



VISUAL SUMMARY

Building circular economy housing: An Australian story

Written by Louise Dorignon, Ralph Horne, Julie Lawson, Hazel Easthope,
Stefanie Dühr, Trivess Moore, Emma Baker and Tony Dalton

Illustrated by Zhen Xiong



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Foreword

The idea of circular economy is often represented with abstract pictures of circles and closed loops. What does circular economy actually look like, and what does it mean when we think of Australian housing?

With this visual summary we offer real, tangible and relatable representations of circular economy principles as we explored them in our research. The story provides a condensed, illustrated view into our evidence base research project. It asks how circular economy can be implemented to provide more sustainable housing in Australia.

The visual summary is based on original and peer-reviewed research funded by the Australian Housing and Urban Research Institute (AHURI) and led by RMIT University. The research was informed by analysis of national and international data, industry and building practice, and key informant sources. It interrogated four key housing issues: neighbourhoods, apartments, social housing and building materials.

Find out more and access the full report at: <https://www.ahuri.edu.au/research/final-reports/403>

Dr Louise Dorignon
RMIT University

Prof Ralph Horne
RMIT University

Prof Julie Lawson
RMIT University

Prof Hazel Easthope
UNSW

Prof Stefanie Dühr
University of South Australia

Dr Trivess Moore
RMIT University

Prof Emma Baker
University of Adelaide

Professor Emeritus Tony Dalton
RMIT University

We acknowledge the Traditional Owners of the land on which this story takes place, and we recognise the unique knowledge and contribution that Aboriginal and Torres Strait Islander people bring to housing and the built environment.

We also acknowledge that there are many Australian stories. The first stories were created by First Nations' people of Australia. In contrast, this particular story relates to contemporary settler housing produced over the last two hundred years on lands which were never ceded.



There are many problems associated with a linear economy, where finite resources are extracted, consumed, and discarded.

The diagram illustrates a linear economy flow: a mountain with trees (resources) leads to a person carrying a log (extraction), then to a house (consumption), and finally to a pile of rubble being excavated (discarded).

Furthermore, the housing industry is highly fragmented.

The diagram shows a large number of small figures, each representing a different actor in the housing industry (e.g., architects, builders, suppliers, regulators), scattered across a construction site, indicating a lack of coordination.

Adverse motivations, incentives and costs to investors and consumers inhibit the adoption of circular economy for housing in Australia.

Two people wearing hard hats are looking at a building under construction. A speech bubble from one of them states the barriers to adopting circular economy.

Australian standards for building performance are currently very low in international comparison.

A person in a hard hat is looking out of a window. A speech bubble from them discusses the current state of Australian building performance standards.

Additionally, there is a lack of professional awareness and training preventing progress towards a low carbon material market...

Cough! Cough!

A person in a hard hat is standing near a building, coughing. A speech bubble explains the lack of professional awareness and training, and another speech bubble shows them coughing.

For example, the adoption of durable and low impact materials is held back by high costs, incomplete markets, information asymmetries about split incentives, and insufficient know-how.

Earth and natural fibre

Waste-based bricks

Engineered bamboo

The diagram shows three types of sustainable building materials: 'Earth and natural fibre' (a brick), 'Waste-based bricks' (a brick made from waste), and 'Engineered bamboo' (a bamboo structure).

There is a real opportunity for Australia to progress towards a circular economy and provide more housing.

A large circular arrow is shown, with a speech bubble from a person in a hard hat stating the opportunity for Australia to progress towards a circular economy.

The concept of circular economy calls for closed loop material flows that minimise environmental burdens...

The diagram shows a closed loop material flow system where materials are recycled and reused, minimizing environmental burdens.

...while also delivering social and intergenerational equity, local economic opportunities and resource efficiency.

The diagram shows a cluster of modern, multi-story buildings, representing the social and economic benefits of a circular economy.

To ensure a just transition to circular economy that creates decent work and housing opportunities as the climate changes, we need a cross-sectoral and multi-institutional approach.

Organisations across the housing industry have varying capacities to respond to change.

Let's examine what instruments can be used across the fields of neighbourhood development, apartment construction, renovation of social housing, and construction materials.

A group of people in hard hats are gathered around a table, discussing the transition to a circular economy. Speech bubbles from them discuss the need for a cross-sectoral approach, the varying capacities of industry organizations, and the instruments that can be used.

