TSA Drive a circular economy by maximising the value of the resources in used tyres and conveyor belts

TyreStewardship AUSTRALIA

Inquiry into Australia's Opportunities in the Circular Economy

Submission to the Productivity Commission

October 2024

Australian Government Accredited Product Stewardship Scheme

Contents

Executive Summary

Purpose of the Inquiry

The purpose of the Inquiry is to examine the opportunities for implementing a **'circular economy'**, viewed principally through the economic lens of **'material productivity'** and **'material efficiency'**, to help **'decouple'** material use from human impact on the environment.

The Economic Proposition

The implication is that the circular economy can help enable the transition needed to foster a resilient, prosperous and expanding economy, in the face of falling productivity in Australia[2], the environmental **'poly-crisis'** of climate change, nature loss, and waste and pollution[3], current geo-political issues, and other megatrends[4].

The Appeal of Material Circularity

The appeal of pursuing improved **'material circularity'** in Australia's export-orientated economy is both strategic and analytical.

Strategically, it positions environmental protection, social equity, and economic growth as aligned objectives. This more complete, longer view[5] on the economy is absolutely fundamental to compete internationally on sustainable development.

Analytically, it delivers efficiency and productivity results, by encouraging wide and deep analysis of what materials we use and how well we use them. Including what we import, produce, and export, and the relates to end-of-life products.

End-of-Life Tyres as the Ideal Case Study

Tyres and conveyor belts are an instructive case study of how circular economy and system thinking can change the way we manage materials in Australia. Tyres are ubiquitous, are all imported to Australia, and provide a microcosm of the environmental, social, and economic considerations important to contend with.

Making the most of the resources at the post-consumption phase of end-of-life phase tyres and conveyor belts, particularly the rubber compounds, is the immediate challenge and focus of TSA's submission.

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[2] Australian Government, Productivity Commission (2024) Annual Productivity Bulletin, https://www.pc.gov.au/ongoing/productivity-insights/bulletins/bulletin-2024

[3] United Nations Environment Programme, International Science Council (2024) Navigating New Horizons, A global foresight repot on planetary health and wellbeing https://wedocs.unep.org/handle/20.500.11822/45890

[4] CSIRO (2022) Our Future World, Global megatrends impacting the way we live over the coming decades https://www.csiro.au/en/research/technology-space/data/Our-Future-World

[5] This longer view, and dynamic efficiency, is explored in Appendix A.

A Decade of Effort

The upshot of tyres being a vexing global waste and pollution challenge, including in Australia, is that much attention has been paid to finding productive applications for them at their end-of-life.

We are not there yet, but for its part, TSA has spent the past ten years and has disbursed over $10M in funding to support industry R&D and related market development, with this leveraging a ratio of 1:3 of private sector investment over the past five years.

Examples Show the Way

TSA's submission presents case studies of some of the firms doing interesting, innovative things to improve material circularity for tyres and conveyor belts.

We also highlight our efforts to develop business cases tailored to specific regions, like North and Far North Queensland, and targeted sectors, particularly the off-the-road (OTR) tyre and conveyor belt sector, which is integral to Australia's mining industry.

Dual Circulation as the Strategy to Succeed

Going forward, a **'dual circulation strategy'** is proposed as an appropriate strategy for Australia to realise the identified circular economy vision, including as it pertains to tyres and conveyor belts.

This means achieving much stronger domestic material circularity (internal circulation) while regenerating nature and continuing to strengthen Australia's international economic position by fully participating in and finding opportunities to specialise in high-value global markets (external circulation).

The internal and external loops are linked. By improving our practices and fully recovering end-of-life tyres and conveyor belts, we can achieve the material scale needed to reindustrialise and produce essential products for both global and domestic markets.

Global Issues are Australia's Opportunities

On external circulation, issues in key parts of the global tyre supply chain provide real opportunities, especially for advanced manufacturing. This includes issues with the production of '**natural rubber'**, and the production of the **'carbon black'** material that provides tyres with their longevity.

Addressing Australia's Needs

Within Australia, there are significant needs, including '**carbon abatement'**, and opportunities to enhance durability in roads and other civil infrastructure[6]. Instead of the current heavy reliance on unrecovered disposal and energy recovery pathways (accounting for 74% of all end-of-life tyres), we can enhance resource recovery and shift our domestic focus toward using tyre-derived materials to build the resilient infrastructure Australians want and need.

Regulated Product Stewardship as the Tool to drive Material Circularity

TSA's position is that fully '**regulated product stewardship'** schemes (either co-regulated or mandatory and legislated under the Commonwealth *Recycling and Waste Reduction Act 2020*) are fundamental to improving material circularity on priority products, including tyres and conveyor belts. They are the closest thing we have to a silver bullet. Government regulation is necessary to make big business adopt a recycling mindset and Australia a circular economy[7].

There is a wealth of analysis, dating back decades, including by the CSIRO[8], and most recently by the Western Australian Government[9], that reiterates again and again that moving to fully regulated product stewardship schemes is a necessary, prudent move.

Make the Decision

The main barrier to better material circularity outcomes for priority products is the decision to fully regulate.

TSA is calling on the next meeting of the inter-jurisdiction Environment Ministers' Meeting to commission a regulatory impact analysis process, which includes a benefit-cost analysis, for the introduction of a regulated product stewardship scheme for all end-of-life tyres and conveyor belts. This analysis can happen simultaneous to this Inquiry.

A regulated product stewardship scheme should be designed based on circular economy principles, learn from regulated schemes operating globally, and be fit-for-purpose in the Australian context.

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[6] NSW EPA, https://www.epa.nsw.gov.au/publications/recyclereuse/carbon-abatement-opportunities-for-circular-economy NSW EPA, Carbon Abatement Opportunities for Circular Economy https://www.epa.nsw.gov.au/publications/recyclereuse/carbon-abatement-opportunities-for-circular-economy

[7] The Australian, webpage, https://www.theaustralian.com.au/business/lack-of-investment-holding-back-innovation-and-green-solutions/news-story/f447679d52e6d87a7a4d31b9feaaa1ec

[8] CSIRO (2021) Circular economy roadmap for plastics, glass, paper and tyres https://www.csiro.au/en/research/natural-environment/circular-economy

[9] On behalf of the Environment Ministers' Meeting. The Western Australian Government recently produced the National End-of-Life Tyres Options Project, Discussion Paper.

Economic Advice

The economic advice in our submission is that when evaluating and prioritising circular economy actions, consider the long-run implications for Australian productivity and welfare, which crucially depends on investment in R&D and innovation. This is important to ensure that Australia positions itself strongly for opportunities arising from the global transition to a circular economy.

Recommendations for Whole-of-System Change

TSA has provided five recommendations in our response to Inquiry:

1. Regulate Product Stewardship Schemes
2. Consider Industry Policy
3. Leverage Government Procurement
4. Align Jurisdictions
5. Enable Consumer Choice through Labelling

These recommendations are proposed as the 'big moves' needed to drastically improve material productivity for end-of-life tyres and conveyor belts in Australia.

They have been developed on a whole-of-system approach, to help address the opportunities and barriers.

Preface

Purpose

The primary purpose of this submission is to demonstrate to the Productivity Commission, and government more broadly, that regulated product stewardship schemes can deliver circular economy outcomes and mitigate future risks associated with low-order outcomes from Australia's waste streams.

Scope

The scope of this submission is the circular economy management options, and related barries and opportunities, for end-of-life tyres and rubber-based conveyor belts in Australia.

The focus is on recycling[10] management options in accordance with TSA's mission.

TSA Submission

The submission is in two parts.

- Part A provides background commentary on the current situation and the need for regulation.

- Part B provides responses to the Productivity Commission's requests for information.

  RPS Group has provided economic advice to TSA to assist with our responses in Part B. This advice is provided as Appendix A.

[10] See definition of 'recycling' in the glossary.

Glossary

Glossary definitions are taken from the Australian Standard for Waste and Resource Recovery Data and Reporting (Second edition v3.4), 2024[11].

Circular Economy: Looking beyond the current take-make-waste extractive industrial model, a circular economy aims to redefine growth, focusing on positive society-wide benefits. It entails gradually decoupling economic activity from the consumption of finite resources and designing waste and pollution out of the system. Underpinned by a transition to renewable energy sources, the circular model builds economic, natural, and social capital.

It is based on three principles: design out waste and pollution; keep products and materials in use (ideally at their highest and best value); and regenerate natural systems.

Fate: The ultimate destination of a waste. The possible fates are:

- waste reuse
- recycling
- energy recovery
- disposal
- long-term storage
- the open environment.

The export of wastes is not a fate.

Management type: A classification of a waste management process based on the fate of most wastes that pass through it, for example, a recycling fate.

Product Stewardship: An approach to managing the impacts of different products and materials which acknowledges that those involved in producing, selling, using and disposing of products have a shared responsibility to ensure that those products or materials are managed in a way that reduces their impact, throughout their lifecycle, on the environment, and on human health and safety.

Recycling: Activities that culminate in the reprocessing of wastes into products or secondary materials that are returned to productive use (excluding for energy). May include collection, sorting and/or reprocessing.

[11] Australian Government, DCCEEW, (2024) Australian standard for waste and resource recovery data and reporting, https://www.dcceew.gov.au/sites/default/files/documents/australian-standard-wrr-data-reporting-second-edition.pdf

For data reporting purposes, the mass of material allocated to the fate 'recycling':

- includes all materials received by a reprocessing facility that are processed to the point of being suitable for manufacturing or return to productive use, whether immediately used or stored for later sale or use
- includes weight losses to the atmosphere during the processing of wastes (for example, moisture, carbon dioxide from organics degradation)
- excludes residuals that are sent to landfill or otherwise disposed of
- excludes materials received at a recycling facility but not yet processed
- is reported as wet weight.

Resource recovery: Activities that culminate in the reprocessing of wastes into products or secondary materials that are returned to productive use, including for energy. May include collection, sorting, reprocessing and/or energy recovery.

For data reporting purposes, the quantity of waste allocated to the fate 'resource recovery' is the sum of the quantities allocated to waste reuse, recycling, and energy recovery.

Reuse: Reallocation of products or materials to a new owner or purpose without reprocessing but potentially with some repair (for example, repair of pallets for resale, tyre retreading).

Secondary materials: Recovered materials that have been processed to the point of being suitable for use in manufacturing or other return to productive use.

Waste: Materials or products that are unwanted, surplus, discarded, rejected, abandoned, or left over, including those materials or products intended for or managed by recycling, energy recovery, treatment, storage, and disposal. Waste-derived materials cease to be waste and transition to being 'secondary materials' when the following conditions are met:

- they are to be used for a specific purpose
- a market or demand exists
- they fulfil the technical requirements for the specific purposes and meet the existing legislation and standards applicable to products
- their use will not lead to overall adverse environmental or human health impacts.

The transition from waste to secondary materials is generally deemed to occur at the out-going gate of a reprocessing facility when the outputs require no further processing prior to being returned to productive use.

Part A: Background

Tyre Product Stewardship Scheme

The existing Tyre Product Stewardship Scheme (the Scheme) is a national, government accredited, voluntary arrangement, first authorised by the Australian Competition and Consumer Commission (ACCC) in 2014. The ACCC re-authorised the Scheme in 2018 for the six years to 2024, and again on 2 September 2024 for the three years to 2027.

Tyre Stewardship Australia's (TSA) Application[12] for ACCC Authorisation for 2024-2027 sought a three-year period to keep the current Scheme Guidelines[13] unchanged to minimise disruption to the industry while the government is actively consulting and reviewing options - including a regulated product stewardship scheme - to achieve stronger outcomes for end-of-life tyre management.

The Scheme includes both automotive (passenger, bus, and truck), and off-the-road (OTR) (e.g., mining, agriculture, industrial) tyres. Other tyres, rubber-based conveyor belts, tracks, and other rubber-based products are not part of the existing Scheme, but as there are commonalities, these are given attention too (in particular rubber-based conveyor belts).

To fund the Scheme, tyre and automotive manufacturers/importers that voluntarily participate contribute $0.25c per Equivalent Passenger Unit (EPU) on every passenger, bus, and truck tyre they sell in Australia. For OTR, a levy is applied based on the type of tyre and rim size, with the highest applicable levy being $50 per tyre.

Scheme participants come from across the tyre supply chain including fleet managers, tyre retailers, used tyre collectors, and recyclers. This creates a network contributing to the responsible management of end-of-life tyres.

[12] ACCC Authorisation Register (2024) Tyre Stewardship Australia Limited, Authorisation, https://www.accc.gov.au/public-registers/authorisations-and-notifications-registers/authorisations-register/tyre-stewardship-australia-limited-0

[13] TSA (2019) Guidelines for the Tyre Product Stewardship Scheme, https://www.tyrestewardship.org.au/wp-content/uploads/2021/01/TSA0060-TPSS-Guidelines-2021-Final.pdf

Tyre Stewardship Australia

TSA was formed and incorporated to administer and implement the Scheme in accordance with the Scheme Guidelines. TSA is governed by a Board comprised of an independent Chair and industry-based representatives including some that are independent and/or have circular economy expertise.

Our Mission

Drive a circular economy by maximising the value of the resources in used tyres and conveyor belts.

TSA is funded voluntarily by participating tyre and automotive manufacturers/importers and is focused on problem-solving for the benefit of the entire industry. TSA's objectives, as broadly laid out in the Scheme Guidelines, are to undertake:

- market development
- auditing and compliance
- education and public awareness.

TSA is not tasked to undertake the management (e.g., collection, processing, recycling) of end-of-life tyres and conveyor belts, but, through the Scheme, accredits participants in the stewardship chain.

Essentially, TSA's work, in alignment with the objectives in the Scheme Guidelines and the objects of the Commonwealth *Recycling and Waste Reduction Act 2020*, seeks to:

- reduce the environmental impact of products
- maximise the value of the benefits of taking responsibility for product stewardship
- help develop a circular economy
- contribute to Australia meeting its targets.

TSA operations help all tiers of government achieve policy objectives including:

- rural equity
- circular economy
- waste and pollution reduction
- nature protection
- decarbonisation
- road safety
- public and environmental health
- material productivity
- sustainable and social procurement
- consumer awareness
- industry collaboration
- resilient infrastructure
- advanced manufacturing
- economic development
- industrial sovereignty
- regulatory consistency
- research and development
- public engagement
- regulatory compliance
- data and reporting
- technology transfer
- policy reform

Each year TSA runs and participates in extensive industry and stakeholder engagements, and advocacy and consumer awareness communication activities.

It also undertakes a significant amount of research, and funds market development – with over $10M in funding disbursed to date and a trend of committing circa 40% of its budget each year.

TSA performs an important data monitoring and reporting function in respect to tyres that is valued by government and industry.

In many ways TSA operates as Australia's think tank on tyres and conveyor belts, making an international level contribution.

For more information, please refer to the TSA Annual Report 2023-24[14].

Review Spotlight

Independent Review of TSA and the Tyre Product Stewardship Scheme[15]

In 2022, TSA commissioned an independent review, completed by Arcoona Consulting, to meet ACCC requirements, and focusing on the efficiencies and operations of the voluntary Scheme.

The review found that TSA effectively administers the Scheme, delivering significant public benefits that far outweigh its financial costs, which were approximately $5 million in 2020-2021 against an industry value of $5.1 billion. It highlighted TSA's strong corporate governance, essential for ACCC authorisations.

The review suggested TSA seek government support to transition to a more fully regulated product stewardship scheme under the *Recycling and Waste Reduction Act 2020*. This was supported by the vast majority of interviewees including contributors, recyclers, retailers and government.

[14] TSA (2024) Annual Report 2023/2024 https://www.tyrestewardship.org.au/wp-content/uploads/2024/09/TSA-Annual-Report-FY2024.pdf

[15] Arcoona Consulting (2022) Tyre Stewardship Australia National Tyre Product Stewardship Scheme – Independent Review, https://www.tyrestewardship.org.au/wp-content/uploads/2022/09/TSA-Independent-Review-2022.pdf

Where Are We Now?

Our Material Management Options

There are many material management options, from design to disposal. In this submission we are focused on recycling options, as this is the focus of the existing Scheme and TSA's mission.

However, recycling options are only one part of what a circular economy has to offer, and TSA's vision reflects this wider view.

Below, for reference, is a description of the five material management options phases.

For further information see TSA's Analysis of the Material Circularity of Management Options for Tyres and Conveyor Belts[16].

Design Options

There are important opportunities to improve tyre and conveyor belt product design to incorporate more of the recycled content that is now being produced (globally), in increasing amounts, by a maturing range of recycling technologies.

There are also important measures available to improve product design that relate to the environment and efficiency. Some of these are already codified in international quality standards and in labelling, but not yet applied in Australia.

As an example, the frontrunners in implementing labelling programmes for passenger car tyres, considering rolling resistance coefficient as an indicator for fuel efficiency, include the European Union (EU), Japan, and South Korea.

The programmes are based on the United Nations Economic Commission for Europe Regulation (UNECER) Regulation 117 which is the globally accepted standard on 'tyres, rolling resistance, rolling noise and wet grip'. The standard has been strengthened over time and is now at revision four[17].

The EU label on this matter, as an example, is aimed at helping consumers to be better informed when buying new tyres. The communication message is that 'the indication of rolling resistance is an indicator of the tyre's energy efficiency'. Or simply put, fuel-efficient tyres require less energy to roll and save on money and emissions.

Each grade of rolling resistance - A to E - denotes a difference in energy consumption.

[16]TSA (2024) Analysis of the Material Circularity of Management Options for Tyres and Conveyor Belts, https://www.tyrestewardship.org.au/reports-facts-figures/material-circularity-of-management-options-for-tyres-and-conveyor-belts/

[17] Consolidated Auto Regs, webpage, https://consautoregs.com/unece/un-r117-02-rev-4

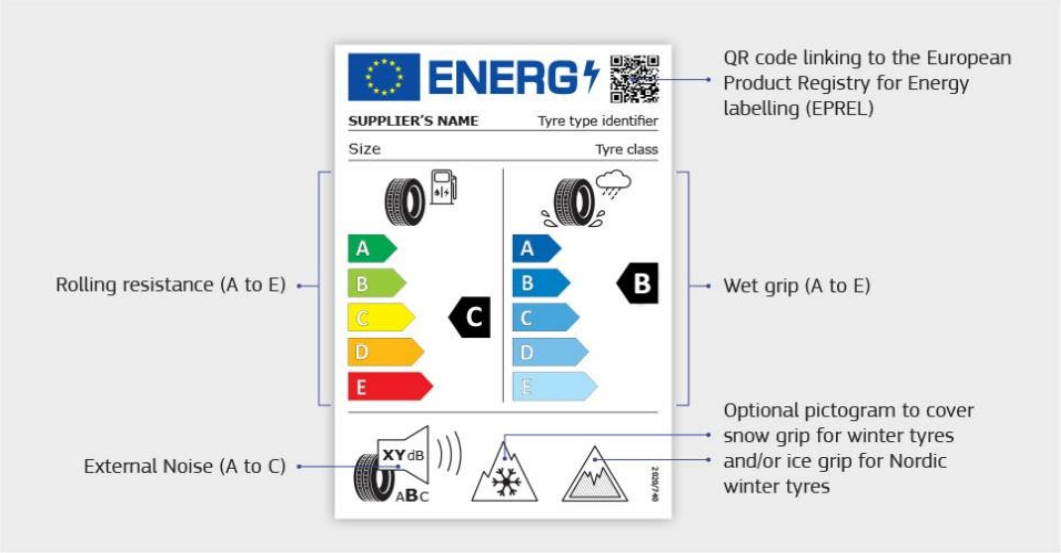

Figure 1: EU tyre label

To achieve harmonisation between the Australian Design Rules and the UNECER regulations, Australia could establish a new Australian Design Rule based on the global standard UNECER 117, resulting in both economic and environmental benefits for the public.

