MONASH University

AUSTRALIA'S CIRCULAR ECONOMY UNLOCKING THE OPPORTUNITIES

RESPONSE TO PRODUCTIVITY COMMISSION INTERIM REPORT

22 APRIL 2025

INTRODUCTION

Monash welcomes this interim report of the Productivity Commission's (PC) Inquiry into Circular Economy Opportunities (Interim Report), in particular the findings that

- Progress has been slow, barriers are high and regulation is insufficient and fragmented
- There is a greater role for government to remove these barriers and support industry into circular transitions
- There is a lack of information to inform decision-making by producers and consumers
- Aboriginal and Torres Strait Islander knowledges and expertise in circular practices should provide a powerful contribution to Australian policy and practice

We understand the PC's focus on priority opportunities to improve materials productivity for economic and environmental benefit, assessed against material significance, applicability to Australia and the viability of policy interventions to reduce barriers to adoption.

Our core concern is that the reform directions of the Interim Report miss the biggest opportunities of 'going circular' because of an emphasis on waste management, marginal savings and reduced negative externalities rather than a strategic transformation aimed at economic growth from new revenue streams and improved international competitiveness through innovation.[1]

The report also overlooks the benefits of higher value circularity strategies such as dematerialisation and intensification.

In particular, we note that[2]:

1. Compared to advanced circular economy nations, Australia is focusing on recycling and waste-to-energy, destroying most of the inherent value from products and materials and leading to the circular economy becoming a cost-centre rather than a value driver. This has led to low-value downcycling solutions starting to crowd out higher value models from the market.
2. Circular economy is not a deficit compensation strategy, assessing small efficiency gains and environmental benefits against the cost of adopting more circular approaches. It is a far-reaching opportunity for economic growth from new revenue streams, reduced resource risks, brand differentiation, and resilience against global regulatory changes and volatility.
    - Australia's most impactful opportunities lie in innovations that extend current conceptions of resource recovery, especially around mining, clean energy circularity and becoming a preferred destination for the testing of cutting-edge technologies that would not be possible in more mature markets
    - Rather than a sector-by-sector or a single-sided focus on domestic value-add, considerations of scalability (including B2B and government procurement), competitiveness and integration into global trade and supply chains should influence investment and reform priorities

[1] Notwithstanding the PC's acknowledgement that "across all levels of government, there has been an increasing shift to incorporate earlier parts of the product life cycle" Interim Report, p4

[2] These are additional to the eight strategic priorities articulated by Monash in our previous submission (see Appendix 1)

3. Circular economy is a strategic transformation at all levels of the economy, similar to the Digital Transformation, and it requires portfolio-wide policy engagement (as expressed in the recently released National Circular Economy Framework) and a strong pipeline of research and experimentation for innovation.
    - The R&D sector has unrealised potential as a broker of transition partnerships and coordinating collaborations across the innovation system, supporting evidence-based policy and investment decision-making.
    - We have included a potential model in our response to Chapter 10 for an enduring Commonwealth-led nationally representative coordination body, and an R&D-led transition partnership involving Monash University and CSIRO. Monash is the national leader in industry-connected R&D.[3]Together they can promote collaboration across the innovation system, providing evidence-based research, conducting feasibility studies, and supporting pilot projects

A growth focus could lead to greater sovereign capability and resilience against global regulatory changes in times of geopolitical volatility.

Discussion of relevant chapters and our recommendations are presented below. Specific recommendations are directed to generating the greatest benefit from the circular economy in Australia.

We would be pleased to engage further as the reform directions are finalised.

Professor Robyn Ward
Deputy Vice-Chancellor Research and Enterprise

[3] Over the last five years, industry partners have invested $563 million in R&D delivered by Monash

DISCUSSION

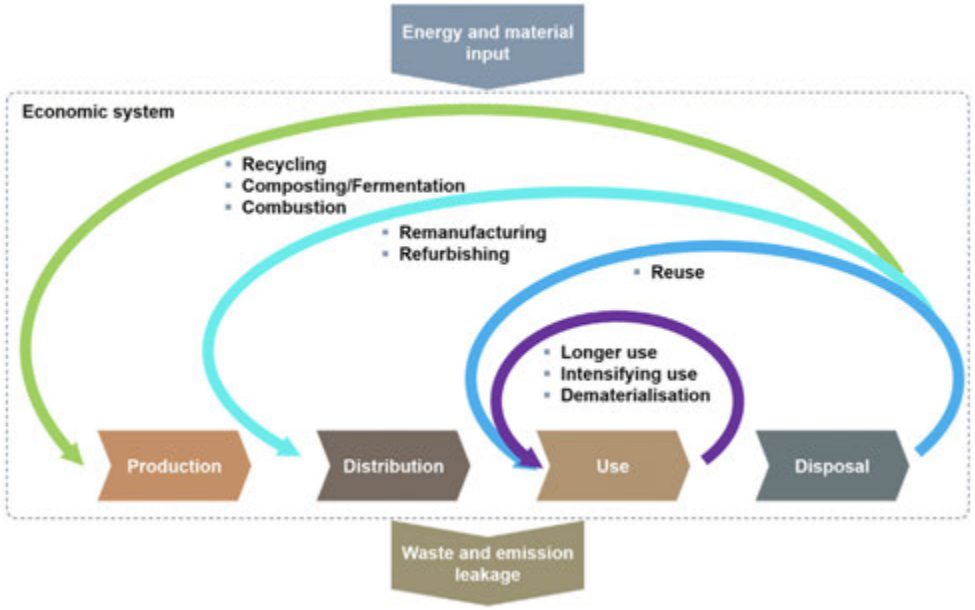
Chapter 1 Overview of Circular Economy

Definition and model

The way in which the circular economy is conceptualised by the PC and in subsequent policy reforms will be crucial to how it is implemented and what it can achieve. The Interim Report definition includes three key principles - narrowing, slowing and closing, aligning closely with the widely accepted definition introduced by Geissdoerfer et al[4]. This definition was expanded in 2020[5] to emphasise higher-value circularity strategies, notably dematerialisation (replacing products with services or software) and adding the principle of intensification (increasing asset utilisation via sharing and public provision models). In this model, "narrowing" is a supporting strategy alongside renewable energy and materials since it can be applied to improve performance in both circular and linear models[6].

- We recommend a broader definition and model of circular economy
    - It should include the principle of Intensification
    - We note the PC focus on material circularity, but also recommend reference be made to the higher value strategy of dematerialisation, strategies for avoidance, reduction and sufficiency, as well as consideration to resources like energy and water.

We note that the simplified figure of linear and circular economies in the Interim Report's Executive Summary (p4) gives significant emphasis to recycling, which is a lower order strategy, as well as being less accurate in its terms and visual depiction of the model; we therefore recommend replacing it (and potentially the more detailed graph in Fig 1.4 p34) in with a more informative graphic, clearly outlining the different elements and their relation, such as the example provided below:



Source: Geissdoerfer et al., 2020

[4] The Circular Economy – A new sustainability paradigm? In Journal of Cleaner Production Volume 143, 1 February 2017, Pages 757-768 (https://www.sciencedirect.com/science/article/abs/pii/S0959652616321023)
[5] For a broader discussion about a more inclusive definition, please refer to Geissdoerfer et al., 2020 (https://doi.org/10.1016/j.jclepro.2020.123741), discussed further in Appendix 2
[6] i.e., a model employing efficiency or renewables does not qualify in itself as 'circular', e.g., disposable cups produced efficiently and with solar energy

Chapter 3 Prioritisation framework

The framing of circular solutions as inherently costly exploits temporary inefficiencies due to insufficient scale, and allows the justification of inflated margins from suboptimal solutions. Such narratives discourage investment and innovation, entrench linear practices, and ultimately undermine long-term economic and environmental gains.

The selection of the six priority areas could result in too narrow a focus on sector-by-sector opportunities without sufficiently accounting for how policies can scale up and capture Australia's specific comparative advantages.It risks overlooking how global supply chains, resource recovery innovations, and competitive export opportunities can drive significant economic and environmental gains.

Australia's greatest opportunities lie in resource recovery innovation, especially around mining, clean energy circularity, and being a testbed for cutting-edge technology that would fail in more mature markets. Considerations of scalability, competitiveness, and integration into global supply chains could better align policy with Australia's unique assets, market realities, and long-term strategic interests.

Chapter 4 The built environment

Reform direction 4.2 Coordination mechanisms

Market creation through government procurement is a key lever to facilitate at-scale adoption of circular models in the construction industry.

- We recommend a reform direction for direct federal government sustainable procurement, as well as facilitation of discussion about best practices in circular procurement for the construction industry in a coordinated dialogue between the Commonwealth and the States/Territories and to establish a permanent coordination body to further develop procurement guidelines towards international best practices and harmonise the results across Australia

Reform direction 4.3 Specific regulatory changes

Lack of specific guidance in construction codes can result in uncertainty for designers, manufacturers, and authorities, limiting wider adoption. The National Construction Code (NCC) doesn't always account for aspects unique to modular construction methodologies and off-site manufacturing, transportation, and assembly.

- We recommend providing more precise and specific guidance through the NCC. Changes could involve specific deemed-to-satisfy solutions for prefab/modular or clearer pathways for performance-based solutions for modular construction. These should address areas such as structural design for transport and lifting, connection details between modules accounting for assembly/disassembly, and procurement and inspection processes for off-site manufacturing

It is inefficient for each state and territory to have its own government uptake initiative.

