

Inhabiting circularity: circular economy housing in a planetary commons

Thursday 19th of August 2023, 12-1.30pm

An event of the AHURI Inquiry into housing in a circular economy

Led by: Prof Ralph Horne, RMIT
University

Dr Louise Dorignon, RMIT University

Prof Julie Lawson, RMIT University

Prof Hazel Easthope, UNSW

Prof Stefanie Dühr, UniSA

Dr Trivess Moore, RMIT University

Prof Emma Baker, UniAdelaide

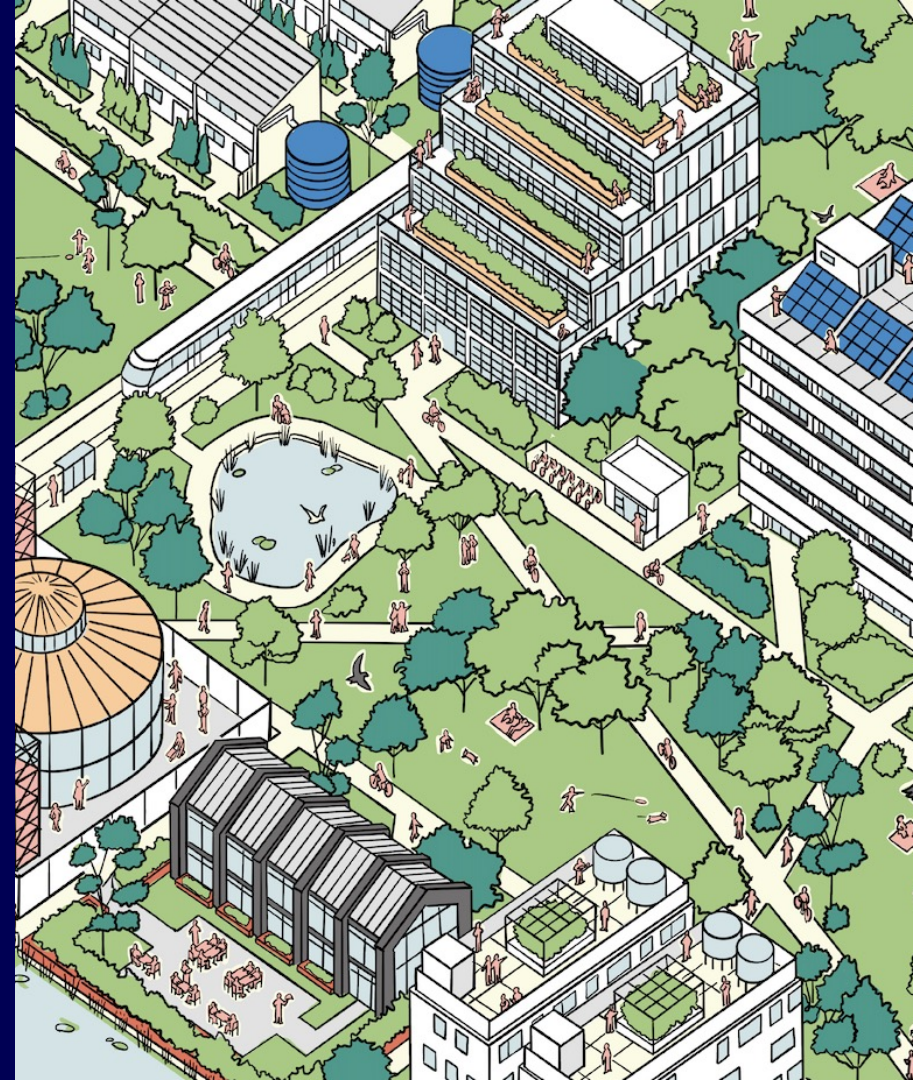
Prof Tony Dalton, RMIT University

Prof Hal Pawson, UNSW

Prof Peter Fairbrother, UTas



Illustrations by Zhen Xiong



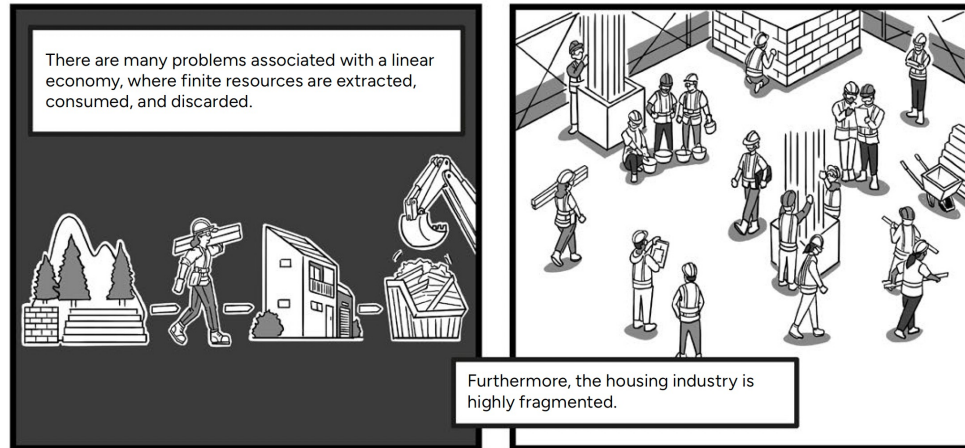
We acknowledge the Traditional Owners of the land on which this research took place, and we recognise the unique knowledge and contribution that Aboriginal and Torres Strait Islander people bring to housing and the built environment.

We also acknowledge that there are many Australian housing 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.



Rationale

- Climate change, economic volatility and social inequality increasingly demand a more sustainable housing industry respecting circular economy principles.
- The widespread adoption of high quality, durable, low impact, low-risk materials, and maintenance systems aligned to extend asset life, is held back by high costs, incomplete markets, and insufficient know-how and incentives.
- Existing strategies have not delivered sufficient or rapid enough change in housing systems and processes to meet the challenge of climate change, nor to tackle the housing affordability crisis.



What is circular economy housing?

- The circular economy concept calls for closed-loop material flows involving low-emission, recyclable and durable assembly while also meeting sustainable development objectives of social and intergenerational equity, local economic opportunities and resource efficiency.
- Circular economy housing implies the transformation of all major processes in the housing ecosystem, such as extraction, production, consumption and disposal, to achieve more resource-efficient and sustainable use, reuse and reprocessing.
- **For this Inquiry, circular economy housing was defined as housing that is produced and consumed utilising closed-loop principles, prioritising local employment, resilient and functional design, and carbon-neutral or energy-efficient operation.**



Potential instruments shaping a circular economy

Potential instruments – brief definitions

Financial instruments

Increase the availability of, or access to, capital for investing in energy-efficient neighbourhoods and buildings, retrofits or recycling and re-use of building materials, key aspects of the CE in housing, and include:

- Financial frameworks guiding market participants
- Financial intermediaries channelling investment flows
- Promotional banks with CE investment platforms
- Various types of debt and equity instrumentseg. Sustainability and social impact bonds.
- Venture capital funds

Fiscal instruments

Government support, in for form of direct expenditure or revenue allocation, grants, procurement policies and indirectly tax incentives, such as:

- Research and development grants
- Technical and feasibility studies
- Start-up subsidies or low interest loans for innovative enterprises
- Green books or purchase lists
- Investment in training schemes
- Tax credits, reliefs and allowances
- Payments for waste, infill
- Guarantees on products

Regulatory instruments

Binding or voluntary rules, standards, compliance mechanisms and enforcement that limits, steers, or otherwise controls actors behaviour, such as:

- Ban of waste export
- energy performance directives and circular promoting building standards, progress indicators,
- energy performance certificates, eco -labels
- requirements to use, recycle, re-design etc,
- land use strategies to promote energy efficiency and re-use of buildings etc.

Other instruments: industry alliances and partnerships, research and platforms for innovation, collaboration and exchange

Policy and Research Gap



- Given the urgency to decarbonise Australian **housing**, the housing industry needs support to shift practice to deliver more sustainable housing outcomes.
- A circular economy approach can contribute to a more sustainable housing system.
- To achieve this requires a clear vision of the desired transformation in the most relevant fields, mobilising responsible leaders and engaging key stakeholders with the right regulatory frameworks, incentives, resources and capacities.
- A shift towards circular economy housing depends upon the selection and enactment of appropriate levers for change, to guide transformation in the many linear processes involved in housing production.



The Inquiry Program: housing in a circular economy



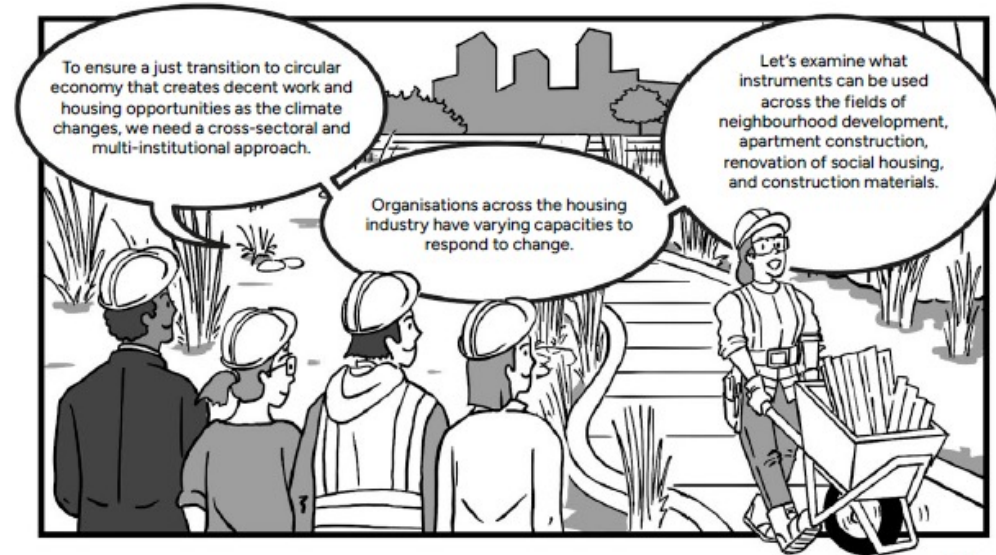
Inquiry Goal

This Inquiry established a framework and evidence-base to support a transition to circular economy housing in Australia. It is informed by analysis of national and international data, industry and building practice, and key informant sources.

This Inquiry addressed the overall research question:

How can the transition to a circular economy in housing be implemented to provide more sustainable housing?

