adelaide 2010–2040
Tasmania (City of Hobart; Homes Tasmania; Infrastructure Tasmania)	Tasmanian Housing Strategy 2023–2043 Capital City Strategy Plan 2015–2025 Hobart: A Capital City for the Future 2018 Tasmania's Strategic Infrastructure Framework
Australian Capital Territory (Department of Environment, Planning and Sustainable Development)	ACT Housing Strategy, Homes and Housing 2018 ACT Planning Strategy 2018–2045 Indicative Land Release Program 2023–24 to 2027–28
Northern Territory (Department of Local Government, Housing and Community Development)	A Home for all Territorians: Northern Territory Housing Strategy 2020–2025 Darwin Regional Land Use Plan 2015 Darwin City Centre Masterplan 2015

Source: ACT Government 2018; City of Hobart 2015; Department of Communities 2020; Department of Planning 2023; Department of Transport and Planning 2017; DFFH 2017; DLGHCD 2020; DLPE 2015; DPIE 2021; DPLG 2017; DPIE 2021; Government of South Australia 2020; Greater Cities Commissions 2018; Homes Tasmania 2023; Infrastructure Tasmania 2024; SA Housing Authority 2020.

Scoping research methodologies relating to the housing-energy-transport nexus

The project brings together a range of cross-disciplinary academic and grey literature from the fields of housing, poverty, health and wellbeing, urban planning, transportation and energy. Issues related to affordability that directly linked to housing were analysed, including:

- household size, composition and formation
- tenure type
- housing quality and energy efficiency
- neighbourhood conditions
- proximity and accessibility to essential resources and services.

The literature corpus was thematically analysed in accordance with the research questions guiding this project.

The review findings highlight a range of methodologies and datasets used across the literature corpus through 11 thematically organised case studies that have demonstrated potential to inform current housing affordability measurements. This includes examination of the metrics and variables applied, the identified household outcomes, the resulting policy recommendations, as well as the critical debates and identified limitations across a range of jurisdictions. Commonly identified data sources include the ABS Housing Expenditure Survey and ABS Survey of Income and Housing; the HILDA survey; the Australian Housing Conditions Dataset; and a suite of location-specific and organisation-specific housing affordability surveys.

Expanding the framework for housing affordability policy and research

The thematic analysis of policy documents seeks to better understand how, and to what extent, the housing-energy-transformation nexus is accounted for within existing policy frameworks. The case studies that follow highlight and discuss available datasets and methodologies that have demonstrated potential to strengthen current housing affordability measurements and policy. Taken together, this scoping study seeks to address a critical gap in the evidence-base on housing affordability, and expand the framework for policy development and future research to consider the quality and locational significance of housing affordability.

Research limitations

As a scoping study, tight research parameters had to be set. This project primarily focusses on the housing affordability implications for lower-income households, with an emphasis on those residing in the private and social rental sectors. While income, tenure and affordability intersections are considered, broader sociocultural dimensions of housing are not explicitly examined. Additionally, while the study recognises the significance of affordability-related issues impacting households within the home ownership sector, a distinct research approach or expansion of the current methodology is required to address in-situ owner-occupier-specific factors related to housing affordability—such as tenure security, maintenance, taxes, asset appreciation, and intergenerational wealth transfers.

As the project progressed, the research methodology was adjusted to align more closely with the core objectives. While understanding household decision-making factors remains crucial, future qualitative research involving households directly promises more comprehensive and rigorous set of findings—rather than relying on industry stakeholders' interpretations (as initially planned in this research). Preliminary interviews conducted with real estate agents and mortgage brokers revealed that—with the exception of descriptions of dwelling price, size, aesthetics and, to some extent, location preferences—their responses indicated a lack of clarity regarding how households factor key elements such as housing quality and commuting costs into their occupancy decisions. While this observation indicates a potential gap in industry stakeholders' knowledge of household decision-making dynamics, it fails to provide deeper insights into the complex trade-offs and implications involved. Thus, as the research progressed, the undertaking of an in-depth policy and program analysis signified a more valuable contribution to this scoping project.

The authors acknowledge the challenge of bringing together the largely siloed topics of housing affordability, quality and location within the confines of a scoping study. This study is a conduit for further research and policy development. Avenues for further research arising from the findings of this study are also presented.

2. Policy and programs to support affordability across the housing-energy-transport nexus

- Recent changes to the National Construction Code (NCC) demonstrate a significant policy shift to improve the quality of new housing.
- The voluntary application across the states and territories has led to variation in minimum performance requirements.
- The standard of housing for households in existing dwellings is not likely to improve without additional policy measures.
- The Australian Capital Territory is the only jurisdiction to mandate energy-efficiency disclosure requirements for the sale or leasing of residential buildings.
- A range of initiatives seek to improve the energy-efficiency and thermal performance of housing, largely targeting owner-occupiers.
- While not excluding social and private renters, these initiatives are likely hindered by the need for landlord permission and investment.
- Few policy measures apply a spatial-specific focus to housing affordability, with the exception of varying degrees of inclusionary zoning in some jurisdictions.
- Most jurisdictions have initiated large-scale infrastructure schemes to improve accessibility and connectivity between housing and employment.
- Few initiatives target transportation hardship among low-to-moderate-income households.

This chapter critically reviews state, territory and federal government policies, strategies, programs and initiatives designed to increase housing quality standards, including those that improve both the thermal and energy performance of residential dwellings across the housing continuum. Measures are also examined that provide support to households experiencing energy hardship, as well as those designed to address the core drivers of material deprivation.

2.1 Measures to improve housing quality standards

2.1.1 Minimum standard of housing

The most significant policy shift in recent years to improve the quality, energy efficiency and accessibility of Australian homes is arguably the recent changes to the National Construction Code 2022 (referred herein as 'NCC 2022') implemented by the Australian Building Codes Board (ABCB 2022a). The NCC 2022 incorporates new standards to enhance the liveability of new homes, making them more accessible, energy efficient and comfortable to live in, as outlined in the national Trajectory for Low Energy Buildings signed in 2019 by the federal, state and territory governments (Department of Climate Change, Energy, the Environment and Water [DCCEEW] 2023a). Key changes relating to improved dwelling quality include:

- new energy-efficiency and condensation-mitigation requirements
- new liveable housing requirements.

The energy-efficiency changes will improve the underlying performance of the building shell and account for the energy use of household appliances and equipment. The minimum requirement for new houses and apartments will increase from 6 stars to 7 stars (out of 10), according to the Nationwide House Energy Rating Scheme (NatHERS) (DCCEEW 2023a; 2023b; 2023c; NatHERS 2019). Energy-efficiency features may include optimal dwelling orientation, improved insulation and window performance, ceiling fans, and lighter-coloured roofs and exterior walls. A new 'Whole of Home' energy-use budget will also apply annually to account for a home's major fixed appliances and any on-site renewable energy generated (DCCEEW 2023b).

The increased housing requirements follow the silver level of the Livable Housing and Design Standards (Livable Housing Australia 2017), to ensure that homes are more accessible to older people, people with disability, families with young children and people with temporary mobility issues (Australian Building Codes Board 2022b; DCCEEW 2023c). Design requirements include at least one step-free entry, slightly wider internal doors and corridors, one step-free access into a bathroom and shower, an accessible toilet, and reinforced bathroom and toilet walls to facilitate handrail instalment if needed at a later date.

Most states and territories are scheduled to implement the NCC 2022 at varying dates and through a phased approach (see Table 2). While these changes have the potential to improve dwelling quality standards across new Australian homes, they do not apply to existing dwellings. Further, the application of the NCC 2022 into state and territory policy is largely voluntary, which has led to jurisdictional variation in minimum performance requirements. For instance, the governments of Western Australia and New South Wales will not be adopting the Livable Housing Design Standards improvement (DMIRS 2023; NSW Government 2023a), and the Tasmanian Government will not be adopting the 7-star energy performance requirements (CBOS 2023). In the Northern Territory, limited changes have been made to energy-efficiency requirements, including a minimum 5-star rating for all new houses and substantial renovations, and 3.5-star rating for all new apartments (DIPL 2023a; Northern Territory Government 2023d).

Prior to the NCC 2022 changes, the Australian Capital Territory government was the only jurisdiction in Australia to enforce mandatory minimum energy-efficiency standards for new builds, major renovations and social and private rental properties. For new builds and major renovations, the Australian Capital Territory government require proof that the minimum energy-efficiency standards will be met before granting building approval (ACT Government 2023b). An energy modelling tool is used by accredited assessors to calculate the energy performance of a building. The tool is developed according to NatHERS specifications.

The Australian Capital Territory is also the only jurisdiction with a mandatory energy-efficiency disclosure requirement for residential buildings. The building's current level of energy performance must be disclosed to prospective purchasers or tenants. Owners must employ an accredited energy assessor to determine the energy performance and administer an Energy Efficiency Rating statement, which is then recorded via the government's Access Canberra portal[1].

Table 2: NCC 2022 implementations by state and territory

State or territory	Housing energy efficiency	Apartment energy efficiency	Livable housing design
Australian Capital Territory (ACT Government 2023a)	Adopting 7-star requirement from 15 January 2024	Adopting 7-star requirement from 15 January 2024	Adopting from 15 January 2024
New South Wales (NSW Government 2023a)	Enhanced BASIX from 1 October 2023	Enhanced BASIX from 1 October 2023	Not adopting
Northern Territory (NT Government 2023a)	Not adopting (Limited to 5-star requirements from 1 October 2023)	Not adopting (Limited to 3.5-star requirements from 1 October 2023)	Adopting from 1 October 2023
Queensland (Department of Energy and Climate 2023)	Adopting 7-star requirement from 1 May 2024	Adopting 7-star requirement from 1 May 2024	Adopting from 1 October 2023
South Australia (Department of Trade and Investment 2023)	Adopting 7-star requirement from 1 October 2023	Adopting 7-star requirement from 1 October 2023	Adopting from 1 October 2023
Tasmania (CBOS 2023)	Not adopting	Not adopting	Adopting from 1 October 2024
Victoria (DEECA 2023a; 2023b)	Adopting 7-star requirement from 1 May 2024	Adopting 7-star requirement from 1 May 2024	Adopting from 1 May 2024
Western Australia (DMIRS 2023a; 2023b)	Adopting 7-star requirement from 1 May 2025	Adopting 7-star requirement from 1 May 2025	Not adopting

Source: Authors.

2.1.2 Minimum rental standards

As at December 2023, a framework for minimum rental requirements—which outlines the settings for minimal rental standards, including energy-efficiency requirements—was under development by federal, state and territory governments as part of the Trajectory for Low Energy Buildings (DCCEEW 2023a; 2023b).

Some states and territories have already implemented minimum rental standards. For example, minimum housing standards came into effect for new tenancies in Queensland from 1 September 2023 and will come into effect for all remaining tenancies on 1 September 2024. Key provisions include adequate lighting, ventilation, window coverings, plumbing and functioning locks, as well as a range of security measures. Tenants also have increased rights to request repairs for issues that affect their safety or health (Residential Tenancies Authority 2023).