- We recommend coordination of state/territory-based policy responses. The government can be a major driver of uptake through its assets (e.g., social housing, hospitals, prisons, etc).
- Another barrier is private capital investment, and the government could be a form of guarantor through this pipeline (or directly underwriting investment or taking stakes in companies

Benefits of regulatory changes on modular and prefabricated construction

Environment	Economy	Society
Much less construction waste due to controlled manufacturing facilities / processes / stocking / upcycling - Metrics: traditional MFA and embodied GHG emissions Lower energy consumption enabled by factory efficiency and reduced construction time and disruptions (dust, traffic, noise, air quality, etc). - Benchmarking and whole-of-life analysis is needed because of higher upfront costs and emissions than BAU	Faster delivery - Project delivery time can be reduced 30-50%, resulting in cost savings Improved productivity - Automation of processes and assembly lines allow productivity to increase Enhanced quality (reduced rework). - Controlled factory environment results in a better-quality product, reducing post-sales burden and increasing environmental performance	Greater housing affordability potential New jobs for skilled workers Improved safety and work conditions

Information Request 4.4 Other circular economy opportunities

Designing for disassembly (DFD)
There is no clear indication of fast-paced adoption without policy incentives due to higher upfront costs and an absence of reused material markets. Without government intervention, DFD may be limited to flagship projects and early adopters, including high-profile or government-led projects with explicit sustainability and circular economy targets, such as the City of Ballarat's circular economy precinct and the Brisbane 2032 Olympics. Uptake in the residential sector is low to non-existent.
Modular and prefabricated construction opens opportunities for DFD as off-site manufactured components are better suited for disassembly and reuse.
Barriers include an absence of policy incentives, lack of industry know-how and tools to support a transition, perceived higher upfront costs, and limited availability of modular, reusable products and systems in the Australian market.

- We recommend
    - Updates to the NCC and planning instruments to incentivise DFD across states/territories,
    - Education and accreditation programs to disseminate DFD principles and methods
    - Incentivising or mandating levels of DFD outcomes in government procurement to drive market demand
    - Practical support to generate markets (e.g. infrastructure and standards) for the recovery and resale of materials
    - Funding of pilot projects to demonstrate the business case for DFD

Chapter 5 Food and agriculture

Focus
The Interim Report focuses on retail. It notes but does not prioritise opportunities and areas for reform at other parts of the food value chain. End Food Waste Australia's Horticulture Action Plan[7] identifies a number of policy/regulation root causes for food waste at the production and distribution stages, including: "Red tape, interjurisdictional inconsistency, and absence of regulation or financial incentives that can prevent food waste,"

[7] End Food Waste Australia Horticulture Action Plan
(https://endfoodwaste.com.au/wp-content/uploads/2023/11/EFWA-Final-Report-_HORT-SAP.pdf)

and finds that it is important to “institute an effective policy and regulatory environment for food waste minimisation across the horticulture sector”.

- Monash recommends that greater attention should be given to the significant opportunities to prevent food loss and waste in
    - the primary production, manufacturing and distribution stages
    - food service and hospitality sectors, which present about 15 per cent of Australia’s food waste
- We also recommend a role for greater coordination of industry collaboration, which has been identified as a core drive or food loss / waste reduction, and relates to the PC’s reform direction 10.2 [8]

The Interim Report acknowledges the education and behaviour changes programs directly engaging with consumers. We note that the report suggests that there are limited benefits from further policy interventions in this area, however it is important to note that The Great Unwaste campaign funding was not sufficient to achieve significant market penetration and finishes at the end of 2025. Without further support there will be no national program engaging with consumers on this issue. Food-related behaviours are habituated and behaviour change in this space emerges from repeated reminders, prompts, nudges, tools, resources and messaging that make food waste reduction solutions normal. A one-off campaign will not achieve this.

- Monash recommends that the PC include reform priority to involve ongoing support for behaviour change rather than fragmented investments.
- We also recommend a priority reform direction aimed at behaviour change by institutional consumers such as hospitals and prisons.

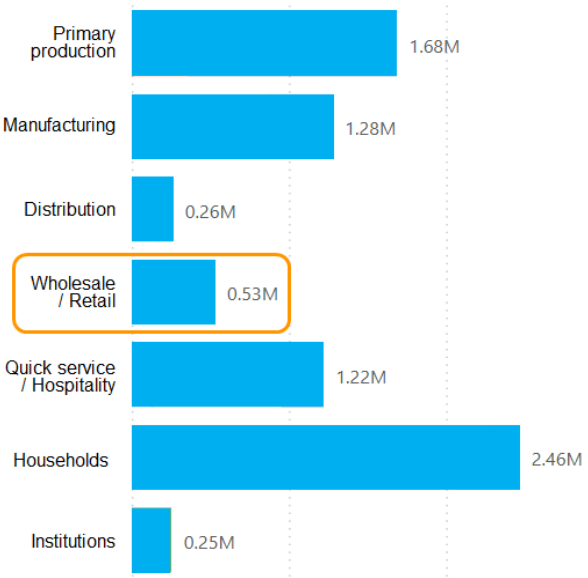
Reform Direction 5.1 Reducing food waste through food relief and donation to charity

The proposed priority of food donation/rescue is a good waste avoidance action but it represents a small opportunity[9] at a small section of the supply chain. Food waste in the food retail sector is estimated to be 0.5m tonnes (7 per cent) of Australia’s 7.7m tonnes food waste (refer chart below)[10].

[8] See for example Table 3, and Tables 5-7 of Bhattacharya & Fayezi (2021) (https://www.sciencedirect.com/science/article/pii/S0019850121000171?via=ihub)

[9] While data on food donations is scarce and fragmented, it was calculated that 6.7 kt were donated to SecondBite, OzHarvest and Fare Share in 2012-13, with 12.2kt donated in 2015-16 by supermarkets#. While donations may have continued to rise in the 10 years since, even if they tripled this would still represent just 7% of food retail food waste.

[10] National Food Waste Baseline, Food Innovation Australia Limited, https://www.fial.com.au/sharing-knowledge/food-waste#Dashboard



Food rescue should not be the priority reform area for circular food policy because it

- treats the "symptom" of food waste, rather than the cause (ie. it redistributes potential waste, rather than reducing food retailer waste (eg. through demand forecasting, supply chain coordination, packaging innovation, etc.)
- relies on the existence of surplus/waste in the system, and if successfully scaled, could, (given the 'social good' that it provides) actually incentivise/entrench waste generation, counter to the general drive to prioritise avoidance (as with other downstream practices)
- may not be a sustainable, long-term solution to food security if other upstream reforms are widely adopted (for example some food-relief charities have already reported a decline in donations caused by better supply chain management that reduces food waste)
- replicates a particular model of 'charity' that is inequitable, and can stigmatise recipients

    - We recommend caution with Reform Direction 5.1 to encourage food donation. Particularly, we recommend that if this reform direction is maintained it should be accompanied by policy to support food waste prevention. Opportunities include packaging redesign, and greater clarity and simplicity in date-labelling.[11]

Indepth research into the barriers to food donation (and other food waste avoidance strategies) by supermarkets has been conducted for the NSW EPA[12]. It includes a literature review and primary research with Australia's major supermarkets to identify the stages at which food waste occurs, the drivers of that food waste, and the barriers to implementing strategies such as food rescue. Monash's research regarding SME food service/hospitality businesses suggests that lack of knowledge about food regulations, is also an important barrier: SMEs don't want to donate excess food due to the fear of liability for food-related sickness, to the extent that food waste is the preferred option. This could easily be addressed through policy reform and guidance. There are also barriers imposed by the time and resources needed to package and store the food for donation.

[11] Refer to research by NSW EPA / UTS Institute for Sustainable Futures (https://opus.lib.uts.edu.au/bitstream/10453/115674/1/Lewisetal2017EPA_Food_waste%20report_2017-08-23.pdf) and, End Food Waste Australia (https://endfoodwaste.com.au/reduce/)

[12] NSW EPA / UTS Institute for Sustainable Futures (https://opus.lib.uts.edu.au/bitstream/10453/115674/1/Lewisetal2017EPA_Food_waste%20report_2017-08-23.pdf)

Some international solutions have focused on coordination, which could guide government efforts in Australia:

- In the UK some of these barriers have been overcome by virtual marketplaces which assist redistribution of food to charities. Retailers list the types, quantities and locations of food they have available, and charities respond based on the type of food they need and the logistics they can arrange. Several food waste apps are available in the UK to make this happen, including FoodCloud and Plan Zheroes.
- Also in the UK, FareShare expanded its role to involve brokerage with existing waste management companies. They divert fit-for-purpose food into its existing charitable network and pass on the remainder without having to build the full infrastructural capacity that would otherwise be required. Provision of a single, tailored waste management solution with charitable donations alongside waste recovery is a more attractive proposition to retailers than the existing model which is supplementary to the retailer's waste disposal responsibilities.

Reform Direction 5.2 Recognising the benefits of biogas in carbon reporting

Lower order actions like waste to energy and recycling can reduce the motivation and likelihood of higher order strategies being enacted. Monash has commenced research on the potential negative impacts of waste-to-energy from solid waste on higher order strategies, which can be made available to the Commission upon request.

- Based on emerging evidence, Monash recommends that incentives for anaerobic digestion and biogas should be accompanied by strong policy action to support food waste production across the sectors most likely to adopt anaerobic digestion as a food waste recycling strategy, or risk undermining higher-order food waste prevention efforts.

Improving date labelling is a simple yet significant reform action that could also be given greater priority. There is considerable research that shows why and how federal regulation reform should be considered[13].

- We recommend that improvement and jurisdictional harmonisation of data labelling be added as a reform priority

Chapter 6 Textiles and clothing

Focus

The report highlights the stages of production, consumption and disposal, but does not distinguish retail and supply. Language and framing matters. There are many opportunities that exist in retail (across online, distribution B2B, or brick and mortar). For example, renting and take back are important circular clothing strategies at the retail stage, which consumers cannot undertake unless a retailer provides such a service. Monash research[14] has shown that incorporating repair into circular business models is likely to be much more effective than encouraging DIY repair. Similarly, 'consumption' includes the separate stages of purchase and use.