Drawing on evidence from four interconnected research projects, the Final Inquiry Report informed a strategy towards circular economy housing in Australia relevant to the many interrelated but distinct segments of the residential sector.



Source: Visual Summary, P.3



Inquiry Structure

Overarching Inquiry Project. Led by Prof Ralph Horne, RMIT University

Project A – Sustainable housing at a neighbourhood scale

This project identified opportunities for a circular economy approach at neighbourhood scale, to achieve a transition towards sustainable housing in urban infill and new-build development locations.

Led by Prof Stefanie Dühr



University of
South Australia

Project B – Delivering sustainable apartment housing: new build and retrofit

This project examined financial, fiscal, regulatory and policy levers that can facilitate a transition towards the mainstream supply of sustainable apartments in Australia.

Led by Prof Hazel Easthope



Project C – Sustainable social housing retrofit? Circular economy and tenant trade-offs

This project investigated circular economy approaches to large-scale retrofits of social housing, and the implications for the broader housing and retrofit industry.

Led by Prof Emma Baker and Dr Trivess Moore



Project D – Building materials in a circular economy

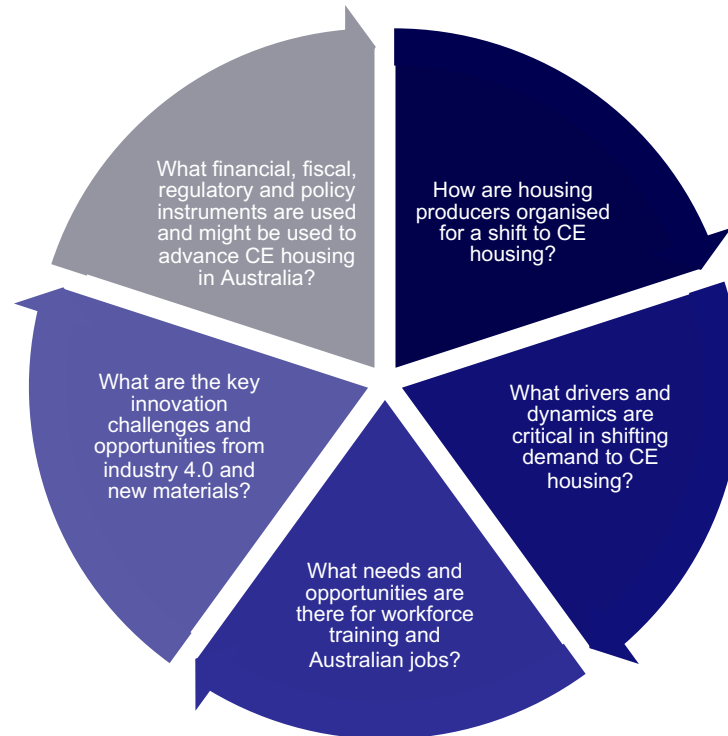
This project used a circular economy framing to investigate use and waste in material supply chains to enable the housing construction sector to reduce, reuse, recycle and recover resources.

Led by Emeritus Prof Tony Dalton and Dr Trivess Moore



Inquiry Scoping Research Papers

These Research Projects were informed by responses to five cross-cutting Inquiry research questions that were answered in scoping papers by leading experts:



Inquiry Research Methods

Methods used in the overarching Inquiry project consisted of:

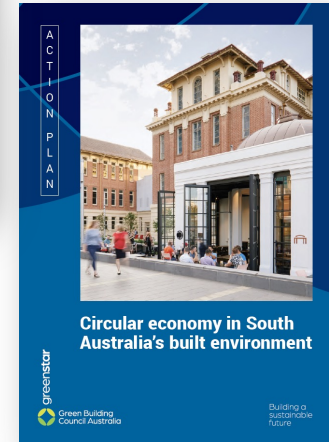
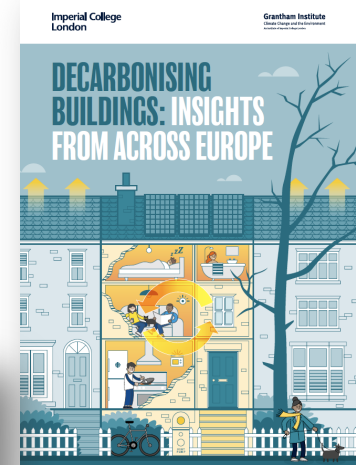
1. document and data analyses of national datasets, incl. a review of international good practice;
2. and focus groups with key practitioners and experts.

Each project was informed by an elaboration and interrogation of a set of key questions that were devised and elaborated upon by a set of experts.

Methods in the subprojects included:

- Online surveys of key stakeholders
- Case-studies of circular economy precincts
- Online workshops
- Stocks and flows modelling and analysis

Expert advice from policy makers and practitioners was sought and informed the research outcomes via the Inquiry Panel.



Inquiry Key Steps

2021: Five Scoping Papers

2021: Discussion Paper 1 and Panel Meeting 1

2021-2022: Research projects conduct data collection and analysis

2022: Discussion Paper 2 and Panel Meeting 2

2023: Final reports and transition framework



Inquiry Panel Members

Each AHURI Inquiry is supported by a panel of experts drawn from the research, policy and practice communities. The Inquiry Panel provided guidance on the policy relevance of the research and drew together the research findings to address the key policy implications of the research.

Panel members for this Inquiry were:

Asa Jonasson,
Green Industries,
South Australia

Damien Crough,
PrefabAUS

Heinz Schandel,
CSIRO

Jacob Wallace,
Homes Victoria

National Australia
Bank

Joana Correia,
Master Builders
Association of
Victoria

Megan Peacock,
Master Builders
Association of
Victoria

Philip Alviano,
Master Builders
Association of
Victoria

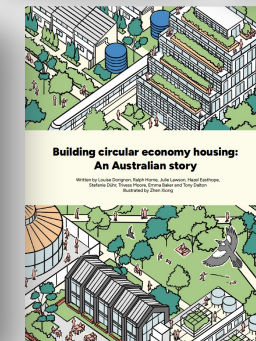
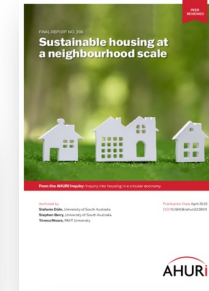
Rukshika Perera,
Department of
Industry Science,
Energy and
Resources

Suzanne
Toumbourou,
Australian Council
of Recycling



Inquiry Outputs

- **5 cross-cutting Inquiry Scoping Papers incl.:**
 - Dalton, T. (2021) *The organisation of housing producers in Australia and the prospect of a shift to a circular economy.*
 - Fairbrother, P., Banks, M., Douglas, K., Farhall, K. and Toner, P. (2021) *Jobs And training: needs and opportunities in the Australian housing circular economy.*
 - Lawson, J. and Dorignon, L. (2021) *What finance, fiscal, regulatory and policy instruments are used and might be used to advance CE housing in Australia?*
 - Pawson, H. (2021) *What drivers and dynamics are critical in shifting demand to circular economy housing?*
- **4 Inquiry sub-project Research Reports**
- **2 Discussion Papers**
- **1 Inquiry Research Report**
- **1 'Policy Framework: Actions towards Circular Economy housing in Australia'**
- **1 Visual Summary**



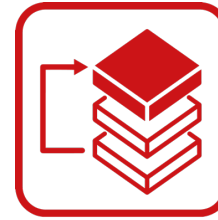
The quadrant framework



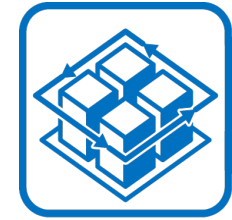
Inquiry Framework

The Inquiry proposed a quadrant framework for circular economy housing. This comprises four components to be progressed in tandem (see slides 26-29):

- Reappraising value: value inclusion and prioritisation, market setting, institutional frame.
- Shaping market practice and processes: regulatory or steering instruments, performance-drivers, market-shapers, etc.
- Tilting investment flows: finance, capital and tax incentives.
- Building capacity: skills, knowledge and training.

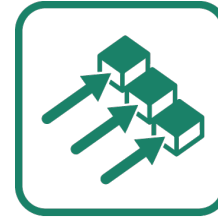


Reappraising
value

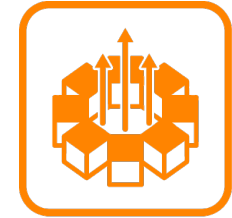


Shaping markets

**Circular
economy
housing**



Tilting investment
flows

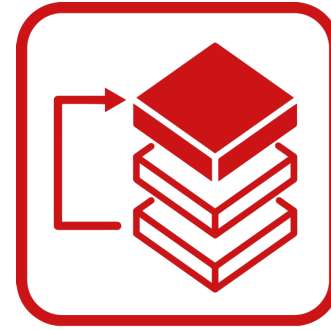


Building capacity



Re-appraising value

- Greater awareness of CE, through strategic research and discussion of results—as well as through demonstration of good practices—can foster new professional norms that prioritise sustainability, circularity and decarbonisation.
- These values must inform leadership, training and sense-making, as well as the setting of targets and key assessment frameworks, such as procurement and auditing of assets, and reporting.



**Reappraising
value**



Shaping markets

- Regulation is essential to shape housing markets to reinforce CE approaches, from the micro level of building materials, to construction and ongoing maintenance, to the macro level involving precinct-level spatial planning.
- Alongside legislative reform, clear targets and performance standards need to be enforced by monitoring, as well as being made accountable via appropriate reporting systems that sustain improving practice.

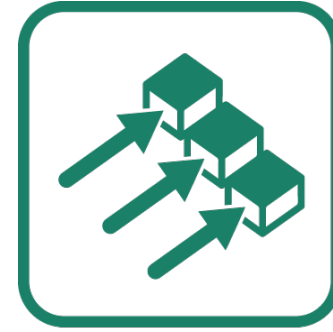


BC Materials, Brussels



Tilting investment flows

- To tilt circular investment flows to promote sustainable housing relevant to Australia, public sponsorship of industry best practice will be an essential instrument to showcase and raise standards.
- Accredited training and professional awareness-raising on the practice and advantages of CE housing could shift practices and attract additional investment flows.
- Grants, incentives and subsidies have the potential to lever resources of investors, building providers, local communities and residents.
- Procurement policies will be an essential tool to shift commissioning practices and support major CE retrofit programs and foster CE market development.