Importantly, UNECER 117 includes a new stringent test to allow a tyre to be used in complete confidence right down to the legal wear limit of 1.6 mm. According to a Michelin study, 50% of tyres are removed before reaching a residual depth of 3 mm. Meaning that on a global scale, 400 million tyres are scrapped prematurely every year[18].

There are also opportunities to address chemicals of concern, including as disbursed through tyre road wear particles in Australia[19]. Euro 7, for example[20], establishes rules for the exhaust emissions of road vehicles, and for other types of emissions such as tyre abrasion and brake particle emissions.

Further, a global consortium of 30 tyre manufacturers mobilised by the US Tyre Manufacturers Association (USTMA) has been conducting an alternatives analysis for a chemical of concern, 6PPD, in accordance with California's Safer Consumer Product Regulations.

For large OTR tyre and conveyor belt products, improved value chain system designs can change the way these products are supplied, collected, refurbished, and recycled.

[18] Michelin, webpage, https://www.michelin.com/en/publications/group/michelin-supports-new-european-regulation-r117-04

[19] Cassandra Rauert, et.al (2022) Tyre additive chemicals, tyre road wear particles and high production polymers in surface water at 5 urban centres in Queensland, Australia, Science of The Total Environment, https://www.sciencedirect.com/science/article/abs/pii/S004896972205567X

[20] European Council, webpage, https://www.consilium.europa.eu/en/press/press-releases/2024/04/12/euro-7-council-adopts-new-rules-on-emission-limits-for-cars-vans-and-trucks/

‘Closed loop’ product supply systems have operated in the aviation sector for decades – with appropriate adaptation they could also operate in the mining and other sectors.

Use Options

There are opportunities to extend the use phase through repair and refurbishment, and where possible retread.

Truck tyres in Australia have been successfully retreaded since Frank Beaurepaire imported the idea and started business in the 1920s[21]. However, we are seeing the practice abandoned as cheap single use truck tyres are imported by the container load, potentially without being checked for compliance with the Australian Design Rules.

Further, for high-value large OTR tyre and conveyor belt products, repair and refurbishment is not as common in Australia as it is overseas. Australia is a major global consumer of these tyres and needs a repair and refurbishment industry, comparable with similar jurisdictions, like Canada.

Overall, reuse amounted to 9% of used tyre generation in 2023-2024.

Recycling Options

The quality of feedstocks is critical for the technical and economic feasibility of recycling processes, emphasising the circular economy focus on the primacy of good design.

Many different recycling options for end-of-life tyres have been identified, highlighting a variety of processing mechanisms, including mechanical, chemical, thermal, hydraulic and pressure treatment options. Each of these recycling options can vary with many processing parameters, providing a diverse and broad range of technologies which are at varying stages of maturity.

Importantly, the extent of material circularity across the recycling options varies from high to none.

This demonstrates the need to understand not only the technology used to process end-of-life tyres and conveyor belts, but also the product application. It is the product application that determines the material circularity and waste hierarchy outcomes.

The market maturity of the recycling options varies from long-established and globally mature, to globally immature.

There are circular recycling options in Australia currently, and important developing international options such as the use of devulcanised rubber in new tyre and conveyor belt manufacturing.

Overall, recycling amounted to 16% of used tyre generation in 2023-2024.

[21] Museum Victoria Collections, webpage, https://collections.museumsvictoria.com.au/articles/6210

Energy Recovery Options

End-of-life tyre energy recovery options play a role globally and are in preference to disposal. When end-of-life tyres are used as tyre-derived fuels (TDF) they often displace coal. TDF has a higher calorific value compared to coal and when displacing coal there may be CO_2 emissions reductions. TDF use in cement kilns is a large mature global energy recovery market. Most of Australia's TDF is sent to India.

All energy recovery options (including TDF) have no material circularity as the rubber compound materials are lost once used for energy production. Further, the current reliance on this option is a barrier to investing in circular options.

Moving towards 2030 targets and the 2050 net zero target, there will be increasing pressure to decarbonise operations, not just offset or reduce emissions. This will increase the priority for renewable energy options and so technical solutions will lead to a shift away from, and decreased demand for TDF.

The primary processing infrastructure necessary to convert an end-of-life tyre to TDF, is the same infrastructure needed to produce other tyre-derived materials that go into material circularity applications.

Overall, energy recovery amount to 40% of used tyre generation in 2023-2024.

Disposal Options

In Australia it is still an option for the mining sector to legally bury end-of-life tyres at mine sites. As a result, almost all OTR tyres and conveyor belts used in mining are buried onsite or are otherwise disposed. There are a range of options that are available to recover these tyres and conveyors, including recycling and energy recovery options. The solution to onsite burial of mining end-of-life OTR tyres may involve implementing more than one option (i.e. contract design, reverse logistics, retreading, recycling and or energy recovery). Like TDF, the continuation of onsite burial remains a barrier for circular economy investment, as does disposal to landfill.

Overall, disposal amounted to 30% of used tyre generation in 2023-2024.[22]

[22] TSA (2024) Australian Tyre Consumption and Recovery – 2023-24

Image 1: Rubber-based conveyor belt

The Current Cost of Half Measures and Complexity

The existing system of end-of-life tyre management in Australia is complex, inefficient, and not fit-for-purpose.

The current voluntary Scheme has many good attributes and has made headway on the issues. And stakeholders participating in the voluntary Scheme have displayed commendable levels of commitment to sustainable outcomes. But the problems are persistent and the current solutions incomplete. We have reached a plateau of what the voluntary Scheme can achieve.

As examples of the issues:

- There is patchy participation in the voluntary Scheme. **Free riders are gaining a competitive advantage by not participating**. Only two automotive companies contribute financially (Mercedes-Benz and Porche), despite tyres fitted to vehicles accounting for 16% of all tyre imports[23]. Further, if significant contributors depart, the whole Scheme may be put in financial jeopardy.
- The Scheme is **not able to ensure equitable outcomes for regional, rural and remote communities**. The failures are mostly outside the urban centres.

[23] TSA (2024) Australian Tyre Consumption and Recovery, Fact Sheet, 2023-24, https://www.tyrestewardship.org.au/handbooks/tyre-consumption-recovery-fact-sheet/

- By exporting most of our tyre derived material, we are in effect **exporting opportunities for local industry and business**, particularly manufacturing.
- There is **not a strong diversity of market opportunities** within Australia.
- There are **fragmented rules across different states and territories**, and even within them. For example, NSW has a landfill levy in some places and not others, and licencing arrangements for mines to bury onsite are not consistent.
- There is **no uniform standard for the quality of processed end-of-life tyre materials**. This leads to the importation of tyre derived material from overseas that is standard tested for use in local manufacturing. A lack of standards may also lead to downstream issues in terms of poorer quality materials/products with reduced circularity options, and potential environmental pollution.
- There is **limited collection and processing infrastructure capacity in many places that need it**, including in regional, rural and remote areas, where tyres are essential, and mining and agriculture is at its greatest. Not enough is being invested in sustainable outcomes.
- There are **significant clean-up costs to councils from illegal dumping**, in the range of $6M across the country annually. This doesn't include the costs to others.

The Results

In the 2023-24 financial year Australia generated approximately 537,000 tonnes or 67 million used tyres passenger tyre equivalent units:

- 34% was unrecovered, meaning it was disposed to landfill or buried onsite at mines, stockpiled in long-term storage, or dumped to the open environment and not cleaned up.
- 40% was sent to energy recovery.
- This means that nearly three-quarters (74%) of our end-of-life tyres are still going to end fates that are not circular.
- Only a quarter is going to recycling and reuse[24].

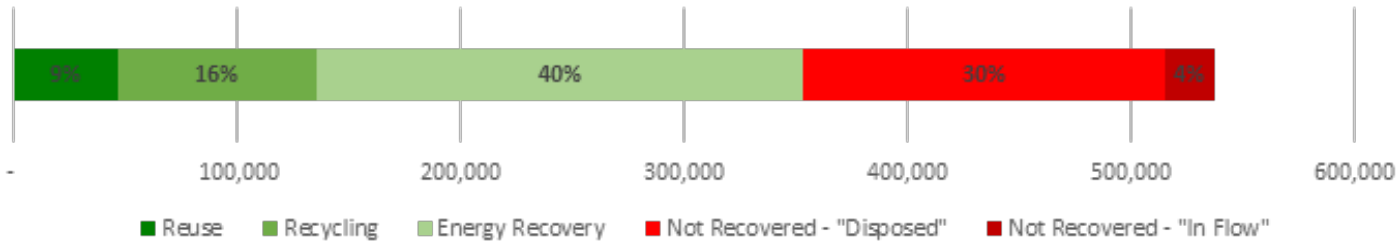

Figure 2: End-of-life tyre fates 2023-24

[24] Data is from TSA (2024) Australian Tyre Consumption and Recovery, Fact Sheet, 2023-24, https://www.tyrestewardship.org.au/handbooks/tyre-consumption-recovery-fact-sheet/

For a review of the global issues see ICC & EY (2024) Putting the circular economy into motion: From barriers to opportunities[25]

The report outlines that those businesses seeking to put in place circular economy approaches face policy, regulatory, technology, infrastructure, financial, organisational, and social barriers; and that opportunities exist to alleviate the pressure of these barriers across sectors.

Image 2: Giant mining dump truck tyres

[25] ICC & EY (2024) Putting the circular economy into motion: From barriers to opportunities https://iccwbo.org/global-insights/sustainability-and-climate-action/circular-economy-challenges-and-opportunities-for-businesses-and-policymakers/

Where Do We Want to Be?

Our Critical Interests and Opportunity

Before addressing the Productivity Commission's information requests, it's essential to identify Australia's critical interests in the transition to a circular economy for end-of-life tyres and conveyor belts.

Domestically, Australia aims to enhance resource recovery, reduce landfill waste, and improve environmental sustainability through effective tyre and conveyor belt management. Internationally, the focus is on aligning with global best practices, fostering trade in recycled materials, and enhancing Australia's reputation as a sustainability leader.

Australia needs a 21st century circular economic model. The current, mostly linear material economy must be transformed to a more circular one in a matter of decades. Close to a 100 percent recovery rate is feasible for end-of-life tyres and conveyor belts. With the right regulations and supporting interventions, tyres can become the circular shaped mascot of the circular economy in Australia.

There are five good reasons to act.

- **Driving Economic Growth**: Increased resource recovery will generate jobs and foster economic growth. Effective incentives can create strong onshore and offshore markets for recycled products, leading to new business opportunities. Encouraging research and development (R&D) and technology transfer of advanced recycling technologies and sustainable alternatives will position Australia as a leader in circular economy practices on the international stage.
- **Enhancing Resource Efficiency**: By embracing a circular economy model and enhancing resource efficiency, we can reclaim valuable resources from used tyres and conveyor belts, mitigate against the risks associated with the current reliance on exporting end-of-life tyre materials to foreign destinations, and deliver advanced products at scale.
- **Protecting the Environment**: By ensuring all tyres are recovered, we can end our reliance on landfills, avoid the onsite burial of tyres at mines, and assist farmers and other businesses to dispose of end-of-life tyres and conveyor belts responsibly to protect our natural environment.
- **Promoting Public Health and Safety:** By stamping out illegal dumping and stockpiling we can reduce public health and safety hazards like mosquito breeding, rodent infestations, and toxic fires, ensuring a safer, cleaner Australia.
- **Ensuring Compliance and Fairness:** A regulated product stewardship approach will provide all stakeholders with consistent environmental and safety standards, increasing compliance, reducing administration, streamlining enforcement, and promoting fairness across the country including in regional and remote areas.

How Do We Get There?

Recommendations

TSA has provided five recommendations in our response to Inquiry:

1. **Regulate Product Stewardship Schemes**
2. **Consider Industry Policy**
3. **Leverage Government Procurement**
4. **Align Jurisdictions**
5. **Enable Consumer Choice through Labelling**

For information, TSA has provided the following related recommendations as a submission to the recent Environment Ministers' Meeting, National End-of-Life Tyres Options Project, Discussion Paper on end-of-life tyres:

- **Discuss and Commit**: Include in the next Environment Ministers' Meeting communiqué a commitment to commission an Impact Analysis process for end-of-life tyres and conveyor belts, with a draft Regulatory Impact Analysis and Statement to be completed promptly. The Discussion Paper indicates that Option 2: Regulated Product Stewardship should be the focus of this analysis.

- **Avoid Delays:** Ensure that this Impact Analysis proceeds without delay, as it is crucial for introducing a more comprehensive approach to end-of-life tyre management. Progressing the Impact Analysis and Statement is complementary to and supports the Productivity Commission's Inquiry into Australia's Opportunities in the Circular Economy and can progress simultaneously.

- **Acknowledge Industry Leadership:** Industry leaders have funded, supported, and participated in a voluntary product stewardship approach for more than 10 years. However, industry leaders have been undermined by free riders. In the absence of a fully regulated approach, industry may abandon the current Scheme for their own arrangements to deliver against their global corporate ESG goals (e.g., funding deforestation initiatives in Asia) in lieu of taking responsibility for their end-of-life tyres in Australia. Industry leaders are also unlikely to indefinitely support a voluntary approach.

- **Support Australians:** Currently many tyre and vehicle manufacturers, brands and retailers are making Australians use tyres that would not be acceptable elsewhere in the world. Tyre brands, manufacturers and retailers are also avoiding product stewardship responsibilities they fulfil elsewhere in the world. Australians should no longer be subject to such inequity.

Economic Spotlight

The relationship between R&D and productivity growth in Australia

Productivity growth and R&D activities are closely intertwined. R&D activities, in a business context, aim to introduce new products through innovative methods and applications. Productivity growth, broadly the ability to do more with less, is underpinned by the relentless desire to improve processes and uncover new information. A key driver of productivity growth is the efficacy of research activities that can develop new techniques and processes.

As businesses become more efficient, living standards rise proportionately. Productivity growth has been a key driver of global economic prosperity since the Industrial Age and supports Australia's high standard of living. However, global productivity growth rates have stagnated over the last decade, and Australia has experienced the lowest productivity growth in 60 years at 1.2 percent a year and dropped to 16th in the OECD productivity rankings from sixth in 1970[26].

Australia has a comparative advantage in having a highly skilled workforce. Australian R&D activities have achieved success in the past, but often struggle to develop beyond conceptualisation to commercialisation. A strong focus on R&D activities that is supported by government, business, and academia will help support Australia's future productivity growth and ensure living standards continue to rise.

[26] InnovationAus, Turning around Australia's lagging economic complexity, webpage, https://www.innovationaus.com/turning-around-australias-lagging-economic-complexity/

Part B: TSA Submission

TSA presents the following submission in response to the Australian Government, Productivity Commission, Call for Submissions to the Inquiry into Opportunities in the Circular Economy.

Image 3: Crumb rubber from end-of-life tyres

1. Circular Economy Success Stories and Measures of Success

Information request 1:

The PC is seeking views and information on the following:

Australian case studies of circular economy activities already occurring, which may involve narrowing loops (e.g. reducing the demand for materials) closing loops (e.g. using materials multiple times) slowing loops (e.g. extending useful product life) or regenerating (e.g. using non-toxic materials and regenerating ecosystems).

Information would be particularly welcome on:

- how these activities affected business and economic outcomes (including costs), environmental outcomes (including waste and pollution) and social outcomes
- levels of uptake
- reasons why businesses, consumers and communities adopted circular economy activities
- the effectiveness and costs of these activities (such as from project evaluations, participant surveys).

Australia's overall potential to move to a more circular economy, as well as how best to monitor progress and measure success.

1.1 Australian Case Studies at the Firm Level

The following case studies provide examples of narrowing loops (e.g. reducing the demand for materials), closing loops (e.g. using materials multiple times), and slowing loops (e.g. extending useful product life) at the firm level within Australia as it relates to material circularity and tyres and conveyor belts.

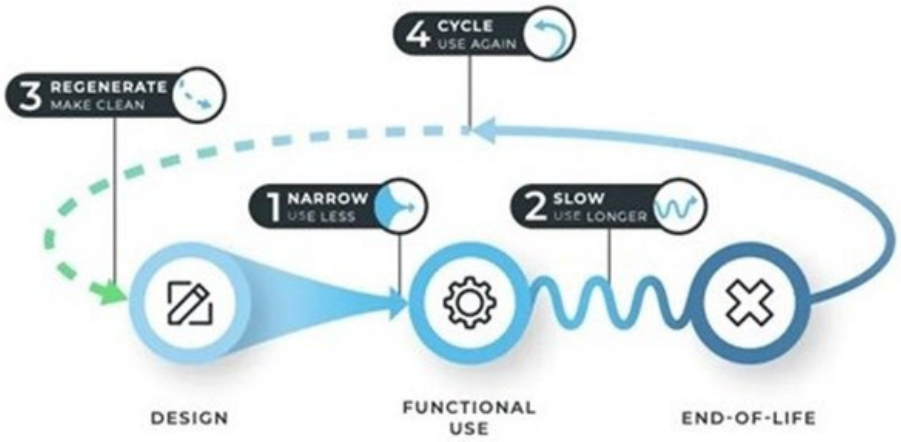

Figure 3: Conceptual model of the circular economy[27]

[27] Circle Economy Foundation, Four flows framework, webpage, https://www.circle-economy.com/frameworks

1.1.1 Case Study: Narrowing Loops, East-West Pilbara Rubber Recycling

East-West Pilbara Rubber Recycling (EWPRR) is pioneering a circular economy solution in the Pilbara region of WA. The Pilbara region generates nearly half of all of Australia's OTR mining tyre waste with around 44,000 tonnes and substantial quantities of conveyor belts generated annually[28].

To tackle this issue, EWPRR is establishing a tyre recycling and devulcanisation facility in Port Hedland, in collaboration with Indigenous owned East West Pilbara Group, Nextek, Get-A-Grip Tyres, and Canadian devulcanisation leader, Tyromer.

The new facility, supported with government funding[29], will process 12,000 tonnes of tyres each year, converting waste into high-value reusable rubber materials. This localised approach fosters a material circularity by recovering waste generated within the mining industry in the same geographic area, and then through advanced manufacturing, providing this product to global markets to produce new tyres and conveyor belts, abating the need for virgin materials.

EWPRR's initiative embodies the concept of 'narrowing loops', which emphasises reducing material demand by keeping resources in use longer. By employing innovative devulcanisation technology, EWPRR aims to make the most of the OTR tyres and conveyor belts in region, that to date, have not been recovered.