- We recommend distinguishing the distribution/retail stage as a crucial step between production and consumption. Differentiating between these stages, and articulating opportunities at each will provide greater clarity and increased impact.

[13] End Food Waste Australia (https://endfoodwaste.com.au/wp-content/uploads/2025/04/2503_EFWCRC_124_Final-Report.pdf), Food Bank (https://www.foodbank.org.au/wp-content/uploads/2019/12/Macquarie-Law-PACE-Reforming-Date-Labelling-in-Australia.pdf), Harvard Law School Food Law and Policy Clinic (https://www.foodbanking.org/wp-content/uploads/2023/01/atlas-date-labeling-issue-brief.pdf) European Commission Regulator Impact Statement (https://ec.europa.eu/info/law/better-regulation/have-your-say/initiatives/12749-Revision-of-food-information-to-consumers_en)

[14] Macklin, Jungbluth, & Borg 2023 (https://cdn.prod.website-files.com/619ab5836de9f00d9c722d98/64e826a743656941ab9e9886_Behaviour%20Roadmap%20to%20Circular%20Consumption%20Final%20Report.pdf), Downes and Hatty 2022 (https://www.dcceew.gov.au/sites/default/files/documents/technical-research-report-methods-waste-prevention-activity.pdf)

Consumption involves individual and organisational/industrial consumers[15]. Monash research[16] has identified that it is likely to be both easier and more impactful to shift the circular consumption practices of large organisations, which would then have a trickle down effect on SMEs and individuals.

- We recommend the introduction of distinct consumer categories for nuanced consideration in the reform priorities.

The report and reforms focus quite heavily on consumer clothing, but more emphasis and attention could be given to other textile categories.

- We recommend including other household textiles consumption categories, interior decor, automotive as well as large scale geotextiles utilised in construction, mining and other heavy industries.

Information request 6.1 Protections for consumers

Consideration of the impact of certification of trademarks should include both organisational and individual consumers separately.

Certification trademarks
Globally, the EU's REACH regulation is seen as 'the most advanced and comprehensive chemical legislation in the world'[17].
Some of the most trusted transparency certifications[18] and standards include

- OEKO-TEX – A portfolio of independent certifications and product labels which enables companies along the textile chain and consumers to make responsible decisions in favour of products that are harmless to health, environmentally friendly and manufactured in a fair way.
- The Better Cotton Initiative (BCI): this certification applies to cotton that is produced in a way that "cares for the environment, minimising the negative effects of fertilisers and pesticides, and caring for water, soil health and natural habitats." In Australia, BCI cotton is certified under the name myBMP (My Best Management Practice).
- Global Organic Textile Standard (GOTS): GOTS applies to the dyeing of the clothing, with each garment having been dyed with its own organic wash recipe certified by GOTs.
- Zero Discharge of Hazardous Chemicals (ZDHC): a coalition of fashion brands, value chain affiliates and associates - together empowering the global textile, leather, apparel and footwear value chain to substitute hazardous chemicals for safer ones in the production process.

Misleading behaviours outside of existing consumer protection laws
Australia imports 97 per cent of fashion and clothing products from overseas retailers (1.4 billion items,[19]), which affects considerations for transport and transparency of how resources are extracted and processed, how products are made, by whom, and under what conditions. This presents a competitive challenge to Australian retail if all of the clothing and textile products imported by Australian businesses are required to comply with enhanced regulation and best practice labelling requirements.

[15] While both are significant, organisational/industrial consumption in Australia is among the highest international per capita averages.
[16] Macklin, Jungbluth, & Borg (2023) (https://cdn.prod.website-files.com/619ab5836de9f00d9c722d98/64e826a743656941ab9e9886_Behaviour%20Roadmap%20to%20Circular%20Consumption%20Final%20Report.pdf),
Downes and Hatty (2022) (https://www.dcceew.gov.au/sites/default/files/documents/technical-research-report-methods-waste-prevention-activity.pdf)
[17] https://ec.europa.eu/commission/presscorner/detail/en/ip_18_1362
[18] https://ausfashioncouncil.com/uncategorized/sdg-12-chemicals-and-fashion/
[19] https://www.seamlessaustralia.com/news/insights-from-national-clothing-benchmark

- We recommend that careful consideration be given to regulation and monitoring of all of the individual online orders from ultra fast fashion international retailers which are growing in numbers and arriving via express and direct shipping to Australian consumer homes

Product stewardship schemes
The Future Made in Australia plan to expedite advanced manufacturing and clean energy initiatives presents important opportunities for the growth of sovereign capabilities in textile and garment manufacturing and remanufacturing.

- Ultimately, we recommend legislation in Australia to ban the destruction of unsold products (including faulty in-store or faulty returns), similar to the preliminary EU agreement.
- In the meantime, we recommend accelerating and expanding government sustainable procurement, incentivising the use of recycling materials, and regulating textile transparency.
- Public education programs could guide shoppers to ignore the false debates (ie. between in-store versus online) and focus more on how much they buy, from whom, where it's made, how long will it last, what they do with it and is it repairable.

Information request 6.2 Product labelling

Monash research[20] shows that consumer product labelling schemes have the greatest impact when they are mandatory and include guidance and support for business on how to achieve higher ratings. Voluntary schemes that centre around labelling information for the consumer typically only have impact on a niche consumer audience, and don't change the behaviour of the mainstream population. This is because the circular characteristics being highlighted are not typically the primary consideration in consumer purchasing, and providing information about these lower priority characteristics does not change behaviour in the face of other barriers (eg. cost) and drivers (eg. functionality needs). Durability is the exception, where information about expected/guaranteed lifetime will directly influence consumer purchasing decisions and willingness to pay.

An important insight for any repairability labelling is that consumers tend to associate the term 'repairable' with the product being able to be repaired by someone else – a repair firm or the manufacturer/retailer – rather than oneself. This means that information on repairability is only useful if repair services exist that are both accessible and affordable.

- We recommend that any product labelling scheme should prioritise durability information over repairability information.

The majority of research on product labelling has explored the influence on individual consumer behaviour.

- We recommend investment into further research on the impact of product labelling on organisational consumers as a critical area of need.

Other forms of labelling
Advanced digital passports or individual product codes, such as UPCs, are unique digital identifiers assigned to each product for tracking and identification. These codes, often associated with barcodes, are essential for retail operations, inventory management, and online selling, and are particularly critical to advancing and scaling product life extension practices (repair, renewal and resale) within large volume retailers.

Information request 6.3 Textiles and clothing product stewardship schemes

Shifting from a voluntary to a mandatory Product Stewardship Scheme with greater government involvement would significantly increase the impact of existing and future textiles/clothing product stewardship schemes,

[20] Kaufman et al (2020) (https://drive.google.com/file/d/19nV758qJYK7BXQUTtU1ZC4-Cr1FtXb_w/view)

because the initiatives required to advance the transition to circular economy practice could be funded at scale (proportionate to that of the challenge)[21].

- Based on our research including interviews[22] with textiles, clothing and footwear (TCF) industry members we recommend the following priorities
    - Developing a clear definition of circular economy for the TCF industry that includes priority targets covering the types of materials that can be used for textile product manufacturing, and timelines to meet targets.
    - Support access to open source information, covering in particular the life cycle assessment of different materials and procurement providers.
    - Support consumer education, co-designed with industry, that covers all aspects of the circular economic cycle, including inputs, production, use (care and repair) and end of life options.
    - Support research investigating consumers' attitudes towards sustainability and consumer behaviour impacting transitions to, and adoption of, circular economy TCF products.
    - Support greater collaboration between industry, research and government organisations with the explicit aim of research and development in renewable materials, circular business model adoption, product life extension practices and end of life recycling opportunities.
    - Fund innovation and offer financial support to Australian organisations and businesses that are finding solutions to these problems in order to support commercially viable and scalable solutions locally.

Experiences with packaging product stewardship emphasise the challenge with co-regulatory schemes, particularly the issue of free riding as well as other reasons/benefits that have been outlined through the Meeting of Environment Ministers communiques. Moving to co-regulatory arrangements for clothing stewardship risks repeating past mistakes.

- We recommend direct government involvement as an opportunity to leapfrog the packaging industry learnings.

Chapter 7 Mining

Information request 7.1 Regulatory barriers

There are a number of regulatory barriers to mining companies that wish to harness circular economy opportunities for mining waste or to repurpose closed mine sites for higher-value uses.

- Prescriptive environmental and planning approvals limit the re-mining of tailings. Some state legislation enshrines closure plans that require full rehabilitation on a predetermined timetable, so operators face significant hurdles if they wish to re-enter the site, reprocess valuable residual minerals, or otherwise adopt a more circular approach.
- Land-use classifications locked in by regulation can prevent alternate and sometimes more productive uses—for instance, industrial or renewable-energy projects—in favour of returning the site strictly to grazing or an undeveloped state.
- Inconsistent waste definitions between jurisdictions can complicate the use, transport, and sale of tailings or other byproducts, raising compliance costs for firms that operate across state borders.

[21] For broader recommendations for supporting a transition to circular economy practice for textiles in Australia refer to Boulton, McCallion & Dechrai (2022)

[22] Boulton, McCallion & Curtis (2019) - This study investigated sector insights in three areas: the encapsulation of sustainability and circular economy by the Australian Textile, Clothing and Footwear industry; current priority for sustainable and/or circular economy initiatives including enablers and barriers; and potential opportunities which could assist or facilitate the Australian TCF industry to transition to a circular economy model

Relaxing or amending such barriers holds the potential to unlock substantial benefits.

- Allowing tailings re-mining can tap into valuable stockpiles of critical minerals, enhancing domestic supply chains and generating new revenue streams.
- Introducing flexible land-use approvals and liability-transfer schemes would encourage creative, community-focused redevelopment such as renewable-energy precincts or tourism ventures, transforming sites from liabilities into local assets.