Tilting investment flows

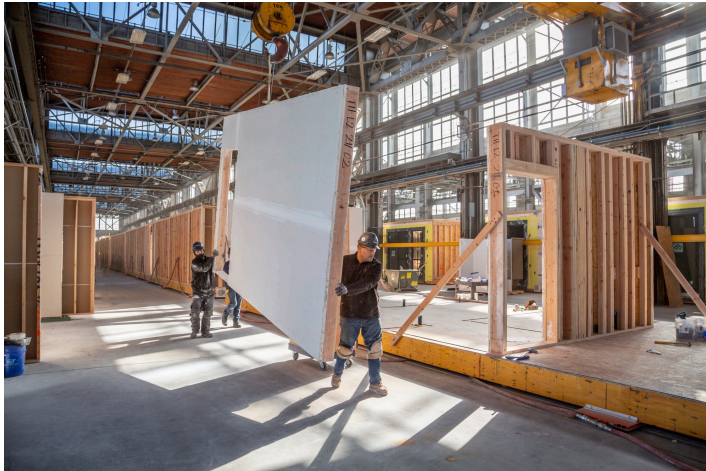


Resource Rows residential complex, Copenhagen, Denmark



Building capacity

- To support effective implementation, professional and skilled work is required, as well as digital systems, monitoring and enforcement.
- This will require rigorous engagement with the principles of economic and industry training policy, as well as review of how the economic processes and outcomes for workforces is measured.



Learning from diverse housing fields



Directions of reform for each housing field

Sustainable housing at a neighbourhood scale

- Development of a common understanding of circular economy housing at a neighbourhood scale, how it can be delivered and what support or opportunities exist beyond individual houses.
- This will result in a more educated built environment sector but also policy makers and other key decision makers.

Delivering sustainable apartment housing: new build and retrofit

- Property valuation reflects building performance.
- Development teams to embed sustainability in project feasibility.
- The quality and design of delivered apartment buildings reflects what was designed and approved.
- Purchasers and renters have access to adequate information about building performance.
- A level playing field for financiers: all bankers to require development proposals to meet sustainability targets.
- The potential benefits of physical interdependence and shared services are realised.
- Sustainability initiatives account for joint ownership and joint decision-making.

Sustainable social housing: solutions for large-scale retrofit

- Improved social housing policy ensures higher quality and liveable social and public housing.
- Higher uptake of programs and higher levels of satisfaction, with happier, healthier tenants.

Building materials in a circular economy

- Strategy conserves embodied carbon in the existing materials in the residential housing stock and supports the progressive lowering of the carbon intensity of new residential housing and housing retrofits.
- Framework for decarbonisation of high-emission production of building materials, especially concrete and steel, developed with financial system regulators, investors and asset owners.
- Inter-governmental agreement for decarbonising high emission production of building materials, especially concrete and steel, through innovative government procurement program design.



Sustainable housing at a neighborhood scale

The complexity of realising sustainable housing at a neighbourhood scale requires:

- new governance approaches
- partnerships between public-sector and private-sector actors (and the professions involved in planning, designing and building housing at this scale)
- better coordination of planning policies and building regulations across administrative borders and across scales.

Financing was identified as one barrier for eco-precincts, with costs often increasing due to delays in the process and lenders reluctant to support projects that are perceived as higher risk.

Overall, there is a need for much stricter regulatory requirements on urban sustainability and for policy frameworks and development models supportive of realising housing developments at precinct scale.



White Gum Valley, Western Australia



Project A - Sustainable housing at a neighbourhood scale

Strategic outcomes



Re-appraising value

- Common understanding of CE and implementation at urban scale
- Awareness of CE values and principles among planners, state and local politicians, as well as the housing industry
- A range of policy instruments and governance models support a CE approach
- Research and development focus for CE at urban level
- Collaborative urban production, consumption in neighbourhoods
- Prioritizing the use of recycled materials and product



Shaping markets

- Policy frameworks and regulation for sustainable homes and neighbourhoods incorporated in masterplan / precinct plans
- Strategic use of green and blue infrastructures
- Land use instruments facilitate mixed-uses, and are integrated transport
- Statutory development assessment processes for comprehensive CE criteria, including community sustainability and impacts
- Increased and reinforced regulations on key areas for CE: minimum standards for energy efficiency, reduction of car parking spaces per dwelling
- Integrate planning with other policy instruments (subsidies, guidelines demonstrations)
- Consolidate CE in existing tools to ensure comprehensive appraisals of neighborhood scale CE, avoid duplicating instruments



Tilting investment flows

- Using direct public investment to fund improved standards and demonstrate them
- Use subsidies and financial incentives for communities to implement neighborhood scale solutions (micro-grids, sharing economy approaches, etc.)
- Use urban design competitions and government tendering processes to prompt developers to propose better solutions (European continental countries may serve as examples)
- Develop databases and warehouses for reusable products and materials to facilitate ease of procurement of previously used over new structures



Building capacity

- Review policy frameworks and assessment tools to ensure sustainability considerations central in political decision-making processes on plans and development applications
- Tailor tertiary education and continuous professional development of built environment professionals to focus on circular economy policies and practices at urban scale
- Implement education and training for policymakers, administrators, and private sector actors

Actions in the field



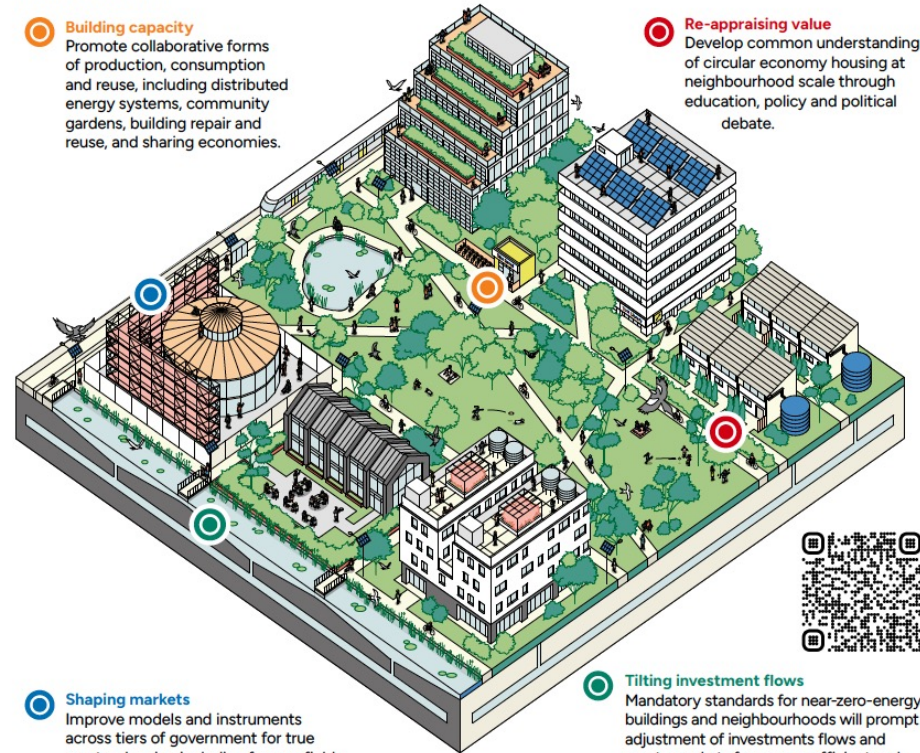
Building capacity

Promote collaborative forms of production, consumption and reuse, including distributed energy systems, community gardens, building repair and reuse, and sharing economies.



Re-appraising value

Develop common understanding of circular economy housing at neighbourhood scale through education, policy and political debate.



Shaping markets

Improve models and instruments across tiers of government for true masterplanning including for greyfields and urban infill developments.



Tilting investment flows

Mandatory standards for near-zero-energy buildings and neighbourhoods will prompt adjustment of investments flows and create markets for energy-efficient and reused products and materials.

Delivering sustainable apartment housing new build and retrofit



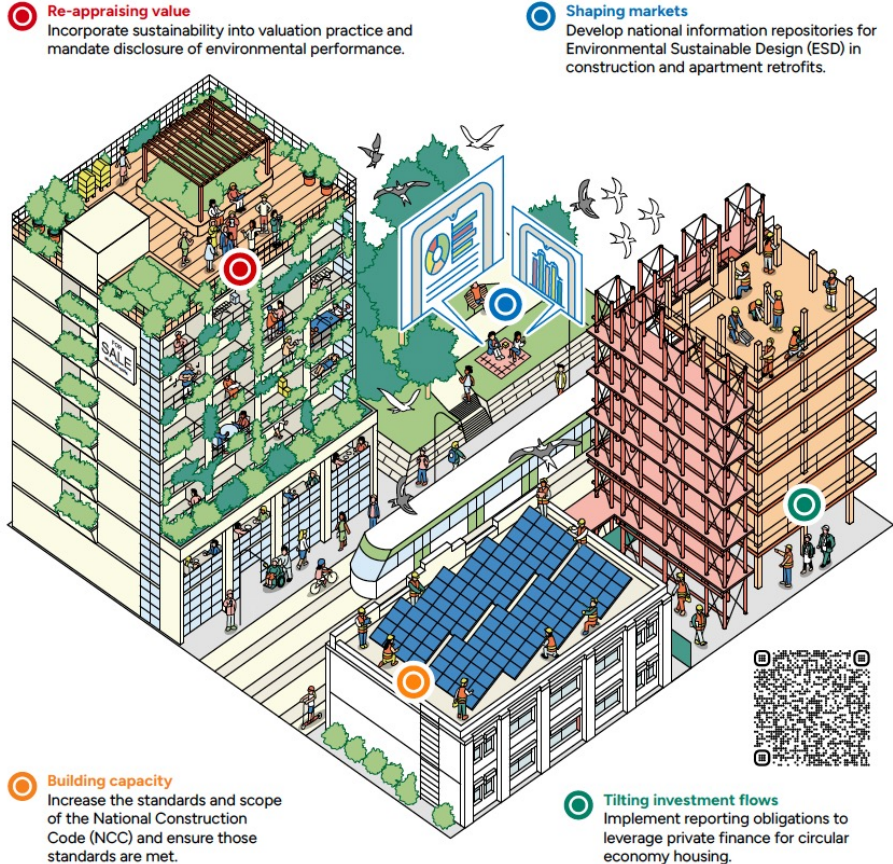
443 Queen St, Queensland, Australia

- Key actors in the apartment delivery system include large-scale developers and major lenders. Thus, successful projects and best practice applied to apartment buildings can influence other sectors to implement change toward the real application of CE principles.
- As shown in Europe with the Energy Performance of Buildings Directive (EPBD), much can be achieved with the improvement of apartment building standards in Australia.
- A very high proportion of apartments are rented in Australia, so it is of central importance to consider the energy standards for rental properties so that energy poverty can be addressed.
- Putting vacant homes back in use is also important to circularity.
- Care must be undertaken in monitoring the affordability of CE—especially for low-income households.