1 https://www.accesscanberra.act.gov.au/city-services/energy

As of 1 April 2023, the Australian Capital Territory government introduced a new minimum energy-efficiency standard for social and private rental properties (Justice and Community Safety Directorate 2023a). With a phase-in period extending to 30 November 2026, the new standard targets ceiling insulation upgrades with the aim to improve thermal comfort, reduce energy bills, improve health and wellbeing, reduce carbon emissions, and improve property values (Justice and Community Safety Directorate 2023b). Dwellings with no or poor ceiling insulation (rated less than R2[2]) must be upgraded to meet the minimum energy-efficiency standard of new builds (rating of R5). Rental providers must disclose to prospective tenants whether the property meets the minimum standard or has received a valid exemption. The policy does not restrict landlords from increasing rents following the ceiling insulation upgrades.

2.1.3 Energy-efficiency schemes

A range of incentives, programs and supporting initiatives seek to promote energy efficiency across Australian homes. These include measures to facilitate the uptake of renewable energy systems, thermal performance improvements, and appliance upgrades. Common schemes identified include:

- rebates on home energy assessment ratings—home audits
- rebates for the installation of renewable systems—solar panels, hot water systems and solar batteries
- rebates to improve a dwelling's thermal performance—draught-sealing, insulation, window glazing
- rebates for energy-efficient appliance upgrades—refrigerators, air conditioners, lighting
- no-interest loans for energy-efficient appliances
- personalised support, training and advice.

Under the Energy Savings Plan, the federal government has allocated $1.6 billion to improve accessibility to energy-efficiency upgrades for both homeowners and tenants. This initiative, in collaboration with state and territory governments and the Clean Energy Finance Corporation (CEFC), will facilitate financing options for household energy upgrades for over 110,000 homes, and energy upgrades to approximately 60,000 social-housing properties (DCCEEW 2023d: 1). The implications of these measures are discussed below.

Social housing energy-efficiency scheme

Under the federal government's Energy Saving Plan, $300 million over four years has been committed to target energy upgrades for vulnerable Australians in social housing (DCCEEW 2023d). As at January 2024, a $206 million joint-government package had been committed to improving the energy performance of around 24,000 social homes in New South Wales (Department of Planning and Environment 2024). Similarly, in Victoria, Tasmania and the Australian Capital Territory respective joint-government investment packages of $156, $16.6 and $35.2 million had been committed (Collins 2023; 2024; Housing Victoria 2023). Upgrades can include the installation of energy-efficient solar systems, heat pump hot water systems, reverse-cycle air conditioners, ceiling fans, insulation and draught-proofing.

Private household renewable energy schemes

The promotion of renewable energy systems to private households—including solar systems, hot water systems, and battery storage systems—constitutes a key aspect of state, territory and federal government commitments to achieving net zero by 2050[3]. Schemes to facilitate these objectives across the housing system, while largely accessible to all households, primarily favour property owners who have the autonomy and long-term incentives to upgrade their homes or investment properties.

2 https://www.yourhome.gov.au/passive-design/insulation
3 https://www.dcceew.gov.au/climate-change/emissions-reduction/net-zero

For instance, as part of the national Energy Savings Plan, $1 billion has been committed to provide non-means-tested concessional loans and mortgages for household renewable energy upgrades (DCCEEW 2023d; 2023f). Similarly, the Small-Scale Renewable Energy Scheme incentivises property owners to install eligible renewable energy systems. These systems include solar panel systems, small-scale wind systems, small-scale hydro systems, solar water heaters, and air source heat pumps (Clean Energy Regulator 2023; DCCEEW 2023d; 2023f).

At the state and territory level, the Tasmanian Government offers non-means-tested, no-interest loans ranging from $500 to $10,000 for property owners to purchase and install renewable energy systems (Department of State Growth 2023). In the Australian Capital Territory, eligible property owners can access up to $5,000 in rebates (Climate Choices 2023a) and no-interest loans ranging from $2,000 to $15,000 (Climate Choices 2023b). In the Northern Territory, the Home and Business Battery Scheme (HBBS) provides grant funding of up to $6,000 for property owners and businesses to purchase and install solar and battery systems (Territory Renewable Energy 2023).

Similarly, the Solar Homes Program in Victoria offers rebates and zero-interest loans of up to $8,000 for the installation of eligible renewable energy systems, including solar panels, hot water systems and solar batteries. To be eligible, property owners must meet certain household income (<$210,000) and property value (<$3m) criteria (Solar Victoria c. 2023). In New South Wales, the Energy Bill Buster Program allocated $128 million to assist eligible low-income households to install 3-kilowatt solar systems at zero cost (NSW Government 2023c; Treasury NSW 2022a). Eligible households include home-owning pensioners and Department of Veterans Affairs Gold Card holders receiving the Low-Income Household Rebate.

For schemes targeting social and private renters, the Queensland Government ran a trial solar rebate scheme between 5 March 2019 and 30 June 2020, where private landlords could access rebates of up to $3,500 for installing solar systems in rental properties within selected regional local government areas (Queensland Government 2023f). The program resulted in significant energy bill savings for participating tenants, averaging $600 per year (Department of Energy and Climate 2023).

By a similar token, a small-scale solar program in South Australia funded the purchase and installation of solar systems for rental providers and eligible low-income homeowners across Adelaide (City of Adelaide 2018). Under the program, costs were recovered through a quarterly separate rate charged to property owners over a 10-year period. Despite delivering cost-saving benefits to households, the program was discontinued in 2018. In Victoria, private landlords and community housing providers (CHPs) can access rebates of up to $1,400, along with the option to apply for zero-interest loans, provided a lease agreement with renters is in place (Solar Victoria c. 2023).

The Government of Western Australia did not offer any state-issued solar battery rebates or concessions as of January 2024. However, eligible property owners can access an energy buyback scheme that enables a time-of-export payment for electricity they export to the grid from renewable energy generation (Department of Treasury 2019).

Improved energy performance rebates and loans

In addition to renewable energy systems, a range of rebates and no-interest loans is available to Australian households to improve the energy performance of their homes. Most states and territories offer some form of energy-efficiency program targeted at very low-income households, including no-interest appliance loans, in-home efficiency audits, or fixed rebates for appliances.

In New South Wales, the Energy Savings Scheme (ESS) provides non-means-tested rebates to households to install energy-efficient lighting and air-conditioning systems (NSW Government 2023b). Funding is also available to eligible concession card holders to upgrade a range of energy-efficient appliances, including fridges, dryers, air conditioners and hot water systems, as well as upgrades such as window shading and draught-sealing valued at up to $4,000 (Treasury NSW 2022a).

Under the Victorian Energy Upgrades scheme (VEU), rebates are available to all households on the purchase and installation of energy-efficient household appliances such as LED lighting, reverse-cycle air-conditioning, heat pump hot water systems, draught-sealing, double-glazed windows, as well as home energy assessment ratings (DEECA 2023d). Meanwhile, in South Australia, the Retailer Energy Productivity Scheme provides non-means-tested rebates for households to install free or reduced-price efficient products, including energy-efficient lighting, water-saving showerheads, hot water upgrades, air-conditioner upgrades and energy-efficient appliances such as a fridge, freezer or clothes dryer (ECOSA 2023).

In Tasmania, no-interest loans of up to $2,000 are available to low-income Tasmanians to purchase essential items, which could include energy-efficient appliances (NILS Tasmania 2020). The Australian Capital Territory government offers eligible concession-card-holding property owners up to $5,000 in rebates for the installation of energy-efficient reverse-cycle air conditioners, hot water heat pumps, ceiling insulation, electric stove tops and ovens (Climate Choices 2023a). Zero-interest loans ranging from $2,000 to $15,000 are also available to property owners participating in the program (Climate Choices 2023b).

2.2 Energy hardship mitigation

Energy hardship relief schemes vary across Australian states and territories. Of those reviewed, most were identified as short-term responsive measures, offering eligible households time-limited, one-off payments to mitigate the extent of energy hardship. In some cases, recurring energy bill concessions are made available to very-low-income households. Few jurisdictions have initiated more holistic, proactive measures that attempt to address some of the root drivers of energy hardship—particularly relating to energy-inefficient housing consumed by lower-income households.

2.2.1 Responsive measures

The largest energy hardship scheme is the National Energy Bill Relief Fund (NEBRF), which is jointly administered by the federal, state and territory governments (DCCEEW 2023f). This fund was developed in response to the escalating cost-of-living crisis experienced by households across the nation, and offered a one-time bill-relief credit during the 2023–24 financial year. The amount of relief provided varies across jurisdictions and is typically supplemented by other state and territory energy support schemes. With the exception of Western Australia and Queensland, all jurisdictions direct energy hardship assistance to low-income concession card holders.

In New South Wales, eligible households under the NEBRF receive a one-time payment of $500 in bill relief, targeted at low-income households, pensioners, self-funded retirees, and families and carers (NSW Government 2023d). The New South Wales government also operates various energy assistance programs, including a Life Support Rebate and a Medical Energy Rebate (Treasury NSW 2022b). These are in addition to:

- the Low-Income Household Rebate—an annual rebate of $285 (Services NSW 2023)
- the Family Energy Rebate—up to $180 per financial year for people with dependent children (NSW Government 2023e)
- the Energy Accounts Payment Assistance—a one-time $50 payment for eligible households experiencing severe energy hardship and financial stress. Payment is in the form of a digital voucher (NSW Government 2023f; 2023g).

In Victoria, households with eligible low-income concession cards received a $250 one-time payment under the NEBRF (DEECA 2023d; 2023e). Further assistance is available through the state government's Annual Energy Concessions schemes, offering a 17.5 per cent reduction on electricity bills, with additional support for households facing exceptionally high energy bills through the Excess Energy Concession schemes (DFFH 2023a; 2023b).

The Queensland Government's commitment to energy bill relief during the 2023–2024 financial year included a $500 electricity bill rebate for all households under the Energy Bill Relief Fund (DCCEEW 2023b; Queensland Treasury 2023), and a further $200 for eligible low-income concession card holders. Additional support of $372 was available to this cohort through the Queensland Electricity Rebate Scheme. Thus, Queensland households could receive annual rebates ranging from $500 to $1,072.

Similarly, in Western Australia, all households were entitled to up to $400 in bill relief under the NEBRF, with additional support of up to $500 available through the Western Australian Energy Concession Extension Scheme (ECES) for eligible concession card holders (Government of Western Australia 2023b). This scheme encompassed various programs including the Energy Assistance Payment and Dependent Child Rebate, as well as an Air Conditioning Rebate, structured to subsidise the cost of operating an air conditioner in specified regions of high heat discomfort (Concessions WA 2023; RevenueWA 2023). Eligible households with outstanding energy utility debt could also apply for mediation and financial assistance of up to $640 and $1,060 per financial year, depending on dwelling location, through the Hardship Utility Grant Scheme (Government of Western Australia 2023c).

In both South Australia and Tasmania, eligible lower-income concession card holders could access $500 and $250 one-time bill relief payments, respectively, through the NEBRF (Government of South Australia 2023a; 2023b; Tasmanian Government 2023a; 2023b). In South Australia, this cohort could access up to $263 a year during 2023–24 (calculated as a flat rate per day) which covers energy payments and fuel used to generate energy within the home (e.g. bottled gas and petrol) (Government of South Australia 2023b). For Tasmanians, additional concessions and allowances were made available to low-income concession card holders and eligible pensioners, including a $56 heating allowance (Tasmania Government 2023a; 2023b).