Changing these rules presents costs and risks that should be managed through regulation supported with guidance

- Government consultation on the development of streamlined approvals policies and processes that are supported with transparent, consistent guidelines for industry.
- Regulators must maintain environmental safeguards around reprocessing tailings (to prevent acid drainage, contamination, or elevated emissions) and verify that new developments align with community expectations for rehabilitation.

The potential benefit is significant: a study in Queensland projected that if mine operators were able to reprocess copper tailings under a more flexible set of regulations, it could yield a net present value of tens of millions of dollars over a decade, and converting closed mine sites for solar energy in Western Australia was estimated to generate millions of dollars in annual local economic activity.

- We recommend that policymakers examine best-practice examples from countries such as Canada, where regulators have developed nuanced frameworks for decommissioned sites that welcome new proposals for residual-value extraction. Australia could launch a nationwide assessment of mining waste regulations, focusing on barriers in environmental approvals, legacy liability, and planning rules. A state-by-state analysis of the financial bond-release processes to understand whether inflexible bonds unnecessarily tie up capital and deter operators from undertaking resource recovery or secondary development.

  Some possible reforms include
  - replacing rigid “once-closed, always-closed” mine rehabilitation with modular, performance-based approvals. This approach would allow new proposals to enter the planning or environmental review process without requiring an operator to start from scratch.
  - standardising definitions of hazardous mining byproducts across states so that when producers recover high-value materials for re-use or sale, they do not face inconsistent classifications that discourage investment.
  - introducing clear liability-transfer mechanisms so that a new entrant re-mining tailings or repurposing a site can assume only the risks specific to its activities rather than incurring open-ended responsibility for historic environmental damage.

Information request 7.2 Government facilitation of circular economy opportunities in mining

The government has an essential role in enabling circular economy opportunities for mining waste and alternative post-mining land uses at all stages of production.

- We recommend integrating circular outcomes directly into regional planning. By designating industrial symbiosis precincts or renewable-energy hubs in former mining areas, governments can invite diversified economic activity that uses waste streams and associated infrastructure. Examples range from reclaiming tailings for valuable minerals to establishing centralized processing facilities that recycle materials from multiple sites, which can help smaller operators benefit from economies of scale.
  Clear, well-communicated guidelines would reassure businesses about approval processes and encourage them to invest in advanced waste-management technologies, from re-mining systems to water-treatment solutions.

- We recommend embedding stricter controls on the production or storage of mining waste during a mine's active phase. If companies must consider the full lifecycle of tailings from the outset—through measures such as mandated waste-minimization plans or proportionate levies on each tonne of tailings produced—they have a clear financial and regulatory incentive to reduce waste volumes, adopt more efficient extraction techniques, or collaborate on shared processing facilities.
  A levy that accurately reflects environmental and social costs could prompt companies to invest in re-mining or in advanced separation technologies that cut total waste. A complementary option involves setting stricter performance standards for tailings storage facilities, requiring that they be designed from the outset for possible future re-entry and lower-impact closure. The cost of development and compliance for operators might be higher initially, but should result in net long-term savings.

Chapter 9 Household, consumer and emerging electronics

Focus
Unlike other chapters, this chapter narrows the overall material stream to specific categories ('household, consumer'). The justification for the narrow focus is data on global generation and collection/recycling, and the overall recycling rate. While large items and temperature exchange equipment do have higher recycling rates, they are still quite low, and given their size, in absolute terms, the unrecycled quantity equals of approx ~20 b kg, which is greater than the unrecycled quantity of small items (~18 b kg).
The prioritisation is based on progress in one of the lowest-order circular economy strategies of recycling, and does not include consideration of progress in these product categories of higher order strategies like reduction, reuse, repair etc. These other electronics product categories could also benefit greatly from the higher order strategies of reuse and repair. Cases for narrowing to a focus on small items should be part of the prioritisation process for reform directions.

- We recommend that the topic/chapter be identified simply as "electronics". Productivity Commission reports have a long impact, as they can guide future attention and effort of researchers, industry and other jurisdiction policy makers beyond the life of the specific inquiry.
- We recommend that other areas of electronics be considered reform priorities, alongside small items.

The areas of reform priority do not include durability which is a core circular strategy and particularly relevant in electronics, where there are important aspects of technical, functional and emotional durability. The pace that technology evolves puts pressure on function and emotional durability, which can lead to products being abandoned well before they reach their technical end of life. There can also be a substantial tension between designing for technical durability and designing for repairability (ie. where strategies to increase either durability/reliability, or repairability, are actually in conflict with the alternative outcome)[23].

- We recommend that Durability be included as a reform priority, alongside reuse and repair (and recycling).

Recommendation 9.1 Product labelling scheme

Monash strongly supports this recommendation.

Labelling for durability offers the most opportunity for changing consumer purchasing behaviour. Labelling for repairability is also valuable for those niche segments of consumers who are strongly motivated by environmental concerns, or getting the most out of their products. There can be tradeoffs between designing for durability and designing for repairability[24], and so it would be important to consider how this could affect a label that includes both durability and repairability scores, and ensure that highly durable designs are not unduly penalised for scoring lower on repairability.

[23] Cordell et al (2021) (https://www.sciencedirect.com/science/article/pii/S0959652620354342)
[24] Cordell et al (2021) (https://www.sciencedirect.com/science/article/pii/S0959652620354342)

If such a scheme is introduced, we recommend:

- Consumer awareness and education on the greater benefits of durability compared to repairability to prevent any backfire effects
- that as part of the scheme, businesses are supported to understand how they can design products to have better durability and repairability outcomes (and achieve higher scores) so that the scheme works as much to influence producer behaviour as it does consumer behaviour, for the greatest impact overall.[25]

Information request 9.1 Barriers to greater reuse and repair

Just under half of Australians have ever had household electrical or electronic items repaired by a paid third party service, or via a free brand service (e.g. under warranty)[26]. In one Australian state, paid repair was highest for whitegoods (24% ever) and ICT (22%) and much lower for small items (6% ever)[27]. While this highlights the biggest adoption opportunities for small items, it again shows there is still significant adoption opportunity amongst the other categories.

Fewer than 15 per cent of Australians had successfully had an item repaired in a 12 month period through one of the channels, but 54 per cent reported intentions to attempt to get any broken electrical/electronic items repaired in the coming 12 months, representing a large gap between intention and action. Importantly, there is a pattern of people who initiate a repair attempt but abandon the attempt[28] often due to system barriers including a lack of replacement parts, price comparisons once the issue was diagnosed or the design of the product itself rendered it unrepairable.

This indicates a strong unmet demand. A large part of it relates to supply/availability of relevant repair services: over 40 per cent of Australians do not have any access to, or knowledge of how they could access repair services for electrical and electronic items.

Providers are crucial intermediaries to the supply and availability of repair services, overcoming barriers with knowledge of spare parts availability, expected cost of the repair or the design aspects of the broken item. When service providers recommend that it would be ‘easier to replace’ an item, consumers are often led to abandon repairs. On the other hand, service providers can offer important advice such as ways to access hard to find replacement parts (e.g. eBay).

- We recommend strategies that not only support the supply and uptake of repair services, but ensure repairs can be successfully completed
    - Several Local Councils have begun to establish their own repair directories[29]. While this information is beneficial to residents, it is fragmented and a central source is lacking. A national database of repair service providers could support consumers to easily access repair information, while also supporting service providers. Examples of databases internationally provide the Australian Government a blueprint for how knowledge can be provided at a national level[30]
    - To address the system barriers relating to abandoned repair attempts, policies should support service providers to adequately enable consumer repair efforts. We suggest this can occur through increased access to repair training, improved availability of spare parts (e.g. through mandates that address the current reliance on sourcing second-hand options) and incentivising service providers to prioritise repair when it is appropriate to do so.

[25] Kaufman et al (2020) (https://drive.google.com/file/d/19nV758qJYK7BXQUTtU1ZC4-Cr1FtXb_w/view)
[26] Downes & Hatty (2022) (https://www.dcceew.gov.au/sites/default/files/documents/technical-research-report-methods-waste-prevention-activity.pdf)
[27] Details available to the Commission from Monash upon request.
[28] Details available to the Commission from Monash upon request.
[29] See example: Boroondara repair directory (https://www.boroondara.vic.gov.au/services/waste-and-recycling/reduce-and-recycle-your-waste/boroondara-repair-directory)
[30] See: Repairmystuff (https://www.repairmystuff.ie/) Nationaal Reparateurs Register (https://www.nationaalreparateursregister.nl/)

Recommendation 9.2 Include reuse and repair targets in the NTCRS and increase the use of tracking devices

Monash supports this recommendation and suggests consideration also be given to changes that directly support reuse and repair activities (i.e. by redefining collection as end-of-use; incentivising, e.g. through eco-modulation, the design of durable and repairable TVs, printers and peripherals; and public reporting on achieved durability, reuse and repair outcomes), as well as removal of 'recycling' from the scheme name to emphasise this shift to higher-order strategies.

Reform direction 9.3 and Information request 9.2 Product Stewardship for small electronics, including embedded lithium-ion batteries

Monash supports this recommendation.

Barriers
Consumer barriers can typically be categorised according to the stage they are experienced: awareness, intention, attempting and completing. As an example, with returning batteries to a return point, just over one-third do not make an attempt, either because of complete lack of awareness or lack of intention, another one-third make some effort/attempt to return without having (yet) completed the action, and just over one-third have successfully completed a return of batteries to a dropoff point[31]

- We recommend that any scheme needs to consider availability, ease and capacity to use the scheme.

Monash's preliminary consideration of potential strategies to increase battery return shows that a significant number of the strategies actually need to be implemented at the design, production and packaging stages, and therefore design considerations need to be an important part of the scheme (discussed below).

Scope
Monash research has shown that the general population find it very difficult to distinguish between electrical/electronic items that contain removable batteries, embedded batteries, and no batteries.[32] A scheme that encompasses all of these products is crucial.