There are many benefits to going beyond the building scale. Considerable scale efficiencies can be realised by planning, designing and building housing, energy networks or water management systems at neighbourhood scale.

This approach may also strengthen social sustainability in neighbourhoods

Despite a growing number of eco-precincts, these developments mostly focus on the building scale and the potential of the neighbourhood scale is underused.

White Gum Valley, Western Australia

Experiences from Europe might offer inspiration for how the precinct-scale could be used as the central consideration to develop sustainable communities.

Buiksloterham, Amsterdam, The Netherlands

Statutory planners and local councils can unlock more progressive opportunities in relation to circular economy at a larger scale.

New models for community engagement, beyond statutory requirements, would be useful to ensure that eco-precincts can thrive.

Digital tools can help tackle urban overheating at the neighborhood scale or demonstrate the viability of net-zero and positive energy neighbourhoods and collective housing.

How to facilitate circular economy housing at the neighborhood scale?

Measures to de-risk circular economy precinct development include sharing cases of successful approaches, standards and streamlined planning and development processes.

Ginninderry, ACT

Realising sustainable housing at a neighbourhood scale requires new governance approaches, partnerships between public and private sector actors, and consistent planning policies and building regulations across administrative borders and across scales.

Few apartment building projects contain sustainability features that exceed minimum standards, despite residents and owners wanting more sustainable apartments.

Speculative strata title development does not incentivise practical shared services and efficiencies in apartment buildings, so their potential benefits are often not realised.

The performance of new and existing apartment buildings could be improved through standards and practices to embed sustainability in the work of development teams at the project feasibility stage.

443 Queen St,
Brisbane,
Queensland

Measures to improve building energy performance include a more widespread use of renewable energy systems and measures to optimise the thermal quality of the building envelope.

Property valuation processes that take better account of building performance over time would facilitate consumer demand for greater sustainability, including for rental properties.

Purchasers and renters should have access to adequate information about building sustainability, including its common areas and services. Apartment residents must be considered and where possible included in sustainability initiatives that affect them.

There is great potential to move towards a circular economy by improving the performance of new and existing apartment buildings. Ensuring that build quality reflects what was approved is vital, as well as making information on building performance available to consumers.

Putting vacant homes back in use is also important to circularity. Vacancy taxes can be used to ensure effective use of our national housing stock and reduce wasteful and speculative practices. Harnessing the sharing economy and enabling collaborative group housing solutions can help make use of underutilised buildings and support inclusive access to affordable housing.

Retrofit to achieve circular economy goals has been mostly driven by market incentives directed towards middle-upper income homeowners.

Yet this focus has overlooked the fact that many Australians still lack access to even a basic quality of housing.

This has limited opportunities for large-scale retrofit that deliver the most efficient, cheapest and best outcomes.

Social housing providers have to balance business obligations with their social duty to assist residents: they must maintain often poor-quality dwelling stock, improve it and build more while relying on tied government funding.

Objectives underlying retrofit programs are rarely explicit and vary greatly between stakeholders. Often competing objectives of retrofit certainly limit successful retrofit outcomes.

Retrofitting social housing can reduce carbon emissions and improve energy-efficiency, whilst simultaneously improving building quality and residents' health.

Merton Regeneration project, Wimbledon, UK

This project aims to provide 2,800 new, quality homes by repurposing materials whilst reducing waste, carbon emissions and project costs through a circular economy framework.

Circle House Project, Lisbjerg, Denmark

Similarly, the Circle House Project integrated circularity and design for disassembly focus to create 60 housing units. However, both projects are focused on building process, rather than on creating efficient and high-quality homes.