In the Australian Capital Territory, households with an eligible concession card were entitled to a one-time payment of $175 in bill relief under the NEBRF (ACT Revenue Office 2023b) plus $750 under the Australian Capital Territory Utilities Concessions scheme. The Concessions scheme included an additional one-time $50 rebate during the 2023–24 financial year to account for the rising cost of living (ACT Revenue Office 2023c). Thus the total sum available to eligible Australian Capital Territory households during the 2023–24 financial year was $975.

Households in the Northern Territory with an eligible low-income concession card were entitled to a one-time payment of $350 in bill relief under the NEBRF and a combined sum of $1,200 per annum under complementary territory energy concession schemes (Northern Territory Government 2023e; 2023f).

2.2.2 Proactive measures

More proactive measure designed to mitigate energy hardship among lower-income households are beginning to emerge across various government jurisdictions. For example, the federal government, in conjunction with the states and territories, will co-invest $100 million into shared solar systems under the Community Solar Banks initiative. The program aims to provide low-income households access to renewable energy either through funding for rooftop solar installations on apartments, or a subsidy to purchase offsite solar energy. As of January 2024, partnership projects are underway in Victoria ($16m), New South Wales ($30m), Northern Territory ($4.7m) and the Australian Capital Territory ($3.6m) (DCCEEW 2023e; Department of Planning and Environment 2024). Meanwhile, the Western Australian government recently committed $13 million to the Energy Ahead program to assist households experiencing energy hardship. Although minimal program details had been released at the time of writing, the state government's media announcement indicated that eligible households will be supported to improve the energy efficiency of their homes, including support for low-efficiency appliances (Government of Western Australia 2023d).

In the Australian Capital Territory, various programs have been developed to reduce the cost of energy and water bills. These programs are aimed variously at:

- renters—Renters' Home Energy Program
- homeowners—Sustainable Home Advice Program
- Concession Card holders—Home Energy Efficiency Program (Climate Choices 2023c; 2023d; 2023e).

These programs offer free advice on a range of measures designed to improve a building's thermal performance. They include free home energy assessments, self-assessment tools, online workshops, information kits, and other digital resources. Australian Capital Territory residents can also receive personalised energy-saving advice via phone and email.

2.3 Locational dimensions of housing affordability

A range of programs, schemes and initiatives exist across Australia to improve the supply of, and access to, housing. For example, the federal government has mechanised multiple levers and funding streams to facilitate the growth of social and affordable housing. These include the Housing Australia Future Fund, the National Housing Infrastructure Facility and the Social Housing Accelerator (see Department of Social Services 2023; Housing Australia 2023b; Housing Australia 2023c; Treasury 2023). Federal, state and territory governments also promote housing affordability through a range of demand-side initiatives. The policy review showed that most measures aim to facilitate the transition into owner-occupancy through first home owner grants, stamp-duty concessions and low-deposit guarantee schemes (ACT Revenue Office 2022; 2023a; Government of Western Australia 2023e; Housing Australia 2023a; Northern Territory Government 2023a; 2023b; 2023c; Queensland Government 2023a; 2023b; 2023d; Revenue NSW 2023a; 2023b; 2023c; Revenue SA 2023a; 2023b; State Revenue Office 2023a; 2023b; 2023c). In terms of accessing housing affordability, locational dimensions are rarely integrated into the reviewed initiatives.

2.3.1 Non-spatial focus on housing affordability

In terms of policy measures to assist households into home ownership, a wide range of shared equity schemes, low-deposit home loan guarantees, first home owner grants, tax-efficient home deposit saving schemes (such as the First Home Super Saver Scheme), stamp-duty concessions and exemptions are available. Some states and territories also offer schemes that enable social-housing tenants to purchase the property in which they reside, typically through an adjacent shared equity scheme (Department of Communities 2020; 2022; Government of Western Australia 2023d; Home Start 2023; Housing ACT 2022; Queensland Government 2023c; Queensland Revenue Office 2023a; 2023b; 2023c; SA Housing Authority 2023). Most programs have price caps relative to local median house prices, and varying degrees of income-eligibility criteria.

Fewer options are available for private renters. For instance, CRA, no-interest bond loans and rental grants are typically available for very-low-income households. Eligible renters can also access rental affordability programs and headleasing programs, depending on income and location. These programs are discussed below.

Rental affordability programs

The National Rental Affordability Scheme (NRAS) was a federal government initiative that aimed to increase the supply of affordable rental dwellings. Under NRAS, the federal government, in conjunction with the states and territories, provided an annual financial incentive for up to 10 years to approved landlords who rent dwellings to eligible households on low-to-moderate incomes at a rate at least 20 per cent below market rent. The scheme was implemented in 2008 and dissolved in the 2014–15 Budget, which means that remaining participants will have gradually exited the scheme by 2026. As of November 2022, over 30,000 private rental dwellings had been enrolled in the scheme (Department of Social Services 2022a).

Following the dissolution of the NRAS, Tasmania is the only state or territory to have launched a similar large-scale affordable rental program. Under the Private Rental Incentives scheme, participating property owners receive an incentive payment per property of up to $9,900 per annum, and property management is provided fee-free (Homes Tasmania 2023). For tenants, rent is capped at 25 to 30 per cent below median market rents and a minimum lease of two years is guaranteed. Part of the project design is to capture eligible properties and tenancies exiting the NRAS program.

Most states and territories facilitate headleasing programs to assist low-to-moderate-income households into private rental housing. For example, the Queensland Government will lease private rental property through a real estate agent, and then sublease to eligible households. Eligible households are identified as those that have the capacity to afford and sustain a private rental tenancy but cannot access private rental accommodation for various reasons, such as having a limited rental history (Queensland Government 2023d). Similarly, the Northern Territory Government headleases private rental housing that is offered to low-to-moderate-income households, including key services workers, at 30 per cent below market rates (Department of Territory Families, Housing and Communities 2023; DLGHCD 2020).

Bond loans

Most states and territories offer interest-free loans to eligible households to cover the rental bond required when moving into private rental accommodation. Eligibility is assets-tested and means-tested, and households can typically access a one-time grant of two weeks rent to support their transition into private rental accommodation. For example, under Queensland's Bond Loans and Bond Loans Plus schemes, interest-free loans are available up to a maximum of six weeks rent for eligible households (Queensland Government 2023e).

2.3.2 Spatial focus of housing affordability

The policy review showed that few measures apply a spatial-specific focus to housing affordability. Although varying degrees of tenure-neutral infill development targets have been proposed across urban Australia, most jurisdictions do not practise inclusionary zoning, with the exception of urban areas across South Australia, New South Wales, the Australian Capital Territory, and to some extent Victoria, where voluntary and mandatory measures apply.

Each state and territory has committed to increasing the proportion of infill development to promote sustainability and liveability, and also to reduce urban sprawl and maximise the use of existing infrastructure and services. Infill targets range between 40 per cent and 85 per cent of new development across the major capital cities (see Table 3).

Table 3: Infill housing targets across Australia's major capital cities

Capital city	Housing targets	Infill housing targets	Inclusionary zoning targets
Sydney	725,000 homes by 2036	70% by 2036	5–10% of new development
Melbourne	1.6 million new dwellings by 2050	70% by 2050	Limited
Queensland	863,800 new dwellings by 2046	60–70% by 2046	N.A.
Perth	880,880 new dwellings by 2050	47% by 2050	N.A.
Adelaide	248,000 new dwellings by 2040	85% by 2040	15% of new development
Hobart	36,000 new homes by 2030	70% by 2030	N.A
Canberra	100,000 new dwellings by 2041	70% by 2041	15% of new development
Darwin	36,000 new dwellings by 2030	40% by 2030	N.A.

Source: Adapted from ACT Government 2023c; DFFH 2017; Department of Planning 2023; Department of Planning, Land and Heritage 2018; DLGHCD 2020; Greater Cities Commission 2018; Homes Tasmania 2023.

The New South Wales government has set a housing target of 725,000 dwellings to be delivered across Greater Sydney's major urban centres by 2036. An affordable housing target of 5–10 per cent of new residential floorspace is also required in new developments when land is rezoned (Greater Cities Commission 2018). These affordable housing targets are achieved through a voluntary inclusionary zoning scheme introduced in 2005, referred to as Voluntary Planning Agreements (VPAs) (NSW Government 2005). The voluntary provision of affordable housing was further strengthened in 2009 with the introduction of the *State environmental planning policy (Affordable rental housing) (ARHSEPP)*, and again in 2021 with the *State environmental planning policy (Housing)*.

Further, the City of Sydney illustrates the key role of local governments in facilitating the provision of well-located housing for lower-income households. The local government has mandated an affordable housing component in specified zones across the inner city, requiring developers to commit a small percentage of floorspace to affordable housing within new developments, or pay an affordable housing levy (City of Sydney 2023).

In South Australia, the strategic plan for Greater Adelaide constitutes a housing target of 248,000 new dwellings, with 85 per cent in existing urban areas (Department of Planning and Local Government 2017). The plan emphasises the need to prioritise infill housing development near job-rich, walkable areas, as well as low-impact employment near existing housing. An affordable housing target of 15 per cent has been set for all new significant developments, including at least 5 per cent for high-needs groups. South Australia constitutes the only state-level government in Australia to implement a mandatory inclusionary zoning requirement, which has led to a mix of affordable home ownership, rental and social housing in well-located areas (Attorney-General's Department 2020).

The Victorian government has set a housing target of 1.6 million new dwellings by 2051, with an infill target of 70 per cent located near public transport and job-rich areas. While affordable housing targets were not included in the Metropolitan Planning Strategy (Department of Transport and Planning 2017), the Victorian government has undertaken a pilot Inclusionary Housing Program to facilitate the delivery of social, affordable and market housing across six sites (Department of Transport and Planning 2024). In partnership with the community housing sector, the pilot is anticipated to deliver 100 new social homes on surplus government land.

In the Australian Capital Territory, the planning strategy outlines a housing target of at least 100,000 homes over 25 years. Locational targets include 70 per cent of new homes in existing areas. Fifteen per cent of the Australian Capital Territory government's Indicative Land Release Program will be dedicated to growing the supply of social and affordable housing (ACT Government 2023c). While not strictly an inclusionary zoning scheme, the government plans to provide incentives to private developers and landholders to increase the supply of affordable and social housing (ACT Government 2018).

Under the strategic-planning strategy for South East Queensland, the Queensland Government has set a housing target of 863,800 new dwellings by 2046, with an infill target of 60–70 per cent (Department of Planning 2023). The strategy also includes dwelling diversity targets, aiming for a decrease in detached dwellings and an increase in medium-density and high-density developments. Although no affordable housing target or implementation strategy has been published, the Queensland Government is in the process of *'exploring potential inclusionary planning measures'* (Department of Planning 2023: 66).