The broadest and most inclusive scope for return would maximise benefits, not just because of product volume, but because of the behavioural impact on the success of the scheme. This is due to the varied ability of consumers to differentiate between different types of electronics products, and then to understand eligibility of different types of batteries and where they can and cannot be taken. This results in consumers either abandoning intentions to return products or attempting to return ineligible products to a scheme, and then after meeting a refusal, never attempting to use that scheme again, even for eligible products.

- We recommend that decisions around whether to exclude items, should explicitly include the negative impact on all relevant behaviours as part of any cost-benefit analysis.[33]

Similarly for reasons of clarity, expanding one or more existing schemes is likely to have greater uptake than creating a new, distinct (third) scheme.

- We also recommend harmonisation with battery stewardship scheme(s) that cover loose (ie. removable batteries).

There is likely to be significant benefit to expanding the existing battery scheme to include all small electrical/electronic items, given the moves in battery responsibility/stewardship to include products containing

[31] Details available to the Commission from Monash upon request.
[32] Details available to the Commission from Monash upon request.
[33] Details available to the Commission from Monash upon request.

embedded batteries[34]. A scheme where all (small) electrical/electronic items can be taken, including those products with removable batteries where the batteries *a*re still inside, as well as loose batteries, is the most effective type of scheme from a behavioural point of view. Challenges with expanding BCycle but not the NTCRS include the potential overlap in small electronic/electrical products and NTCRS peripherals.

Expanding the NTCRS might be a viable option as it already includes some small electronic items ('peripherals'), however as TVs are quite large appliances, there is a possibility for confusion over which other 'large' appliances are eligible. Challenges with expanding the NTCRS and not BCycle include the potential for confusion around products containing removable/embedded batteries, and questions of whether batteries need to be removed.

- If legislative reform is being considered, Monash recommends including for consideration the option of a single mandatory stewardship scheme for televisions/computers, small electrical/electronics and batteries. This could potentially incorporate the current voluntary Mobile Muster. Behavioural research can be specifically designed to test whether an expanded BCycle, expanded NTCRS or combined and expanded BCycle/NTCRs (and MobileMuster) would have the greatest behavioural success.

Staging
Given the potential for consumer confusion about product eligibility and the negative consequences, a staged approach would create significant behavioural challenges including lower takeup, and dissatisfation.

- We recommend that 'behavioural costs' be included in any cost-benefit analysis of a staged approach.
- If a staged approach is adopted, we recommend considering behavioural side-effects and mitigation strategies when determining the sequence of additions.

Minimum value threshold
A minimum value threshold for small electronics carries an extremely high risk of establishing a perverse incentive to purposefully design products more cheaply, to come under the minimum value threshold.

The proliferation of low value electronic products is already a significant issue for Australia, and is expected to only get worse over time. Their price point introduces two challenges for circular economy:

- They can be more easily purchased in greater quantities meaning there is a lot of them in the market
- They are likely to be disposed of in a much shorter time than higher value/quality products, either because there is little 'cost' to a consumer to dispose of it when they no longer desire it, or because it stops working optimally or at all due to its cheap design.

- We recommend that low value small electronics are exactly the products that need to be covered by a product stewardship scheme.

Support for circularity earlier in the product life cycle
Minimum design (+import) standards can have the greatest impact on the transition to a circular economy for manufactured products, including electronics[35]. Minimum standards that require design for durability ensure that products are built to last a sufficient time, and they also lead to many of the other strategies, underpinning the majority of circular business models and responsible consumption practices. Durability is both essential to, and incentivises adoption of, business models centred around sufficiency; product-as-a-service/leasing/hiring; and take-back of products at end-of-use. It is also essential to the post-purchase responsible consumption behaviours

[34] For example, BCycle's Proposed 2.0 Scheme Design includes expanding the scope to accept products with embedded batteries (BCycle, 2024) (https://bcycle.com.au/wp-content/uploads/2024/12/B-cycle-2.0-Design-20241205.pdf); NSW's battery product responsibility legislation includes products containing embedded batteries, and some of these products have already been eligible as part of a trial of collection at a number of Community Recycling Centres across NSW (NSW Government, 2025) (https://www.nsw.gov.au/ministerial-releases/nsw-leads-way-first-state-to-regulate-batteries), (NSW EPA, 2024) (https://www.epa.nsw.gov.au/Your-environment/Recycling-and-reuse/household-recycling-overview/Embedded-batteries)
[35] Macklin, Jungbluth & Borg (2023) (https://cdn.prod.website-files.com/619ab5836de9f00d9c722d98/64e826a743656941ab9e9886_Behaviour%20Roadmap%20to%20Circular%20Consumption%20Final%20Report.pdf)

of Keeping in use as long as possible, Making do with existing, Repairing instead of replacing, and Passing on instead of disposing.

The barriers to voluntary business and consumer adoption of products 'built to last' are significant and form a negative feedback loop in the economy[36]. Without demand, businesses can't shift to making products built to last, and until they make products built to last, consumer demand can't increase. Government intervention is therefore required. Mandatory ecodesign standards have been shown to work in Europe, and are in the process of being extended to maximise circular economy outcomes, providing a good template and learnings to build on.

- We recommend a complementary policy of requiring manufacturers to publish expected minimum lifetimes for key electronic products at different price points and incorporating these into consumer guarantees. This would not only allow consumers to better make use of their existing consumer rights, but also provide the incentive to producers to ensure their products last the expected lifetimes. This would also substantially increase the effectiveness of any durability labelling that might be adopted for electronic products.

Incorporating reuse and repair in extended producer responsibility approaches is the second greatest system transformational opportunity

- We recommend that the design of any electronics stewardship scheme includes explicit, and potentially enforceable, guidance to prioritise reuse and repair over recycling when feasible/appropriate.

There are a number of ways that reuse and repair can be included in a product stewardship scheme, and these include reuse and repair that is facilitated or undertaken by the brand, rather than relying on the user. For example:

- Redefining collection as end-of-use, rather than end-of-life. Consumers are encouraged (and potentially incentivised) to return unwanted but still working products, as well as unusable products. Brands are required to triage returned products for those that can be resold, redistributed (eg. through charities), repaired/refurbished for resale or redistribution. Only products that are not feasible for reuse or repair are recycled. Monash research has found that reuse facilitated by brands (eg. resale or refurbished) is more likely to encourage greater uptake of reuse than relying on peer-to-peer reuse. Similarly, the barriers to repair by a brand are typically smaller than those faced by individual consumers and/or third party services.
- Including a form of eco-modulation for brands' financial contributions where the contributions for products that exceed certain criteria for durability, reuse and repair are lower than for those that are only designed for collection/recycling. Any such criteria should either be based on actual performance/outcomes (eg. achieved lifetimes, achieved use-cycles, achieved repair outcomes) or included explicitly as a transition framework, where initially, modulation is based on meeting or exceeding certain durability, reuse and/or repair *design* criteria, but these transition to being based on actual *outcomes* over time. Any such criteria will need to take account of the potential trade-offs between durability and repairability, and ensure that durability is prioritised, and not penalised where it occurs at the expense of enhanced repairability. (Monash research shows that consumers would much more prefer a product that lasts a significant length of time, than one that has no such guarantees but is easy (even free) to repair.[37]

Importantly, any situation where businesses are required to attempt and/or publicly report on durability, reuse and repair efforts and achievements is likely to motivate up-the-chain design improvements and business model innovations.

- We recommend that regardless of any specific attempts to incorporate specific initiatives/requirements for durability, reuse and repair, any stewardship scheme should have reporting obligations, e.g. annual

[36] BehaviourWorks Australia (2020) (https://cdn.prod.website-files.com/619ab5836de9f00d9c722d98/645add96c112e06dec7090c5_Business%20barriers%20to%20CE_Rapid%20review_POLICY%20HIGHLIGHTS.pdf), Macklin, Jungbluth & Borg (2023) (https://cdn.prod.website-files.com/619ab5836de9f00d9c722d98/64e826a743656941ab9e9886_Behaviour%20Roadmap%20to%20Circular%20Consumption%20Final%20Report.pdf)

[37] Klemm & Kaufman (2022) (https://drive.google.com/file/d/1_zmWow0sm8Pb2E0ME24UrLh8IcAoNtra/view)

reporting of minimum or average average product lifespan, number and duration of use-cycles, which is then published by the scheme.

Reform direction 9.4 and Information request 9.3 Product stewardship for small-scale PV systems

Monash supports this reform direction, and believes that many of the points above regarding circularity earlier in the product life cycle for small electrical items apply here.

Specifically:

- Compensation for systems returned in good condition is likely to incentivise the return of potentially reusable systems, which could maximise optimal use of working systems.
- Designing features into the scheme that encourage durability, reuse and repair, to maximise the effectiveness of the scheme, for example (re)defining collection as end-of-use; incentivising (eg. through eco-modulation) the design of durable, reusable, dismantable and repairable PV systems/installations; and public reporting on achieved durability, reuse and repair outcomes.

Chapter 10 System wide arrangements

We agree with the overview of cross-cutting issues that affect the adoption of circular economy practices, especially around harmonising regulations, closing data and information gaps, and clarifying roles for different levels of government. By emphasising policy coordination and calling for improved monitoring (including expansion of metrics beyond merely weight-based measures), the Interim Report recognises that a systems lens is needed to tackle barriers across multiple sectors of the economy.

Framing the circular economy as a collection of discrete opportunities (particularly around reducing waste and alleviating regulatory inconsistencies) misses the the strategic, transformative character of the circular economy across value chains and underplays the strategic and financial upsides of resilience, innovation, differentiation.

The focus of intergovernmental harmonisation on regulatory coordination could be strengthened by a clearer vision of the circular economy as a driver of future competitiveness and new sources of growth rather than purely a mechanism to “reduce negative externalities” or to manage waste streams, and framing of circular economy benefits as marginal “efficiencies” or “savings weighted against the cost” of circular transitions.