Project B - Delivering sustainable apartment housing new build and retrofit

Actions in the field



Strategic outcomes



Re-appraising value

- Clear, whole of government commitment to CE and sustainability targets
- Commonwealth government support for the development of a process for incorporating sustainability into valuation practice
- All levels of government to review existing and future government grants for sustainability upgrades to ensure common property is considered to avoid exclusion of strata properties
- Commonwealth government to review and amend housing taxation systems to identify and amend inequalities between housing typologies



Shaping markets

- Commonwealth government commitment to increase minimum standards for energy efficiency in the National Construction Code
- State and local governments to strengthen regulations for pre-and post-occupancy compliance auditing to ensure approved performance standards are met at the planning and building permit stages
- Commonwealth government commitment to expand the regulatory scope of the National Construction Code beyond energy consumption in use
- Commonwealth and state government to implement programs to standardise tools, measures and regulations for building performance
- Commonwealth government to mandate the collection of environmental performance standards for all apartment buildings and their publication on advertising and transaction portals for rent and purchase



Tilting investment flows

- Commonwealth government to explore imposing European Union style reporting obligations on financiers and establishing a process to leverage private financing in support of a transition to CE in the housing system
- All levels of government to introduce additional government grants to incentivize housing retrofit projects
- Commonwealth government to provide government guarantees for deliberative development construction loans



Building capacity

- Commonwealth government support for the development and operation of an online portal to enable knowledge exchange on ESD in construction
- State governments to explore legislative and regulatory amendments to encourage and support sustainable retrofit in strata schemes
- Commonwealth government commitment to fund development and operation of an information repository of sustainable retrofitting of apartments
- State governments ensure that the planning assessment system is adequately resourced to assess building performance for sustainable developments
- State governments update apartment design guidelines to ensure that the potential for future retrofit is considered before new projects are approved.
- All levels of government to require publicly funded apartment projects to involve residents in design, including where publicly-owned land is made available for development

Sustainable social housing: solutions for large-scale retrofit

- The focus of sustainability retrofit activity in social housing has been driven largely by energy efficiency and alternative energy technologies.
- Social housing households are generally the least likely to be targeted by retrofit or able to fund or access retrofit.
- Households' preferences for housing retrofit/upgrades did not generally align with what housing energy-efficiency technology experts consider to be optimal retrofit priorities, nor with the upgrades that generally receive co-funding in retrofit programs—with the exception of solar panels.
- Social housing providers rely on access to tied government funding to maintain or improve the quality of their stock over time.
- Different and often competing objectives of retrofit limit success and ease of retrofit programs.



Merton Regeneration project, Wimbledon, UK



Nottingham City Homes, UK



Project C - Sustainable social housing: solutions for large-scale retrofit

Strategic outcomes



Re-appraising value

- Recommend supporting the 'secondary' role of CE for its positive CE implications on tenant care and stock maintenance
- Promote Social Housing Providers and sitting tenants as beneficiaries of any interventions



Shaping markets

- Subsidize minimum quality/performance requirements for social (and rental) housing
- Need to create a better second-hand market for reuse and recycling of materials and technologies
- Where social housing infrastructure does not yet meet minimum standard, 'non-housing' energy assistance (such as more efficient, moveable heating, or winter fuel subsidies) is appropriate



Tilting investment flows


- Move from rebates or support for one off retrofit to more holistic retrofits
- Focus of improvement should not necessarily be retrofits, and (in social housing at least) it should be on the people, not the dwelling
- Retrofits as one part of a package of assistance
- Occasional direct financial assistance to the tenants
- In many cases, the poor underlying quality of the SHP stock would make extensive retrofit unviable. In these cases, other strategies including direct-to-tenant 'non-housing' assistance are more appropriate




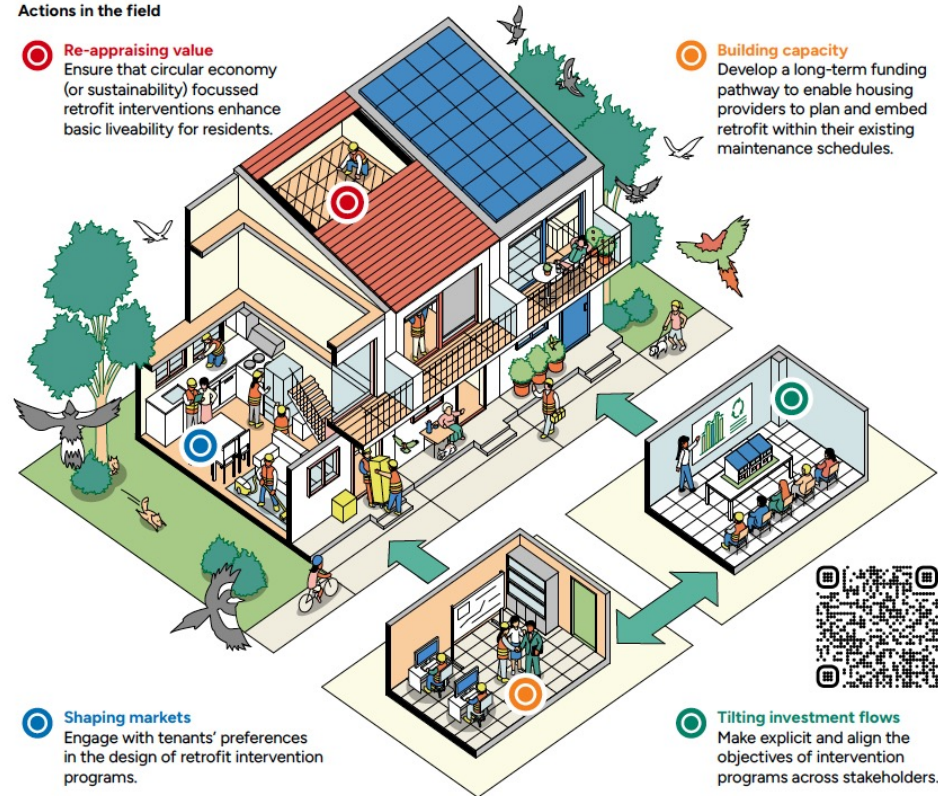
Building capacity

- A dual focus on building capacity of SHPs and tenant households

Actions in the field

- 
Re-appraising value
 Ensure that circular economy (or sustainability) focussed retrofit interventions enhance basic liveability for residents.

- 
Building capacity
 Develop a long-term funding pathway to enable housing providers to plan and embed retrofit within their existing maintenance schedules.



- 
Shaping markets
 Engage with tenants' preferences in the design of retrofit intervention programs.

- 
Tilting investment flows
 Make explicit and align the objectives of intervention programs across stakeholders.

Building materials in a circular economy



Circle House Project, Lisbjerg, Denmark

- The use of concrete is continuing to increase—which is increasing the carbon intensity of housing. Analysis of material flows can be extended and improved through the development of better data systems.
- Sustainable housing developments in Victoria (The Cape and Nightingale Village) face challenges facing the introduction of circularity. Some changes were easy, such as brick reuse, while others, such as timber reuse, were more difficult because of concerns about structural integrity.
- Concrete, steel and timber supply chains have local and global features, which means that reducing emissions requires governance arrangements that span multiple jurisdictions.
- Material supply chain decarbonisation and CE development will require close attention to supply-chain institutional arrangements, and collaborative reform supported by broader public policy.
- CE principles are best put in place at the design phase—which can be difficult, given the lack of expertise and the constraints of financing which mitigate against offsite manufacturing.

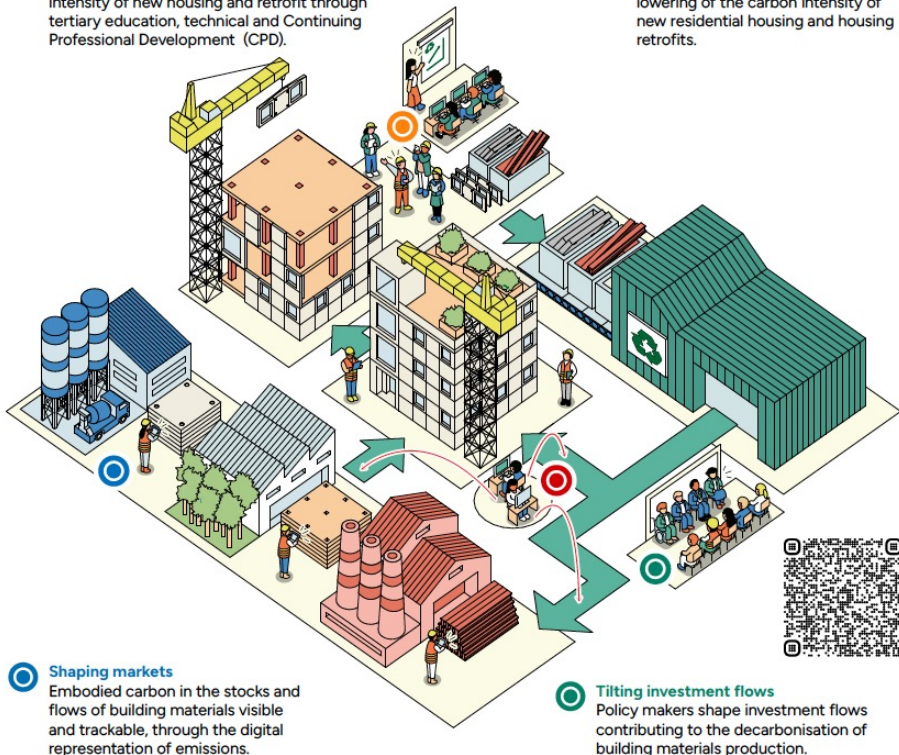


Project D - Building materials in a circular economy

Actions in the field

- Building capacity**
Increased capacity of workforces that design, procure and construct to reduce the carbon intensity of new housing and retrofit through tertiary education, technical and Continuing Professional Development (CPD).

- Re-appraising value**
Model of the stocks and flows of building materials to support a lowering of the carbon intensity of new residential housing and housing retrofits.