Under the Perth and Peel capital city strategic-planning framework, the West Australian government has acknowledged the implications of locational disadvantage across Greater Perth. In response, a range of measures have been implemented to better connect middle and outer suburbs with the CBD through improved public transport infrastructure and road networks (Department of Planning, Land and Heritage 2018). This includes a housing target of 880,000 new dwellings, with 47 per cent in existing areas and 53 per cent as new, greenfield development. No affordable housing targets or implementation strategies have been published.

The Tasmanian Government has set a housing target of 36,000 new homes by 2030, with an infill target of 70 per cent in Hobart. No affordable housing targets are included (City of Hobart 2015). In the Northern Territory, the Darwin Regional Land Use Plan (DLPE 2015) outlines a new homes target of 48,000 dwellings over 40–50 years with a focus on compactness and mixed-used development. To facilitate new housing growth, the plan aims to improve public transport and road network infrastructure. The plan does not include affordable housing targets or an implementation strategy.

Regional programs

The spatial significance of housing affordability has also been considered across some parts of regional Australia, namely in relation to housing and place of employment. For example, the Key Worker Accommodation program aims to deliver well-located housing for health workers in rural New South Wales health districts. As at November 2023, $45.3 million had been committed to delivering short-term and long-term accommodation across six sites across Far West, Murrumbidgee and Southern New South Wales (Health Infrastructure NSW 2023). Similarly, the Queensland Government has committed $519 million to build more than 400 government employee housing units, and to maintain an existing portfolio of around 3,000 homes for key workers in regional communities (Queensland Government 2023g).

2.4 Transportation and accessibility measures

2.4.1 Strategic infrastructure programs

All state and territory governments have made commitments to improving accessibility, connectivity and sustainability throughout the built environment. Most commitments are documented in each jurisdiction's respective strategic infrastructure plans or housing strategies.

As an example, the Western Australian government's Metronet scheme constitutes the single largest investment in public transport in Greater Perth, with the aim of connecting housing and employment centres. The scheme includes the expansion of passenger rail networks, improved bus services and implementation of a light-rail system as part of a mid-tier transport initiative to facilitate a high-frequency public transport corridor (Department of Transport 2021). Metronet also involves collaboration across government agencies such as DevelopmentWA and the Department of Communities to facilitate mixed-use redevelopment around key transport hubs that include medium-to-high-density mixed-tenure housing development. The aim is to *'promote urban efficiency by introducing a critical mass of people to the existing communities, increasing housing diversity and supporting greater economic opportunities and wellbeing'* (DevelopmentWA 2021: 11). The Department of Communities has committed funding to deliver new social and affordable housing as part of this scheme, including the $394 million Metronet Social and Affordable Housing and Jobs Package (Department of Communities 2023).

2.4.2 Transportation concession schemes

A key aspect of locational disadvantage not only considers proximity to essential resources and services, but also access to them (Sarkar, Gurran et al. 2024). In this regard, transport-specific programs were reviewed to consider how, and to what extent, they could be engaged by lower-income households experiencing locational disadvantage to increase their access to higher-amenity areas.

A wide range of public transport concessions are available across Australia to assist eligible concession card holders to access transport. Concessions exist for students, seniors, pensioners, carers and people with mobility impairments (see for example Public Transport Victoria 2023). For motorists, most jurisdictions offer private vehicle registration concessions for eligible low-income households, such as seniors, veterans and pensioners (see for example Department of Transport 2023). Some jurisdictions offer toll-relief rebates to individuals with high toll usership. For instance, New South Wales motorists who spend more than the prescribed minimum amount on tolls in a financial year can claim a 40 per cent rebate. Between 1 July 2023 and 30 June 2024, the minimum toll spend was $402 with a maximum rebate of $802. No income-eligibility criteria are required to participate in the scheme (Service NSW 2023).

Travel assistance schemes are also available across some jurisdictions to contribute to travel and accommodation costs to access medical treatment and education or training facilities (Department of Education 2023; Department of Health 2023; Transport NSW 2023; Queensland Government 2023h). For example, the Travel and Accommodation Allowance in Western Australia supports eligible apprentices and trainees travelling over 70 kilometres (in a round trip) to a training facility, paying 40c per kilometre for travel claims and up to $150 per night for accommodation (DTWD 2023).

2.4.3 Zero-emission vehicle schemes

Zero-emission vehicles (ZEVs) constitute vehicles that produce zero tailpipe emissions of greenhouse gases and pollutants during operation. Depending on the source of energy generation, ZEVs are typically cheaper to run than fossil-fuel-operated vehicles (Department of Infrastructure, Transport, Regional Development, Communications and the Arts 2024). The purpose of reviewing government ZEV initiatives and incentives is to assess the extent to which these cost-effective modes of private transportation are accessible to lower-income households, which are more likely to experience challenges across the housing–energy–transportation nexus.

The review showed that all state and territory governments offer non-means-tested ZEV incentives to support the decarbonisation of the automobile sector (see Table 4). Depending on jurisdiction, ZEV rebates of $2,000–$6,000 are available to purchase new battery electric and hydrogen fuel cell vehicles valued below $70,000 (Climate Change Office 2023; Department of Transport 2023; Department of Treasury and Finance 2023; Revenue NSW 2023; Solar Victoria c. 2023). Various stamp-duty or vehicle registration concessions are also available. Similar to the household renewable energy schemes discussed previously, most ZEV schemes invariably favour households along the higher end of the income spectrum with the capacity to afford new vehicle purchases.

Notably, Queensland is the only jurisdiction to offer an increased rebate to participants with a household income of $180,000 or less (Queensland Rural and Industry Development Authority 2023). Queenslanders above this income threshold are eligible for a reduced rebate of $3,000. Although ZEV-purchasing rebates are not available in the Australian Capital Territory or Northern Territory, vehicle registration and stamp-duty concessions exist for eligible used ZEV purchases (Access Canberra 2023; DIPL 2023b). Significantly, the Australian Capital Territory and Northern Territory constitute the only two jurisdictions that incentivise the purchase of used ZEVs, which is significant to individuals and households at the lower end of the income spectrum.

Some states and territories offer financial incentives for electric-vehicle charging systems (DIPL 2023b). Tasmania offers subsidies to support the uptake of e-mobility devices, such as e-scooters and skateboards ($250), e-bikes ($500) and cargo e-bikes ($1,000) (Renewables, Climate and Future Industries Tasmania 2023).

Table 4: Zero-emission vehicle incentives, by jurisdiction

State/territory	Rebate amount	Registration and duty concessions	Eligibility criteria
New South Wales	$3,000	Stamp-duty concession	New ZEV valued below $68,750; no income or asset limits
Victoria	$3,000	Registration concession (5 years)	New ZEV valued below $70,000; no income or asset limits
Queensland	Up to $6,000	Stamp-duty concession	New ZEV valued below $68,000; income below $180,000
Western Australia	$3,500	No concessions	New ZEV valued below $70,000; no income or asset limits
South Australia	$3,000	Registration exemption (3 years)	New ZEV valued below $68,750; no income or asset limits
Tasmania	$2,000	No concessions	New NEV; no price caps on vehicle price; no income or asset limits
Australian Capital Territory	No rebate	Registration and stamp-duty concessions	New and used ZEVs purchased after 24 May 2021; no price caps on vehicle price; no income or asset limits
Northern Territory	No rebate	Registration and stamp-duty concessions	New and used NEVs valued below $70,000; no income or asset limits

Source: Adapted by authors

2.5 Overview and implications

The policy review has examined measures designed to increase housing quality standards and address experiences of material deprivation. Measures targeting the locational dimensions of housing affordability, including transportation disadvantage were also explored. An overview of the key observations and subsequent policy implications follows.

Raising the minimum standard of housing

While recent changes to the NCC 2022 demonstrate a significant policy shift to improve dwelling quality, the voluntary application of these changes across the states and territories has led to variations in minimum performance requirements across Australia. Moreover, as the NCC 2022 applies to new or substantially renovated dwellings, the standard of housing for households in existing dwellings is unlikely to improve without additional policy measures. Queensland and the Australian Capital Territory have committed to implementing an improved minimum standard of housing for rental properties, which targets the provision of adequate lighting, insulation, ventilation, window coverings, plumbing and functioning locks, as well as a range of security measures. However, these measures are the exception rather than the norm. Moreover, the Australian Capital Territory constitutes the only jurisdiction to mandate energy-efficiency disclosure requirements for the sale or leasing of residential buildings.

Household energy-efficiency schemes

We identified a range of largely non-means-tested incentives, programs and supporting initiatives aimed to facilitate the uptake of renewable energy systems, thermal performance improvements and appliance upgrades. The review showed that while some schemes are targeted toward lower-income households and social and private renters, most are geared toward property owners.

This was particularly notable regarding schemes designed to support the uptake of household renewable energy systems, including solar, hot water, and battery storage systems. While these initiatives do not explicitly exclude social and private renters from participation, the likely benefits of these incentives for this cohort must be balanced against the need for landlord permission and vary degrees of investment. Some jurisdictions have implemented schemes specifically designed to incentivise landlords to integrate renewable energy systems within the private rental sector. This was most notable through South Australia's small-scale solar program and Queensland's trial solar rebate scheme. Meanwhile, under the federal government's Energy Saver Plan, joint-government investment is anticipated to improve the energy performance of social housing across Australia through the installation of energy-efficient solar systems, heat pump hot water systems, reverse-cycle air conditioners, ceiling fans, insulation and draught-proofing.

Providing energy hardship relief

There are a wide range of schemes offering financial assistance, mediation and advice to households to mitigate the extent of energy hardship. This was particularly notable under the NEBRF, which provided eligible Australian households with a one-time bill-relief credit during the 2023–24 financial year in response to a growing cost-of-living crisis. The amount of relief provided varied across jurisdictions and was typically supplemented by other state and territory energy support schemes. With the exception of Western Australia and Queensland, all jurisdictions directed energy hardship assistance to low-income concession card holders. Few measures designed to address the root drivers of energy hardship were observed, with the exception of the cross-government Community Solar Banks initiative, which seeks to provide low-income households access to renewable energy through either co-investment for rooftop solar installations on apartments, or subsidies to purchase offsite solar energy.

Addressing locational disadvantage

Very few of the policy measures reviewed address locational disadvantage by applying a spatial-specific focus to housing affordability. The review highlighted a range of tenure-neutral infill housing targets to promote sustainability, reduce urban sprawl, and maximise the use of existing infrastructure and services. However, clear objectives regarding how these targets will be met are largely absent. Further, given the expansive footprint of Australian urban areas, infill development does not inherently increase locational advantages to households, nor does it directly promote housing affordability without adjacent policy measures, such as inclusionary zoning. Notably, South Australia is the only Australian jurisdiction to implement a mandatory inclusionary zoning requirement, where an affordable housing target of 15 per cent has been set for all new significant developments, including at least 5 per cent for high-needs groups. In New South Wales, affordable housing targets are set at 5–10 per cent on the residential development of rezoned land through a voluntary inclusionary planning framework. The Australian Capital Territory government offers incentives to private developers and landholders to increase the supply of well-located affordable and social housing through its Indicative Land Release Program. Small-scale key-worker housing programs have also been launched across specific jurisdictions and regions.