The environmental benefits include reducing new rubber demand, management of tyre waste and pollution from the mining sector, and a reduction in the risks associated with tyre stockpiles; and decarbonisation, as devulcanisation is more energy-efficient than producing new rubber. Furthermore, by reducing the demand for new natural and synthetic rubber and carbon black, this process mitigates the impacts on nature by preventing the need for further extraction of materials. Local processing using reverse logistics reduces transportation energy and costs, to take end-of-life tyres to processing further afield, such as in Perth.

The project promises a cost competitive circular economy solution that also delivers significant environmental and social value, and a strong local option if onsite disposal is removed. Overall, EWPRR creates a new advanced manufacturing industry to produce high-value recycled materials, contributing to jobs and growth in a remote area, and particularly benefiting Indigenous Peoples and Local Communities.

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[28] TSA (2023) Tipping the Balance, The business case for a circular economy for Australia's off-the-road tyres, conveyors, and tracks, https://www.tyrestewardship.org.au/wp-content/uploads/2023/06/TSA0003%20-%20L8%20-%20OTR%20-%2040pp%20Business%20Plan%20-%20A4.pdf

[29] Joint Media Release, More than $44 million to help significantly reduce waste in WA, https://minister.dcceew.gov.au/plibersek/media-releases/joint-media-release-more-44-million-help-significantly-reduce-waste-wa

1.1.2 Case Study: Closing Loops, A1 Rubber

A1 Rubber is a leading example of 'closing loops' in the circular economy, transforming end-of-life tyres into high-quality rubber products since 1993. This Australian company illustrates how waste materials can be recirculated into valuable resources, significantly minimising reliance on virgin materials and reducing landfill waste.

Closing loops in the circular economy involves recycling materials back into production systems. A1 Rubber embodies this principle by procuring over 7,500 tonnes of used tyre rubber annually, creating valuable products from these materials.

The company offers a diverse range of products from recycled rubber, including gym tiles, automotive mats, residential flooring, commercial school surfaces, and specialised industrial matting. This versatility ensures that recycled rubber is utilised across various sectors, effectively closing the loop.

A1 Rubber prioritises quality and durability, demonstrating that recycled products can meet or exceed traditional alternatives.

By expanding operations in Victoria and establishing local warehouses, A1 Rubber reduces transportation distances and associated carbon emissions, facilitating quicker access to sustainable products. Their capacity to warehouse raw materials and finished products ensures a continuous flow within the production cycle, minimising the need for virgin materials.

However, A1 Rubber faces challenges such as insufficient domestic crumb rubber production, lack of standardisation in quality, competition from international sources, and inadequate government incentives towards circular products.

Addressing these issues through comprehensive federal frameworks and national quality standards could enhance the closed-loop system for tyre recycling in Australia, further solidifying A1 Rubber's role in the circular economy.

1.1.3 Case Study: Slowing Loops, Bandag Retreading

Bandag's tyre retreading program exemplifies 'slowing loops' within the circular economy, extending the lifespan of truck tyres and significantly reducing resource consumption and waste. As the tread manufacturing and retreading arm of Bridgestone, Bandag has pioneered circular economy practices in Australia for over 60 years.

Bandag's retreading service embodies 'slowing loops' through several key approaches:

- **Extended Tyre Lifespan:** Retreading allows a single tyre casing to be reused multiple times. This process delays the need for new tyre production and postpones the end of life of the used tyre.
- **Preservation of Valuable Components:** By reusing the tyre casing - the most resource-intensive part of the process - Bandag conserves the energy and materials embedded in the tyre's initial production, thereby maintaining the value of existing resources.
- **Minimal Material Addition:** The retreading process replaces the worn tread of a truck tyre, which constitutes about 20% of the tyre's total material, significantly reducing the demand for new raw materials when compared to a new tyre.
- **Quality Maintenance:** Bandag ensures that retreaded tyres meet safety and durability standards, so the extended lifespan does not compromise functionality.
- **Design for Longevity:** Increasingly, quality truck tyres are designed with retreading in mind, leading to more durable casings that can endure multiple cycles.
- **Economic Incentives:** Re-treaded tyres are offered at 30-50% lower cost than new tyres, encouraging businesses to adopt this sustainable practice.
- **Reduced Environmental Impact:** Retreading diminishes raw material extraction, manufacturing emissions, and waste generation, contributing to significant environmental benefits.

Overall, Bandag's approach demonstrates that slowing loops can serve as both an effective environmental strategy and a viable business model.

Of note, Australia's overall use of retread tyres is low in comparison to other markets such as the USA. Australia is heavily reliant on cheap, single use tyres from Asia. This suggests that the true costs of these cheaper imports may not be captured in their price.

Image 4: New Bandag tread

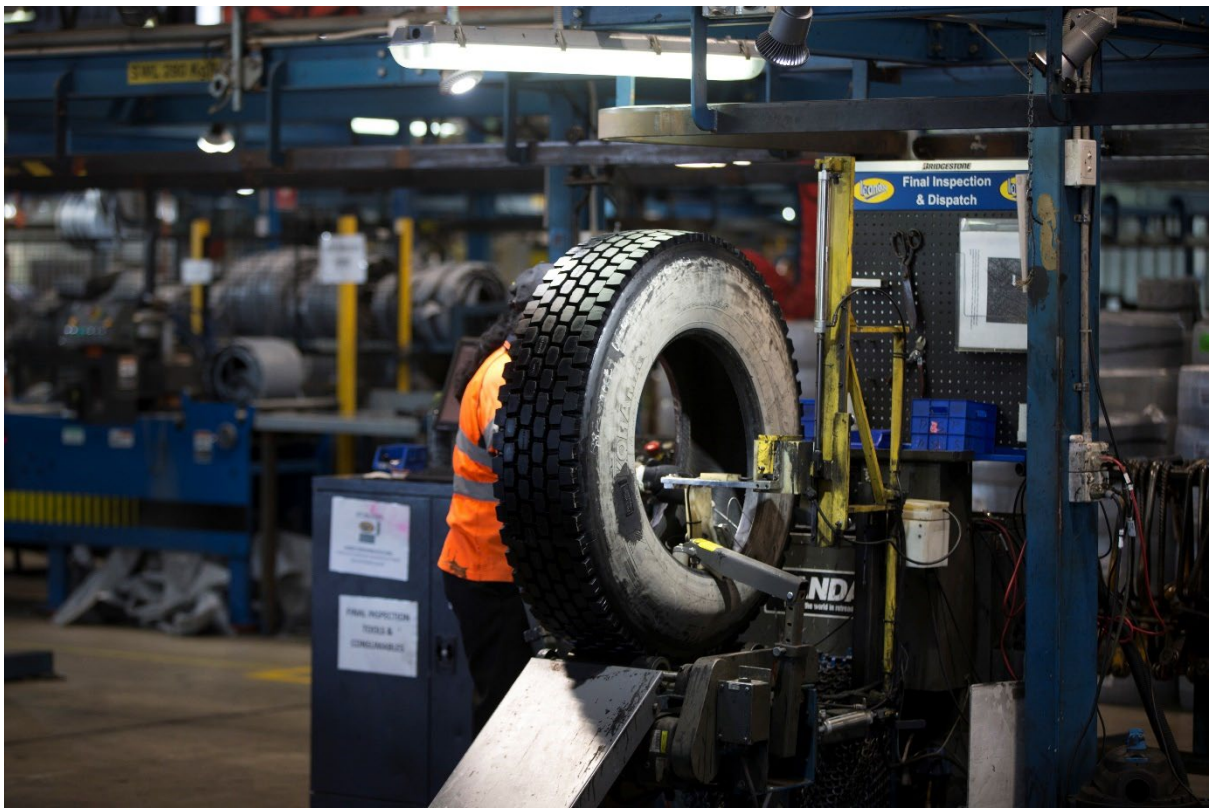

Image 5: Bandag retread tyre

1.2 Overall Potential to Move to a More Circular Economy

In the last decades we have seen an unprecedented increase in the use of natural resources, materials and products. At the same time, innovations in technology and other actions have, in some cases, enabled us to do more with less and be better off (as evidenced in the case studies above).

But we are swimming against the tide. Economic growth remains the global political goal, populations continue to grow, and the world's raw materials consumption is expected to nearly double from a 2017 baseline to 2060[30]. Despite the circular economy entering the mainstream, global circularity is still in decline[31]. The trend is that we are doing more with more.

It is not hard to see that this growth in material use, coupled with the environmental consequences of material extraction, processing, and waste generation, if unchecked, may jeopardise future gains in well-being. Especially in the context of climate change, and the reality that 45% of emissions are embedded in production[32].

Thus, to ensure that future generations continue to enjoy productivity gains and improvements to their welfare, we need to take a longer-term view on the economy[33].

In short, doing more with less, faster than the economic growth rate, is the aim.

Importantly, the principles of the circular economy[34] direct that, driven by design, in addition to considering climate change, we must also consider the other two issues of the global environmental crisis: waste and pollution, and nature decline. And we must address social inequity on the way through.

Achieving a circular economy to 'enable the circulation of products and material at their highest value', is provided as one prescription to respond to this challenge.

But the question remains: does it work? Do individuals, firms, cooperatives, industries, regions, and countries experience value creation and enhance community welfare, when they pay attention to environmental, social, and governance concerns, and take material circularity seriously?

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[30] OECD (2019) Global Material Resources Outlook to 2060 https://www.oecd.org/en/publications/global-material-resources-outlook-to-2060_9789264307452-en.html

[31] Circle Economy Foundation (2024) Circularity Gap Report 2024 https://reports.circularity-gap.world/cgr-global-2024-37b5f198/CGR+Global+2024+-+Report.pdf

[32] Ellen Mcarther Foundation (2021) Completing the Picture – How the circular economy tackles climate change https://emf.thirdlight.com/file/24/cDm30tVcDDexwg2cD1ZEcZjU51g/Completing%20the%20Picture%20-%20How%20the%20circular%20economy%20tackles%20climate%20change.pdf

[33] See Appendix A, RPS Group (2024) Opportunities in the Circular Economy

[34] See Ellen Macarthur Foundation, webpage, https://www.ellenmacarthurfoundation.org/topics/circular-economy-introduction/overview#:~:text=The%20circular%20economy%20is%20based,Regenerate%20nature

This submission positions tyres as a circular economy case study for Australia.

It provides case studies at the micro (product), intermediate (region and sector), and macro (Australia) level to demonstrate that there is a significant opportunity for Australia to move to a circular economy on tyres.

The overwhelming conclusion is that paying attention to material circularity is not a drag on value creation and the environment and the economy, but in fact, quite the opposite. The synergies between material circularity and decoupling provide a global opportunity.

Australia has the opportunity to position itself to maximise the benefits, particularly concerning end-of-life tyres and conveyor belts. However, to achieve this, we must overcome our hesitance and have confidence in ourselves and our processes, including the regulatory impact analysis process.

Thus, our success will be dictated by the level of political ambition to introduce national policies, such regulated product stewardship schemes supported by other nationally coordinated supportive measures. The current major barrier to harnessing the opportunity on circularity is government's willingness to back the concept of the circular economy, with the necessary regulation to make it happen.

The CSIRO has calculated that the circularity rate of Australia (2019) is close to 4 per cent (well below the OECD average), but that the maximum theoretical circularity rate achievable for Australia under today's economic structure to be 32 per cent[35].

If we set a stretch goal (40 per cent), this means that it may be possible to achieve an approximate order of magnitude (x10) circular rate improvement across the economy.

For tyres, 25%[36] of our end-of-life tyre resource is currently entering a materially circular fate (See Figure 2: recycling 16 percentage points, reuse 9 percentage points). This means that it is possible to quadruple our level of material circularity to reach 100% on end-of-life tyres. A worthwhile goal.

CSIRO analysis specific to tyres has mapped out a transition roadmap[37]. While this roadmap was developed in 2020, it shows what is possible and remains instructive. Further CSIRO analysis has reviewed international best practice and found that [38] regulating product stewardship in Australia is the foundational change required.

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[35] CSIRO (2024) Australian material flow analysis to progress to a circular economy, Summary Report, https://research.csiro.au/circulareconomy/wp-content/uploads/sites/303/2024/03/24-00034_ENV_REPORT_MaterialFlowAnalysisToCircularEconomy_Summary_WEB_240305-2.pdf

[36] TSA (2024) Australian Tyre Consumption and Recovery, Fact Sheet, 2023-24. https://www.tyrestewardship.org.au/handbooks/tyre-consumption-recovery-fact-sheet/

[37] CSIRO (2021) Circular economy roadmap for plastics, glass, paper and tyres, https://www.csiro.au/en/research/natural-environment/circular-economy

[38]CSIRO (2024) Best practise case studies for increasing value recovery from end-of-life tyres and conveyor belts,

Figure 4: CSIRO roadmap for tyres

https://www.nespsustainable.edu.au/sites/default/files/documents/IP5.02_Stage%202%20tyre%20and%20conveyor%20belt%20case%20study%20report%20final-20240716.pdf

1.3 Monitoring and Measuring Success

Given the objectives - to decouple material use from economic growth[39] - what should be our metrics of success?

Transitioning from a linear consumption model to a circular economy is a broad economic transformation. Measuring elements of the transition is essential for monitoring progress and ensuring accountability.[40] However, the large scope of the transition presents complexity when defining measurements to monitor progress.

At a high level, governments in Australia are committed to a waste hierarchy that extends from most-preferred actions (i.e., avoiding waste) to least-preferred actions (i.e., disposing of waste).[41] Measuring the transition to a circular economy is typically grouped per each waste activity including in respect to:

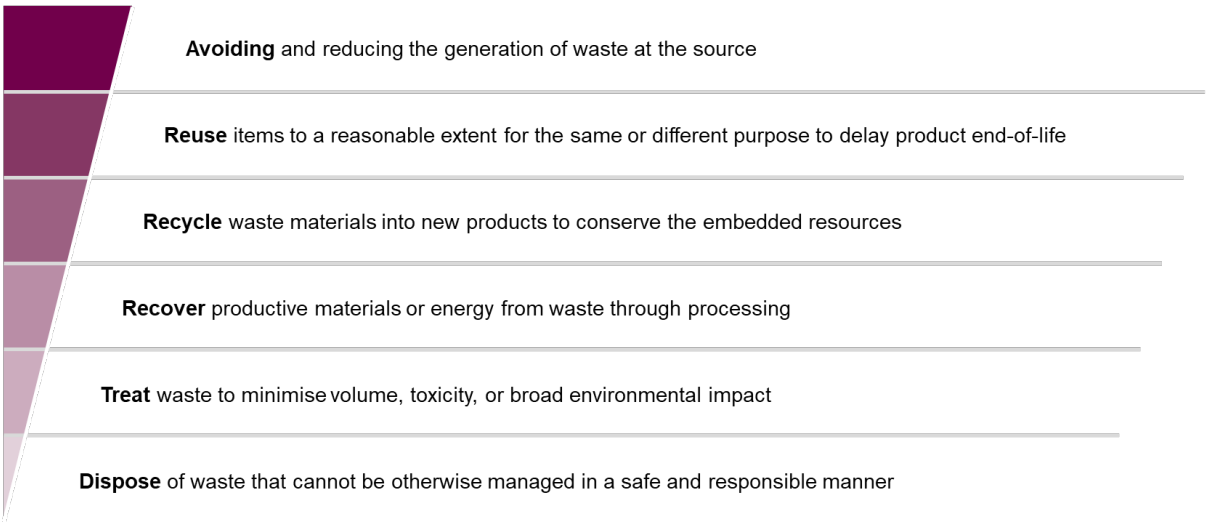

Figure 5: Waste hierarchy

The Australian Bureau of Statistics currently has several quantified macro circular economy measures. They are:[42]

- waste generation per person

[39] Typically, claims of green growth are assessed by considering decoupling rates. However, in the context of climate change, green growth should arguably be judged with reference to decoupling that is both absolute and sufficient for meeting the Paris climate accord goal of limiting the increase in global temperature to *'well below 2 °C above pre-industrial levels and pursuing efforts to limit the temperature increase to 1.5 °C above pre-industrial levels'* – see https://www.sciencedirect.com/science/article/pii/S0921800921001592

[40] The importance of measuring socioeconomic indicators is recognised by the Australian Government. See: Australian Government (2023) Measuring what matters: Australia's first wellbeing framework. https://treasury.gov.au/sites/default/files/2023-07/measuring-what-matters-statement020230721_0.pdf

[41] For example, see: NSW EPA (2024) The waste hierarchy. https://www.epa.nsw.gov.au/your-environment/recycling-and-reuse/warr-strategy/the-waste-hierarchy

[42] ABS (2024) Circular economy, https://www.abs.gov.au/statistics/measuring-what-matters/measuring-what-matters-themes-and-indicators/sustainable/circular-economy

- proportion of waste recovered for reuse, recycling, or energy
- circularity rate
- material footprint per capita
- material productivity

At the micro level of tyres, TSA has recorded several measurements.[43] They include:

- used tyre generation volumes
- tyre disposal rates
- tyre recovery rates, per type of recovery activity
- tyre recovery rates, per type of tyre
- used tyre importing and exporting

Used tyres contain significant productive materials that can be both re-used and recycled.

There is currently a need for establishing a metric that can measure Australian commercial interests in tyre recovery.

The Organisation for Economic Co-operation and Development has published a comprehensive conceptual framework and indicators for monitoring the progress of the transition towards a circular economy in 2024[44].

It contains 19 circular economy themes that have corresponding core indicators.

One theme ('market developments and new business models') is relevant to the Australian context and contains three indicators.

Table 1: OECD circular economy measurements for the Australian context

Indicator	Subthemes	Measurements	Realisation steps
(1) Gross value added of circular economy sectors	Circular economy entrepreneurship and products	• Circular economy new business registration • Circular economy new trademarks and patents • Circular economy certification of companies	• Define measurement boundaries • Improve quality and availability of data accounts • Develop practical guidance on how to use measurements
(2) Jobs in circular economy sectors	Employment markets and jobs	• Jobs in sharing economy • Reuse and repair activities	• Define measurement boundaries • Improve quality and availability of data accounts • Develop practical guidance on how to use measurements
(3) Markets for recycled materials	Recycling markets	• Diversity of recycled material markets • Size of recycled material markets	• Define measurement boundaries • Improve quality and availability of data accounts • Develop practical guidance on how to use measurements

[43] TSA (2024) Australian Tyre Consumption and Recovery, Fact Sheet, 2023-24, https://www.tyrestewardship.org.au/handbooks/tyre-consumption-recovery-fact-sheet/
[44] OECD (2024) Monitoring progress towards a resource-efficient and circular economy, https://doi.org/10.1787/3b644b83-en

The three indicators represent international best-practice. To improve their applicability in the Australian context, they can be augmented to increase their comprehensiveness and relevance (see Table 2).

Table 2: Augmentations of OECD indicators for application in the Australian context

Indicator	Contextualisation	Augmentations
(1) Gross value added of circular economy sectors	Gross value added refers to the value of an output less the cost of intermediate inputs (e.g., raw materials, services). It is useful to record the net contribution of a producer, industry, or sector to a total measure (e.g., GDP). However, it can be misleading as it does not reflect the efficiency of the inputs	• Monitor the inputs and factors of production used and their opportunity cost, to contextualise the efficiency of the gross value added
(2) Jobs in circular economy sectors	Jobs in the circular economy are likely to have a propensity for being high-skilled jobs, which plays to Australian labour force strengths. However, this is not always the case, and a more complete measure should incorporate the attributes and additionality of new employment.	• Monitor the counterfactual employment of circular economy labour force • Monitor the skill complexity and productivity of new employment
(3) Markets for recycled materials	Markets should be considered in local, state, national, and international contexts.	• Monitor the strength of markets for Australian recovered resources at the local, state, national and international scale

Of note, at the micro level of tyres, TSA publishes an annual report that includes reporting on range of metrics, and insights into the circular economy on end-of-life tyres in Australia.