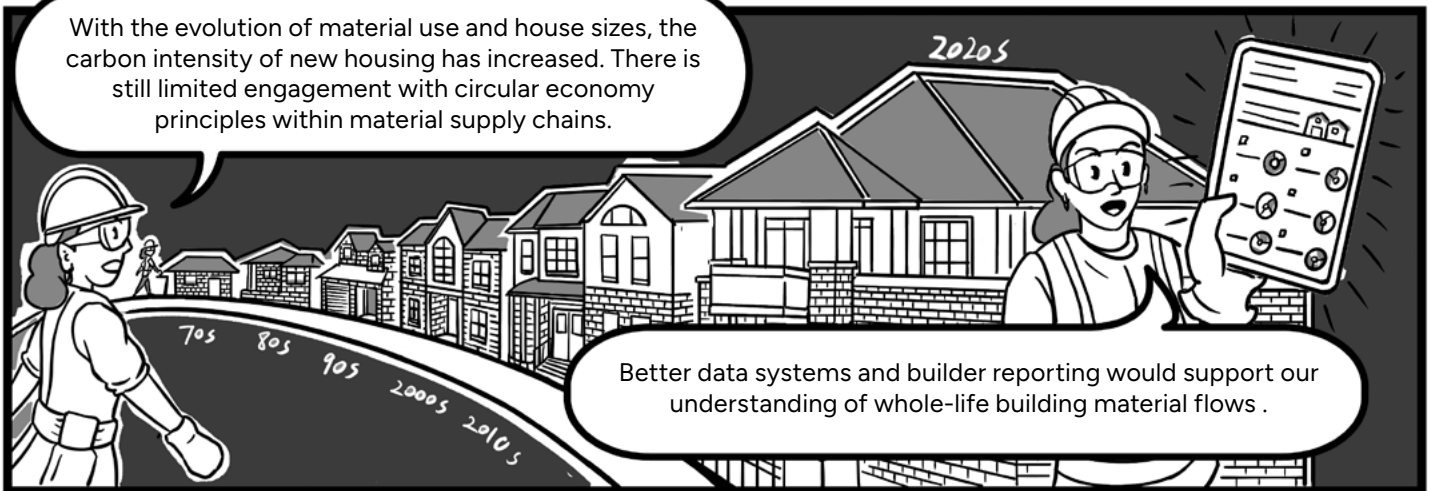
International best practice now includes the setting of minimum standards for social housing, including window coverings or heating and cooling systems.

In New Zealand, these minimum standards are also linked to wider social benefits such as health. Any development or revision of minimum standards should include requirement for basic quality and liveability.

Lower income housing tenants and mortgage holders have no alternative than to live in whichever home they can afford. This is generally poor-quality housing where bills are higher. Everyone should have access to sustainable retrofit.

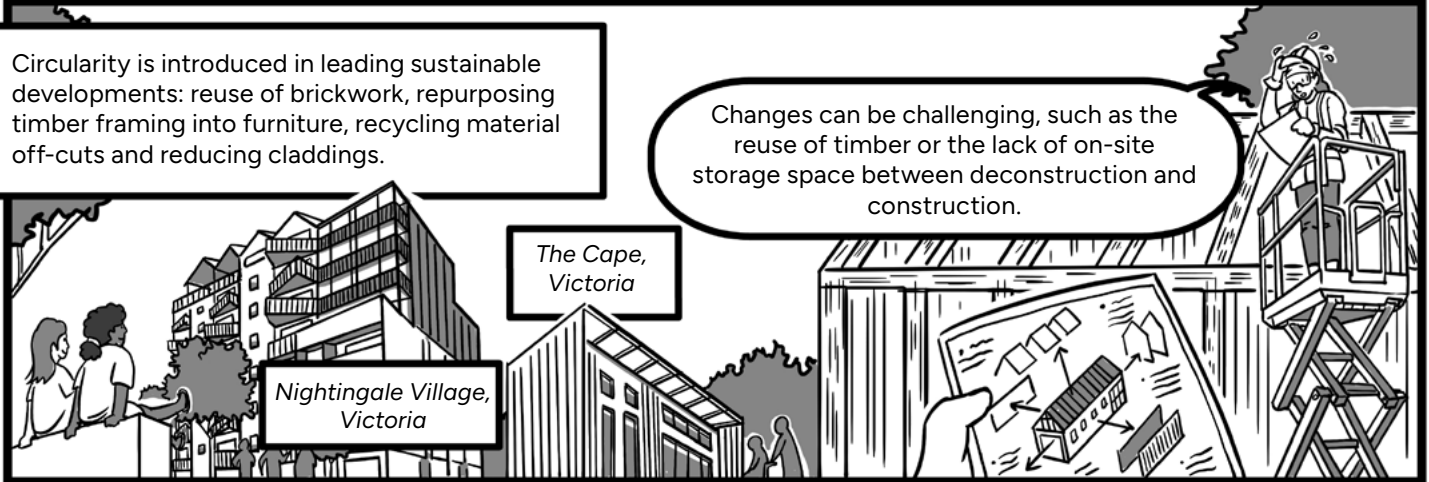
longer-term funding pathway for upgrades + industry advice = strategic coordination + improved energy costs and living environment for tenants

The retrofit of social rental housing is a major opportunity to test and advance circular economy housing, but competes for scarce budgetary resources and is held back by lack of clarity and transparency. Funding for social housing retrofit and quality upgrades would benefit from a longer-term funding pathway and industry advice around sustainability. This funding could then be accessed by social housing providers to reduce energy costs and improve tenants' living environment.