Addressing transportation disadvantage

The review of strategic infrastructure planning documents indicated commitments to improving accessibility, connectivity and sustainability throughout Australia's built environment. Western Australia's Metronet scheme illustrated how governments are aiming to promote urban efficiency and better connect housing with employment precincts through high-frequency public transport systems coupled with mixed-use and mixed-tenure housing development around key transport hubs. Regarding commuting hardship, although a range of public transport concessions and travel assistance schemes are available to eligible very-low-income households, there are few initiatives that target low-to-moderate-income households that have significant transportation expenditure.

3. Measuring the housing–energy–transportation nexus

- **The case studies illustrate a diverse range of methodologies used to examine the quality, energy, locational and transportation dimensions of housing affordability.**
- **Taken together, they provide valuable insight into the:**
  - **housing conditions, energy-efficiency and thermal performance of households**
  - **prevalence and experience of energy hardship and poverty**
  - **spatial patterns of residential inclusion and exclusion in relation to employment connectivity**
  - **relationship between locational affordability and transportation time-cost burdens.**
- **Engagement with and expansion of these methodologies offer strong potential for housing affordability policy.**

A range of studies have examined the intersection between housing quality, affordability, energy hardship, health and wellbeing outcomes internationally (Brown, Soni et al. 2020; Gibson, Petticrew et al. 2010; Heylen 2023; Horne and Hayles 2008; Lee 2024) and across Australia (Baker, Daniel et al. 2018; Cornwell, Hejazi et al. 2016; Nicholls and Strengers 2017; Ong ViforJ, Singh et al. 2022).

The literature on the spatial implications of housing affordability is vast, both internationally (Khabiri, Abadi et al. 2023; Howell, Currans et al. 2017; Keall, Baker et al. 2010; Khabiri, Soja 2010) and domestically (Burke and Hulse 2015; Dodson, Li et al. 2020; Gilbert, Nasreen et al. 2021; Liu and Judd 2016; 2019). For example, Burke and Stone (2014) considered the transportation disadvantages for outer-suburb, low-income renters. Meanwhile Hulse and Pinnegar (2015) provided an Australian perspective on housing markets, affordability and socio-spatial inequalities.

In contrast, very few studies have collectively examined the housing-energy-transport nexus with a focus on housing quality and location in relation to housing affordability. The 11 case studies in this chapter illustrate a suite of methodologies developed in Australia to better understand the quality, energy, and locational and transportation dimensions of housing affordability. The subsequent research findings, and policy implications are also included, to demonstrate the potential value of these research methods to inform the directions of housing affordability policy.

3.1 Quality dimensions of housing

3.1.1 Measuring housing standards

Previous AHURI research examining the relationship between substandard housing and energy hardship across Australia's rental housing market provides valuable insights into the social effects of low housing quality (Daniel, Moore et al. 2020). The researchers identify strategies and policy actions to improve the energy performance of rental housing, while mitigating the impact of energy hardship among tenants.

The research employed a mixed-methods approach, combining a review of existing literature and Australian policy, secondary data analysis, and insights from key stakeholders and experts to produce comprehensive evidence on social and private tenants' experiences with poor housing conditions and energy hardship. Analysis of the Australian Housing Conditions Dataset (AHCD) and the Housing Energy Efficiency Transitions data uncovered key findings about the living conditions and experiences of households facing energy hardship.

Important to this research, the AHCD includes *'information on the housing conditions, energy-efficiency features, and indoor environmental quality satisfaction of 4,500 households across South Australia, Victoria and New South Wales collected in 2016'* (Daniel, Moore et al. 2020: 11). Expansion of this dataset to capture the housing conditions across other states and territories is anticipated. Crucially, the AHCD can be analysed to produce a snapshot of housing conditions in the social and private rental sectors, and in comparison, to owner-occupied homes. As noted by the AHCD architects:

> *The AHCD is a baseline dataset to which additional samples may be added or compared. Analyses of the data can help researchers address questions of housing adequacy, amenity and accessibility, and formulate policy-relevant evidence on Australian housing conditions. (Baker, Daniel et al. 2018: 3)*

The AHCD and research protocols are accessible through the Australian Data Archive (Baker, Daniel et al. 2018).

Daniel, Moore et al. (2020) showed how energy hardship is significantly exacerbated when lower-income households reside in poor housing conditions, underscoring the intersections between social and economic disadvantage and low housing quality. Exposure to energy hardship is particularly likely for vulnerable individuals, including those with very low or no income, existing health issues, or minimal support networks (see also Lombard, Caught et al. 2022). At the same time, the issue of funding emerged as a significant barrier to increasing the energy performance and comfortability of rental housing, including financial support from state, territory and federal governments, private investor landlords and CHPs. For Daniel, Moore et al. (2020: 11), *'this barrier was closely linked with the prevailing view of housing as a commodity in Australia, which some stakeholders cited as a deterrent for major policy change in this area'.*

The research underscored the necessity of implementing a diverse set of strategies to enhance energy efficiency in rental housing, encompassing mandatory building standards, targeted financial assistance for vulnerable households, and bolstering investment across the social housing sector. While mandating minimum energy performance criteria for rental properties is deemed vital, potential resistance from property industry stakeholders due to perceived expenses was recognised as a challenge. Thus, achieving a consensus on defining 'safe' housing among various governmental and non-governmental entities was determined as pivotal for effective policy formulation and execution.

Daniel, Moore et al. also argued for a more comprehensive understanding of energy hardship to be developed, accompanied by improved data on housing quality—especially within the social and private rental sectors. Importantly, the study illustrated the need for measurements to include *required* energy expenditure, rather than *actual* energy expenditure to adequately capture households rationing their energy use to mitigate financial hardship (Daniel, Moore et al. 2020).

Overcoming initial financial hurdles for CHPs and private landlords to partake in retrofitting or renewable energy initiatives were identified as paramount. The need for clear monitoring and regulatory measures to support improved energy- and thermal-efficiency were also emphasised, with the research team raising concerns about potential rent hikes post-improvement in the private rental sector.

3.1.2 Thermal performance of rental housing

A series of research projects commissioned by *Better Renting* investigated the challenges faced by private renters in Australia regarding temperature control in their homes (Barrett, Catania et al. 2023; Dignam 2024; Dignam and Barrett 2022). The collective aim of this research was to understand the lived experience of energy hardship and the consequences of inadequate housing design, lack of climate control and affordability constraints.

These studies employed similar methodologies, recruiting participants across Australia and providing them with smart thermometers to track temperature and humidity in their rental homes during the winter and summer months. Participants were instructed to place the thermometers in relevant areas of their homes for the duration of the monitoring period (Barrett, Catania et al. 2023; Dignam 2024; Dignam and Barrett 2022). Additionally, qualitative data were collected through surveys, phone interviews, and discussions in WhatsApp groups to gain deeper insights into renters' experiences.

The research findings highlighted the critical impact of substandard housing on renters, leading to adverse health effects and financial constraints (Barrett, Catania et al. 2023; Dignam 2024; Dignam and Barrett 2022). Through rich descriptions, poor housing quality was shown to contribute to physical and mental health effects among renters, with many experiencing discomfort and stress due to temperatures often falling below (or exceeding) healthy indoor housing thresholds of 18°C–25°C (see Barnard, Howden-Chapman et al. 2018). Notably, it was observed that renters living in substandard homes face unique financial challenges, including high energy bills and costs associated with home improvements.

To improve the living conditions in rental housing and reduce the prevalence of energy hardship, the research findings collectively point to the need to establish minimum energy-efficiency standards across the private rental sector. The need for measures that facilitate increased thermal performance were noted, such as upgrades to insulation and efficient climate control systems. This was in addition to the importance of integrating cheaper and less energy-intensive cooling measures into rental homes to mitigate the impact of heat-related challenges exacerbated by climate change, such as ceiling fans and insulation.

To assist lower-income households in managing their energy costs, the findings from these studies emphasise the need to address some of the core drivers of energy hardship and poverty, such as increasing income support payments, including JobSeeker, DSP and CRA (Barrett, Catania et al. 2023; Dignam 2024; Dignam and Barrett 2022). Furthermore, the authors argue that tenant protections should be strengthened through residential tenancy act reform to empower tenants to exercise legal rights, including the removal of no-grounds evictions and ensuring homes are maintained to a decent standard. Strengthened tenancy regulations can lead to tangible improvements in living conditions, as demonstrated by research participants renting in Melbourne who experienced better indoor temperatures and reduced energy costs following energy-efficient upgrades through Victoria's improved rental standards (Barrett, Catania et al. 2023).

3.2 Energy hardship

3.2.1 Measuring poverty after housing costs

Randolph, Liu et al. (2023) investigated the geography of poverty after housing costs (PAHC) in Australia and its implications for measuring housing affordability and energy hardship. Specifically, they sought to demonstrate the effects of housing costs on a household's ability to maintain a basic standard of living, and to identify regions where households struggled the most with housing affordability.

The study utilised data from the 2015–16 Survey of Household Expenditure, Income and Housing and the 2016 ABS Census of Population and Housing to estimate the distribution of incomes minus housing costs across different regions of Australia. This allowed the researchers to calculate the incidence of PAHC at ABS Statistical Area 2 (SA2) level. By focussing on residual income (income left after basic housing costs are met), the study aimed to provide a more comprehensive understanding of housing affordability beyond the rent-to-income ratio.

The findings showed that an estimated 13.2 per cent of Australian households were experiencing poverty after accounting for housing costs during the study period—which equates to more than 3 million people (Randolph, Liu et al. 2023: 57). The data also revealed the disproportionate burden of housing costs on low-income households, with housing cost-to-income ratios increasing significantly for households in the lowest income quintile, but decreasing since 2011–12 for those in the highest income brackets. Comparisons between 1995–96 and 2015–16 data showed that households reliant on income support payments and pensions were particularly affected by PAHC, illustrating the inadequacy of income supports in keeping up with rising living costs.

In terms of tenure, the analysis showed that most households living in PAHC resided in private housing, including both renters and owner-occupiers. However, private (21%) and social housing (49%) renters were significantly more likely to experience PAHC compared to home buyers (9%) and homeowners (8%) (Randolph, Liu et al. 2023: 57). Regarding location, areas with significant disparities between poverty rates before and after housing costs were identified, indicating regions where households struggled to meet housing costs. Coastal and rural hinterland locations, as well as certain urban areas like the Gold Coast/Tweed Heads and middle suburbs of Sydney, exhibited the largest differences, with Randolph, Liu et al. inferring that increased poverty levels were being driven by higher housing costs relative to incomes.

The policy recommendations arising from the study advocate for comprehensive actions across all levels of government to address housing affordability and energy hardship (Randolph, Liu et al. 2023). At the federal level, there was a call to increase income support payments on a regular basis to better align with community living standards and rising costs. At the state and territory level, Randolph, Liu et al. urged policy makers to introduce and enforce minimum standards for private rental housing to enhance housing conditions to improve thermal comfort and efficiency—and, in turn, reduce household energy expenditure. Expanding energy-efficiency retrofits in social housing and establishing long-term energy-efficiency programs for low-income households were emphasised as key to alleviating excessive energy costs. Furthermore, providing guidance to energy retailers on promoting payment assistance and mandating them to offer aid to consumers facing financial hardship were signalled as crucial steps to prevent utility disconnection and mitigate financial struggles (Randolph, Liu et al. 2023).