The TSA Annual Report FY2024 provides an excellent, succinct overview of the achievements and challenges over the past year and reflects on the ten years of operation (2024-2024) of the current voluntary product stewardship scheme. The TSA compilation of data in the report is relied on by government and industry.

See: TSA Annual Report FY2024[45]

Of note, the ACCC has recently, as part of its determination to reauthorise TSA for a further three years, updated the metrics that TSA is required to report upon[46]. These will be monitored for FY2025 and reported in the TSA FY2025 Annual Report.

In addition to the annual report, for more detailed information, TSA publishes a material fate analysis report, that combines material flow analysis data with TSA participant reports to provide a complete picture on the fate of all tyres: passenger, truck, bus and off-the-road. An updated version of TSA'S material fate analysis report will be published

[45] TSA (2024) Annual Report 2023-2024, https://www.tyrestewardship.org.au/wp-content/uploads/2024/09/TSA-Annual-Report-FY2024.pdf

[46] ACCC (2024) Determination in respect to the continuation of the Tyre Product Stewardship Scheme, https://www.accc.gov.au/system/files/public-registers/documents/Final%20Determination%20-%2002.09.24%20-%20PR%20-%20AA1000655%20TSA.pdf?ref=0&download=y

soon. This report supports TSA's role as an information hub, thought leader, and provider of rigorous, independent data. In the meantime, the summary of this analysis, the Fact Sheet, TSA (2024) Australian Tyre Consumption and Recovery, Fact Sheet, 2023-24, has been used as the data reference for this submission[47].

[47] TSA (2024) Australian Tyre Consumption and Recovery, Fact Sheet, 2023-24, https://www.tyrestewardship.org.au/handbooks/tyre-consumption-recovery-fact-sheet/

2. Priority Opportunities to Progress the Circular Economy

Information request 2:

The PC is seeking views and information on the following.

Opportunities in Australia to improve environmental and economic outcomes through greater adoption of circular economy activities.

These may relate to sectors, products or supply chain segments, and involve narrowing loops (e.g. reducing the demand for materials), closing loops (e.g. using materials multiple times), slowing loops (e.g. extending useful product life) or regenerating (e.g. using non-toxic materials and regenerating ecosystems). Information would be particularly welcome on:

– how these opportunities could affect business and economic outcomes (including costs), environmental outcomes (including biodiversity, climate and water, land and air quality), and social outcomes

– feasible levels of future uptake or adoption in Australia

– how their effects could best be monitored or measured, and how opportunities could be prioritised

– how Aboriginal and Torres Strait Islander knowledges could be valued, in ways that protect Indigenous cultural and intellectual property, to identify and develop these opportunities.

Analysis of which circular opportunities provide the greatest scope to improve environmental and economic outcomes in Australia and why, including information on:

– metrics used to inform this analysis

– modelling or analysis relating to the potential benefits and costs of implementing specific circular economy opportunities at the sector, product or supply chain segment level (including, but not limited to, life cycle assessments or cost-benefit assessments)

– the distribution of benefits and costs, and whether they will occur in the short, medium or long term.

- **Information on specific opportunities and risks for Australia resulting from international developments, including circular economy policy. These may include developments that:**

  – affect Australian **exports**, such as by opening or creating new markets, or by placing regulatory requirements on the design and production processes of Australian exports

  – affect Australian **imports**, such as changes to production methods internationally, or developments in international markets

  – innovative **processes** that could be adopted in Australia.

2.1 Opportunity to Improve Outcomes on Tyres and Conveyor Belts

TSA presents tyres and rubber-based conveyor belts as a priority opportunity to improve economic and environmental outcomes in Australia through the greater adoption of circular economy activities.

This proposal is in accordance with the federal Environment Minister listing tyres on the Minister's Product Stewardship Priority List[48] in 2022-23, and again in 2023-24. This listing is made under the *Recycling and Waste Reduction Act 2020*. See: Minister's Reasons for Inclusion[49].

In short, tyres are a natural choice priority candidate as they:

- are a persistent waste and pollution issue (environment and economic)
- can be recovered entirely, reducing externalities (environment and economic)
- can be processed to provide secondary materials of value (environment and economic).

Why not to act?

The counter argument against implementing change is that there is a high level of resource recovery for passenger (88%), truck and bus (85%) tyres, and so no issue to be resolved - other than for the OTR sector which has low levels of resource recovery (13%)[50].

While true that there is an established market for end-of-life passenger, bus and truck tyres, most of this material is sourced from cities where collection is relatively easy, and most ends up being shredded, and then exported for energy recovery.

In short, there is an issue. The status quo does not fully service regional, rural and remote areas; does not address OTR; and carries risk from an over reliance on export to an energy recovery end fate that is not circular and so not aligned with policy objectives.

A comprehensive new approach is needed, with a 'regulated product stewardship scheme being the most capable option' as identified by the recent Environment Ministers' Meeting, National End-of-Life Tyres Options Project, Discussion Paper on end-of-life tyres.

[48] Australian Government DCCEEW, Minister's product stewardship priority list, webpage, https://www.dcceew.gov.au/environment/protection/waste/product-stewardship/ministers-priority-list
[49] Australian Government DCCEEW, Minister's product stewardship priority list, webpage, https://www.dcceew.gov.au/environment/protection/waste/product-stewardship/ministers-priority-list-23-24#tyres
[50] TSA (2024) Australian Tyre Consumption and Recovery, Fact Sheet, 2023-24, https://www.tyrestewardship.org.au/handbooks/tyre-consumption-recovery-fact-sheet/

2.1.1 Background on Tyres and Conveyor Belts

Tyres and rubber-based conveyor belts are complex, highly engineered products and their composition can differ depending on their designed use. The core elements are steel, carbon black, and natural and synthetic rubber.

Tyres and conveyor belts go through three life cycle phases:

- design and production (materials, design, manufacturing)
- consumption (use, reuse, repair)
- post-consumption end-of-life (recycling, energy recovery, and disposal).

➢ Making the most of the materials at the post-consumption stage is the current focus of TSA, with an emphasis on recycling[51] management options, as energy recovery and disposal are not circular.

Recycling options in highest to lowest order of material circularity, are:

- applications that offset the demand for virgin rubber by recycling rubber compounds into tyres and conveyor belts
- derived rubbers that can be recycled, and then recovered and re-processed again back into another useful product, such as crumb for road surfacing
- applications which are single use, such as crumb used in explosives.

➢ The outputs along with the application (e.g., Crumb: tile adhesive, sealants etc.) is what determines material circularity. Without this holistic consideration of processing output and product application, processing technologies (such as pyrolysis and gasification) could be considered highly circular without considering the use of the material and its associated life cycle.

In respect to processing for recycling:

- Primary processing is about size reduction and steel recovery: shredding, granulation, and crumbing.
- Secondary processing is about further resource extraction, following on from primary processing with the application of energy: devulcanisation, reclamation, pyrolysis and gasification. In Australia, very little secondary processing occurs currently.

➢ Of interest, different end-of-life tyre products are best suited to the production of different secondary material outputs due to different compositions.

[51] The definition of recycling is provided in the glossary.

2.1.2 Issues on Tyres and Conveyor Belts

Australia, a resource-rich, export-orientated, OECD member country, operating in the globalised economy, imports all tyres either loose or fitted to vehicles. Australian manufacturing of tyres ceased in 2010. Australia still manufactures conveyor belts and tread for retreading tyres.

In the 2023-24 financial year Australia generated approximately 537,000 tonnes or 67 million passenger tyre equivalents units of used tyres[52]. To appreciate this number, it equates to around 20 kg per Australian. For conveyor belts, an estimated range of 60,000 to 85,000 tonnes reaches their end-of-life each year[53].

In terms of the recovery of this material, despite substantial effort by the voluntary product stewardship Scheme contributors and participants, TSA, all tiers of government, and others, the current resource recovery rate is falling short of community expectations and the close to 100% rate that is achievable. We still don't have a systematic approach to resource recovery in place in Australia.

In 2023-2024:

Unrecovered material: Being that which includes fates such as landfilled, buried onsite, retained onsite, stockpiled, or dumped and not cleaned up, continued to be a significant portion of the fate of end-of-life tyres, at 34%[54].

- Stockpiles and dumping are especially prevalent and problematic in urban fringe, and regional, rural, and remote locations where councils and communities bear the brunt of these illegal activities.[55]
- OTR tyre recovery, which includes huge mining tyres, is negligible. For mining around 98% are being buried onsite at mines or otherwise not recovered each year[56].

[52] TSA (2024) Australian Tyre Consumption and Recovery, Fact Sheet, 2023-24, https://www.tyrestewardship.org.au/handbooks/tyre-consumption-recovery-fact-sheet/
[53] TSA (2023) Tipping the Balance The business case for a circular economy for Australia's off-the-road tyres, conveyors, and tracks, https://www.tyrestewardship.org.au/wp-content/uploads/2023/06/TSA0003%20-%20L8%20-%20OTR%20-%2040pp%20Business%20Plan%20-%20A4.pdf
[54] TSA (2024) Australian Tyre Consumption and Recovery, Fact Sheet, 2023-24, https://www.tyrestewardship.org.au/handbooks/tyre-consumption-recovery-fact-sheet/
[55] Blue Environment (2024) Stockpiling and illegal dumping of tyres: cost to local governments and others, https://www.tyrestewardship.org.au/reports-facts-figures/stockpiling-and-illegal-dumping-of-tyres-cost-to-local-governments-and-others/
[56] TSA (2023) Tipping the Balance The business case for a circular economy for Australia's off-the-road tyres, conveyors, and tracks. https://www.tyrestewardship.org.au/wp-content/uploads/2023/06/TSA0003%20-%20L8%20-%20OTR%20-%2040pp%20Business%20Plan%20-%20A4.pdf

Recovered material: Being materials separated, sorted, or processed for the purposes of reuse, recycling, or energy recovery, was 66% in 2023-24[57].

- Less than 25% of the portion that is recovered (16% of total generation) is used in Australia for circular applications such as re-use, asphalt for road surfacing, permeable pavement, and concrete road barriers. Although there is a range of circular applications for end-of-life tyres, the lack of consistent onshore demand for these products has resulted in most recovered material being exported to be burnt as fuel in Asia, which is not a circular outcome[58].

2.2 Opportunities at the Intermediate Scale

The good news is that end-of-life tyres can become a valuable resource for the circular economy. Ensuring that these components get to an appropriate sustainable, and ideally circular end use, however, takes deliberate management.

The case studies provided in our response to 'information request 1' outline examples of how the circular economy can operate to narrow, close, and slow loops at the 'micro', product and business scale.

TSA has undertaken detailed analysis of market segments and commissioned several business cases at the 'intermediate' (meso) place-based regional scale, and at the sector scale, that demonstrate a case for action, including government intervention.

Place-based business cases include:

- Tyre Recycling in the Northern Territory
- Tyres and Conveyor Belts in WA
- Queensland Circular Economy for Used Tyres – North and Far North Queensland
- Queensland Circular Economy for Used Tyres – Southeast.

Detailed market segment analysis has been undertaken for:

- Off-the-Road Tyres and Conveyor Belts and Tracks.

Below we discuss case studies for used tyres in North and Far North Queensland, and for end-of-life OTR tyres across the nation.

[57] TSA (2024) Australian Tyre Consumption and Recovery, Fact Sheet, 2023-24, https://www.tyrestewardship.org.au/handbooks/tyre-consumption-recovery-fact-sheet/
[58] TSA (2024) Australian Tyre Consumption and Recovery, Fact Sheet, 2023-24, https://www.tyrestewardship.org.au/handbooks/tyre-consumption-recovery-fact-sheet/

2.2.1 Case Study: Used Tyres in North and Far North Queensland

The Queensland Waste Management and Resource Recovery Strategy[59] emphasises the shift towards a circular economy, and many regional councils in Queensland are exploring circular models that enhance economic and social value while addressing waste and pollution. The TSA report, Queensland Regional Business Case for a Circular Economy for Used Tyres (2022), focuses on the North and Far North Queensland regions, analysing the opportunities for these councils.

Currently, most end-of-life tyres from these regions are transported to Southeast Queensland, while some are stockpiled, illegally disposed of causing environmental issues and financial strain for councils or buried in mining pits. The TSA report highlights the potential for a more efficient tyre recovery model, tapping into the resources within tyres from various vehicles, including cars, trucks, and mining machinery. The report identifies several benefits of establishing a regional tyre recycling solution, including (in 2022 prices/estimates):

- a capital investment of approximately $5 million in tyre recycling infrastructure
- creation of 10 to 20 full-time equivalent jobs, fostering transferable skills
- economic diversification and new local business opportunities
- retention of up to $5.2 million in resources within the region
- savings of around $500 per tonne in transportation costs.

To succeed, a new crumbing and granulation facility near Townsville is recommended, contingent on a sufficient supply of tyres. However, barriers to regional tyre recycling must be addressed, including investments and market demand for recycled products. The report suggests coordinated actions to overcome these barriers and stimulate a new tyre recovery industry. Additionally, the involvement of Aboriginal and Torres Strait Islander communities and the protection of significant natural landscapes like the Great Barrier Reef and Daintree Rainforest should be considered in this transition, ensuring that local knowledge and cultural heritage are valued in the circular economy. Any stewardship scheme on end-of-life tyres works for these communities[60].

[59] TSA, Queensland Regional Business Case for a Circular Economy for Used Tyres – North and Far North Queensland, https://www.tyrestewardship.org.au/reports-facts-figures/queensland-regional-business-case-for-a-circular-economy-for-used-tyres/

[60] See submission comments by the North Queensland Regional Organisation of Councils in respect to the ACCC reauthorisation of TSA and issues in FNQ,

2.2.2 Case Study: Off-the-Road Tyres

Australia's mining and agricultural sectors are internationally renowned for their economic success. However, this success brings expectations for heightened environmental and social responsibility. A critical yet often overlooked component of these sectors is OTR tyres, tracks, and conveyor belts. These OTR rubber products are essential for operations in mining, agriculture, construction, manufacturing, and aviation.

The TSA report, Tipping the Balance – The business case for a circular economy for Australia's off-the-road tyres, conveyors, and tracks (2023)[61], examines the opportunity to enhance the recovery of OTR rubber products.

Currently, nearly all end-of-life OTR mining products are not recovered; they are either buried, stockpiled, or sent to landfill. Limited onshore recovery infrastructure and a lack of regulatory oversight regarding onsite disposal have contributed to this issue. In 2023-24 only 13% of all OTR was recovered across all sectors[62].

Addressing this challenge requires collaboration among all stakeholders - including miners mining organisations, farmers, government, tyre importers, recyclers, and Indigenous Peoples and Local Communities - to establish a viable market for recycled OTR products. Implementing a regulated product stewardship scheme would compel participation and facilitate recovery efforts.

Key findings in the report highlight mining hubs such as the Pilbara in Western Australia, Bowen Basin in Queensland, and Hunter Valley in New South Wales as critical areas for focused efforts. TSA engagement with these stakeholders has begun to yield positive outcomes, supported by government funding for projects. Additionally, reconciling industry practices with the values of Indigenous Peoples and Local Communities peoples is essential, particularly in land management and site rehabilitation efforts.

Emphasising collaboration and responsibility can create reliable economic opportunities while promoting sustainable practices in Australia's mining and agricultural sectors.

[61] TSA (2023) Tipping the Balance The business case for a circular economy for Australia's off-the-road tyres, conveyors, and tracks, https://www.tyrestewardship.org.au/wp-content/uploads/2023/06/TSA0003%20-%20L8%20-%20OTR%20-%2040pp%20Business%20Plan%20-%20A4.pdf

[62] TSA (2024) Australian Tyre Consumption and Recovery, Fact Sheet, 2023-24, https://www.tyrestewardship.org.au/handbooks/tyre-consumption-recovery-fact-sheet/

Image 6: OTR mining tyre and conveyor belt sustainability forum NSW 2024

2.3 Activities with the Greatest Scope to Improve Outcomes and Why

In respect to tyres and conveyor belts, a **'dual circulation strategy'** is proposed as an appropriate strategy for Australia to succeed in the circular economy, including as it pertains to tyres and conveyor belts.

This means achieving much stronger domestic material circularity (internal circulation) while continuing to strengthen Australia's international economic position by fully participating in and finding opportunities to specialise in high-value global markets (external circulation).

The internal and external loops are linked. By cleaning up our act and recovering all our end-of-life tyres, we will have the scale of material necessary to (re)industrialise to

produce through the products needed by both global and domestic markets. This type of systems thinking plays an important role in the circular economy.[63]

In accordance with the 'dual circulation strategy', TSA proposes that the circular opportunities with the greatest scope to improve economic, environmental and social outcomes[64] are **'advanced manufacturing'** for global markets (external circulation), and the construction of **'resilient civil infrastructure'** within Australia (internal circulation).

Both opportunities are circular and can work in concert. Principally: High-value end-of-life material can be directed towards the production of high-value export outputs and applications, and low-value end-of-life material can be directed towards domestic outputs and applications.

Both opportunities depend on radically improved resource recovery as the first step, to give us the scale of materials needed to make the most of the opportunities. Regulated product stewardship can deliver the necessary improvement in resource recovery rates in a comprehensive and capable manner. The reasons for these two priorities are provided in the following descriptions.

2.3.1 Priority 1: Advanced Manufacturing Exports to Global Markets

Every Australian manufacturer has the potential to be advanced - as advanced manufacturing is not what you make but how you make it. For example, by using:

- advanced knowledge
- advanced processes
- advanced business models.

As Australian manufacturers recognise the need to compete on quality and value rather than cost, advanced manufacturing provides an opportunity to contribute innovative products, components or services within global supply chains, or to produce finished products for export.

Just as progress in material science and engineering has paved the way for groundbreaking advancements and markets for other industries, so too will the R&D

[63] Ellen Macarthur Foundation, webpage, https://www.ellenmacarthurfoundation.org/systems-and-the-circular-economy-deep-dive#:~:text=The%20role%20of%20systems%20thinking,our%20conceptual%20understanding%20of%20it.

[64] Australian Government, Productivity Commission, Call for Submissions, Inquiry into Australia's opportunities in the circular economy, https://www.pc.gov.au/inquiries/current/circular-economy/call-for-submissions/circular-economy-call.pdf

and market development on the use of tyre derived material help to shape the future of material circularity for end-of-life tyres.

Creating a system that ensures high-value use for end-of-life tyres is the most desirable approach to solving the problem of waste – noting that creating secondary materials that can go back into tyre and conveyor manufacturing is very energy intensive.

Carbon black

Carbon black, an almost pure carbon product, is a necessary ingredient in tyres, and is typically produced from fossil fuels. China and Russia are the biggest producers. Over the past years there has been volatility in the market including most recently as a result of the European Parliament banning, as war sanctions, the import of Russian carbon black into European markets completely from 1 July 2024.