Strategic outcomes



Establish a fully developed model of the stocks and flows of materials in the Australian housing system so that:

- The value of the embodied carbon in the existing housing stock is recognised and conserved in a carbon constrained world
- The level of additional embodied carbon being added to the housing stock through new build and retrofit is monitored
- The flow of embodied carbon in materials out of the housing stock is consistently monitored for conservation and reuse



Establish a nationally auspiced project supporting making embodied carbon in the stocks and flows of building materials visible and trackable, through the digital representation of emissions through

- Required use of Mandated Environmental Product Declarations (EPDs) for all manufactured building materials
- Revision of all built environment codes and legislation that progressively require and support carbon accounting in the project design and specification; procurement; construction; and verification phases of all residential housing projects
- Designing and establishing a system supporting building material reuse by recognising the embodied carbon in construction and demolition waste (CDW)



Support the continued examination of the ways in which policy makers can shape investment flows contributing to building materials production decarbonisation by

- Presenting a case to finance system regulators that they establish a project on 'governing for the reduction of embodied carbon' in the built environment by expanding their concept of risk and respond to growing demand for sustainable investment opportunities
- Establish a project that examines the opportunities for tilting investment flows into low carbon housing through public procurement of public and community housing



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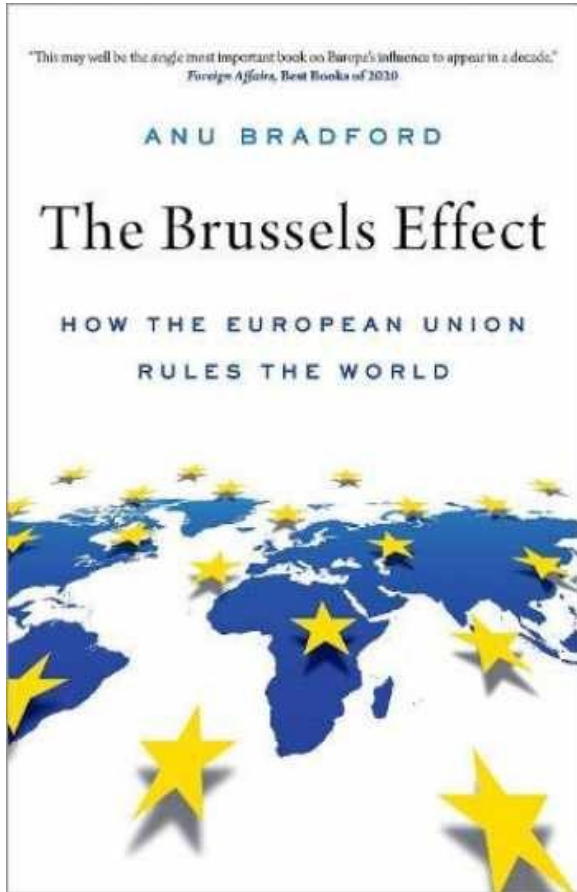
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Relevant tools for a circular economy of housing

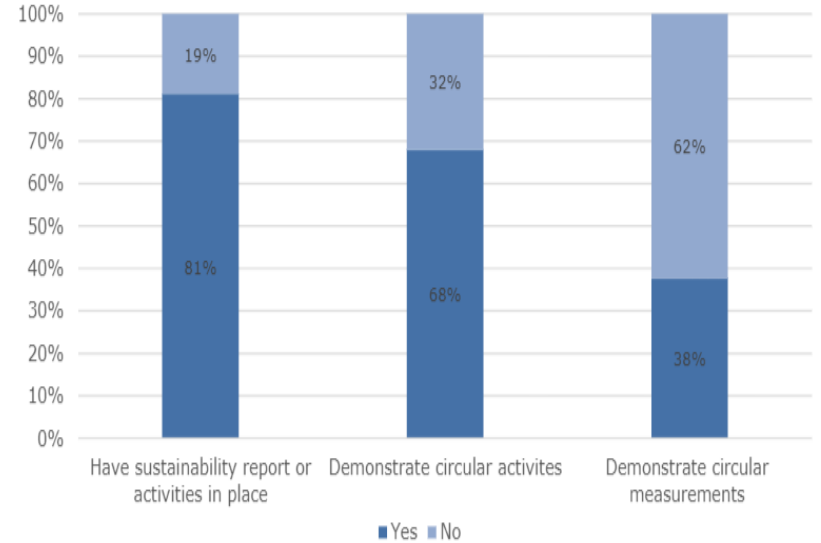
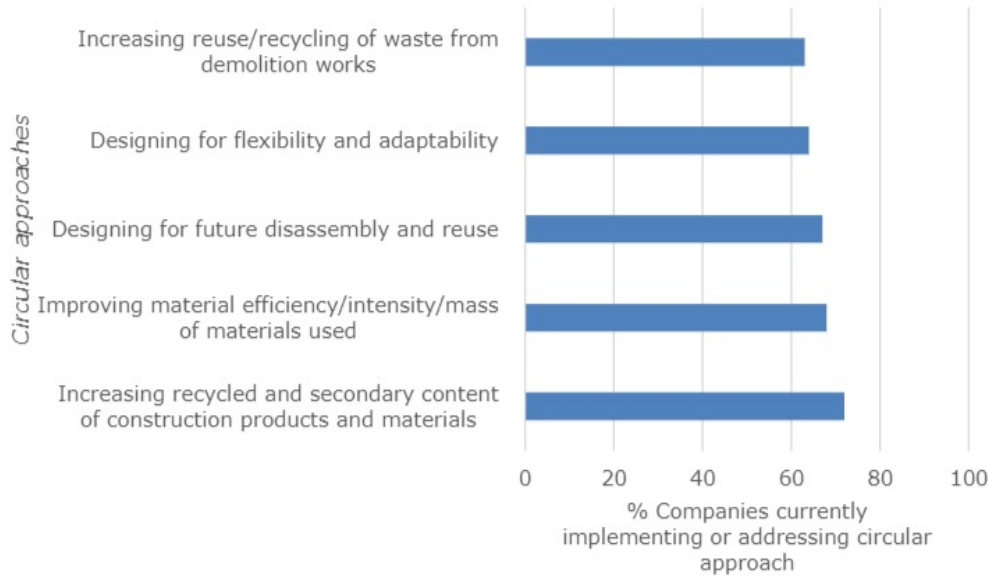


CE strategic domain >	Knowledge development				Business support schemes	Regulatory frameworks	Procurement and infrastructure	Fiscal frameworks	Other CE strategic approach
Countries	Communicate best practices	Research and development	Measurement methods	Collaboration platforms					
Argentina	●								
Belgium					●●	●●●			
Canada	●	●		●					
China	●●●	●●			●●●	●●●	●	●●	
Denmark	●	●		●●	●				
Finland		●	●			●●●	●●	●	●●●
France	●●	●●●	●●	●●●	●●	●●●	●●	●●	●●
Germany			●			●		●	
India	●●●	●●			●	●●			
Japan	●●●	●			●●	●●●	●		
Luxembourg	●	●				●			
New Zealand	●	●			●				
Portugal	●	●	●		●	●			●
Rwanda	●	●●							●
United Kingdom	●●	●●	●	●●	●●	●●●		●	
USA	●	●							
Spain	●●	●●	●			●			
Sweden	●	●						●●●	
The Netherlands	●	●	●	●●●	●●	●●●	●●	●●	●●

Source: Lawson, J. and Dorignon, L. (2021) *Scoping Paper: What finance, fiscal, regulatory and policy instruments are used and might be used to advance CE housing in Australia? Inquiry into Housing in a Circular Economy*, RMIT University, AHURI Melbourne.



EU Influence of Circular Economy on Construction (EC, 2023)



European strategies, building directives, RnD, definitions, ESG conditions, incentives



Energy Performance of Buildings Directive (EPBD) and the Energy Efficiency Directive



Circular economy Action Plan 2019



EU technical criteria and ESG Taxonomy – defines CE investment requirements



Relevant instruments – Neighbourhood scale housing developments

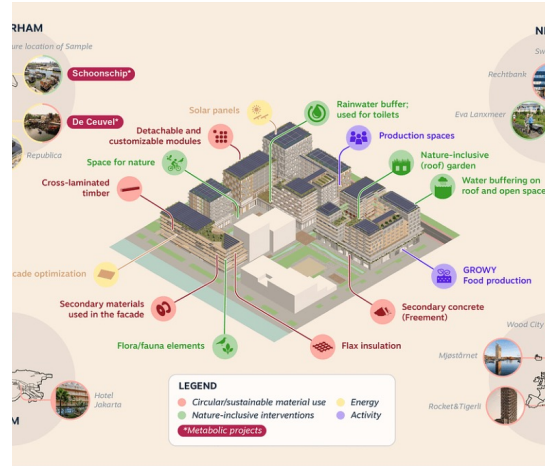
Financial instruments	Fiscal instruments	Regulatory instruments
<ul style="list-style-type: none"> • EU taxonomy – incorporating CE, influencing investment proceeds • State investment bank loans- EIB investment mandates, CE platforms • Leasing arrangements, e.g. home appliances (Flanders) • Pay on CE outcomes, e.g. proportion waste recycled • Profitable reinvestment, use food waste to power waste collection fleet (Prague) • ARIF – not yet applicable to residential buildings • CEFC invests in green social housing, eg SGCH 	<ul style="list-style-type: none"> • Grants for demonstration projects – e.g. 100 circular cities • Land banking combined with city plans (STEP and Wohnfond, Vienna) • Co-investment in CE businesses • Green, low carbon, CE procurement • Circular tendering processes • City deals, challenges, competitions e.g. Four Pillar developer competitions (Vienna) • Taxes levied to discourage waste • Fund programs from waste levies • Education programs training house builders, planners, etc 	<ul style="list-style-type: none"> • Green mobility plans, Scotland 20 minute city, Paris 15 minutes etc • Neighbourhood planning and investment agreements (Finland, MAL) • Local bi-laws health, safety product stewardship (US) • Mandated recycling relationships, eg Milan, China • Certification as per the Living Building Challenge (LBC) standard • ‘Soft renewal’ processes (Vienna) • Performance measurements that focus on circular values, emissions, pollution, destruction, social value, natural value e.g. The Environmental Meter, tracking tool for waste in Milan • Co-location hubs, Enterprise zones: China • Positive Energy Districts, Local heat plans (‘Warmteplan’)

Other instruments: Note China’s legislation, France’s inventories, and Rwanda’s plan, as well as several research collaborations, CE City labs, cross departmental working groups

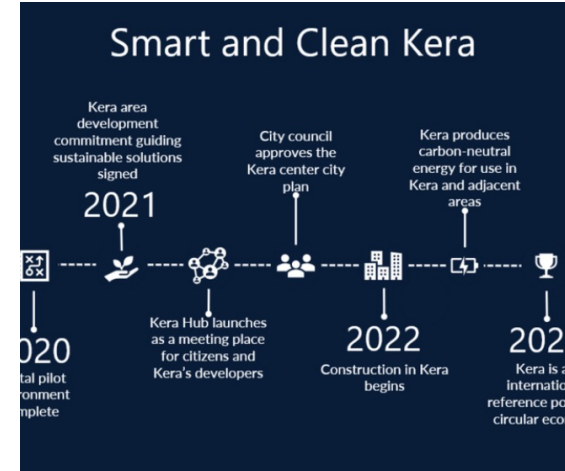
European eco neighbourhoods (SRP A)



The Scharnhäuser Park (Germany).