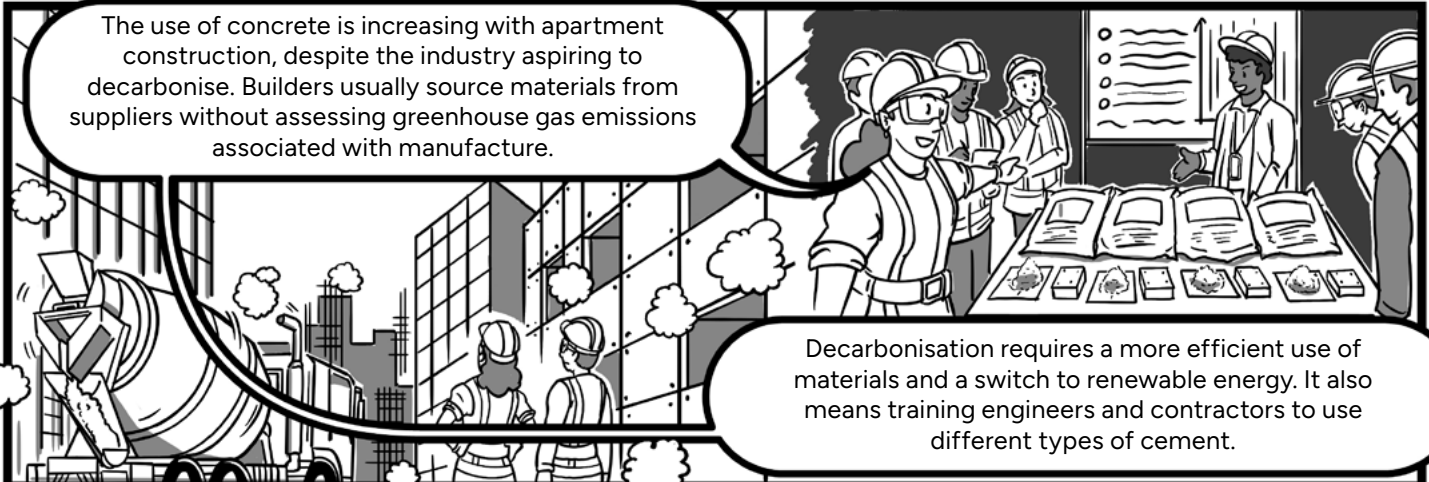
With the evolution of material use and house sizes, the carbon intensity of new housing has increased. There is still limited engagement with circular economy principles within material supply chains.

Better data systems and builder reporting would support our understanding of whole-life building material flows.



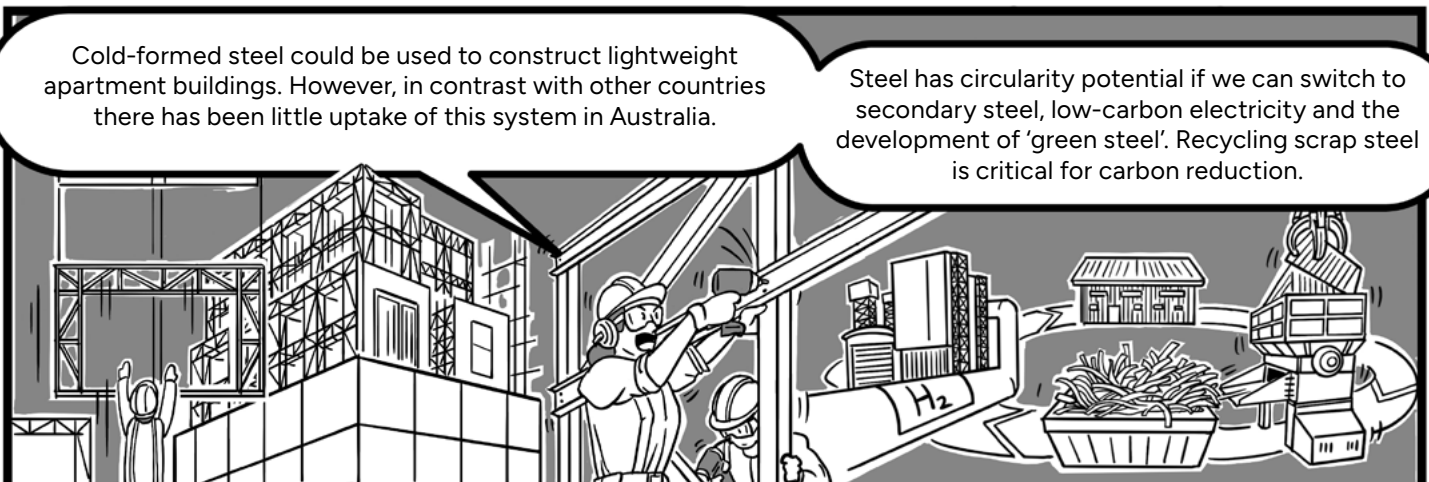
Circularity is introduced in leading sustainable developments: reuse of brickwork, repurposing timber framing into furniture, recycling material off-cuts and reducing claddings.