3.2.2 Measuring persistent energy hardship

A 2018 study by Dekker and Nicholls aimed to investigate the extent of persistent energy hardship in Victoria, and to identify the characteristics of households experiencing this hardship.

The study examined the HILDA survey for self-reported measures of energy hardship, which provided insights into the duration of energy hardship and the characteristics of affected households (Dekker and Nicholls 2018). The analysis covered the three most recent years of available data (2014–2016). Households were identified as experiencing persistent energy hardship if they faced payment difficulty or heating inability in any two or all three years of the period analysed.

The study found that approximately 7.3 per cent of Victorian households (or 180,000 households) experienced persistent bill-payment difficulty, and 1.8 per cent (or 45,000 households) were persistently unable to heat their homes (Dekker and Nicholls 2018: 14). Among households facing persistent energy hardship, some experienced both payment difficulty and heating inability, while others faced one but not the other. Key features of households in persistent energy hardship included low incomes, with households experiencing heating inability being the most financially constrained. In addition:

- a majority of households in persistent payment difficulty had children
- renters were more likely to face energy hardship than homeowners
- there was a significant association between poor mental health and energy hardship.

The report's findings underscore the pressing need for policy interventions to alleviate energy hardship experienced by households. To this end, the report advocates for a multifaceted approach.

First, to provide financial relief to vulnerable households struggling with energy costs, Dekker and Nicholls recommended bolstering income support mechanisms by increasing the rate of JobSeeker allowances and promoting access to the Low-Income Health Care Card, particularly for low-wage earners.

Second, the findings emphasise the importance of measures that enhance the liveability and affordability of rental housing. This includes:

- mandating minimum rental energy-efficiency standards
- facilitating targeted energy-efficiency upgrades
- empowering renters to make minor modifications without requiring landlord approval.

The report also calls for the expansion of support services such as financial counselling, energy brokerage for households in need and the integration of energy assistance into existing healthcare programs (Dekker and Nicholls 2018).

3.2.3 Measuring household energy expenditure and wellbeing

Azpitarte, Johnson et al. (2015) investigated the relationship between housing costs, household energy expenditure and socio-economic status, exploring alternative definitions of energy poverty to identify households most in need.

Their study utilised data from the HILDA survey and employed five definitions of energy poverty to analyse the relationship between household energy expenditure and economic wellbeing. Two indicators of economic wellbeing were utilised: household disposable income, and a multidimensional measure of social exclusion developed by the University of Melbourne and the Brotherhood of St Laurence (Scutella, Wilkins et al. 2009). This measure of social exclusion integrated data from 30 indicators across seven domains, including material resources, employment, education, health, social connections, community involvement and personal safety.

To compare the welfare of different groups experiencing energy poverty, Azpitarte, Johnson et al. analysed overall household expenditure derived from the HILDA dataset, including housing costs, clothing, transportation, groceries, insurance, healthcare, education, communication services, and discretionary items such as entertainment and dining out. The study qualified and characterised energy poverty in Australia by presenting alternative definitions grouped into two broad categories:

1. Income-expenditure—which identifies energy-poor households by analysing the relationship between income and energy expenditure. This includes absolute and relative definitions where households are considered energy-poor if their energy costs surpass a specific threshold relative to their income.
2. Consensual definitions—which rely on households' self-reported assessments of their ability to adequately heat their homes and manage energy bill payments in a timely manner.

The analysis showed that low-income households allocated a larger portion of their income to energy expenditure compared to high-income households. Specifically, households in the bottom income decile spent nearly 7 per cent of their annual incomes on energy, while those in the highest income decile spent slightly more than 1 per cent (Azpitarte, Johnson et al. 2015: 6). Private renters were identified as the most affected among all tenure groups, and reported difficulties heating their homes or defaulting on bill payments. The findings also showed a tight correlation between households experiencing higher levels of social exclusion and those spending a larger proportion of their income on energy expenditure.

The study underscored the need to consider multidimensional measures to identify the scale of energy hardship problems and the target populations most affected. Using this approach, it was observed that policy intervention must take into account the diverse ways in which households respond to energy hardship, including those struggling to pay bills on time, heat their homes adequately, or cutting back on other essential goods and services to meet their energy costs. In turn, different types of assistance may be required based on the specific dimensions of energy poverty experienced by households. Moreover, Azpitarte, Johnson et al. noted that policies addressing energy poverty should acknowledge the varied causes and dimensions of the problem—and tailor interventions to different groups of households accordingly (Azpitarte, Johnson et al. 2015).

3.3 Locational dimensions of housing

3.3.1 Mapping spatial and demographic characteristics of housing affordability

A 2014 report entitled *The real cost of housing in WA* provided a contextual understanding of housing affordability in the Perth metropolitan area, with a focus on identifying spatial variations and demographic characteristics impacting affordability (Cassells, Duncan et al. 2014). One aim of the study was to develop a refined understanding of the spatial dimensions to housing affordability, highlighting the unique circumstances of West Australian households to inform effective housing policy options.

This project involved a mixed-methods approach, examining quantitative datasets from the ABS census and Survey of Income and Housing, the Real Estate Institute of Western Australia (REIWA), and qualitative findings from the 2014 BCEC Housing Affordability Survey (Cassells, Duncan et al. 2014). The study included analysis of ABS datasets to identify the proportion of household income dedicated to housing costs for owner-occupiers and renters. Analysis of REIWA housing transactions data over the fourth quarter of 2013 was used to map the variation in the median price of established housing for each suburb in metropolitan Perth, as well as the major regional centres in Western Australia. The findings from the BCEC Housing Affordability Survey elicited personal stories and experiences about the trade-offs Western Australian households had made in order to access housing. To examine the local affordability of housing, Cassells, Duncan et al. refined the price-to-income ratio indicator, comparing the typical sales price of properties in each subregional market across Perth and Western Australia with the incomes of households who live in those areas (Cassells, Duncan et al. 2014).

The findings showed that housing affordability varies spatially across the Perth metropolitan area, with significant differences in median price-to-income ratios and lower quartile price-income ratios across subregions. The cost burden of owning a home is considerably higher for lower-income households, particularly in sub-markets where lower quartile properties are rated as 'severely unaffordable' (Cassells, Duncan et al. 2014: 10). Subregions closer to desirable areas such as the CBD and the coast exhibited much higher price-to-income ratios. This reflects the spatial drawcard of these locations, and shows how metropolitan averages conceal the spatial distribution of house prices relative to household income, and emphasises the importance of analysing affordability at a subregional level. Significantly, households renting in the private market committed similar proportions of their incomes towards housing costs compared to mortgage holders.

Taken together, the research highlighted the need for a differentiated approach to analysing housing affordability that considers the diverse circumstances of lower-income households (Cassells, Duncan et al. 2014). In terms of housing affordability policy, Cassells, Duncan et al. advocated for the expansion of a sustainable private rental market by offering long-term leases and providing tax incentives to landlords (similar to the NRAS). Additionally, the study underscored the barriers faced by private sector development—such as the physical cost of development—to delivering more affordable housing options. To address this, they recommended policy intervention addressing cost issues, including taxes, developer contributions to infrastructure, and exploring alternative construction technologies proven to cut costs and build times, which will ultimately deliver greater housing affordability.

3.3.2 Mapping socio-spatial disadvantage

Hulse, Pawson et al. (2014) aimed to investigate how concentrations of social disadvantage are conceptualised, and their relationship to housing affordability and urban systems. They explored the impacts of spatial disadvantage on residents of disadvantaged areas, and the role of housing and place in mediating these impacts. The research focussed on suburbs as analytical units because of their typical population size and mapping feasibility with ABS census and housing market data.

Hulse, Pawson et al. utilised data from the 2001, 2006 and 2011 ABS censuses coupled with secondary housing market datasets. The ABS data provided information on 16 socio-economic indicators—including incomes, unemployment, disability, and language skills—to identify disadvantaged suburbs, while the housing market datasets included information on dwelling sales prices, entry rents, and volumes of sales and lettings.

To identify and classify disadvantaged suburbs, the study utilised the ABS Socio-Economic Index for Areas (SEIFA) rankings, particularly the Index of Relative Socio-Economic Disadvantage (IRSD), and employed cluster analysis of indicators derived from the ABS census. Housing market analysis compared disadvantaged suburbs to city-wide averages, assessing dwelling sale price, medium entry rents, and spatial distribution. Customised ABS census data and administrative records of house sales and rental lettings were utilised. The study categorised disadvantaged suburbs into four types based on a typology, analysing changes over 2001–2011 in housing market dynamics and their role relative to each metropolitan area.

The findings showed that across Sydney, Melbourne and Brisbane, 10 per cent of all suburbs were classified as disadvantaged, encompassing 1.7 million people in 2011 (16% of the total population). Disadvantaged suburbs were shown to form distinct clusters in middle and outer suburbs as well as peri-urban areas, rather than inner-urban areas (Hulse, Pawson et al. 2014).

Cluster analysis identified four distinct types of disadvantaged suburbs based on socio-economic characteristics. These types were distributed unevenly across cities, with Sydney displaying the most complex pattern. Housing markets in disadvantaged suburbs varied significantly across types. While some areas offered relatively affordable housing, others faced affordability challenges and potential risks of housing stress and displacement for low-income residents.

Policies targeting well-located affordable rental options were recommended to maintain diversity, and to mitigate risks of displacement in disadvantaged suburbs. The research highlighted that Australia's major cities have distinct concentrations of disadvantage, with substantial growth in low-income residents in identified disadvantaged suburbs in the period 2001–2011. The researchers called for policy intervention that facilitates affordable rental options in well-located disadvantaged suburbs to reduce housing stress and prevent displacement. Importantly, the socio-spatial findings indicated a dispersed pattern of disadvantage compared to international trends, with challenges of transport and service access in urban peripheries. Subsequently, the research pointed to the need for cross-government policy action that aims to integrate housing, planning, transport, and employment policies to counteract mono-centrism. Additionally, understanding residents' choices and experiences in these areas is crucial for effective policy formulation (Hulse, Pawson et al. 2014).

3.3.3 Mapping spatial segregation: neighbourhood porosity-exclusion index

Sarkar, Gurran et al. (2024) shed light on the extent and patterns of segregation and deprivation within Australia's largest capital cities. Datasets from the 2011 and 2016 ABS censuses were analysed, with a specific focus on internal migration data and journey-to-work (JTW) data, to compute indices of neighbourhood change and to measure residential mobility and employment connectivity. By employing these measures, Sarkar, Gurran et al. established a functional typology for each neighbourhood, considering factors such as housing market dynamics, social and economic deprivation, and employment connectivity within each city and the wider region. The methodology used further extends JTW data analysis by introducing a 'neighbourhood porosity' indicator. This indicator shows the porosity-exclusion index for each neighbourhood, contributing valuable insight into ongoing processes of exclusion and displacement that contribute to spatial segregation within urban areas (Sarkar, Gurran, et al. 2024: 4).