Buiksloterham (Netherlands)



Kera (Finland)

Relevant instruments - apartment building scale

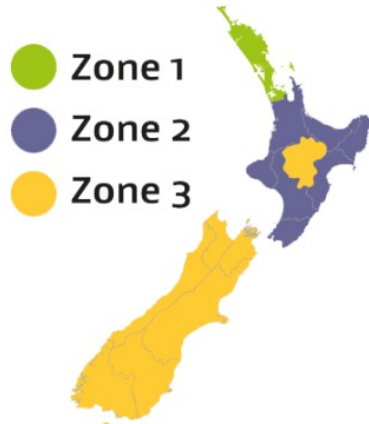
Financial instruments	Fiscal instruments	Regulatory instruments
<ul style="list-style-type: none"> • Philanthropic efforts (WRAP) • Crowd Funding • Impact Investing • Venture capital • Sustainable bonds (debt) • Conditional public investment (debt) • Guarantees insurance • Revolving maintenance funds for renovation of co-operative housing (LBF, Denmark) • Dedicated revolving funds of affordable housing (Estonia, Slovenia, Denmark, Austria) • Lease and sale to support Modular components, such as kitchens and bathrooms • Potentially state investment banks (EIB, KfW, NEFCO - CEFC and NHFIC) 	<ul style="list-style-type: none"> • Collaborative research with industry or along supply chains on resource efficiency in building process • EU funded Housing2020 Houseful project • Direct investment (ELENA EIB) • Tax on vacant underutilised dwellings (France) • Low Income Housing Tax Credit (US) channels profit rich tax credits towards investment towards affordable housing 	<ul style="list-style-type: none"> • EU Energy targets, certificates and European energy performance of buildings directive • Scotland's energy standards for social housing • German Building code - Energy Conservation Act and Germany's DGNB rating criteria • France's Energy and Climate Act, soon mandatory audits • City of Melbourne high-rise recycling program • The 2021 draft Apartment Design Guidelines for Victoria • Design standardisation and guides for modular construction (UK) • EU Taxonomy and ICMA Voluntary codes for sustainable finance

Other instruments: many *Alliances, Platforms, peer networks, dialogues, see SP.*

Lawson, J and Dorignon, L (2021) What finance, fiscal, regulatory and policy instruments are used and might be used to advance CE housing in Australia?

CE construction and renovation (B)

Map of climate zones



New Zealand Residential Tenancies Act – setting appropriate minimum standards for rental housing

HOUSING TO 2040



Scotland's Housing Strategy – addressing poor EE of segments of the housing market, especially rental

Renovation Wave Priorities



Tackling energy poverty and worst-performing buildings



Renovation of public buildings



Decarbonisation of heating and cooling

Renovation Wave of the EU and the Green Deal – incorporating Retrofitting and CE principles

Relevant instruments – large scale housing retrofit

Financial instruments

- Sustainability Bonds in affordable and green housing (eg EU Taxonomy, incorporating CE definition)
- Revolving dedicated maintenance funds for renovation of co-operative housing (LPHA Austria, LBF, Denmark, Housing Fund Slovakia)
- SDG investment in Dutch Energiesprong funds investments in retrofitting through bill savings, ensuring no net additional cost to tenants. <https://energiesprong.org/>
- Lease and sale to support Modular components, such as kitchens and bathrooms
- Programs run by third and private sector

Fiscal instruments

- Collaboration tools for developing circular buildings
- Direct investment: e.g. EC Renovation Wave, Estonia's long term renovation plan
- Facilitating new circuits of (re) investment such as Dutch Energiesprong
- Victoria's Resource Recovery Infrastructure Fund
- Investing in training to support France's renovation efforts, establishing specialist courses, certification

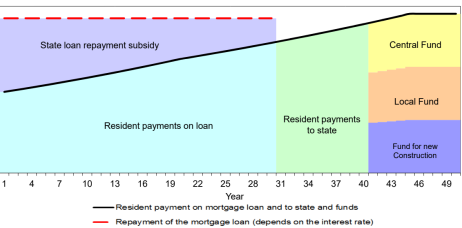
Regulatory instruments

- Energy Performance of Buildings Directive (EPBD, 2002/91/EC)
- EU Energy targets, certificates
- Scotland's energy standards for social housing
- German Building code - Energy Conservation Act
- France's Energy and Climate Act, soon mandatory audits
- Design guides, Tools for ease of modular design and disassembly in housing, e.g. Design standardisation and guides for modular construction (UK)
- City of Melbourne high-rise recycling program

Other instruments: Much sharing and piloting of good practices occurring in Europe, supported by EC.

Lawson, J and Dorignon, L (2021) What finance, fiscal, regulatory and policy instruments are used and might be used to advance CE housing in Australia?

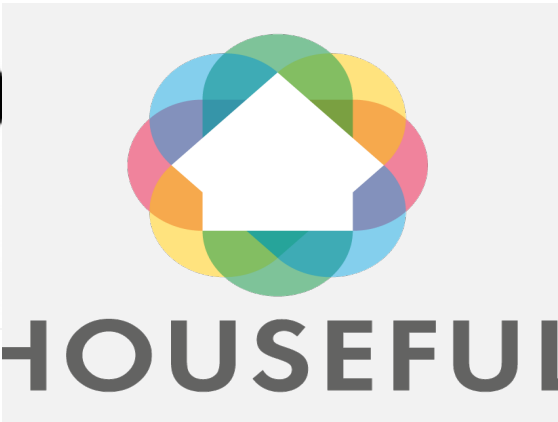
Affordable and Social Housing retrofitting (C)



BL DANMARKS ALMENE BOLIGER



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ALMENE
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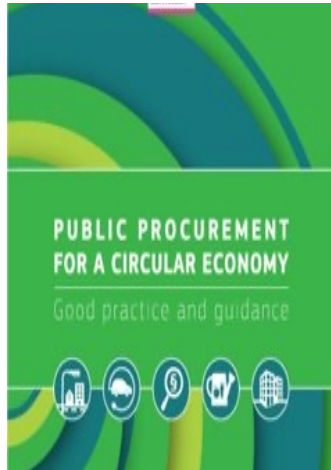
Revolving funds for renovation and retrofit of affordable rental housing in Denmark (BL)



Financial instruments	Fiscal instruments	Regulatory instruments
<ul style="list-style-type: none"> • EU Taxonomy Angel investing networks • CEFC co-investment • ARENA • PPPs e.g. Macquarie investment and international funds management company DIF combined with funding from the CEFC and ARENA 	<ul style="list-style-type: none"> • EU Financial support for CE transition (ESIF) • Horizon 2020 (EU research programme) eg Houseful • EU Structural funds for waste management. • Procurement policies • Dutch ‘raw materials agreement’ was reached in 2016 and the government is driving circular innovation through industry initiatives such as Green Deals and Top Sector policies. • Taxation frameworks guiding resource use and applied across lifecycle from tax on raw materials, to tax relief on re-use and repair and tax on waste, carbon credits to prevent emissions and also reduce them: such as the Landfill Tax (UK, 1996) • French CO2 tax (2014) and UK Climate Change Levy (2001) • Spain Promotion of repairs through tax incentives 	<ul style="list-style-type: none"> • Ban on waste import or export • Europe’s obligation to reduce biodegradable wastes to landfill through the Landfill Directive • Climate Change Act Finland (2015) pledging to reduce emissions by at least 80 percent by 2050 • Producer responsibility laws US • China Standards for re-utilized products, EU Environmental Technology Verification (ETV) • Obligations to use renewable materials, such as wood (Finland) • UK Climate Change Act 2008 binding emissions targets for 2050 • Common measurement methodology and Indicators to measure various aspects of resource consumption • Design guidelines or standards • Regulation of products, reuse of products (water) • Eco-labelling • EU compulsory green public procurement

Other instruments: Many industry alliances and cross sector partnerships in Europe and US to build on.

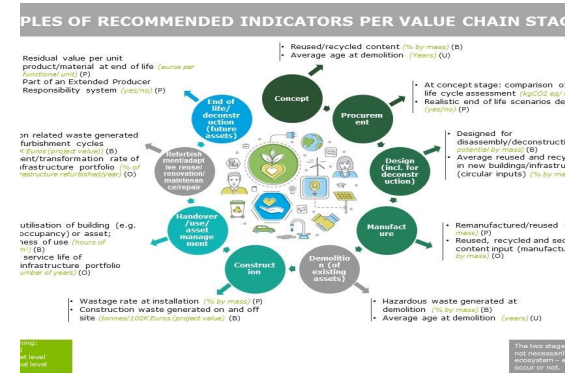
International inspiration for circular housing materials (D)



Green procurement



EU Taxonomy (2021-



Circular Economy Key Metrics (2023)

Recommendations for a circular economy housing strategy



Recommendation 1: Adopt the quadrant framework



Reappraising
value

Reappraising value: value inclusion and prioritisation, market setting, institutional frame



Shaping markets

Shaping market practice and processes: regulatory/steering instruments, performance-drivers, market-shapers, etc.