Australia’s most impactful opportunities lie in innovations that extend current conceptions of resource recovery, especially around mining, clean energy circularity and becoming a preferred destination for the testing of cutting-edge technologies that would not be possible in more mature markets

We support a comprehensive challenge-based mission approach. Monash research consistently finds that significant barriers—fragmented governance, siloed funding structures, risk-averse mindsets, and uncertainty about new business models—cannot be addressed solely by harmonising regulations (important though that step is). Instead, an overarching mission-based approach is vital, led by the Commonwealth and co-created with States/Territories, industry, households, peak bodies, and the research sector.

A mission-led approach would engage departments dealing with industry, trade, finance, regional development, and beyond, ensuring that the circular economy is treated as a national economic transformation—akin to digital or energy transitions—rather than an environment-focused endeavour alone.

There are a range of challenge-based funding models that offer a powerful way to mobilise these capabilities.

- Mission-driven funding calls that align research and industry efforts on specific circular economy goals (e.g. EU Horizon’s Circular Cities and Regions Initiative, and in the health sector WellcomeLeap);
- Industry-posed problem solving where researchers respond directly to business needs (e.g. NSW Circular’s partnership with UNSW on low-carbon concrete);

- Collaborative R&D consortia that tackle systemic issues across supply chains (e.g. UKRI's Smart Sustainable Plastic Packaging Challenge, CRCs);
- Place-based demonstration projects in precincts and regions (e.g. Christchurch's CE approach);
- Innovation sprints and accelerators that bring together SMEs, researchers and policymakers (e.g. Canada's Circular Economy Solutions Series); and
- Procurement or outcome-based models that create demand-pull for circular solutions (e.g. Circular Bioeconomy Alliance's SDG-aligned funding).

- To ensure an enduring and consistent approach that maximises Australia's Circular Economy opportunities, we recommend a Commonwealth-led nationally representative coordination body, with an R&D-led transition partnership program.

  A coordinating body across the Commonwealth and States/Territories (all portfolios) could collaborate with business, academic and consumer stakeholders to produce:
  - a statement that links circular economy progress to broader objectives including productivity growth, carbon emissions reduction, resource security, brand differentiation for Australian exports and intergenerational equity
  - an investment framework including support for high-risk, high-reward projects[38]
  - national reporting frameworks
  - a regulatory roadmap to overcome fragmentation and give coherence to specific policy instruments

  It could oversee:
  - A Circular Economy Standards Board with powers similar to national build standards bodies. This body would streamline definitions, standards and data reporting across states and territories and it could integrate the performance-based standards approach outlined in earlier chapters
  - Investment in mission-focused innovation funds including a Circular Production Investment Fund and a Circular Business Incubator Fund to spur collaboration between large-scale manufacturers, startups and research institutions, and tying capital allocation ot measurable, mission-driven outcomes
  - An enlarged role for public procurement and lighthouse projects that includes requirements for Commonwealth agencies and guidelines for State/Territory agencies. They could be accelerated with lighthouse approach, perhaps piloting detailed implementation within specific agencies or major infrastructure projects.
  - Alignment of data and measurement to enable systemic change. The Commission's call for additional data could explicitly tie indicators to long-term national missions (e.g., resource security, economic value-added from circular activities, or carbon impacts). That way, measurement becomes a pathway to gauge Australia's transformation rather than merely tracking "material diverted from landfill."

  R&D-led transition partnership
  Australia's universities are well positioned to act as knowledge and action brokers in advancing circular economy transitions. With deep research capability, longstanding relationships across sectors, and infrastructure for experimentation, they can convene diverse stakeholders—industry, government, and communities—to co-develop, test, and scale innovative circular solutions

  As the Interim Report notes, cultural and organisational barriers to collaboration exist yet greater cross-sectoral engagement is foundational to the circular economy transition.

[38] The Australian Government already has relevant instruments in place for infrastructure and research, but without explicitly allocating patient capital for circular economy opportunities, promising innovations may fail to scale.

Current research funding resembles an SME procurement process, fragmenting resources across diverse, often loosely related projects labelled as circular economy, diluting impact and diverting resources from genuine circular economy experts and innovation leaders. A more investment-oriented approach, akin to private equity or venture capital, would better identify and support high-impact initiatives.

A dedicated transition partnership can connect businesses with academics, investors, regulators and government. We propose a comprehensive R&D-led transition partnership of academic research organisations and national institutes, governments, industry, and peak bodies to systematically identify and advance strategic circular economy investments.

Monash and the CSIRO are in discussions about a possible partnership to take advantage of the CSIRO's national science-mission infrastructure and the Monash Circular Economy Labs' proven ability to broker industry–policy collaborations. It could:

- Coordinate collaboration across the innovation system\
- Systematically identify, evaluate, and advance strategic circular economy investments through dedicated governance structures and clear strategic priorities
- Leverage Monash and CSIRO's collective research and practical capabilities, creating an authoritative, action-oriented knowledge hub providing data-driven insights, actionable strategies, and practical toolkits for stakeholders.

Successful international examples include Germany's Energiewende (over 300,000 renewable jobs, targeting 95% emissions reduction by 2050), the EU Green Deal (EUR 1 trillion investment for carbon neutrality by 2050), South Korea's Green New Deal (USD 61 billion investment for 650,000 jobs by 2025), and China's sustainable finance pilot zones (over USD 220 billion mobilised), underscoring the effectiveness of collaborative approaches in achieving competitiveness and sustainability goals.

Reform Direction 10.4 Place-based initiatives

Facilitation of Aboriginal and Torres Strait Islander roles in place-based circular initiatives
We endorse the 12 core principles developed by the Victorian Federation of Aboriginal Corporations (VFAC) in their caring for country circularity framework:

1. Stewardship - An obligation to care for Country. Regenerative and moderate use of resources.
2. Seasons - Understand Seasonal indicators and considerations.
3. Species - Know local Species and ecosystem relationships. Local species as Participants.
4. Source - Identify indigenous sustainable Sources. E.g. Original water tables.
5. Sharing - Sharing and Reciprocity. E.g. Share abundant seasonal crops with neighbours.
6. Social Impact - Actions that contribute to societal health and well-being.
7. Supply chains - Sustainable, regenerative, fair and transparent supply chains.
8. Systems - Systems not Silos. Systems dynamics. Develop collaborative business systems.
9. Scale - How does it operate on Country at different scales? Macro, Meso and Micro.
10. Sense and Respond - Feedback Loops. Capture and respond to real needs.
11. Synergy and Time - Take a broader and longer view of time. Yesterday, Today & Tomorrow.
12. Songlines and Stories - Traditional Owner Cultural knowledge and Lore. Seek publicly available information.

- We recommend engaging with the VFAC and enacting the 12 principles in Indigenous-led initiatives would help realise the goals to value Aboriginal and Torres Strait Islander knowledge and develop place-based circular opportunities. Existing cultural safety and IP frameworks are a good start but need stronger and more consistent implementation.

Regional and remote circular economy transition compared with urban innovations

Monash is conducting substantial research via the National Environmental Science Program 2: Sustainable Communities and Waste Hub on regional and remote Circular Economy innovation and their contribution to transitions to a circular economy. The material presented here is based upon the first phase in 2022-23 which explored the roles of local governments via a survey comparing regional / remote and urban local governments[39].

The survey showed inequity between urban and regional transitions to circularity in terms of the nature and level of activities regarding materials of concern and/or interest, circular economy initiatives and implementation (with urban areas having a wider base of partners), and initiative maturity (regional areas tend to have initiatives stall in the conceptual phase at a greater rate).

Analysis suggests the inequity arises when state and federal strategies miss contextual differences and challenges, and opportunities of Australian regional and rural areas, compared to urban environments. This is especially pronounced for policies and initiatives that are taken from other contexts such as the EU.

Circular economy innovators in regional local governments reported that they have

- a relative lack of input to policies and strategies impacting them, or that could help but don't
- a need for capacity building needed in regions
- a lack of networks and collaborations

Local councils need

- place-based strategies
- network governance models
- consideration in both policy and theoretical perspectives, rather than a one size fits all strategy

The current phase of research is exploring whether or not place based regional initiatives are an effective innovation niche for CE, and what different actors can do to seed, build and bolster regional, place based initiatives.

Materials recovery.
Barriers. Regional and remote areas have space, and regional areas can sit in logistics hubs pre-consumer materials streams, but tend not to have as large volumes of post-use materials (except where they are hosting urban sourced landfill material). They lack economies of scale, skilled specialist capabilities, and access to private sector funding (their initiatives were more likely to rely on government investment in our 2022 study).
Urban areas by contrast benefit from being close to logistical hubs, such manufacturing as exists, and b2b and post-consumer material streams, and have access to a wide variety of partners and capabilities. However, they also face challenges in land use conflicts and encroachment, integrating circularity amongst other council priorities (it tends to be more siloed and specialised in larger urban government areas). Many local governments in urban areas rely on third-party handlers of waste, and can face unequal capability and scale issues when negotiating with multinational companies on materials handling value capture and waste management.
Priorities. The focus in urban areas is specific to individual materials and re-circulation options, while regional and remote areas grapple with transportation challenges, limited resources, and environmental concerns surrounding waste disposal and recycling. Respondents' comments from both locations suggested some tensions between what materials are priorities for community and political reasons, and what council managers see as priority materials based on considerations such as impacts on processing capacity, finances, health and environment.