Just as carbon black is required for tyres, it can also be partially recovered from tyres. For example, Continental's tyre plant in Korbach, Germany now produces tyres[65] containing carbon filler materials recovered from end-of-life tyres. The carbon is also produced by Pyrum Innovations through a thermolysis (similar to pyrolysis) process. Recovered carbon black reduces use of fossil fuel, raw materials and can reduce CO_2 emissions.

Given Australia's competitive advantage in clean energy and global need for more sustainable and geo-politically acceptable sources, the production of recovered carbon black seems to be a natural opportunity for Australian manufacturing.

TSA's report, **Pyrolysis of end-of-life tyres – Review of pyrolysis technologies and product opportunities for Australia** provides a detailed pyrolysis product and market review for Australia.

Devulcanisation

Devulcanisation is an emerging technological process that can recycle used rubber materials into a productive resource.[66]

Vulcanisation is a stage in the production of tyres that introduces sulphur to 'cure' the rubber and create a stronger material.[67] Devulcanisation is essentially the reverse process that aims to 'regenerate' the elasticity of the rubber and produce a re-mixable rubber-derived material comprised principally of the natural rubber, synthetic rubber, and carbon black.

[65] https://www.continental-tyres.co.uk/newsroom/recovered-carbon-black-in-solid-tyres/
[66] For more information, see: Roetman, E., et.al. (2024) Does the Rubber Meet the Road? Assessing the Potential of Devulcanization Technologies for the Innovation of Tire Rubber Recycling. Sustainability, 16(7), 2900. https://www.mdpi.com/2071-1050/16/7/2900
[67] TSA. (2024). Analysis of the material circularity of management options for tyres and conveyor belts. https://www.tyrestewardship.org.au/reports-facts-figures/material-circularity-of-management-options-for-tyres-and-conveyor-belts/

Devulcanisation is an emerging process and is operating at small scale worldwide. In Australia, interest is gaining, and in addition to the devulcanisation project mentioned (East-West Pilbara Rubber Recycling) other interesting devulcanisation projects are beginning. For example, with government support, RubberGem, a leading Australian rubber recycling and re-manufacturing business, with operations in Perth, Western Australia has committed to open a devulcanisation plant.

In this context, in line with the broad shift to a global circular economy, devulcanisation to produce rubber-derived products represent a potential commercial opportunity in Australia.

Image 7: TSA CEO Lina Goodman visiting a devulcanised rubber factory, Canada 2022

2.3.2 Priority 2: Resilient Civil Infrastructure for Australia

Expanding onshore local markets helps to mitigate the risks associated with global market fluctuations, whilst making the products that Australia's want and need. There is a standout case for tyre derived material in civil infrastructure.

Australia's extensive road network, essential for commerce, faces increasing challenges due to climate change. It is vital to maintain and upgrade this infrastructure to withstand unpredictable climatic conditions. Recent parliamentary discussions[68] emphasise the need for innovative approaches to infrastructure, advocating for the purposeful incorporation of recycled materials.

For example, using crumb rubber derived from processed end-of-life tyres in road construction significantly enhances infrastructure resilience and supports material circularity. Crumb rubber asphalt pavements boast improved durability, reduced maintenance needs, and a longer service life, resulting in significant carbon footprint reductions. Benefits include:

- elimination of waste and landfill reduction
- enhanced resistance to deformation and rutting
- improved driving comfort and safety through better adhesion
- greater elasticity and moisture resistance, leading to reduced cracking
- UV protection, effectively extending road lifespan.

The government can facilitate a circular economy through effective procurement policies, promoting the use of tyre-derived materials in infrastructure projects. A recent report indicated that mandating crumb rubber use could recycle approximately 26.4 million end-of-life tyres annually by 2026[69]. As repair costs for flood-damaged roads soar, increased use of crumb rubber can improve infrastructure resilience and lower renewal costs. Western Australia has already seen success with its mandate for crumb rubber, significantly increasing its adoption in road projects. Emulating leaders like California in crumb rubber usage can enhance Australia's infrastructure while contributing to a sustainable circular economy.

[68] See, for example, the House of Representatives Standing Committee on Regional Development, Infrastructure and Transport, Inquiry into and report on the implications of severe weather events on the national regional, rural, and remote road network, https://www.aph.gov.au/Parliamentary_Business/Committees/House/Regional_Development_Infrastructure_and_Transport/ResilientRoads/Report/Chapter_4_-_Enabling_climate_resilient_infrastructure

[69] TSA (2024) Tyre Derived Crumb Rubber Market in Road Surfacing Australia, https://www.tyrestewardship.org.au/wp-content/uploads/2024/10/TSA-Crumb-Rubber-Road-Surfacing.pdf

2.4 International Considerations

Tyres are a global industry, and there are significant international considerations at every stage of the life cycle. These range from deforestation, biodiversity and labour issues within the natural rubber production system, through to tariff issues. Over two billion tyres are produced globally each year, estimated to be worth $262 billion USD in 2023 [70].

Image 8: Tyre pollution on Balinese beach

2.4.1 Australian Exports

Australia's engagement with international developments in the circular economy for tyres and conveyor belts presents both opportunities and risks that can significantly impact exports.

By proactively embracing sustainability, Australian industries can enhance their growth potential.

Export Opportunities:

- **New Market Access**: Adopting circular economy principles can create new markets for Australian recycled products that meet global standards.
- **Enhanced Product Design**: Compliance with international regulations can make Australian products more appealing in global markets.

[70] Smithers, The Future of Global Tyres to 2028, (webpage regarding report), https://www.smithers.com/services/market-reports/transportation/global-tire-markets-to-2024

- **Investment in Circular Technologies**: Commitment to circular economy practices can attract foreign investment into Australia.

Export Risks:

- **Regulatory Compliance**: Stricter international regulations may impose costly production requirements and create trade barriers if compliance is not met.
- **Market Volatility**: The market for recycled materials can be unpredictable, posing risks for exporters reliant on fluctuating international demand.
- **Technological Challenges**: Adapting to new standards may require significant investment, which could strain smaller businesses.
- **Supply Chain Disruptions**: Changes in international trade dynamics can disrupt vital supply chains.
- **Environmental Accountability**: Increasing scrutiny on sustainability practices may impact the brand reputation and market access of Australian exporters.

2.4.2 Australian Imports

For imports, strategic collaboration and technology transfer will be important to realise local benefits.

Import Opportunities:

- **Access to Sustainable Products**: The global shift toward circular economy practices may lead to a greater supply of high-quality recycled materials, reducing reliance on virgin resources and offering a diverse range of products for Australian consumers and businesses.
- **Innovation Transfe**r: Importing advanced technologies and sustainable materials can enable local industries to improve their operational efficiencies and sustainability efforts, fostering knowledge sharing with international firms.
- **Cost Reductions**: Access to competitively priced recycled materials from countries with advanced recycling systems can enhance the cost-effectiveness of Australian manufacturing and align with circular economy goals.

Import Risks:

- **Increased Competition**: An influx of sustainably produced goods may increase competition for local manufacturers, potentially threatening market share.
- **Dependency on Imports**: Heavy reliance on imported materials could expose Australia to supply chain and sovereignty vulnerabilities and quality control issues.
- **Regulatory Compliance**: Differing international standards can complicate compliance for Australian businesses, adding administrative burdens.

- **Environmental Concerns**: Increased imports might elevate transportation emissions and create waste management challenges if products are not designed for circularity.

2.4.3 Innovative Processes that Could be Adopted in Australia

Australia has the potential to adopt several innovative tyre recycling processes (see earlier description of pyrolysis and devulcanisation) and advanced manufacturing techniques (see below) that can enhance sustainability and efficiency.

By adopting these innovative recycling processes and advanced manufacturing techniques, Australia can significantly enhance its tyre recycling capabilities and other aspects of material circularity.

Investing in R&D and market development, along with collaboration between industry and academia, will be crucial to drive these initiatives forward and position Australia as a leader.

Other innovative processes include the use of AI. For example, for automated OTR tyre inspection[71] to increase productivity and efficiency.

Advanced Manufacturing Techniques

3D Printing with Recycled Materials

- **Overview**: Utilises recycled rubber or rubber composites in additive manufacturing.
- **Benefits**: Enables the creation of custom products and prototypes, reducing waste and allowing for innovative designs.

Advanced Composite Materials

- **Overview**: Incorporating recycled rubber into composite materials for use in various industries, such as automotive or construction.
- **Benefits**: Enhances material properties while promoting recycling and reducing reliance on virgin materials.

Smart Manufacturing

- **Overview**: Integrating IoT and AI technologies, and lasers, to optimise processes and supply chains, and to enable traceability and tracking.
- **Benefits**: Improves efficiency, reduces waste, and enables real-time monitoring and predictive maintenance, and other benefits.

[71] See for example Pitcrew.ai, webpage, https://pitcrew.ai/pitcrew-mining#:~:text=Pitcrew%20Mining%20provides%20automated%20OTR,is%20warmer%20than%20adjacent%20tyres.

3. Hurdles and Barriers to a Circular Economy

The PC is seeking views and information on the following.

The main reasons businesses and consumers have not adopted circular economy practices to date, including (but not limited to):

- costs – attitudes (including about risk)
- regulatory constraints
- lack of information or resources
- lack of coordination.

3.1 Economic Perspective on Hurdles and Barriers

Businesses and consumers in Australia have not widely adopted circular economy practices. In 2023, the Australian Bureau of Statistics (ABS) reported Australia to have a circularity rate of 4.4 per cent (measuring the proportion of materials used by a country that are not 'virgin' materials).[72] This is a marginal increase from 2010 (3.8 per cent) in spite of an overall gradual rate of increase. Australia's rate is below the global average circularity rate (7.2 per cent).[73]

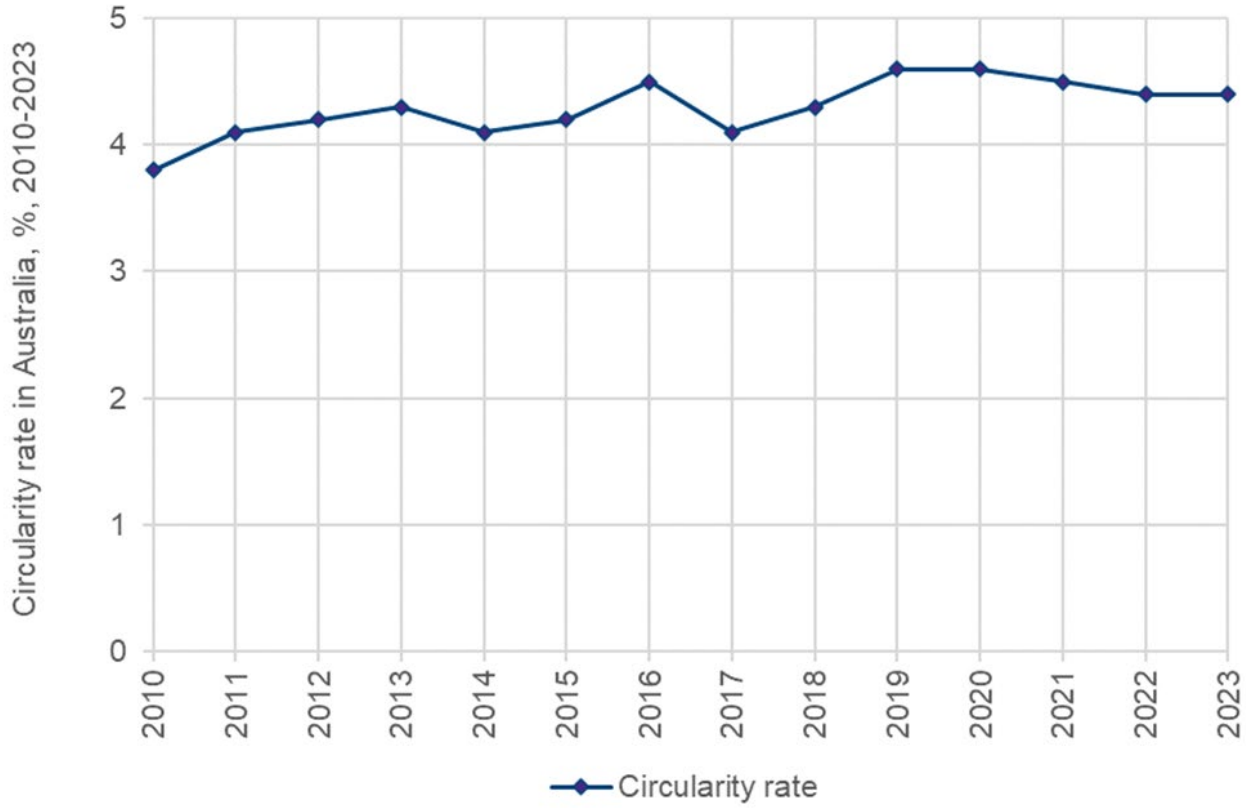

Figure 6: Circularity rate in Australia, 2010-2023

The ABS reported marginal improvements to additional recent circularity indicators relative to 2010:

- Australia's material footprint per capita in 2023 was 31.0 tonnes, relative to 37.6 tonnes in 2010.[74]

[72] ABS. (2023). *Circular economy,* https://www.abs.gov.au/statistics/measuring-what-matters/measuring-what-matters-themes-and-indicators/sustainable/circular-economy#:~:text=In%202023%3A,global%20circularity%20rate%20(7.2%25)

[73] The CSIRO reports a more conservative *value in 2024*: "The circularity rate of Australia is around 4 per cent…This is half the global average". See: CSIRO. (2024). Material flow analysis to progress to a circular economy. https://research.csiro.au/circulareconomy/material-flow-report/#:~:text=The%20report%20highlights%20the%20importance,mobility%2C%20food%20and%20energy%20provision.

[74] The total amount of raw materials per person consumed to make products or services used in Australia.

- Australia's material productivity on a domestic material consumption basis was $1.58 AUD/kg in 2023, relative to $1.45 AUD/kg in 2010.[75]

There are several extant short-run barriers to adopting circular economy practices that apply to a wide range of goods and services. There are also structural changes necessary to capitalise on long-run opportunities. The following subsections outline these short-run and long-run barriers and opportunities.

Image 9: TSA staff communicating tyre circularity to the mining industry at the International Mining and Resource Conference and Expo 2024

3.1.1 Short-run Considerations

Negative externalities

The primary short-run barrier to implementing circular economy practices is the discrepancy between the cost of goods and services in Australia and their overall social cost.

[75] Material productivity measures the efficiency with which raw materials (such as metals, minerals, and biomass) are used in production processes. Higher material productivity indicates the economy is generating more output with less material input.

The Australian economy is broadly structured by a 'take-make-dispose' linear consumption model.[76] This generally results in the acquisition of new products in Australia being less expensive and convenient than adopting circular economy practices. The consumption model is underpinned by unincorporated social costs that are borne by society rather than the producers or consumers of the products.

Social costs are incurred across the lifespan of products that are often not reflected in the product cost, incentivising the continuation of the linear consumption model.

Social costs that are not always or fully internalised into product cost include:

- production externalities (e.g., emissions to air and water associated with extraction, manufacture, and distribution)
- consumption externalities (i.e., pollutants and emissions arising from product use)
- disposal externalities (i.e., the treatment and management of end-of-life products).

Imperfect information

Circular economy practices in Australia are nascent and consumers are likely to have imperfect information on their extent and ability to contribute their effort.

For example, the Commonwealth Bank noted in a 2022 report into circular economy consumer impacts that a consumption-side lack of awareness may inhibit participation in, and the adoption of, circular economy practices in Australia[77].

Poor information about consumption or current end-of-life management practices are also a fundamental barrier to identifying, analysing and implementing circular economy actions.

Positive spillovers

Increasing our material productivity will need investment in R&D, feasibility studies, consumer awareness and market development. Most if not all product stewardship schemes around the world, including in Australia, invest in these areas to systematically improve circular outcomes over time.

This investment leads to production practices that reduce product environmental footprints and increase product life, expand and deepen end-of-life pathways, increase recovered material value and enhance consumer awareness, among other beneficial outcomes.

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[76] CSIRO (2024) Advancing the circular economy. https://www.csiro.au/en/research/environmental-impacts/sustainability/circular-economy
'Take-make-dispose' quote attributable to: Upadhayay, S., & Alqassimi, O. (2018). Transition from linear to circular economy. Westcliff International Journal of Applied Research, 2(2), pp. 62-74.

[77] Commonwealth Bank. (2022). CommBank Consumer Insights October 2022: Circular Economy. https://www.commbank.com.au/content/dam/commbank-assets/business/industries/2022-10/commbank-consumer-insights-report-10-2022.pdf

These outcomes benefit not only the producers that fund these investments but often the entire industry as the knowledge and innovations produced can be widely adopted.

The presence of this free riding discourages investment and disadvantages participating producers who bear the additional cost.

Risk and uncertainty

Investment in R&D and feasibility studies is also needed to reduce barriers to introducing new circular pathways based on previously unproven technologies in Australia. Without this investment, the viability of adopting such technology significantly reduces because of the perceived risk and uncertainty that lead to scarcer and higher cost financing.

In a report funded by the International Chamber of Commerce, Ernst & Young note that this financial barrier as a key inhibitor to increasing circular economy outcomes[78].

Investment in productivity boosting R&D and innovation are crucial for sustaining Australia's living standards in the long run, especially in areas Australia is likely to have a comparative advantages.

3.1.2 Structural Changes Needed for Long-run Opportunities

Current policy settings

Current policy settings aim to structure the Australian economy to promote allocative efficiency (i.e., the allocation of resources to the most productive use), but more so in the short to medium term[79].

While this policy environment is effective at maximising domestic living standards, it does not directly consider intergenerational preferences (i.e., potential future demand from Australian and global markets for circular goods). This misalignment inhibits circular practice adoption.

A circular consumption structure is materially different to a linear consumption model.[80] A transition would require a redesign and restructure of business production

[78] ICC & EY (2024), Putting the circular economy into motion: From barriers to opportunities, https://iccwbo.org/wp-content/uploads/sites/3/2024/10/2024_ICC-x-EY-Report_03.pdf

[79] The topic of allocative efficiency in Australia has garnered material commentary. See: Productivity Commission. (2013). On efficiency and effectiveness: some definitions, https://www.pc.gov.au/research/supporting/efficiency-effectiveness/efficiency-effectiveness.pdf
Reserve Bank of Australia. (2015). 'Reform' and economic growth [speech transcript, Glenn Stevens], https://www.rba.gov.au/speeches/2015/sp-gov-2015-08-26.html
Australian Government Treasury. (2022). Overview: understanding productivity in Australia and the global slowdown. https://treasury.gov.au/sites/default/files/2022-10/p2022-325290-overview.pdf

[80] CSIRO (2024) Australian material flow analysis to progress to a circular economy, https://research.csiro.au/circulareconomy/wp-content/uploads/sites/303/2024/03/24-00034_ENV_REPORT_MaterialFlowAnalysisToCircularEconomy_WEB_240305-2.pdf

processes, incorporation of scaled regenerative and restorative techniques, and development of shared economic practices.[81] The extent of the realignment necessitates a high degree of coordination to implement complex economic adjustments, albeit with some necessary short-run trade-offs.