Tilting investment
flows

Tilting investment flows: finance, capital and tax incentives



Building capacity

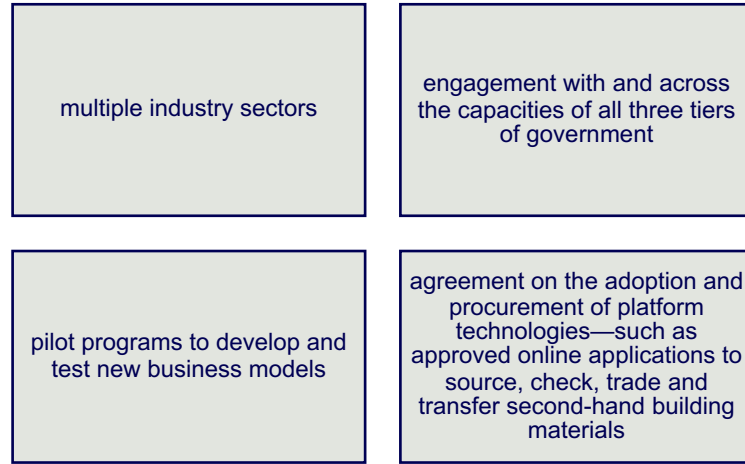
Building capacity: skills, knowledge, and training



Recommendation 2: Set up a vehicle

A strategy can only be successful if it attracts buy-in from diverse stakeholders. Therefore, a key action is to leverage the findings through a design-implementation process that involves a wide spectrum of industry and policy stakeholders. A Commonwealth Task Force should be set up to undertake this work.

Such a process will involve:



A think tank could be charged with the task of linking housing and waste in new ways and could involve:



Recommendation 3: Confirm goals and roles



Commonwealth government

- Coordinate policy to support CE in building, planning and investment
- Increase minimum energy efficiency (EE) standards in National Construction Code (NCC)
- Support database and warehouses for reusable products and materials for procurement
- Establish clear measurable objectives, pre- and post-occupancy and incorporate into accountability frameworks, such as valuations and environmental, social and governance (ESG) investment standards
- Account for embodied carbon in housing materials in a trackable way in relation to emissions targets.
- Develop a long-term funding pathway to enable social housing providers to embed retrofit within their maintenance plans
- Robust ESG CE investment definitions, and compliance reporting
- Support tertiary education, TAFE and professional development to increase workforce capacity to reduce carbon intensity of new housing and retrofit



State government

- Promote CE housing awareness
- Integrate sustainability and CE in both planning with building frameworks at dwelling and precinct level
- Pre-development funding agreements for transport, housing and social infrastructure
- Ensure that CE and sustainability interventions engage with residents and enhance liveability
- Develop a long-term funding pathway to enable social housing providers to incorporate CE within their existing maintenance schedules



Local government

- Promote CE housing awareness and change stakeholder behaviour
- Integrate CE into master planning, greyfield, urban infill development and impact assessment
- Assess sustainability outcomes during all phases from planning through to post-occupancy
- Use subsidies and financial incentives for communities to implement neighborhood-scale solutions (micro-grids, sharing economy approaches, etc.)



Private sector

- Promote CE housing awareness
- Development teams embed sustainability in project feasibility
- Temporary financial support to industry to ease the transition to stricter legislative requirements
- Inform the shape investment flows contributing to the decarbonisation of building materials schedules
- Participate in urban design competitions and government tendering processes that promote CE and sustainability
- New financing models (ethical investments)



Civil society

- Promote CE housing awareness and change consumer behaviour
- Purchasers and renters have access to adequate information about building performance.
- Use subsidies and financial incentives for communities to implement neighborhood scale solutions (micro-grids, sharing economy approaches, etc.)
- Participate in sharing economy approaches in neighbourhoods



Education/ Training institutions

- Understand and apply the principles of a CE in the realisation of sustainable housing and neighbourhoods
- Comprehensive program of research on circular neighbourhoods to support the transition and guide policy
- Inform the investment flows contributing to the decarbonisation of building materials
- Increase implementation capacity and awareness of CE
- Develop an industry education process

Recommendation 4: Establish tools and phasing

- There is a need to sequence and prioritise actions over time.
- A toolbox of key instruments has been established from the Inquiry research as a starting point for organising and engaging in action towards CE housing.

Short term

- Awareness and application of CE to homes and neighbourhoods
- Review current EE standards for effectiveness, mandate
- Review education/training
- Support information exchange and research
- Define and require reporting CE ESG housing investment
- Engage with and ensure benefits of CE for affected residents

Medium term

- Strengthen CE and EE building standards and integrate with planning, building valuation, post occupancy performance
- Implement appropriate education and training
- Funding and investment settings support CE in housing
- Ensure CE built into building life cycle
- All stakeholders promote good CE practices
- Continue to support CE initiatives



Recommendation 5: Test and rollout action plans

- In 'The Policy Framework: Actions towards Circular Economy housing in Australia', an agenda for integrated action across the four quadrants is tailored to distinct fields of the residential sector.
- The actions are presented in graphic form. Recommendation 5 is to test and utilise this material in order to facilitate engagement, discussion and agency in the CE housing strategy.
- For example, the Framework could be used as prompts in meeting with planning agencies and stakeholders, and to inform the Commonwealth Task Force on the CE housing strategy for sustainable housing at the neighbourhood scale.

[Read here](#)



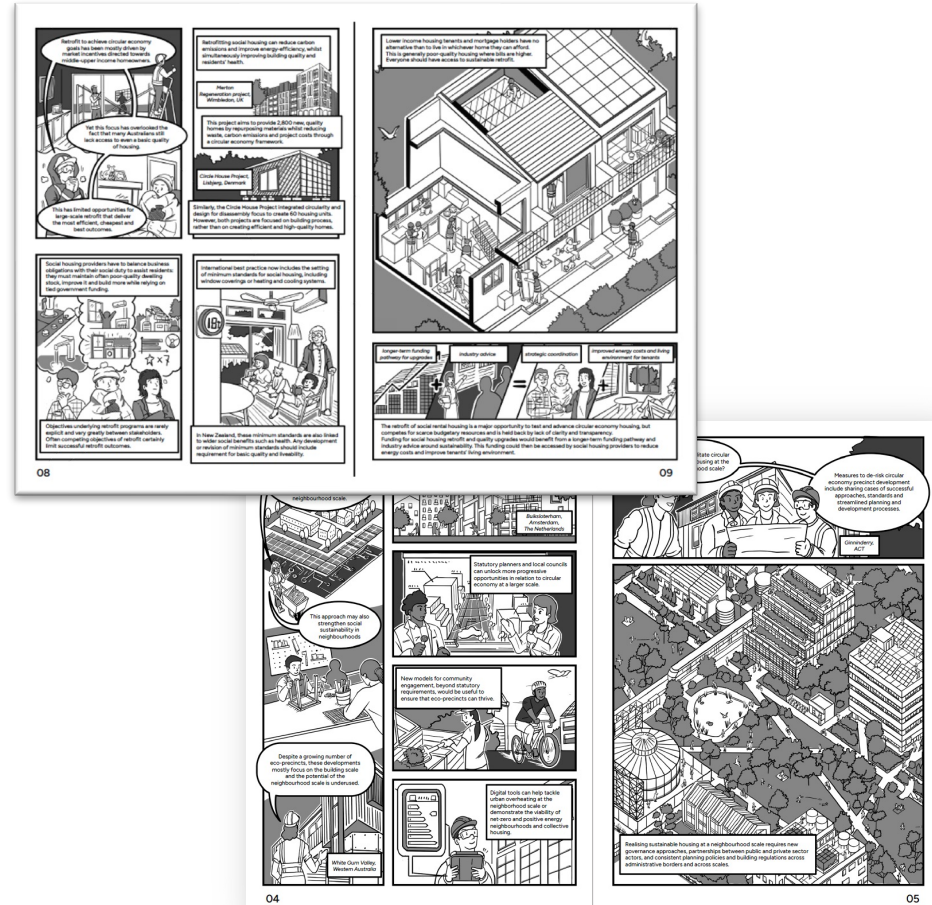
Bringing circular economy housing to life with a graphic novel



A creative experiment

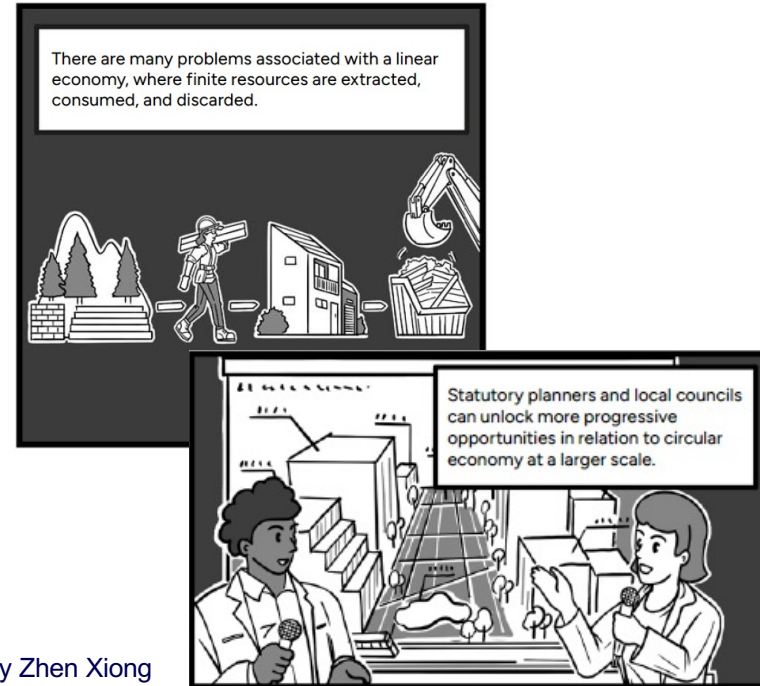
- A unique visual summary was developed to communicate the key ideas of the strategy in an engaging way, not only amongst the wider community, but also the planning, building and renovation sectors.
- The graphic novel was co-designed by the Inquiry research team and illustrated by RMIT trained designer Zhen Xiong.