[39] https://bridges.monash.edu/articles/report/Local_government_facilitation_of_circularity_in_regional_and_remote_Australia_2023_Survey/28440827

A thematic analysis of responses, identified the main reasons given for identifying material priorities:

Urban

- E-Waste (including Solar Panels): Lack of viable local recovery options and product stewardship, leading to potential environmental and safety concerns
- Food Organics (FOGO): Driven by government commitments and environmental concerns, with an emphasis on implementing programs to divert organic waste from landfill.
- Plastics (Soft and Rigid): Community concern and environmental impact, particularly due to limited recycling options and high volumes of municipal waste
- Glass: Political and environmental considerations, although crushing glass is seen as a low-value use of resources.
- Construction and Demolition Waste: Significant landfill contribution due to lack of reuse and repurposing practices, alongside contamination of recycling streams by composite materials.
- Batteries: Safety hazards, especially concerning lithium batteries, lack of operators to manage problematic batteries, and inadequate recycling infrastructure.

Regional/Remote

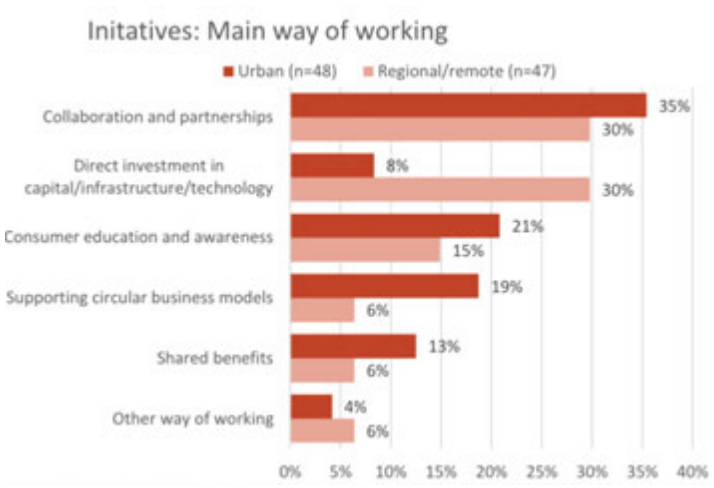
- Transportation Challenges: The environmental impact and financial burden of transporting materials to processing facilities outweigh the positive impacts, particularly for items like mattresses, tyres, and bulky waste
- Limited Infrastructure: Lack of infrastructure for recirculating certain materials like tyres, plastics, and e-waste, leading to illegal dumping, burning or accumulation in landfills.
- Environmental Concerns: Issues with environmental impacts, such as fire hazards and health risks associated with improper disposal of materials like tyres, chemicals, and scrap metal
- Geographical Constraints: Remote locations face challenges in accessing recycling options, leading to stockpiling or landfilling of materials like green waste, tyres, and e-waste.
- Financial Constraints: Limited funding and high costs associated with managing and transporting waste for recycling, especially for smaller local governments.

Service provision and funding models and government assistance

While physical infrastructure remains a gap and the focus of much existing funding, our research also highlights the lack of local of innovation catalysts in the form of non-aligned 'transition brokers' - individuals or groups without a direct vested interest in a given proposal, who can help facilitate collaboration and coordination between industry, government, research and community actors. The ability to seed or source venture capital in promising initiatives seems crucial in the early stages, however this should be with a view to long-term independence and scale-up, rather than ongoing depending on government or philanthropic funding.

In terms of when in the material life cycle of intervene, while real opportunities exist for post-consumer circularity in remote and regional areas, we would suggest the greater opportunity is in pre-consumer and b2b circularity, especially as relates to food, fibre and other agricultural productions, and from mining and the processing of resources.

The charts below show the collaborators and collaboration models for urban and regional/remote localities.



Reform Direction 10.5 Expanding the set of indicators

We note the tension between progress measures and reporting burden and support the core indicators proposed.

A significant reporting gap is the important area of circularity performance and its impact, which is in effect a black box in many industries. This lack of transparency impedes everything from procurement decisions to strategic target-setting. For example, promoting circular procurement without clear performance metrics risks greenwashing, freeriding, and unintended incentives. There is a broad body of literature on the topic of measuring the circular economy[40] and emerging examples for greenhouse-gas-related performance measurement[41] , but a common approach remains elusive. Monash is in discussions with the World Business Council for Sustainable Development (the Council) to conduct a joint review on the performance of already employed indicators and benchmark facilitation approaches for a coordinated adoption of standardised indicator sets for different industries based on the Council's successful work around avoided emission metrics.[42]

[40] Additional to the EMF material, we also recommend Moraga et al., 2019 (https://doi.org/10.1016/j.resconrec.2019.03.045) and Saidani et al., 2019 (https://doi.org/10.1016/j.jclepro.2018.10.014)

[41] For example, the Avoided Emissions concept of the World Business Council for Sustainable Development (https://www.wbcsd.org/news/launch-of-the-open-consultation-for-the-avoided-emissions-guidance/)

[42] https://www.wbcsd.org/news/launch-of-the-open-consultation-for-the-avoided-emissions-guidance/

MONASH University

APPENDIX 1: Eight recommendations for settings for an integrated systems approach to accelerate circular transition

Business & economic outcomes	Environmental outcomes	Social outcomes	Uptake and monitoring	Prioritisation	Incorporation of Aboriginal and Torres Strait Island knowledges
1. Establish a clear target picture with milestones, review processes, and transparent communication. Assign responsibilities and resourcing across levels of government, allowing tactical freedom					
Milestones enhance predictability, enabling businesses to invest strategically in circular innovations. Economic outcomes include increased efficiency and value retention within supply chains	Aligning milestones with biodiversity, climate goals, and waste reduction targets enables more effective water, land, and air quality management.	Transparent communication builds public trust. Clear resourcing and responsibility create job opportunities at various governmental levels	Gradual adoption, beginning with high-profile sectors. Monitor performance through annual progress reviews, tracked against environmental and economic metrics.	Sectors with the highest impact on waste reduction, resource efficiency, and local job creation	Incorporate Indigenous governance models and consultation frameworks to ensure that traditional land management practices are respected, to protect cultural and intellectual property
2. Develop a Circular Economy Industrial & Trade Strategy, engage partners in trade partnerships, streamline regulatory frameworks, and seek trade agreements based on joint priorities around global resilient and responsible supply chains					
Boosts Australia's competitive advantage in global value chains. Businesses will face initial compliance costs but benefit from streamlined regulations and access to resilient, low-risk supply chains.	Supports climate resilience by reducing resource extraction and waste. Global supply chains will be more sustainable, minimising biodiversity and habitat destruction.	Creates sustainable employment opportunities in trade-related industries. More resilient supply chains reduce the social vulnerability of communities dependent on these industries	Measured through trade volumes in circular goods, the uptake would be driven by international agreements and the incentives provided for compliance.	Sectors that can quickly or are actively building momentum to transitioning to circular supply chains, such as electronics, textiles, and plastics.	Engage Aboriginal and Torres Strait Islander experts in discussions on sustainable resource management, and traditional practices that align with circular economy principles
3. Review existing policies and regulations and develop policies inspired by best European practices. Coordinate closely with international partners. Establish a system of regular evaluations to balance Circular Economy needs, waste hierarchy, and trade considerations					
Unlocks growth in sectors focused on waste management and resource recovery, reducing operational costs tied to compliance and waste disposal.	Facilitates better resource prioritisation for reducing high-value waste streams, contributing to climate goals, and preserving biodiversity.	Lowers business barriers and foster job creation in waste management and resource recovery industries, enhancing social equity.	Allows regular evaluations of policy effectiveness and export potential. Metrics could include waste recovery rates and economic value generated from recovered materials.	High-value waste streams wit export potential and high economic and environmental impact such as e-waste and plastic.	Engage Indigenous communities in the co-design of regulations for high-value waste streams that intersect with traditional lands, ensuring the protection of cultural heritage and ecosystems
4. Establish a Circular Economy Standards Board, as a Commonwealth entity, similar to arrangements around building standards, to co-design voluntary standards with States/Territories, consistent implementation					
Reduces regulatory complexity for businesses, leading to cost savings. Standards also create opportunities for businesses to differentiate themselves by demonstrating compliance	Enable effective monitoring of circular practices, such as resource recovery and emissions reduction, improving environmental outcomes	Enhances social equity by ensuring consistent, fair regulations nationwide, benefiting communities and fostering local jobs.	Standards could be voluntary initially but scaled up based on compliance metrics, such as the number of businesses adopting CE standards	Sectors with fragmented regulation or inconsistent performance in circular practices.	Collaborate with Indigenous knowledge holders to develop standards that reflect sustainable use of land and natural resources, ensuring cultural respect and ecological stewardship

5. Set Up a Circular Production Investment Fund to support circular production and logistics projects in global value chains

Access to capital accelerates the adoption of circular production practices, reducing costs associated with raw material procurement. This drives innovation and competitive advantage	Promotes circular production processes, reducing waste and emissions while preserving ecosystems	Job creation in green technologies and innovation hubs, particularly in rural or economically disadvantaged areas, enhances social equity	Funding disbursements should be tied to clear circularity outcomes, measured by reducing virgin resource use and waste production	Focus initially on sectors with high economic potential, such as renewable energy, sustainable packaging, and electric vehicles.	Invest in Indigenous-led circular ventures, ensuring their traditional knowledge and practices are protected and utilised in sustainable production

6. Launch a Circular Business Incubator Fund with place-based incubators to support circular startups and foster collaboration among ecosystem stakeholders

Incubators lower barriers to entry for startups, stimulating entrepreneurship and creating new market opportunities, reducing costs and promoting innovation.	Incubators can drive technological solutions that significantly reduce resource use and waste, improving air and water quality.	Fosters inclusive growth, with incubators supporting Indigenous and minority-owned businesses. Creates job opportunities in circular sectors, enhancing local economies.	Success can be tracked by the number of startups launched and their subsequent impact on reducing resource use or waste.	Prioritise regions with a strong entrepreneurial ecosystem or areas needing economic revitalisation.	Establish incubators with programs specifically for Indigenous entrepreneurs, ensuring their cultural heritage and ecological knowledge are integral to the business models they develop

7. Adopt CE-Focused Public Procurement Rules, mandatory for the Commonwealth and recommended for States/Territories. Pilot a detailed approach with the Australian Defence Forces as a lighthouse project for other government areas.