Changes can be challenging, such as the reuse of timber or the lack of on-site storage space between deconstruction and construction.



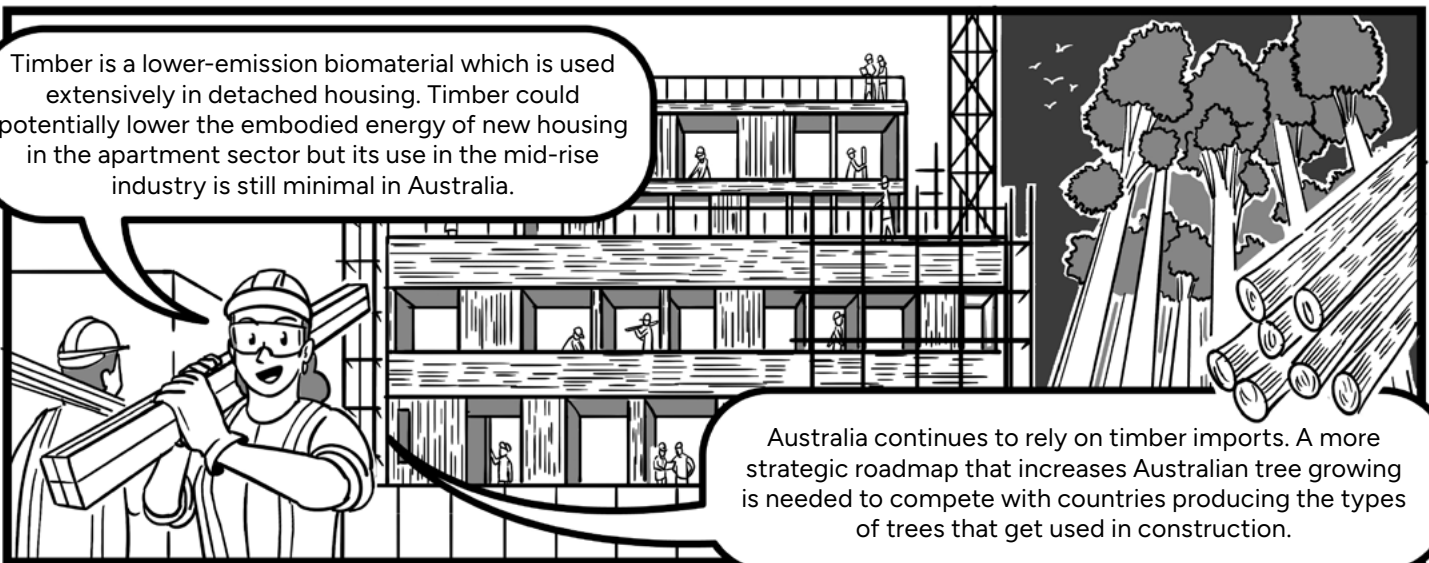
The use of concrete is increasing with apartment construction, despite the industry aspiring to decarbonise. Builders usually source materials from suppliers without assessing greenhouse gas emissions associated with manufacture.

Decarbonisation requires a more efficient use of materials and a switch to renewable energy. It also means training engineers and contractors to use different types of cement.