[Read here](#)



Why a graphic novel

- promote more accurate representations of circular economy practices, incl. based on real case-studies and projects
- illustrate a high-level policy framework with concrete examples and depictions
- provide a picture of what needs to change and how change might occur, showcasing roles across sectors
- explore playful/positive ways to think about circularity and how it might benefit our homes
- draw on RMIT capabilities from the Master of Communication Design (DSC)



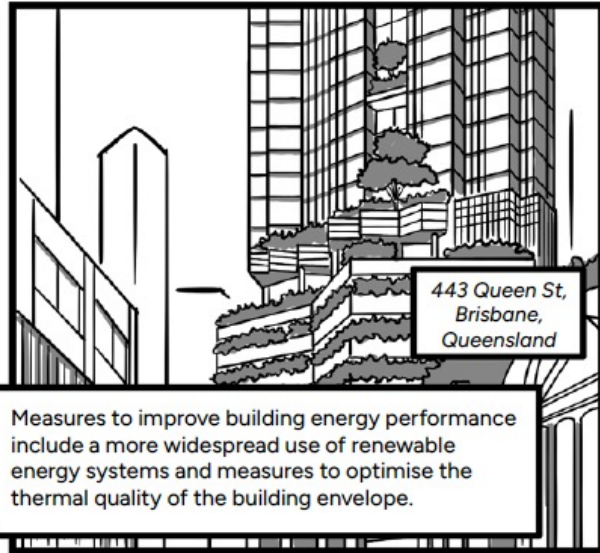
*‘Comics are a powerful way to capture diverse images of still-possible and alternative climate futures that **move beyond apocalyptic imaginaries** to inform debates about the geographies of hope as they relate to climate change.*

*...comics can **enhance the participatory nature of research** and facilitate a move to more ‘desire-based’ research frameworks that **emphasise character-driven and anti-essentialist narratives.**’*

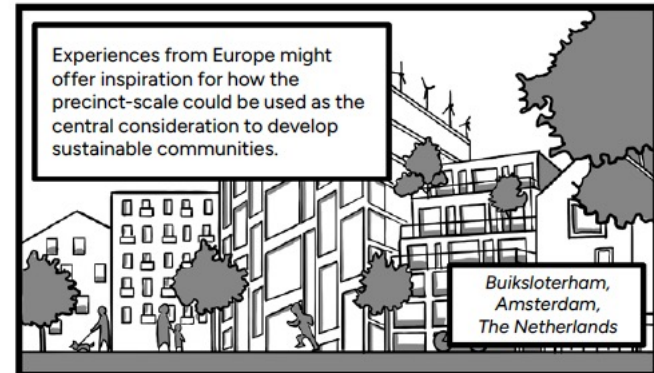
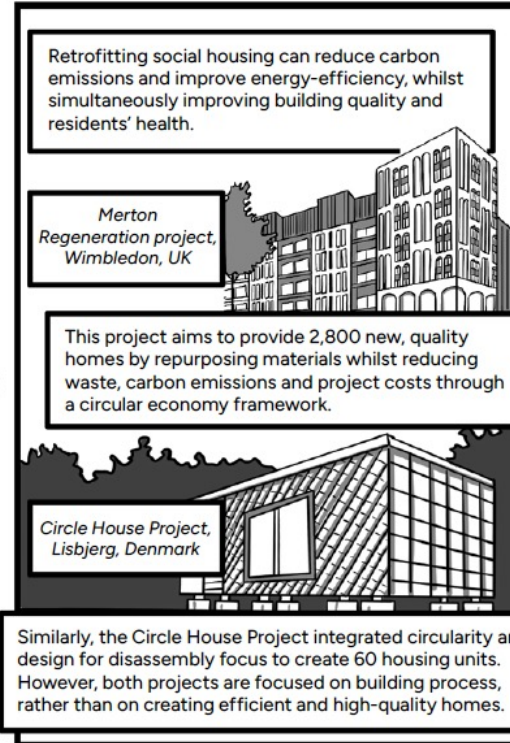
Dr Gemma Sou, Wiley Lecture 2022. Communicating climate change with comics.



Real life built environment projects



The novel makes reference to real-life international projects and initiatives.



Precise/playful depictions

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 a requirement for basic quality and liveability.

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

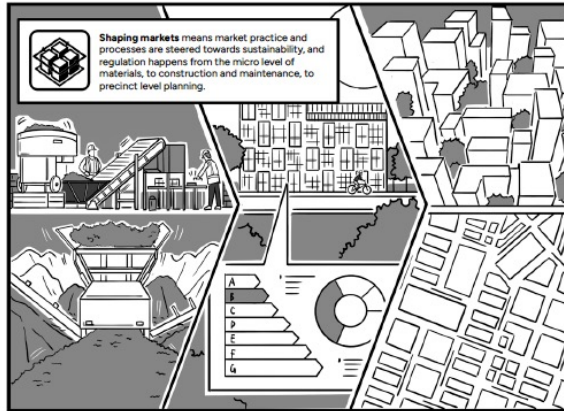


Changes can be challenging, such as the reuse of timber or the lack of on-site storage space between deconstruction and construction.

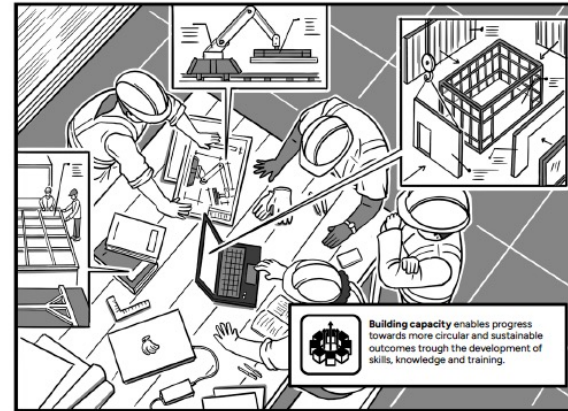
The novel playfully applies the evidence gained from the four research projects and represents opportunities and challenges in an accurate manner.



The quadrant framework, illustrated



12



13



International reach

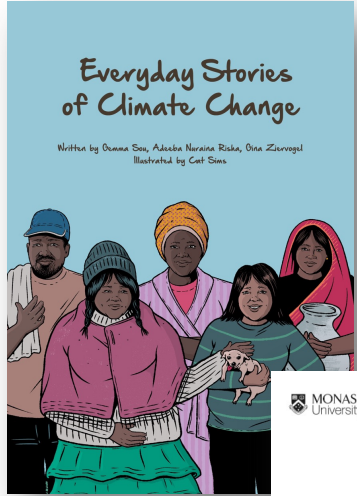
- launch and exhibition of banners at ENHR conference, Lodz (Poland) in 29-30 June 2023
- two pullup banners using all the visuals and graphic novel with links to reports
- use of QR code to gather participants' feedback and contributions
- banners have been brought back to Melbourne to be re-exhibited at future events and at different locations



ENHR, Lodz, June 2023



Benefits and future prospects



Challenges

- increased popularity of graphic novel/comics as a medium for scientific dissemination but need to familiarise audiences with more creative outputs

Opportunities

- findings translated in accessible/attractive output
- make a transition to circular economy look achievable and possible
- graphic novel used as educational resource



Resources



Links to the Inquiry reports

[Informing a circular economy housing strategy](#)

[Sustainable housing at a neighbourhood scale](#)

[Delivering sustainable apartment housing: new build and retrofit](#)





[Sustainable social housing: solutions for large-scale retrofit](#)

[Building materials in a circular economy](#)







Policy Framework

Actors and resources towards sustainable social housing retrofit

 <p>Re-appraising value</p>	<p>Who is responsible and how are they mobilised?</p> <ul style="list-style-type: none"> Social housing providers/state housing authorities (Lead) <p>Requires: Retrofit guidance that considers feasibility.</p>	<p>What can they do?</p> <p>Ensure that CE (or 'sustainability') focused retrofit interventions enhance basic livability for residents.</p>
 <p>Shaping markets</p>	<p>Who is responsible and how are they mobilised?</p> <ul style="list-style-type: none"> State Government(s) on ground service providers (Lead) Residents, State Government(s) on ground service providers, retrofitters. <p>Requires: Funding to support engagement and programs.</p>	<p>What can they do?</p> <p>Engage with tenants' (households') preferences in the design of retrofit intervention programs.</p>
 <p>Tilling investment flows</p>	<p>Who is responsible and how are they mobilised?</p> <ul style="list-style-type: none"> State Government(s) (Lead) State Government(s) housing providers. <p>Requires: Policy or procedural mandate.</p>	<p>What can they do?</p> <p>Make explicit and align intervention programs</p>
 <p>Building capacity</p>	<p>Who is responsible and how are they mobilised?</p> <ul style="list-style-type: none"> Commonwealth Government, State Government, housing providers (Lead) Commonwealth Government, State Government, housing providers <p>Requires: Strategic prioritisation and corresponding investment that embeds considerations of feasibility into retrofit practices.</p>	<p>What can they do?</p> <p>Develop 2 national enable knowledge and construction & 2) support apartments.</p>

Steps towards sustainable housing at a neighbourhood scale

Strategic outcomes: Development of a common understanding of what CE housing at a neighbourhood scale, how it can be delivered and what support or opportunities there are in looking beyond individual houses. Clear policy and assessment tools would enable consistent delivery of CE housing at a neighbourhood scale. It will result in a more educated BE sector and engaged policy makers and stakeholders.

 <p>Re-appraising value</p>	<ul style="list-style-type: none"> Common understanding of CE and implementation at urban scale Awareness of CE values and principles among planners, state and local politicians, as well as the housing industry A range of policy instruments and governance models support a CE approach Research and development focus for CE at urban level Collaborative urban production, consumption in neighbourhoods Prioritizing the use of recycled materials and products
 <p>Shaping markets</p>	<ul style="list-style-type: none"> Policy frameworks and regulation for sustainable homes and neighbourhoods incorporated in masterplan / precinct plans Strategic use of green and blue infrastructures Land use instruments facilitate mixed-uses, and are integrated transport Statutory development assessment processes for comprehensive CE criteria, including community sustainability and impacts Increased and reinforced regulations on key areas for CE: minimum standards for energy efficiency, reduction of car parking spaces per dwelling Integrate planning with other policy instruments (subsidies, guidelines demonstrations) Consolidate CE in existing tools to ensure comprehensive appraisals of neighborhoods scale CE, avoid duplicating instruments
 <p>Tilling investment flows</p>	<ul style="list-style-type: none"> Using direct public investment to fund improved standards and demonstrate them Use subsidies and financial incentives for communities to implement neighborhood scale solutions (micro-grids, sharing economy approaches, etc.) Use urban design competitions and government tendering processes to prompt developers to propose better solutions (European continental countries may serve as examples) Develop databases and warehouses for reusable products and materials to facilitate ease of procurement of previously used over new structures
 <p>Building capacity</p>	<ul style="list-style-type: none"> Review policy frameworks and assessment tools to ensure sustainability considerations central in political decision-making processes on plans and development applications Tailor tertiary education and continuous professional development of built environment professionals to focus on circular economy policies and practices at urban scale Implement education and training for policymakers, administrators, and private sector actors

Our Policy Framework: Actions towards Circular Economy housing in Australia provides quick-reference materials that can be used as an agenda for integrated action—to inform and guide conversations about the transition to CE housing in Australia.

[Read here](#)



Get in touch

Your feedback and experience will help us improve our research on circular economy housing.

Let us know your thoughts about a circular economy for housing:

<https://forms.gle/PGDCR1Nqdfhm1LeL9>