Upadhayay and Alqassimi succinctly summarise this barrier in a 2018 study on transitioning to a circular economy:

> *"But this paradigm shift is not possible alone through the effort of a single entity. Involvement and commitments from individual, regional, governmental and intra-governmental levels are mandatory as it helps to create a synergist effect."*

Global transition to decouple economic activity from resource use

The European Union (EU) has led the world on efforts to decouple economic growth from resource use. Notable measures have included:

- The move by the European Union (EU) to apply tariffs to the imports of selected goods from countries with inadequate carbon policies, known as the Carbon Border Adjustment Mechanism (CBAM), set to go into force in 2026.
- The EU's plastic fee applied based on each member country's amount of non-recycled plastic packaging waste produced.

The EU is also leading the charge on the adoption of sustainability disclosure mechanisms for covered organisations relating to climate change impacts, under the Task Force on Climate-Related Financial Disclosures (TCFD), and relating to nature impacts, under the Taskforce on Nature-related Financial Disclosures (TNFD). Other countries include a number of our key trading partners such as New Zealand, the United Kingdom (UK), Japan, Hong Kong and Singapore are following suit.

These developments are similar to those that preceded the global renewable energy transition. Countries that had the foresight to anticipate the opportunities and restructure industries in ways aligned to their respective comparative advantages, such as Germany, Denmark and China, have reaped the economic dividends of doing so.

Australia has the opportunity to learn from what worked well or could have been more effective, in positioning for opportunities in the renewable energy transition. These learnings can be applied to position itself more effectively and rapidly, capitalising on early mover advantages, for opportunities that are likely to arise with the global transition to a circular economy that best align with Australia's comparative advantages. Identifying and positioning for those opportunities is likely to yield

[81] Upadhayay, S., & Alqassimi, O. (2018). Transition from linear to circular economy. Westcliff International Journal of Applied Research, 2(2), pp. 62-74.

significant long-run economic dividends. The CSIRO's report[82] on Australia's comparative and competitive advantages in transitioning to a circular economy is instructive.

Dynamic efficiency as a policy objective

To capitalise on these long-run opportunities, Australia will need to make dynamic efficiency the goal. While this makes policy evaluation more complex, methods and models to analyse this policy problem are emerging.[83] An economic model that is characterised by dynamic efficiency incorporates consideration of intergenerational demand (i.e., the potential demand from future generations on the current allocation of resources in the economy). In such a model, intergenerational demand necessarily relates to factors that endure across time (e.g., non-biodegradable waste) rather than the allocation of resources to maximise current consumer preferences (e.g., disposable products supported by a linear consumption model). The premise of a circular economy is based on several long-run principles:[84]

- **Virgin resources are finite**. Resource depletion implies a future scenario that does not feature the same volume of materials and non-renewable energy that are available to current consumers. The current global resource consumption rate is generally considered to be unsustainable. These issues are likely to gain greater prominence as the world passes its so-called planetary boundaries, which virgin resource extraction strongly contribute to breaching in a range ways (e.g., impacts on biodiversity/natural habitats, climate change, freshwater use etc.).[85, 86]

- The tendency to dispose of **waste materials creates negative health and environmental impacts.** Disposing of waste rather than re-using waste contributes to landfill areas, emits greenhouse gas emissions, and leaches pollutants into the environment.

- **Linear consumption is not conducive to maximising economic value**. Disposing of waste precludes the re-use of potentially valuable resources. The current unsustainable use of virgin finite resources lends increasing import to this factor.

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[82] CSIRO (2024) Australia's comparative and competitive advantages in transitioning to a circular economy, https://research.csiro.au/circulareconomy/wp-content/uploads/sites/303/2024/04/23-00596_ENV_REPORT_AustraliasComparativeAndCompetitiveAdvantages_WEB_240404.pdf
[83] Refer to, for example, Renewable and Sustainable Energy Reviews. (2015). The static and dynamic environmental efficiency of renewable energy: A Malmquist index analysis of OECD countries https://www.sciencedirect.com/science/article/abs/pii/S1364032115002233
[84] CSIRO. (2024). Australian material flow analysis to progress to a circular economy. https://research.csiro.au/circulareconomy/wp-content/uploads/sites/303/2024/03/24-00034_ENV_REPORT_MaterialFlowAnalysisToCircularEconomy_WEB_240305-2.pdf
[85] Fanning, et. al. (2020) Provisioning systems for a good life within planetary boundaries. Global Environmental Change, https://doi.org/10.1016/j.gloenvcha.2020.102135.
[86] Stockholm Resilience Centre, webpage, https://www.stockholmresilience.org/research/planetary-boundaries.html

3.2 Other Reasons Delaying Success

As Australia navigates its circular economy policies related to tyres and conveyor belts, careful consideration needs to be given to the main reasons businesses and consumers have not adopted circular economy practices to date, and to the remedy to these barriers[87].

While much analysis has been completed, including by TSA, for example in respect to end-of-life OTR tyres and conveyor belts in the Tipping the Balance[88] report, it is important that the need for further or final analysis should not stymie the appetite for reform.

Regulatory Decision Making

For example, an impact analysis process is the necessary next step to consider the costs and benefits of the introduction of a regulated product stewardship scheme on tyres and conveyor belts. This analysis should not be considered onerous and act as a hurdle or barrier to action.

Analysis dating back decades[89,90] has made the case for a level playing field on product stewardship for end-of-life tyres; and tyres have been on the federal Environment Minister's Product Stewardship Priority List for several years, with specific actions:

1. Manufacturers, importers, distributors and retailers must demonstrate improved and measurable product stewardship actions which could include any of the following: expanding and improving the industry-led product stewardship scheme (including through a significant decline in free riding); product design improvements and supply chain initiatives to increase durability, reparability, re-usability and/or recyclability; other supply chain initiatives that measurably support good product stewardship and circular economy progress. ***By November 2024***
2. To avoid government regulation, tyre importers not currently members of the Tyre Stewardship Scheme should commence formal participation. ***By November 2024[91].***

[87] See CSIRO, Australia, Boxall NJ, et.al. (2023) Exploring opportunities for increasing value recovery from end-of-life tyres and conveyor belts in Western Australia, Table 1 for a good summary on end-of-life tyres.
[88] TSA (2023) Tipping the Balance The business case for a circular economy for Australia's off-the-road tyres, conveyors, and tracks, https://www.tyrestewardship.org.au/wp-content/uploads/2023/06/TSA0003%20-%20L8%20-%20OTR%20-%2040pp%20Business%20Plan%20-%20A4.pdf
[89] Australian Government, DEH (2006) Market Failure in End-of-life Tyre Disposal, https://www.accc.gov.au/system/files/public-registers/documents/D12%2B149381.pdf
[90] URS (2005) Financial and economic analysis of the proposed national used tyre product stewardship scheme, https://www.accc.gov.au/system/files/public-registers/documents/D12%2B149379.pdf
[91] Australian Government, DCCEEW, Minister's Priority List 2023-24, https://www.dcceew.gov.au/environment/protection/waste/product-stewardship/ministers-priority-list-23-24#tyres

3. Recently the Environment Ministers' Meeting has also put the industry on notice, that 'if voluntary product stewardship doesn't work, government will regulate'.[92]

With no noticeable response from industry to the actions required by the Minster's List by November 2024, or from the Environment Ministers' Meeting, government should follow through and commence the Impact Analysis process as the next step.

Image 10: End-of-life tyres collected for processing

[92] Environment Ministers' Meeting, (2023) Communique November 2023. https://www.dcceew.gov.au/sites/default/files/documents/emm-communique-10-nov-2023.pdf

4. Governments' Role in the Circular Economy

Information request 4:

The PC is seeking views and information on the following.

The extent to which policy or regulatory changes (national, state and territory, or local; or for specific sectors, products or supply chains segment level) could better enable the pursuit of circular economy activities. This may include:

- financial incentives
- information provision
- regulatory changes (e.g. approval processes, standards and codes, mandatory reporting, competition and consumer regulation, chemicals regulation) and co-regulatory approaches
- education and training
- facilitating collaboration
- planning, and urban and regional development

The benefits, costs, risks and implementation issues associated with current or potential policy or regulatory changes that aim to address barriers to circular economy activities.

What actions governments could take to facilitate Aboriginal and Torres Strait Islander roles in progressing the circular economy, including in drawing on Indigenous knowledges in policy design in ways that recognise and protect Indigenous cultural and intellectual property.

4.1 Overview of the Recommendations

TSA has proposed five recommendations:

1. Regulate Product Stewardship Schemes
2. Consider Industry Policy
3. Leverage Government Procurement
4. Align Jurisdictions
5. Enable Consumer Choice through Labelling.

These recommendations are proposed as the 'big moves' needed to drastically improve material productivity on end-of-life tyres and conveyor belts in Australia.

They have been proposed on a whole-of-system approach, to help address the opportunities and barriers.

Image 11: Used tyres correctly stockpiled at a retailer ready for collection

4.1.1 Recommendation 1: Regulate Product Stewardship Schemes

Australia should take a long-term economic view and aim for dynamic efficiency, where innovation, adaptation, efficient resource allocation, and R&D are front and centre.

In the context of product stewardship for tyres and conveyor belts, dynamic efficiency would involve creating a regulatory framework that not only addresses current and legacy waste management issues but also promotes ongoing improvements and innovations in circularity practices. A more fully regulated approach is needed to ensure that the entire industry participates, and all tyres are required to be recovered.

- **A regulated product stewardship scheme (co-regulatory or mandatory) for tyres and conveyor belts should be established under the *Recycling and Waste Reduction Act 2020*.**

The next step towards this outcome involves the Environment Ministers' Meeting committing to commission an Impact Analysis, which will include a cost-benefit analysis.

A comprehensive, more fully regulated product stewardship scheme can help government achieve multiple policy objectives, including the National Waste Policy Action Plan[93] (Target 3) to achieve an 80% average resource recovery rate from all waste streams following the waste hierarchy by 2030.

It's crucial that all tyres are part of this regulated scheme.

Please review Appendix A: RPS Group (2024) Opportunities in the Circular Economy – Regulated Product Stewardship. The report suggests that assessing the policy case for government action on circular economy improvements should be considered in terms of dynamic efficiency.

[93] Australian Government, DCCEEW (2022) National Waste Policy Action Plan 2022, https://www.dcceew.gov.au/sites/default/files/documents/national-waste-policy-action-plan-annexure-2022.pdf

4.1.2 Recommendation 2: Consider Industry Policy

To enhance investment in circular economy projects, it's essential that there is an economic incentive to do so.

- **Arguably[94], government should play a more active role by implementing industry policy to help build the industrial capacity required, particularly in regions that need assistance.**

In the context of supporting the circular economy on end-of-life tyres, building industrial capacity means developing the necessary infrastructure, systems and capabilities to process materials sustainably.

Strengthening industrial capacity can help regions compete in high-value global markets by ensuring they have the facilities and expertise to handle specific materials, like end-of-life OTR tyres and conveyor belts, and undertake advanced manufacturing, or service local markets, efficiently.

When evaluating and prioritising circular economy actions, it's important to consider their long-term implications for Australian productivity and welfare.

As examples, regions such as Pilbara in Western Australia, Bowen in Queensland, and Hunter in New South Wales produce significant volumes of OTR mining tyres and conveyor belts, with a pressing need for sustainable management solutions.

By recovering materials from these areas, there are opportunities to invest in advanced secondary processing, leading to high-value products such as recovered carbon black and devulcanised rubber, which can serve as feedstock for new tyres and conveyor belts.

The CSIRO (2024) report Best practice case studies for increasing value recovery from end-of-life tyres and conveyor belts[95] identifies international best practice case studies for increasing value recovery from end-of-life tyres.

[94] Productivity Commission, Annual Productivity Bulletin (2024), https://www.pc.gov.au/ongoing/productivity-insights/bulletins/bulletin-2024/productivity-bulletin-2024.pdf

[95] CSIRO (2024), Best practice case studies for increasing value recovery from end-of-life tyres and conveyor belts, https://www.nespsustainable.edu.au/sites/default/files/documents/IP5.02_Stage%202%20tyre%20and%20conveyor%20belt%20case%20study%20report%20final-20240716.pdf

4.1.3 Recommendation 3: Leverage Government Procurement

In the context of a growing economy facing increasing stresses from extreme weather events linked to climate change, it is crucial to build more durable and resilient civil infrastructure.

- **Government procurement can play a vital role in driving domestic resilience and bolstering demand for circular practices, services and products. All three tiers of government should establish clear requirements for incorporating recycled content in road construction and related infrastructure projects**.

By prioritising circularity in procurement, governments can promote the use of end-of-life tyres in higher-order circular applications. Additionally, these procurement strategies can align with social procurement objectives, supporting broader community goals[96].

The Australian Government's National Waste Policy Action Plan[97] (Target 4) emphasises the need to significantly increase the use of recycled content across governments and industries. Achieving this target will require concrete action on procurement practices.

The Infrastructure Australia (2023) report Replace Materials – Understanding the market for replacement materials across major infrastructure projects[98], examines the potential to use recycled materials in road infrastructure.

The TSA (2024) report Tyre derived Crumb Rubber in road surfacing applications in Australia[99] demonstrates that requiring the use of 15% crumb rubber in all the bitumen consumed could utilise 40% of Australia's end of life tyres.

[96] TSA (2024), Submission to Inquiry into the procurement practices of government agencies in New South Wales and its impact on the social development of the people of New South Wales https://www.parliament.nsw.gov.au/lcdocs/submissions/86119/0059%20Tyre%20Stewardship%20Australia.pdf

[97] Australian Government, DCCEEW (2022) National Waste Policy Action Plan 2022, https://www.dcceew.gov.au/sites/default/files/documents/national-waste-policy-action-plan-annexure-2022.pdf

[98] Infrastructure Australia (2023), Replace Materials, Understanding the market for replacement materials across major infrastructure projects https://www.infrastructureaustralia.gov.au/sites/default/files/2023-04/IA22-Replacement-Materials_REPORT_2.0_HR.pdf

[99] TSA (2024) Tyre derived Crumb Rubber in road surfacing applications in Australia, https://www.tyrestewardship.org.au/wp-content/uploads/2024/10/TSA-Crumb-Rubber-Road-Surfacing.pdf

4.1.4 Recommendation 4: Align Jurisdictions

Our environment is essential to our standard of living, yet the environmental costs associated with consumption and production choices are often not factored into prices, resulting in problematic externalities. Externalities are not experienced equitably, meaning that the negative impacts of environmental costs are often borne more heavily by disadvantaged communities and those with fewer resources to adapt or mitigate their effects. This is seen in respect to end-of-life tyres.

- **To improve the effectiveness of national environmental policies, Australia should align environmental laws across jurisdictions and implement environmental fiscal reforms.**

Consistency in regulations and standards is necessary, for example in relation to the disposal of end-of-life tyres to landfill.

Environmental fiscal reform regarding end-of-life tyres involves implementing financial mechanisms to promote circular management.

Key reforms can be done through a more fully regulated product stewardship scheme, for example, the scheme levy can be imposed fairly on all types of tyres, and the funds can support equitable resource recovery.

However, landfill levies for example, are state/territory based and inconsistent. Consistent and equitable application of pollution charges and landfill levies - including for mining – is crucial.

The NSW Circular (2022) Rapid Review: Taxation and Fiscal Policy for a Circular Economy [100] consolidates the international literature regarding fiscal policy to drive a CE, both in terms of proposals and experiences with implementation.

The Standards Australia (2023) Standards to Facilitate the use of Recycled Material in Road Construction[101] explores how standards can assist in overcoming barriers to enable their widespread national adoption in road construction.

4.1.5 Recommendation 5: Enable Consumer Choice through Labelling

[100] Retamal, M. et.al (2022), Rapid Review: Taxation and Fiscal Policy for a Circular Economy. Prepared for NSW Circular. University of Technology Sydney, University of Sydney, UNSW Sydney, https://opus.lib.uts.edu.au/bitstream/10453/156857/2/FINAL_Taxation%20and%20Fiscal%20Policy%20for%20CE_11MAR22_Gil.docx%20%28003%29.pdf

[101] Standards Australian and ACOR (2023) Standards to Facilitate the use of Recycled Material in Road Construction, https://www.standards.org.au/documents/k-3054-recycled-content-roads-report

Labelling tyres for a circular economy involves providing clear and accessible information about the sustainability features of tyres, helping consumers make informed choices, supporting material efficiency and productivity, and aiding the achievement of government policy objectives including as they relate to transport emissions.

- **Australia should introduce labelling for tyres to help consumers make informed choices about sustainability and circularity attributes. Such labelling can enhance choice and competition in the market and provide a decarbonisation benefit.**

TSA advocates for harmonising labelling requirements with international standards, to include key information on tyre performance, such as rolling resistance, sound emissions, and wet surface adhesion.

Tyre reuse is a crucial process for promoting a circular economy and measures should be considered to encourage its adoption.

Further, aligning with international standards for regulating harmful chemicals in tyres will provide valuable guidance, though these standards must be adapted to the Australian context.

As regulations and labelling schemes develop, it's vital for both consumers and manufacturers to remain informed about specific criteria. This will require ongoing education within the industry and community to ensure a shared understanding.

The TSA commissioned report Implications of the Transition to EVs for End-of-Life Tyre Recovery[102] provides an overview of the considerations respect to the growing number of electric vehicle (EV) tyres on recycling processes.

[102] Marsden Jacob Associates and Blue Environment (2024), Implications of the Transition to EVs for End-of-Life Tyre Recovery, https://www.tyrestewardship.org.au/reports-facts-figures/implications-of-the-transition-to-evs-for-end-of-life-tyre-recovery/

4.2 Facilitate Aboriginal and Torres Strait Islander Opportunities

Approximately 70% of the Australian continent's land mass is in some way, shape or form linked by policy, deed or title to an Indigenous estate[103] and many minerals projects are located where Indigenous People have a right to negotiate.[104]

Governments can enhance Aboriginal and Torres Strait Islander involvement in advancing the circular economy by recognising and incorporating their knowledge into policy development and operations. This may best be done through engagement with representative entities such as indigenous councils, land councils and other Traditional Owner entities and local communities (Indigenous Peoples and Local Communities).

This engagement is especially important regarding management of end-of-life OTR tyres at mining sites. At the current time, these products are almost all buried onsite despite the significant amount generated, and the potential cultural and local environmental impacts.

Through engagement, Indigenous Peoples and Local Communities can scrutinise practices around end-of-life tyre management, suggest culturally appropriate and socially acceptable recovery methods, and highlight community concerns about impacts on their land. Establishing genuine partnerships built on trust is vital for successful engagement.