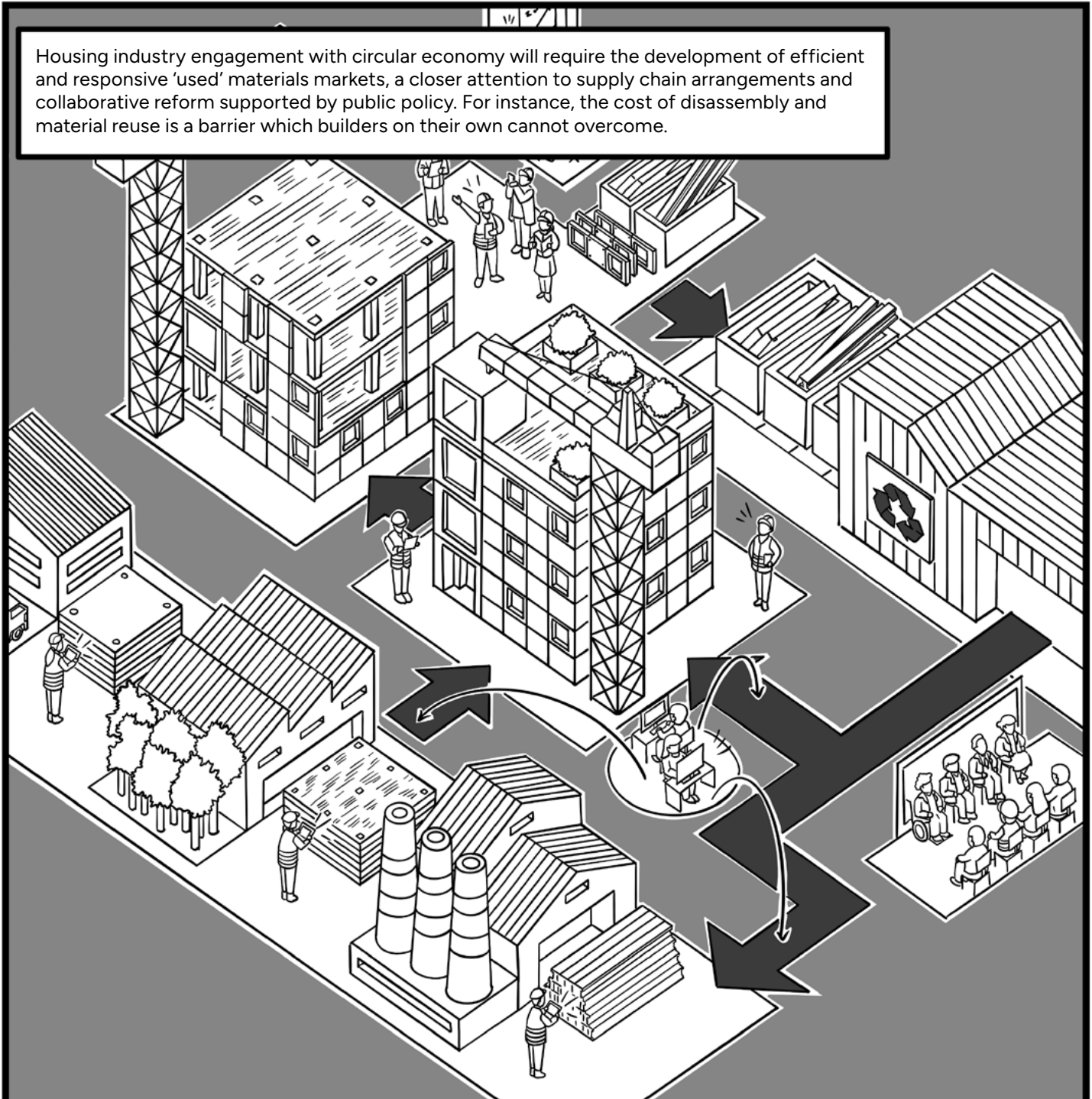
Cold-formed steel could be used to construct lightweight apartment buildings. However, in contrast with other countries there has been little uptake of this system in Australia.

Steel has circularity potential if we can switch to secondary steel, low-carbon electricity and the development of 'green steel'. Recycling scrap steel is critical for carbon reduction.