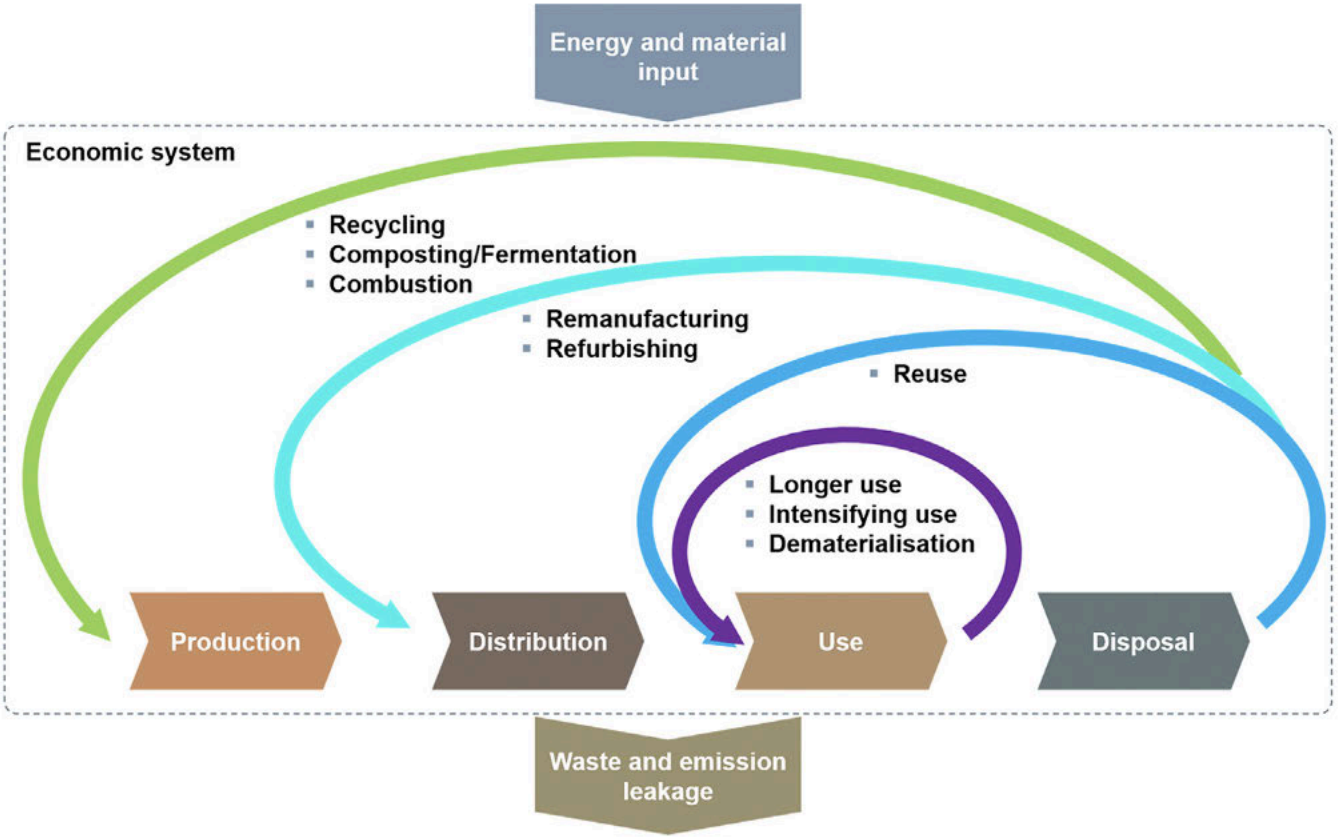
Procurement rules create a stable demand for circular products, lowering costs for businesses that adopt circular practices early	Public sector demand for circular goods sets a strong example for the private sector, driving emissions reductions and resource efficiency.	Job creation in circular product supply chains, especially if linked to local production, enhances community development	Pilot programs like the Australian Defence Forces could serve as test cases, measuring compliance, cost savings, and environmental impact.	Target sectors with large government procurement volumes, such as construction, healthcare, and defence.	Incorporate procurement standards that prioritise Indigenous-owned suppliers and products that integrate sustainable land use practice.

8. Expand Product Stewardship Schemes: Review and strengthen current voluntary schemes, expanding mandatory stewardship to more industries beyond oil

Expanding stewardship programs lowers raw material costs for businesses by incentivising recycling and reuse while creating new revenue streams	Stewardship programs reduce waste, improving land and water quality by diverting products from landfill	Increased engagement in stewardship programs can lead to better waste management systems, job creation, and improved community health	Scheme expansion can be measured through participation rates, waste recovery volumes, and product lifecycle analyse	Focus first on industries with a clear potential for resource recovery, such as electronics, construction, and textiles.	Engage Indigenous communities in stewardship programs related to land conservation and resource recovery, ensuring their ecological practices are respected and preserved.

APPENDIX 2: A definition and model of circular economy

The circular economy describes an economic system in which resource input and waste, emission, and energy leakages are minimised by cycling, extending, intensifying, and dematerialising material, water, and energy loops; this can be achieved through digitalisation, servitisation, sharing solutions, long-lasting product design, maintenance, repair, reuse, remanufacturing, refurbishing, and recycling, and supported by higher efficiency and renewable energy and materials.



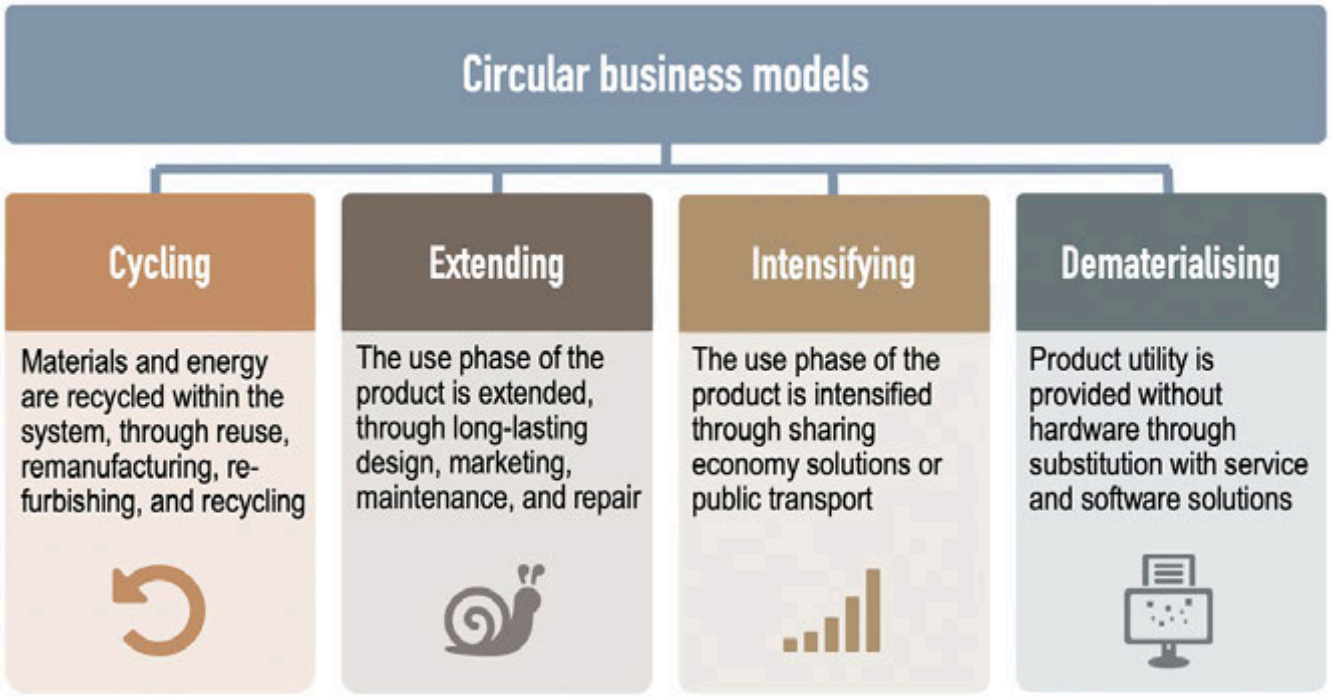
The circular economy, (Geissdoerfer et al. ,2020, p. 4)[43]

Within the circular economy, interventions are directed to maximise resource value. Interventions can occur over all stages of the product life cycle from design, over manufacture and use phase, to the product's end-of-life. Four generic strategies can be derived, as illustrated in Figure 2, supported by increasing energy, water, and material efficiency, and using renewable materials and energy.

Strategies that avoid ownership of products (intensifying and dematerialising) and prolong the lifetime of the product (extending) tend to yield better sustainability performance then end-of-life strategies (cycling).

Within cycling, shorter resource loops can be adopted, maintaining higher resource value. For example, if a product is repaired and reused by another user, instead of recycled,it can re-enter the manufacturing process, compared to going to recycling and being turned back into a material, leading to less energy and material use in the process. This follows the logic of the waste hierarchy. While these strategies should ideally be considered at a case-by-case basis, considering combining different strategies and supporting them through renewables and efficiency measures, there is some consensus that recycling and waste-to-energy should be avoided.

[43] https://backend.orbit.dtu.dk/ws/files/222423121/1_s2.0_S0959652620337860_main.pdf


Circular business models
Cycling
Materials and energy are recycled within the system, through reuse, remanufacturing, re-furbishing, and recycling
Extending
The use phase of the product is extended, through long-lasting design, marketing, maintenance, and repair
Intensifying
The use phase of the product is intensified through sharing economy solutions or public transport
Dematerialising
Product utility is provided without hardware through substitution with service and software solutions

APPENDIX 3: Contributors

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