TSA seeks to facilitate collaboration between users of OTR products and Indigenous Peoples and Local Communities to leverage opportunities for resource recovery in regional, rural and remote Australia. In 2023 TSA published two reports on this topic to provide guidance:

- **Collaborating with Indigenous Peoples and Local Communities in OTR Rubber Product Recovery - Global review and recommendations**[105]

- **Engaging with Aboriginal and Torres Strait Islander Peoples in OTR Rubber Product Recovery**[106]

[103] CSIRO, webpage, https://www.csiro.au/en/news/All/Articles/2022/April/Care-for-Country
[104] Burton, J., et.al (2024) Mapping critical minerals projects and their intersection with Indigenous peoples' land rights in Australia, https://www.sciencedirect.com/science/article/pii/S2214629624001476?via%3Dihub
[105] TSA (2023), Collaborating with Indigenous Peoples and Local Communities in OTR Rubber Product Recovery - Global review and recommendations, https://www.tyrestewardship.org.au/wp-content/uploads/2023/10/OTR-Global-IPLC-Report-2023-Update-09.2023.pdf
[106] TSA (2023), Engaging with Aboriginal and Torres Strait Islander Peoples in OTR Rubber Product Recovery https://www.tyrestewardship.org.au/wp-content/uploads/2023/10/Aust-IPLC-Report-2023-Update-09.2023.pdf

These reports outline global best practice and highlight that the recovery of OTR rubber products provides significant opportunities for regional, rural, and remote communities to reduce environmental risks for future generations and create new markets, commercial enterprises, and jobs.

See case study: Tipping the balance for mine restoration and waste recycling[107]

[107] TSA, webpage, https://www.tyrestewardship.org.au/project/tipping-the-balance-for-mine-restoration-and-waste-recycling/

5. Appendices

Appendix A: RPS Group (2024) Opportunities in the Circular Economy, Regulated Product Stewardship

OPPORTUNITIES IN THE CIRCULAR ECONOMY

Regulated Product Stewardship

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REPORT

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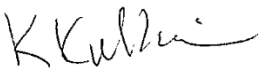
Kapil Kulkarni  29 October 2024

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GLOSSARY

Term	Definition
Allocative efficiency	Use of resources to provide the optimal distribution of goods and services in an economy. An economy that is allocatively efficient facilitates resource allocation that maximises current preferences.
Circular economy	A circular economic consumption model that is characterised by regenerative design, the elimination of waste, and the recirculation of products and materials in an economy.
Circularity rate	The proportion of materials used by a country that are not 'virgin' materials, describing how efficiently resources are reused and recycled within a system.
Dynamic efficiency	Resource allocation that achieves efficiency and incorporates preferences across time and across multiple generations.
Material productivity	The efficiency with which raw materials are used in production processes.
Material recovery	The process of extracting materials from an end-of-life product for reuse or recycling.
Recovery rate	The aggregate proportion of material recovered for the purposes of reuse, recycling or energy recovery.

1 INTRODUCTION

1.1 About RPS Strategy & Investment

RPS, a Tetra Tech company, is a multi-national advisory firm. In the Asia Pacific we have offices in Australia, New Zealand and Singapore.

RPS's Australian Advisory Division is a leading management consultancy, providing services to a wide range of government and industry clients. Our economics practice specialises in the economic analysis of markets, environmental policies, and physical and social infrastructure. We have a track record of delivering economic analyses of environmental policies and projects in accordance with best practice guidelines and government requirements. Our clients include the federal, state and local governments, the private sector and non-government organisations.

RPS also has deep understanding of circular economy policy and product stewardship schemes in Australia. Our stewardship scheme experience spans tyres, coffee pods, plant pots, soft plastics, mobile and telecommunications products, mattresses, batteries, televisions and computers, packaging and container deposit. RPS has been appointed as a specialist advisor for economic modelling with the Australian Government Product Stewardship Centre of Excellence.

1.2 Purpose of this report

Tyre Stewardship Australia (TSA) commissioned RPS to prepare a report on the economic arguments and potential benefits of regulated product stewardship and other measures to promote a circular economy.

TSA has instructed RPS to specifically address the following information requests in the Productivity Commission's call for submissions on opportunities in the circular economy (Call of Submissions):

- **Information request 2:** Priority opportunities to progress the circular economy
- **Information request 3:** Hurdles and barriers to a circular economy
- **Information request 4:** Governments' role in the circular economy.

The structure of the remainder of this report is:

- Economic rationale for a Circular Economy (Section 2), which provides a summary of economic first-principles arguments in support of a circular economy and product stewardship regulation, including:
  - Our interpretation of how the rationale and trade-offs are presented in the Call of Submissions
  - The case for government action
  - Key barriers and opportunities
- Potential priorities and actions (Section 3)
- Potential economic benefits (Section 4)
- Recommendations (Section 5).

1.3 Sources and inputs

This discussion and analysis in this report draw from RPS' prior economic and financial assessments of:

- Circular economy policy
- Circular economy projects
- Product stewardship schemes.

The report also utilised data and content from reports provided by TSA, as well as a brief broader literature review.

2 ECONOMIC RATIONALE FOR A CIRCULAR ECONOMY

2.1 Examples provided in call for submissions

The Call for Submissions identified various reasons to investigate government actions to support a circular economy. RPS agrees with the following points made in the Call for Submissions:

- Australia's current performance compared to its peers, with Australia currently having the fourth lowest rate of materials productivity in the OECD, is important to measure when assessing the potential for improvement
- It is important to:
  - Consider what the barriers and opportunities are for improvements
  - Prioritise opportunities
  - Consider trade-offs any time there is a potential reallocation of resources.

In general, RPS welcomes a robust, pragmatic and evidence-based approach to policy making that supports the long-term welfare of Australians. This report has been prepared with that objective in mind.

2.2 Case for government action

Making the case for government action normally requires considering a range of policy objectives such as economic efficiency, effectiveness, equity and other relevant policy criteria. Economic or 'allocative' efficiency is one of the most frequently used tests for government policy because it tests whether the welfare of society improves as a result of a reallocation of resources.

When markets are complete, perfectly competitive and have perfect information, they facilitate allocative efficiency. When these conditions do not hold, there is, on face-value, a case for government action to address market failures that prevent allocative efficiency.

In terms of the circular economy, the impediments to potential improvements are complex and nuanced. As such, we welcome the Call for Submissions taking a broader view of barriers, in addition to the conventionally defined market failures.

We also suggest that properly assessing the policy case for government action will require a long-run view. This is because, as outlined in this report, global policy settings with our key trading partners are evolving to move to a paradigm that better values society's desire to transition to circular models. As such, circular economy improvements should be considered in terms of their expected dynamic efficiency, or their economic efficiency over the long-term.

The adoption of circular economy practices also aligns with several explicit Australian Government objectives. They include:

- Reduced reliance on first-use commodities.[1] Australia has a target to achieve an 80 per cent resource recovery from all waste streams by 2030 and a range of other circular economy-related targets. This is

[1] Australian Government Department of Climate Change Energy, the Environment and Water. *National Waste Policy Action Plan.* Retrieved on 15 October 2024 from https://www.dcceew.gov.au/environment/protection/waste/publications/national-waste-policy-action-plan

CSIRO. (2024). *Building a circular economy.* Retrieved on 15 October 2024 from https://www.csiro.au/en/about/challenges-missions/circular-economy#:~:text=Australia%20has%20committed%20to%20progressing,all%20waste%20streams%20by%202030.

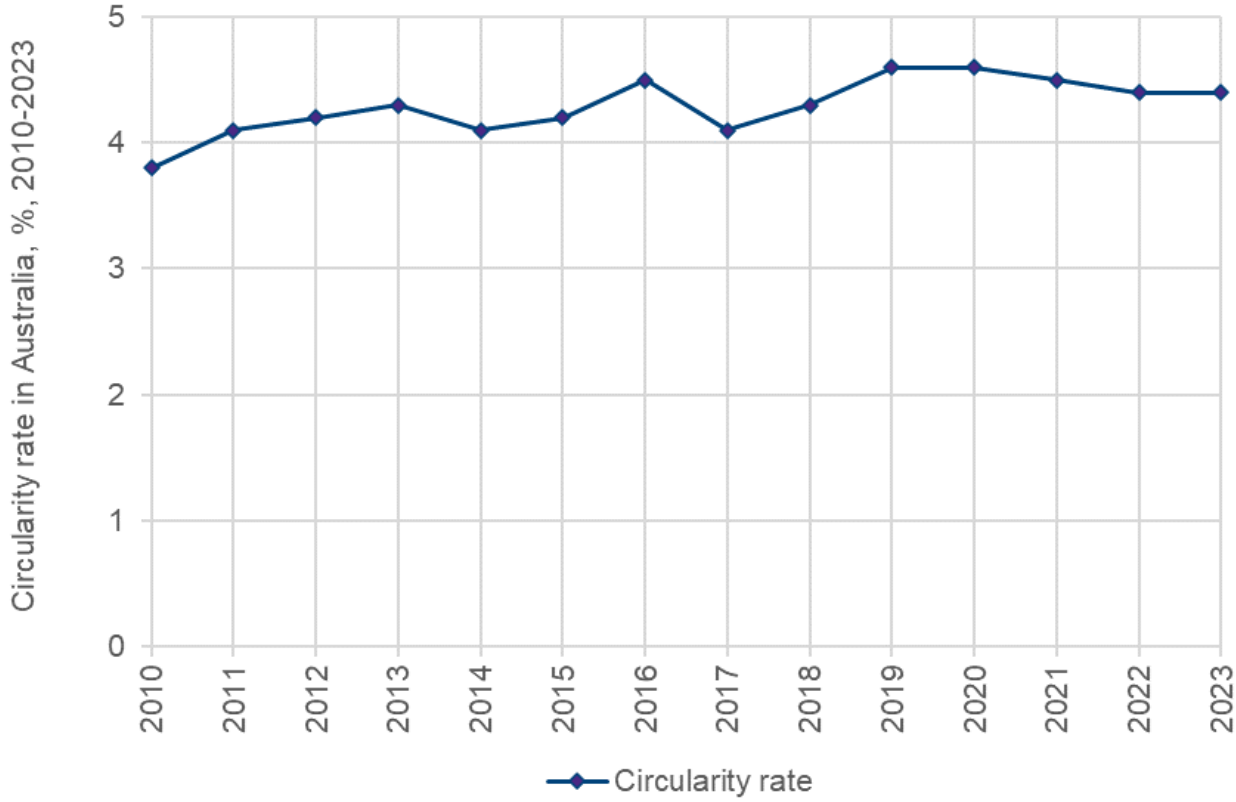
constituent of a broader global trend to reduce waste derived from increased awareness of environmental sustainability and pressure from finite resource usage.[2]

- Increase the use of recycled content by governments and industry.[3] The Australian Government's 2019 National Waste Policy Action Plan defines a target to increase the use of recovered materials.

2.3 Barriers and opportunities

Businesses and consumers in Australia have not widely adopted circular economy practices. In 2023, the Australian Bureau of Statistics (ABS) reported Australia to have a circularity rate of 4.4 per cent (measuring the proportion of materials used by a country that are not 'virgin' materials).[4] This is a marginal increase from 2010 (3.8 per cent) in spite of an overall gradual rate of increase (see Figure 1). Australia's rate is below the global average circularity rate (7.2 per cent).[5]

Figure 1: Circularity rate in Australia, 2010-2023



[2] For example, the European Union introduced a plastic packing waste tax in 2021 that penalises non-recycled plastic waste. See: The Australia Institute. (2024). *Plastic packaging waste tax could raise billions*. Retrieved on 15 October 2024 from https://australiainstitute.org.au/post/plastic-packaging-waste-tax-could-raise-billions/

[3] Australian Government Department of Climate Change Energy, the Environment and Water. *National Waste Policy Action Plan 2019.* Retrieved on 15 October 2024 from https://www.dcceew.gov.au/sites/default/files/documents/national-waste-policy-action-plan-2019.pdf

[4] ABS. (2023). *Circular economy.* Retrieved on 17 October 2024 from https://www.abs.gov.au/statistics/measuring-what-matters/measuring-what-matters-themes-and-indicators/sustainable/circular-economy#:~:text=In%202023%3A,global%20circularity%20rate%20(7.2%25)

[5] The CSIRO reports a more conservative value in 2024: *"The circularity rate of Australia is around 4 per cent…This is half the global average"*. See: CSIRO. (2024). *Material flow analysis to progress to a circular economy.* Retrieved on 17 October 2024 from https://research.csiro.au/circulareconomy/material-flow-report/#:~:text=The%20report%20highlights%20the%20importance,mobility%2C%20food%20and%20energy%20provision.

The ABS reported marginal improvements to additional recent circularity indicators relative to 2010:

- Australia's material footprint per capita in 2023 was 31.0 tonnes, relative to 37.6 tonnes in 2010[6]
- Australia's material productivity on a domestic material consumption basis was $1.58 AUD/kg, relative to $1.45 AUD/kg in 2010.[7]

There are several extant short-run barriers to adopting circular economy practices that apply to a wide range of goods and services. There are also structural changes necessary to capitalise on long-run opportunities. The following subsections outline these short-run and long-run barriers and opportunities.

2.3.1 Short-run

Negative externalities

The primary short-run barrier to implementing circular economy practices is the discrepancy between the cost of goods and services in Australia and their overall social cost.

The Australian economy is broadly structured by a 'take-make-dispose' linear consumption model.[8] This generally results in the acquisition of new products in Australia being less expensive and convenient than adopting circular economy practices. The consumption model is underpinned by unincorporated social costs that are borne by society rather than the producers or consumers of the products. Social costs are incurred across the lifespan of products that are often not reflected in the product cost, incentivising the continuation of the linear consumption model. Social costs that are not always or fully internalised into product cost include:

- production externalities (e.g., emissions to air and water associated with extraction, manufacture, and distribution)
- consumption externalities (i.e., pollutants and emissions arising from product use)
- disposal externalities (i.e., the treatment and management of end-of-life products).

Imperfect information

Circular economy practices in Australia are nascent and consumers are likely to have imperfect information on their extent and ability to contribute their effort. For example, the Commonwealth Bank noted in a 2022 report into circular economy consumer impacts that a consumption-side lack of awareness may inhibit participation in and the adoption of circular economy practices in Australia.[9]

Poor information about consumption or current end-of-life management practices are also a fundamental barrier to identifying, analysing and implementing circular economy actions. TSA supplies accredited logos and other promotional materials to support consumer decision making.[10]

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[6] The total amount of raw materials per person consumed to make products or services used in Australia.

[7] Material productivity measures the efficiency with which raw materials (such as metals, minerals, and biomass) are used in production processes. Higher material productivity indicates the economy is generating more output with less material input.

[8] CSIRO. (2024). *Advancing the circular economy.* Retrieved on 17 October 2024 from https://www.csiro.au/en/research/environmental-impacts/sustainability/circular-economy

'Take-make-dispose' quote attributable to: Upadhayay, S., & Alqassimi, O. (2018). *Transition from linear to circular economy.* Westcliff International Journal of Applied Research, 2(2), pp. 62-74.

[9] Commonwealth Bank. (2022). *CommBank Consumer Insights October 2022: Circular Economy.* Retrieved on 17 October 2024 from https://www.commbank.com.au/content/dam/commbank-assets/business/industries/2022-10/commbank-consumer-insights-report-10-2022.pdf

[10] TSA. (2024). *A quick guide to using the TSA accredited logo and other promotional tools.* Retrieved on 23 October 2024 from https://www.tyrestewardship.org.au/wp-content/uploads/2024/05/TSA-Retailer-Brand-Guide.pdf

Positive spillovers

Increasing our material productivity will need investment in research and development (R&D), feasibility studies, consumer awareness and market development. Most if not all product stewardship schemes around the world, including in Australia, invest in these areas to systematically improve circular outcomes over time. This investment leads to production practices that reduce product environmental footprints and increase product life, expand and deepen end-of-life pathways, increase recovered material value and enhance consumer awareness, among other beneficial outcomes.

These outcomes benefit not only the producers that fund these investments but often the entire industry as the knowledge and innovations produced can be widely adopted. The presence of this free riding discourages investment and disadvantages participating producers who bear the additional cost.

Risk and uncertainty

Investment in R&D and feasibility studies is also needed to reduce barriers to introducing new circular pathways based on previously unproven technologies in Australia. Without this investment, the viability of adopting such technology significantly reduces because of the perceived risk and uncertainty that lead to scarcer and higher cost financing. In a report funded by the International Chamber of Commerce, Ernst & Young note that this financial barrier has been noted as a key inhibitor to increasing circular economy outcomes.[11]

Investment in productivity boosting R&D and innovation are crucial for sustaining Australia's living standards in the long run, especially in areas Australia is likely to have a comparative advantages.

[11] ICC & EY (2024), Putting the circular economy into motion: From barriers to opportunities, retrieved from https://iccwbo.org/wp-content/uploads/sites/3/2024/10/2024_ICC-x-EY-Report_03.pdf

The relationship between R&D and productivity growth in Australia

Productivity growth and research and development (R&D) activities are closely intertwined. R&D activities, in a business context, aim to introduce new products through innovative methods and applications. Productivity growth, broadly the ability to do more with less, is underpinned by the relentless desire to improve processes and uncover new information. A key driver of productivity growth is the efficacy of research activities that can develop new techniques and processes.

As businesses become more efficient, living standards rise proportionately. Productivity growth has been a key driver of global economic prosperity since the Industrial Age and supports Australia's high standard of living. However, global productivity growth rates have stagnated over the last decade, and Australia has experienced the lowest productivity growth in 60 years at 1.2 percent a year and dropped to 16th in the OECD productivity rankings from sixth in 1970 (InnovationAus, 2024, *Turning around Australia's lagging economic complexity*).

Australia has a comparative advantage in having a highly skilled workforce. Australian R&D activities have achieved success in the past, but often struggle to develop beyond conceptualisation to commercialisation. A strong focus on R&D activities that is supported by government, business, and academia will help support Australia's future productivity growth and ensure living standards continue to rise.

2.3.2 Structural changes needed for long-run opportunities

Current policy settings

Current policy settings aim to structure the Australian economy to promote allocative efficiency (i.e., the allocation of resources to the most productive use), but more so in the short to medium term.[12]

While this policy environment is effective at maximising domestic living standards, it does not directly consider intergenerational preferences (i.e., potential future demand from Australian and global markets for circular goods). This misalignment inhibits circular practice adoption.

A circular consumption structure is materially different to a linear consumption model.[13] A transition would require a redesign and restructure of business production processes, incorporation of scaled regenerative and restorative techniques, and development of shared economic practices.[14] The extent of the realignment necessitates a high degree of coordination to implement complex economic adjustments, albeit with some necessary short-run trade-offs.

Upadhayay and Alqassimi succinctly summarise this barrier in a 2018 study on transitioning to a circular economy:

[12] The topic of allocative efficiency in Australia has garnered material commentary. See: Productivity Commission. (2013). *On efficiency and effectiveness: some definitions.* Retrieved on 17 October 2024 from https://www.pc.gov.au/research/supporting/efficiency-effectiveness/efficiency-effectiveness.pdf

Reserve Bank of Australia. (2015). *'Reform' and economic growth* [speech transcript, Glenn Stevens]. Retrieved on 17 October 2024 from https://www.rba.gov.au/speeches/2015/sp-gov-2015-08-26.html

Australian Government Treasury. (2022). *Overview: understanding productivity in Australia and the global slowdown.* Retrieved on 17 October 2024 from https://treasury.gov.au/sites/default/files/2022-10/p2022-325290-overview.pdf

[13] CSIRO. (2024). *Australian material flow analysis to progress to a circular economy.* Retrieved 17 October 2024 from https://research.csiro.au/circulareconomy/wp-content/uploads/sites/303/2024/03/24-00034_ENV_REPORT_MaterialFlowAnalysisToCircularEconomy_WEB_240305-2.pdf

[14] Upadhayay, S., & Alqassimi, O. (2018). *Transition from linear to circular economy.* Westcliff International Journal of Applied Research, 2(2), pp. 62-74.