Key findings from the study underscored the agglomeration of high-income earners in affluent neighbourhoods and the subsequent spatial inequalities. The spatial clustering of high-income earners in inner-urban precincts resulted in exclusionary practices that restricted the access of low-income and moderate-income earners to these neighbourhoods, which typically offer better amenities and connectivity to job opportunities. Additionally, the study revealed that the spatial proximity of high-income residential neighbourhoods to major employment centres contributes to a labour market where higher-income earners have shorter commutes, while lower-income earners living across the urban peripheries needed to make longer commutes to access job opportunities.

The research underscored several key policy recommendations aimed at addressing socio-spatial inequality through urban policy and housing interventions. For example, Sarkar, Gurran et al. recommended that state and local governments monitor housing markets for signs of displacement and exclusion at the neighbourhood scale to assess the impact of specific planning and policy interventions. To prevent the displacement of lower-income residents, strategic infrastructure investment decisions aimed at improving transport accessibility should be complemented by policies preserving and expanding affordable housing programs. To this end, strategic funding and increased planning intervention through, for example, inclusionary zoning, were deemed essential to increase the supply of affordable rental housing in job-rich areas, with the aim of reducing socio-spatial segregation and exclusion (Sarkar, Gurran et al. 2024: 61).

3.3.4 Mapping inclusionary zoning in Australia

Gurran, Gilbert et al. (2018a) examined how land-use planning mechanisms can support affordable housing inclusion within new and existing neighbourhoods. More specifically, their study provides insights into the effectiveness of inclusionary planning models in Australia, focussing on South Australia's 15 per cent inclusionary target and the New South Wales Voluntary Incentives scheme.

Gurran, Gilbert et al. employed a mixed-methods approach, combining an updated review of inclusionary planning mechanisms and affordable housing delivery outcomes in South Australia and New South Wales, compared with selected case studies across the UK and US. Structured interviews were conducted with key stakeholders across each jurisdiction, including state and local planning officers, affordable housing developers, and urban planning consultants. Additionally, policy and program documents, government statistics and online development application registers were analysed. A 'context–mechanism–outcome' (CMO) framework was used to examine the data corpus across different jurisdictions and at different scales of operation (Gurran, Gilbert et al. 2018a: 8).

The research findings showed that approximately 17 per cent of total dwelling approvals within major new residential development areas in South Australia (2005–2015) were dedicated to social and affordable housing. These homes included various housing types catering to different income levels, with a significant portion supported by government incentives or subsidies, including land (Gurran, Gilbert et al. 2018a: 36). Meanwhile, the New South Wales Voluntary Incentives scheme delivered a smaller proportion of affordable homes (0.5–1% of Sydney's housing supply in the period 2009–2017) (Gurran, Gilbert et al. 2018a: 49). Only affordable rental accommodation was provided under this mechanism, and the affordability requirements were limited to a 10-year period. Both the South Australian and New South Wales schemes were found to be modest compared to international standards, where supportive funding or financial incentives for affordable housing are more prevalent. For instance, the researchers observed over 500 cities across the United States practising inclusionary planning, while up to 40 per of new housing developments in the UK were identified as affordable.

Against these international findings, the authors highlighted the potential for inclusionary planning approaches to be extended across Australia through mandates during rezoning or planning rule variations, following significant infrastructure investments (Gurran, Gilbert et al. 2018a: 51). Similarly, voluntary planning incentives can encourage affordable housing inclusion within existing planning frameworks, providing flexible options to facilitate affordable housing provision. Here the authors argued that by securing access to land at 'pre-zoned' values, or by offering increased development potential through density increases, planning system mechanisms should reduce the subsidy required to meet the difference between affordable housing production costs and the affordable price or rent. Lastly, the need for greater planning certainty for affordable housing developments was underscored as a means to reduce developer risk and, in turn, enhance housing delivery outcomes.

3.4 Transportation disadvantage

3.4.1 Developing a housing and transportation affordability index

Saberi, Wu et al. (2017) made a significant methodological contribution to the research on locational affordability in their investigation into the distribution of housing and transport affordability in Melbourne. They argued that conventional measures of location affordability often neglect transportation costs—and thus fail to accurately depict housing expenses (Saberi, Wu et al. 2017). To address this gap, the authors developed a unique housing and transportation affordability index. The index incorporates housing costs and location, and household transportation costs including public transport expense, running and ownership costs of private vehicles, and usage costs for both work and non-work trips on weekdays and weekends (Saberi, Wu et al. 2017: 145).

The housing and transportation affordability index is constructed at the Statistical Area Level 2 (SA2), with the aim of providing a granular understanding of affordability across different subregions and housing markets. Importantly, the research findings showed that living in outer areas away from the CBD area did not necessarily reduce the cost of living. Indeed, the urban periphery became less affordable when transportation expenses were factored in, particularly given the *'high private car dependability and lower levels of income in outer suburbs in connection to housing costs'* (Saberi, Wu et al. 2017: 135). Moreover, areas with lower housing costs but higher transportation costs were shown to be more likely to experience social exclusion and spatial disadvantage due to limited accessibility and mobility options.

Based on their findings, Saberi, Wu et al. (2017) highlighted the need for local and state governments to simultaneously consider transportation infrastructure accessibility—such as availability of public transport—and new residential development when planning for affordable housing (see also Arunachalam, Smith et al. 2020). For the authors, this could involve targeted investments in transportation infrastructure to areas with high private car dependency and lower incomes in outer suburbs, thus improving overall affordability and accessibility. Taken together, the study demonstrates that strong cross-government coordination is critical to improving overall affordability, accessibility and delivering more spatial equitable housing affordability outcomes.

3.4.2 Scoping commuting patterns of key workers

In 2020, Gilbert, Nasreen et al. (2021) engaged in an AHURI scoping study to gather new evidence regarding government support for key workers' access to housing in Sydney and Melbourne. The study examined housing affordability, housing situations, and commuting patterns of key workers across various occupation groups in Sydney and Melbourne.

Data on housing affordability, housing situations and commuting patterns were collected from the 2016 ABS Census, CoreLogic, available government datasets, job listing services, and custom data commissioned from the ABS to examine rates of housing stress across occupation groups and subregions. This included analysis of 21 key-worker occupation categories representing incomes from the lower-to-middle end of the income spectrum, combined with spatial analysis and descriptive statistics (Gilbert, Nasreen et al. 2020).

The study found that Sydney and Melbourne's key workers face considerable challenges accessing appropriate and affordable housing. Twenty per cent of key workers in Sydney and 17 per cent in Melbourne had experienced housing stress, with higher rates in inner subregions. Approximately 31,000 key workers in Sydney and 18,000 in Melbourne were living in overcrowded homes. Notably, it was observed that housing affordability challenges extended beyond lower-income households to include moderate-income and middle-income workers. For example, in Sydney, there were no local government areas (LGAs) with median house prices that early-career registered nurses could afford. Further, close to 8,000 teachers in Sydney were experiencing housing stress, and approximately 4,500 registered nurses and midwives were living in overcrowded homes (Gilbert, Nasreen et al. 2020: 74).

The research also showed that key workers are more likely than the general labour force to reside in outer suburbs and satellite cities, which contributed to significant commute distances. In Sydney, nearly 44,000 key workers commuted over 30 kilometres to work, and just under 16,000 commuted 50 kilometres or more (Gilbert, Nasreen et al. 2020: 54). In Melbourne, almost 38,000 key workers commuted 30 kilometres or more, with over 10,000 commuting 50 kilometres or more. Significantly, between 2011 and 2016, inner subregions of both Sydney and Melbourne experienced a net loss of key workers, while more affordable outer suburbs and satellite cities gained key-worker residents.

In response to the key-worker challenge, Gilbert, Nasreen et al. (2020) advocated for the expansion of planning policies and funding programs aimed to increase the supply of affordable housing across rental and ownership tenures, including programs designed to scale-up the purpose-built rental housing sector. For the authors, these supply initiatives could be achieved by:

- utilising public sector land for affordable housing developments
- encouraging key-worker employers to develop affordable housing
- implementing inclusionary zoning requirements in health and education precincts
- supporting models like community land trusts
- encouraging superfund investments in housing
- initiating government shared–ownership programs.

Although non-housing-based support mechanisms such as transportation subsidies or income supplements for key workers in expensive housing market areas were identified as critical, it was observed that these would not address the problem of rising housing costs over time.

3.5 Overview and implications

The case studies presented in this chapter demonstrate a suite of methodologies developed by Australian researchers to better understand the quality, energy, and locational and transportation dimensions of housing affordability. Taken together, the methodologies and datasets used in these studies have made a critical contribution to the evidence-base on housing affordability, and demonstrate key considerations for future measurement and assessment of housing affordability problems, and subsequent policy intervention.

Quality dimensions of housing

Significant information on the housing conditions, energy-efficiency and thermal performance of 4,500 households across South Australia, Victoria and New South Wales can be gleaned through analysis of the AHCD. Through analysis of this dataset, coupled with supplementary data collection methods, Daniel, Moore et al. (2020) provided valuable insights into the living conditions and experiences of households facing energy hardship. Their research findings illustrate the implications of living in substandard housing and point to the need for a universally applied definition of safe and healthy housing standards across Australia. Importantly, this methodology underscored the need for policy makers to determine, and subsequently measure, a household's required energy expenditure, rather than their actual energy expenditure. This finding was revealed through research observations of households rationing energy use to mitigate financial hardship and consequently 'flying under the radar' of normative measures of energy hardship—and, by extension, housing affordability.

Similarly, Barrett, Catania et al. (2023), Dignam and Barrett (2022) and Dignam (2024) applied a mixed-methods approach to assessing the housing conditions of renters across Australia during summer and winter months. While the respective sample size of each study is not representative of all renter housing experiences, the findings provided a set of important snapshots into the thermal performance of housing across various regions, as well as the subsequent financial, health and wellbeing implications for households. The research methodology of these studies provided compelling evidence about the need to improve housing conditions across the rental sectors. There is capacity to reproduce these studies at a larger scale, and potential to include data from the AHCD into the methodological approach.

Energy hardship and poverty

Regarding methodologies used to interrogate the relationship between housing affordability and energy consumption, Randolph, Liu and colleagues' (2023) development of a poverty after housing cost (PAHC) indicator brought together data analysis from the ABS Survey of Household Expenditure, Income and Housing and the ABS Census of Population and Housing. By examining residual household income (after basic housing costs are met) at the SA2 level, the study delivered a more comprehensive understanding of housing affordability beyond the normative measure of housing stress through the 30:40 housing cost-to-income ratio. Importantly, the research findings showed that around 3 million Australians were experiencing poverty after accounting for housing costs during the study period, exposing the disproportionate burden of housing costs on low-income households (Randolph, Liu et al. 2023). To this end, it is worth reasserting the claim made by Daniel, Moore et al. (2020) that while measurements of actual household expenditure are of critical importance, they can mask other types of hardship and material deprivation if they are used alone.