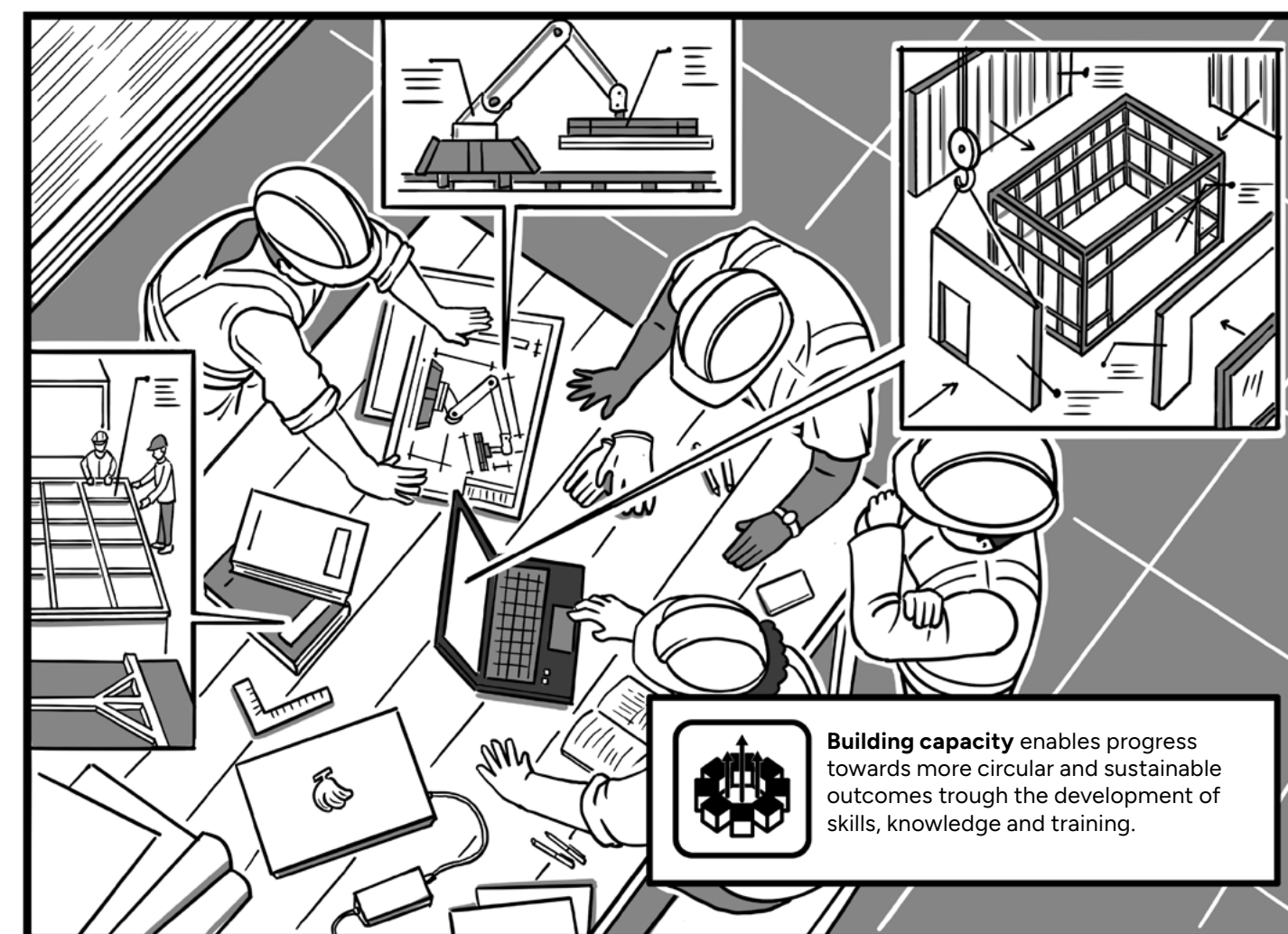
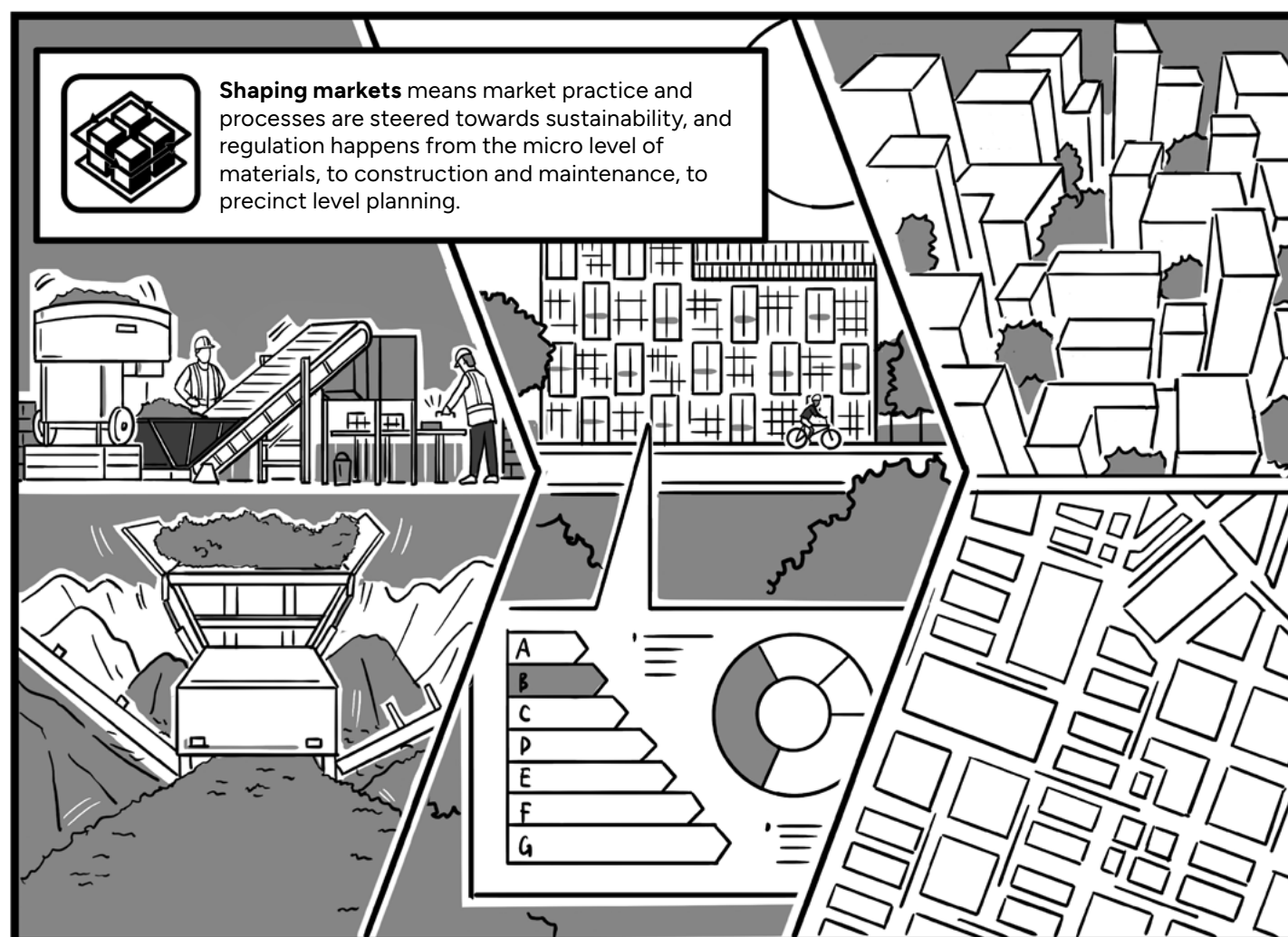


Timber is a lower-emission biomaterial which is used extensively in detached housing. Timber could potentially lower the embodied energy of new housing in the apartment sector but its use in the mid-rise industry is still minimal in Australia.

Australia continues to rely on timber imports. A more strategic roadmap that increases Australian tree growing is needed to compete with countries producing the types of trees that get used in construction.



Housing industry engagement with circular economy will require the development of efficient and responsive 'used' materials markets, a closer attention to supply chain arrangements and collaborative reform supported by public policy. For instance, the cost of disassembly and material reuse is a barrier which builders on their own cannot overcome.



Circular economy housing is a social project as much as a regulatory reform.

Engagement and cooperation across all levels of government, civil society, private sector and education and training institutions is crucial.

Everyone has a role to play.



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This story illustrates how a transition to a circular economy in housing can be implemented to provide more sustainable housing in Australia.

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