To measure the prevalence and experience of energy hardship, Dekker and Nicholls (2018) and Azpitarte, Johnson et al. (2015) demonstrated methodologies using HILDA data. Dekker and Nicolls (2018) examined data from the self-reported measure of energy hardship over a three-year period to identify experiences of persistent energy hardship. Notably, this dataset revealed both payment difficulty and heating inability, illustrating the extent of energy hardship beyond household expenditure. Meanwhile, Azpitarte, Johnson et al. (2015) integrated 30 indicators from the HILDA survey into their analysis to construct a typology of energy hardship. The subsequent findings clearly illustrate the multiple dimensions of energy hardship and the need for carefully tailored policy interventions for different groups of households.

Locational dimensions of housing

In relation to the locational dimensions of housing, the case studies present a range of methodologies used to examine the relationship between housing affordability and locational advantage or disadvantage. The unique methodology developed by Cassells, Duncan et al. (2014) produced a refined understanding of housing affordability in the West Australian context. Through combined analysis of datasets derived from ABS census data, the housing market, and the BCEC Housing Affordability Survey, the research team mapped the spatial variations of housing affordability at a granular scale and captured the individual trade-offs households have made to access housing. Meanwhile, Hulse, Pawson et al. (2014) developed a measure of locational disadvantage by combining longitudinal ABS census data and secondary housing market datasets. Their findings showed that 1.7 million Australians across Sydney, Melbourne and Brisbane were living in disadvantaged suburbs, largely clustered around the middle-and-outer urban areas.

Similarly, Sarkar, Gurran et al. (2024) demonstrated the further potential of ABS journey-to-work data through their development of a neighbourhood porosity-exclusion index. Their research findings revealed the spatial patterns of residential inclusion and exclusion in relation to employment connectivity, and highlighted the need to address socio-spatial inequality through urban policy and housing interventions. Gurran, Gilbert et al. (2018b) showed how a multi-method qualitative research approach can be designed to both:

- clarify critical perspectives from key government and industry stakeholders on affordable housing policy
- examine inclusionary zoning outcomes across various locations.

Transportation disadvantage

The final two case studies presented in this chapter demonstrated significant methodological contributions to research on locational affordability in relation to transportation time-cost burdens. The housing and transportation affordability index developed by Saberi, Wu et al. (2017) captures a granular understanding of housing and transportation affordability across different subregions and housing markets. This research demonstrates how areas with lower housing costs but higher transportation costs were more likely to experience social exclusion and spatial disadvantage. Gilbert, Nasreen et al. (2020) developed a valuable methodology to examine the relationship between housing affordability and commuting patterns among key workers across Australia's largest cities. Their findings illuminated the extent of commuting hardship experienced, and highlighted the need to expand intervention aimed to increase social and affordable housing supply in well-located, job-rich areas.

4. Policy development options

The relationship between housing affordability, quality and location is fundamental to household health, wellbeing and life satisfaction (United Nations 2019; World Health Organization 2007). Yet, as illustrated in this scoping study, these essential life domains can place competing pressure on household budgets, which can have significant health, familial, psychological, social, locational and employment implications for Australians at the lower end of the income spectrum. Taken together, the varying literatures on the quality and locational dimensions of housing affordability emphasise the need for a more robust and overarching set of approaches to understanding and making policy relating to housing affordability. In this context, this scoping study sought to gauge the following.

- The extent to which housing affordability, accessibility and quality factors are integrated into policy.
- How housing quality and location have been considered and examined in the literature, and how these factors intersect with housing affordability.
- Potential ways that governments in Australia could respond to the critical issues identified.
- How available household data could be further used to inform housing affordability policy.

In addressing these objectives, the findings from this research offer a more holistic framework for measuring housing affordability and forming policy responses to affordability problems. The sections below consolidate the research, with an emphasis on implications for policy consideration. Potential avenues for further research are also highlighted.

4.1 How might existing methodologies and datasets be integrated into housing affordability policy?

The various methodologies demonstrated in Chapter 3 have produced research that delivers a more comprehensive and refined understanding of housing affordability beyond the normative measure of housing stress via the housing cost-to-income ratio. For instance, integrating data from the AHCD and the HILDA survey into housing affordability would offer large-scale assessments and deeper insights into housing conditions and self-reported experiences of energy hardship. Moreover, the PAHC indicator has demonstrated value in identifying housing affordability problems by considering residual household income after basic housing costs. Methodologies developed to critically assess socio-spatial inequality can illuminate locational disadvantage in relation to housing affordability. Such methodologies have meaningful but under-recognised implications for households.

Taken together, the application of these methodologies provides compelling evidence for the need to improve housing conditions—including energy-efficiency and thermal performance—to address and mitigate experiences of energy hardship and poverty, and to reduce spatial patterns of residential exclusion in relation to proximity and accessibility of essential resources and services. Given the accessibility of most datasets used, there is great potential to reproduce these methodologies more frequently and at a larger scale—including variation, adaptation and amalgamation.

4.2 What policies, programs or policy reforms could better support housing affordability across the housing-quality-transportation nexus?

Minimum standard of housing across the continuum

To improve household living conditions and address the challenges posed by climate change, there is a strong need to increase the minimum standard of housing across the continuum. Such a measure would ensure that homes meet basic standards of safety, health and comfort. The recent changes to the NCC 2022 demonstrate a significant policy shift in this direction. However, as identified in this research, the voluntary application of these changes across the states and territories has led to variations in minimum performance requirements across Australia. Moreover, as the NCC 2022 applies to new or substantially renovated dwellings, the standard of housing for households in existing dwellings is not likely to improve without additional policy measures.

There is a need to ensure the energy efficiency and liveable housing provisions of the NCC 2022 are adopted by all states and territories. Measures that seek to improve the housing performance of existing residential dwellings should also be explored, such as those implemented across Queensland and the Australian Capital Territory.

Enhance energy-efficiency measures in rental housing

This research underscored the need to introduce minimum standards for rental housing across the states and territories to enhance housing conditions and affordability. This needs to include mandating minimum rental energy-efficiency standards, facilitating targeted energy-efficiency upgrades, and empowering renters to make minor modifications without requiring landlord approval or fear of retaliation. At the same time, overcoming initial financial hurdles for social and private housing providers to partake in retrofitting or solar panel initiatives was identified as paramount.

The introduction and expansion of energy-efficiency retrofit schemes across the social-housing sector and the establishment of long-term energy-efficiency programs for low-income households, such as the Community Solar Bank, represent key steps in this direction. Renewable energy incentive schemes that target private rental housing, although small in scale, have been effectively administered across some jurisdictions.

Expand proactive responses to energy hardship

In addition to increasing the energy and thermal performance of housing, policy considerations arising from this scoping study emphasise the need for a more comprehensive understanding of the relationship between housing affordability and energy hardship. Energy assistance programs are required that cater to the diverse types of households facing energy poverty, acknowledging the varied causes and dimensions of the problem and tailoring interventions accordingly. A key finding in Daniel, Moore et al. (2020) underscored the importance for policy responses to consider a household's required energy expenditure, rather than actual energy expenditure, in order to adequately capture energy-use rationing to mitigate financial hardship.

This research has shown that although energy hardship assistance can provide short-term relief to vulnerable households, there is a need for policy intervention that targets the core drivers of energy hardship. To adequately address energy hardship, among other forms of material deprivation, it is critical to improve the monitoring of such experiences beyond utility bill underpayment, and to implement policies that respond to the root causes—rather than simple short-term, time-limited, one-off bill-payment relief.

While analysis of income distribution is beyond the scope of this project, there is clear consensus across the evidence-base that low household income constitutes a precursor to energy hardship, among other forms of material deprivation. In turn, there is a strong call to increase income support payments such as JobSeeker, DSP and CRA to better assist lower-income households in managing their housing and energy costs.

Policy settings that improve landlord responsiveness to maintenance requests have strong potential to improve dwelling standards and reduce tenants' energy costs. Additionally, it is important to remove the settings that enable landlords to retaliate against tenants who self-advocate for dwelling improvements, as well as ensuring rent increases are moderated in terms of both frequency and the size of the increase. It is essential to reform residential tenancy acts; this would strengthen tenant protections and empower them to exercise their legal rights.

Addressing locational and transportation disadvantage

Throughout the literature reviewed in this study, residents' housing choices and experiences were underscored as paramount for effective policy formulation. The need for well-located social and affordable rental options was identified as a way to mitigate risks of housing stress and displacement, while offering increased proximity and accessibility to key resources and services. Here, the further integration of housing, planning, transport and employment policies is critical. The Metronet infrastructure program in Western Australia provides an example of such inter-governmental support.

This study also demonstrated how inclusionary planning approaches could be extended across Australia's urban landscape through mandates during rezoning or planning rule variations following significant infrastructure investments. Planning incentives can be mechanised to encourage inclusion of affordable housing within existing frameworks, through the likes of density bonuses. Barriers faced by private sector development—such as balancing the physical cost of development with affordable housing delivery—could be mitigated through policy intervention addressing cost issues, including taxes, developer contributions to infrastructure, and exploring alternative construction technologies proven to cut costs and build times. To this end, there is also a need to increase planning certainty to both reduce developer risk and enhance affordable housing delivery outcomes.

By extension, the research further highlights the need for programs incentivising private landlords to provide well-located affordable rental housing. Similar to the now-concluded NRAS, the Tasmania Private Rental Incentives program is illustrative, where participating landlords receive an incentive payment to lease the property at 25–30 per cent below market rates and for a minimum of two years.

Lastly, the research has illustrated a need to expand transport accessibility and assistance schemes for low-to-moderate-income households currently experiencing transportation disadvantage. This could include:

- widening eligibility for transport-related concessions—public transport, private vehicle registration and stamp-duty exemption
- expanding zero-emission vehicles (ZEV) rebate programs that seek to support lower-income households, such as rebates for the purchase of used ZEVs
- applying an increased ZEV rebate threshold determined by income (as illustrated in the Queensland example).

4.3 Final remarks

Throughout this scoping study, three key themes emerged as areas for future research.

Sociocultural dimensions of the housing-energy-transport nexus

While this study has generated evidence on the housing-energy-transport nexus with emphasis on households at the lower end of the income spectrum, there is scope to extend this research to examine the intersectionality of this diverse cohort. For instance, research exploring the sociocultural dimensions of the quality and locational dimensions of housing affordability has the potential to clarify findings that could inform policy seeking to support specific demographic groups experiencing other forms of disadvantage.

International comparative analysis

Comparative analyses of international research that have examined the housing-energy-transport nexus could showcase how comparator countries seek to address housing affordability issues in relation to housing quality and location. Such findings could be analysed to explore whether they have the potential to inform housing affordability policy and practice across Australia.

Combined methodologies

Studies using a combination of the AHCD, PAHC and the Housing and Transport Affordability Index—among other datasets and methodologies demonstrated in this research—could further elicit compelling research around the housing-energy-transport nexus. For example, using the neighbourhood porosity-exclusion index to analyse the outcome of metropolitan infill targets at a granular spatial scale, including the price point to access this housing relative to median house prices, could identify the extent of dwelling diversity delivered across new infill development.

A greater understanding of these themes will complement the evidence-base of housing affordability in ways that could improve household financial, health and wellbeing outcomes.

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