"But this paradigm shift is not possible alone through the effort of a single entity. Involvement and commitments from individual, regional, governmental and intra-governmental levels are mandatory as it helps to create a synergist effect."

Global transition to decouple economic activity from resource use

The European Union (EU) has led the world on efforts to decouple economic growth from resource use. Notable measures have included:

- The move by the European Union (EU) to apply tariffs to the imports of selected goods from countries with inadequate carbon policies, known as the Carbon Border Adjustment Mechanism (CBAM), set to go into force in 2026
- The EU's plastic fee, applied based on each member country's amount of non-recycled plastic packaging waste produced

The EU is also leading the charge on the adoption of sustainability disclosure mechanisms for covered organisations relating to climate change impacts, under the Task Force on Climate-Related Financial Disclosures (TCFD), and relating to nature impacts, under the Taskforce on Nature-related Financial Disclosures (TNFD). Other countries include a number of our key trading partners such as New Zealand, the United Kingdom (UK), Japan, Hong Kong and Singapore are following suit.

These developments are similar to those that preceded the global renewable energy transition. Countries that had the foresight to anticipate the opportunities and restructure industries in ways aligned to their respective comparative advantages, such as Germany, Denmark and China, have reaped the economic dividends of doing so.

Australia has the opportunity to learn from what worked well or could have been more effective, in positioning for opportunities in the renewable energy transition. These learnings can be applied to position itself more effectively and rapidly, capitalising on early mover advantages, for opportunities that are likely to arise with the global transition to a circular economy that best align with Australia's comparative advantages. Identifying and positioning for those opportunities is likely to yield significant long-run economic dividends.

Dynamic efficiency as a policy objective

To capitalise on these long-run opportunities, Australia will need to make dynamic efficiency the goal. While this makes policy evaluation more complex, methods and models to analyse this policy problem are emerging.[15] An economic model that is characterised by dynamic efficiency incorporates consideration of intergenerational demand (i.e., the potential demand from future generations on the current allocation of resources in the economy). In such a model, intergenerational demand necessarily relates to factors that endure across time (e.g., non-biodegradable waste) rather than the allocation of resources to maximise current consumer preferences (e.g., disposable products supported by a linear consumption model). The premise of a circular economy is based on several long-run principles:[16]

- Virgin resources are finite. Resource depletion implies a future scenario that does not feature the same volume of materials and non-renewable energy that are available to current consumers. The current global resource consumption rate is generally considered to be unsustainable. These issues are likely to gain greater prominence in the context of the world's planetary boundaries, which virgin resource

[15] Refer to, for example, Renewable and Sustainable Energy Reviews. (2015). *The static and dynamic environmental efficiency of renewable energy: A Malmquist index analysis of OECD countries,* (47), pp. 367-376. Retrieved from https://www.sciencedirect.com/science/article/abs/pii/S1364032115002233

[16] CSIRO. (2024). *Australian material flow analysis to progress to a circular economy.* Retrieved 17 October 2024 from https://research.csiro.au/circulareconomy/wp-content/uploads/sites/303/2024/03/24-00034_ENV_REPORT_MaterialFlowAnalysisToCircularEconomy_WEB_240305-2.pdf

extraction contributes towards in a range of ways (e.g., impacts on biodiversity/natural habitats, climate change, freshwater use).[17]

- The tendency to dispose of waste creates negative health and environmental impacts. Disposing of waste rather than re-using waste contributes to landfill areas, emits greenhouse gas emissions, and leaches pollutants into the environment.
- A linear consumption is not conducive to maximising economic value. Disposing of waste precludes the re-use of potentially valuable resources. The current unsustainable use of virgin finite resources lends increasing import to this factor.

[17] Fanning, A. L., O'Neill, D. W., & Büchs, M. (2020). *Provisioning systems for a good life within planetary boundaries.* Global Environmental Change, 64, 102135. DOI: https://doi.org/10.1016/j.gloenvcha.2020.102135

Stockholm University Resilience Centre. (2023). *Planetary boundaries.* Retrieved on 23 October 2024 from https://www.stockholmresilience.org/research/planetary-boundaries.html

3 PRIORITIES AND ACTIONS FOR CONSIDERATION

3.1 Considerations to aid prioritisation

Prioritisation of circular economy opportunities should consider the following questions:

- What are the largest opportunities that offer the greatest scale of potential benefit, whether economic, environmental or social, now and in the long-run?
- Where are there already local markets for recovered materials?
- Where is Australia likely to have the strongest comparative advantage(s)?
- Which areas present an opportunity to meet broader economic and policy objectives?
- What sovereign circular economy capability likely provides broader benefits, such as resilience to adverse economic or other supply chain shocks?

In answering these questions, governments should also consider which materials or products have been relatively unimpeded by the barriers and opportunities in Section 2.3 and as such, market forces have already supported circular pathways to a large extent. Examples of materials that are already performing well with respect to circular pathways include:

- Recovered metals, such as steel and aluminium, which have relatively liquid and informed markets
- Beverage containers, which are supported by state and territory container deposit schemes, albeit there are likely to be significant opportunities for other packaging types.

Conversely, materials or products in markets that are not fully developed and/or exhibit some of the barriers in Section 2.3, but satisfy the conditions for prioritisation above, should be examined further.

3.2 Opportunities for tyres

Australia has not manufactured tyres domestically since 2010 and relies entirely on the import of loose tyres and those on vehicles.[18] The market is supplemented with a re-use market and instances of retreading large vehicle tyres.

Table 1 summarises the barriers that inhibit greater circular economy outcomes, as well as likely opportunities for this product category. These include both classic market failures, as well as other barriers and opportunities.

[18] Tyre Stewardship Australia. (2023). *Australian Tyre Consumption and Recovery – 2022-23*. Retrieved on 14 October 2024 from https://www.tyrestewardship.org.au/wp-content/uploads/2023/11/Australian-Tyre-Consumption-2022-23.pdf

Table 1: Barriers and opportunities for tyres

Summary of barriers and opportunities	
Barrier	**Explanation**
Negative externalities	Tyres are readily accessible and widely available to purchase across Australia at product prices that do not fully reflect their social cost, which includes:[19] • Degradation of pollutant materials. End-of-life tyres are made up of cured rubber compounds, chemical stabilisers, and other additives to create a durable material. Although this supports the performance of tyres, polymeric materials do not easily decompose and take a very long time to fully degrade in stockpiles, landfills, or when buried (similarly for conveyor belts).[20] Several factors can increase intermediate degradation.[21] Exposure to water, biological organisms, oxygen and other chemicals will cause ageing effects on the tyre compounds and can accelerate the leaching of compounds within a tyre into soil and waterways. Fires can cause rapid decomposition of chemicals within a tyre, causing a variety of air, water and soil pollution impacts. Due to their shape, tyres in the environment can also become a breeding ground for weeds, pests and vermin, and become a vector for disease. • Overconsumption of finite material resources. Tyres comprise several non-renewable resources, including steel and textiles, that are currently only partially recovered. • High volume space allocation. Tyres are bulky goods and occupy a lot of physical space. Australia disposes an average of approximately 180,000 tonnes of tyres per annum into licenses landfills, on-site burials, illegal dumps, and illegal stockpiles.[22] • The non-market disamenity cost of the illegal dumping of tyres, which Rhodes & Mcnair (2024) estimated to be in the order of $100 million per year Australia-wide[23] • Potential for environmental risk events. Stockpiled tyres are a potential fire hazard and are difficult to extinguish.[24] Tyre fires emit emissions into the atmosphere and severely reduce proximate air quality. They may also present an environment for mosquitos to breed in certain climates.

[19] The price of new tyres generally starts at around $100 (AUD) for inexpensive makes. For example, see: Bob Jane T-Marts. (2024). *Buy Tyres Online.* Retrieved 14 October 2024 from https://www.bobjane.com.au/s/buy-tyres-online?sort-by=cheapest

[20] Shah, A. A., Hasan, F., Shah, Z., Kanwal, N., & Zeb, S. (2013). *Biodegradation of natural and synthetic rubbers: A review.* International Biodeterioration & Biodegradation, 83, 145-157. https://doi.org/10.1016/j.ibiod.2013.05.005

[21] Matthews, M. (2006). *Review of management of used tyres at landfill sites.* Waste Authority of Western Australia. Retrieved on 23 October 2024 from https://www.wasteauthority.wa.gov.au/images/resources/files/2019/11/Review_of_Management_of_Used_Tyres_at_Landfill_Sites.pdf

[22] TSA. (2023). *Australian tyre consumption and recovery – 2022-23.* Retrieved on 15 October 2024 from https://www.tyrestewardship.org.au/wp-content/uploads/2023/11/Australian-Tyre-Consumption-2022-23.pdf

[23] Rhodes, L. & McNair, B. (2024). Stockpiling and illegal dumping of tyres: cost to local governments and others. Retrieved from: https://www.tyrestewardship.org.au/reports-facts-figures/stockpiling-and-illegal-dumping-of-tyres-cost-to-local-governments-and-others/

[24] NSW EPA. (2024). *Waste tyres.* Retrieved on 15 October 2024 from https://www.epa.nsw.gov.au/your-environment/waste/industrial-waste/tyres#:~:text=Dispose%20of%20waste%20tyres%20to%20a%20lawful%20place&text=Tyre%20retailers%2C%20tyre%20retreaders%20and,are%20up%20to%20%245%20million.

Summary of barriers and opportunities	
	Consistent with the principles of dynamic efficiency, a socially optimal market for tyres would reflect intergenerational demand for sustainable end-of-life tyre practices, reduced pollution and greenhouse gas emissions from tyre disposal, and the avoided use of finite resources.
Imperfect information – sustainable end-of-life handling	Information asymmetries are known to lead to poor outcomes for consumers. According to TSA, tyre retailers have varying practices in terms of how they indicate and charge consumers for the costs of tyre handling, including in some cases, allegedly passing on higher costs to the consumer than what they incur. Other issues include rogue tyre collectors who are allegedly not disposing the tyres they collect in a responsible or legal manner. This results in environmental risks that arise is borne by the community rather than the collector.
Positive spillovers Risk and uncertainty	There are many technologies and processes available to recover resources from end-of-life tyres. However, most tyres that are recycled are shredded to create a tyre derived fuel (TDF), which is then predominantly exported as a combustion fuel for other countries. The significant reliance on this method likely reflects its low cost and low risk. However, the drawbacks of the reliance on this pathway include: • A lack of innovation in new technologies and markets • The risk that due to poor regulation in some importing countries, TDF combustion could carry human health risk • Overexposure to one type of market, leading to vulnerability to adverse price shocks in that market. While developing new markets and pathways carries significant benefits, the partial recovery rate of tyres in Australia and partial regulation of end-of-life tyres contributes to uncertain market conditions. Business investment into tyre recycling carries the risk of an uncertain supply of used tyres as feedstock and uncertain demand for processed tyre-derived product. These market conditions inhibit investment.
Opportunity	**Explanation**
Scale	According to TSA, Australia generated around 537,000 tonnes of used tyres in 2023-24.[25] Being a product category with significant volume, tyres provide the opportunity for investment in large scale recycling plants. Expressed in dollar terms and assuming end-of-life management costs of ~$300-$500 per tonne represents an end-of-life expenditure of more than $200 million per year. The physical and economic scale of this end-of-life task provides opportunities for large-scale investment.
Local markets	The recovered resources from tyres, including crumb, granules, oil, carbon black and recovered polymers all have local markets. That is, the recovered resources can be re-inserted into Australian supply chains and manufacturing processes, bypassing export shipping costs and reliance on export markets. For example, Tyrecycle's Barwick's Bridgewater tyre shredding facility in Tasmania collects end-of-life tyres from around Tasmania and then manufactures them into fuel chips using a chipper.[26] Fuel derived from tyres can be used as a replacement fuel for coal in cement kilns and for other industrial processes. Additionally, carbon black and rubber, also extracted from tyres, are scarce resources that Australia could supply to global markets.
Comparative advantages	The production and use of some of these recovered materials, requires more advanced methods. Australian manufacturers tend to compete on quality and using specialised skills, rather than cost. As such, these advanced recovery methods play to Australia's comparative advantages, and our relatively more highly skilled manufacturing workforce. Moreover, the large proportion of mining tyres, which are rich in natural rubber, provide opportunities for circular pathways meeting demand in local and global markets, with supporting logistical infrastructure to reach those markets.

[25] TSA. (2024). *Australian tyre consumption and recovery – 2023-24.*

[26] Tasmanian Government Department of Natural Resources and Environment Tasmania. (2024). *Waste tyre reprocessing grant awarded.* Retrieved 22 October 2024 from https://nre.tas.gov.au/about-the-department/news/waste-tyre-reprocessing-grant-awarded#:~:text=End%2Dof%2Dlife%20tyres%20collected,and%20for%20other%20industrial%20processes.

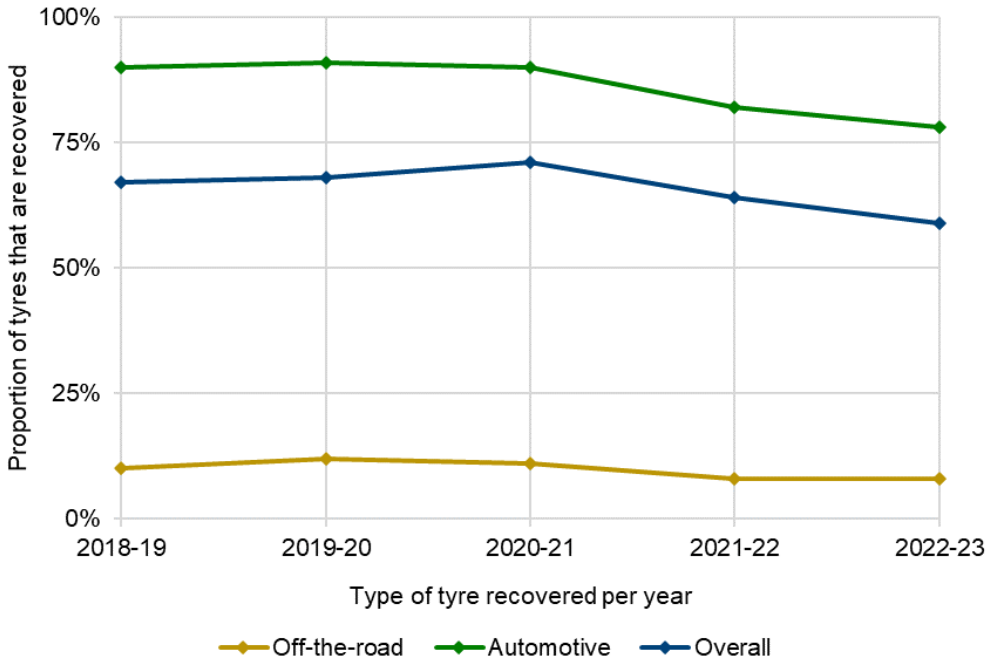
Summary of barriers and opportunities	
Broader policy objectives	A significant proportion of the recovered tyre, conveyer belt and track volume is associated with the mining sector and as such, is located in regional areas. This provides an opportunity for regional investment in recycling facilities and the associated employment, providing an opportunity to meet regional economic development and equity objectives.
Benefit of sovereign capability	The use of recovered resources in local supply chains also reduces Australia's reliance on the import of these resources. Australia is not a primary producer of oil and not a manufacturer of tyres or conveyer belts. All of these are essential goods for our economy. Having some local capacity reduces Australia's reliance on global markets and makes it more resilience to adverse shocks. For example, Australia has an active domestic conveyer belt manufacturing industry that exports to international markets (e.g., ContiTech. Fenner Conveyors).

3.3 Case for regulated product stewardship

Of the possible policy approaches available, regulated product stewardship has proven effective in addressing such barriers and capitalising on opportunities, both globally and in Australia.

It should be noted that there are established methods for recycling tyres in Australia and there is partial regulation of tyre disposal.[27] The Australian Government banned the export of whole baled tyres and tyres in pieces larger than 150 millimetres in 2020.[28] States and territories have similar legislation that broadly requires the transportation of waste tyres over a defined volume to regulated storage facilities (i.e., to prevent dumping and burning).[29] However, Australia only recovered 66 per cent of used tyres in 2023-24, which had been the first increase in Australian tyre recovery rates that had been been declining since 2020-21 (see Figure 2; early indicators for 2023-24 data suggest an uptick).[30]

Figure 2: Rate of used tyre recovery per annum, Australia



Source: TSA. (2023). Australian tyre consumption and recovery – 2022-23.

[27] ABC News. (2024). *Australia produces millions of used tyres a year but many still go to landfills.* Retrieved on 15 October 2024 from https://www.abc.net.au/news/2024-04-13/australia-produces-millions-of-used-tyres-a-year/103694962

Recycling Near You. (2024). *Tyres.* Retrieved on 15 October 2024 from https://recyclingnearyou.com.au/tyres/SydneyNSW#:~:text=They%20can%20be%20recycled%20in,collected%20by%20a%20trusted%20recycler.

Paul's Rubbish Removal. (2024). *Top solutions for tyre recycling Sydney.* Retrieved on 15 October 2024 from https://www.paulsrubbish.com.au/tyre-recycling-disposal-australia/

[28] Australian Government Department of Climate Change, Energy, the Environment and Water. (2024). *Exports of waste tyres.* Retrieved on 15 October 2024 from https://www.dcceew.gov.au/environment/protection/waste/exports/tyres

[29] For example, see: NSW EPA. (2024). *Waste tyres.* Retrieved on 15 October 2024 from https://www.epa.nsw.gov.au/your-environment/waste/industrial-waste/tyres#:~:text=Dispose%20of%20waste%20tyres%20to%20a%20lawful%20place&text=Tyre%20retailers%2C%20tyre%20retreaders%20and,are%20up%20to%20%245%20million.

EPA Victoria. (2024). *How to store and transport waste tyres.* Retrieved on 15 October 2024 from https://www.epa.vic.gov.au/for-business/find-a-topic/manage-industrial-waste/waste-tyres

[30] TSA. (2024). *Australian tyre consumption and recovery – 2023-24.*

However, the existing recovery pathways, supported by partial regulation and limited industry coordination in the current voluntary product stewardship scheme, means that there are likely further latent opportunities that have as yet not been fully investigated. Limited participation inhibits the realisation of further opportunities.

A National Environmental Science Program (NESP) funded research project titled *Best practice case studies for increasing value recovery from end-of-life tyres and conveyor belts* summarised global examples of regulated product stewardship schemes, including in:[31]

- Canada
- Chile
- The European Union
- New Zealand.

A noteworthy scheme is the Tire Stewardship British Columbia (BC). The scheme has successfully supported greater local production of recovered resources. Following the introduction of the Tire Stewardship BC regulation, a major local rubber product manufacturer experienced a 10-fold increase in revenue.

Regulated product stewardship can complement other targeted measures and be implemented in stages. The Western Australian Government's Discussion Paper on National EOLT Options provides examples of 'no regrets' options being improved standards and design rules, and market development.[32] The paper also explains that staging of regulation will help prepare local markets and industry for the changes required.

3.4 Use of metrics to monitor performance

Transitioning from a linear consumption model to a circular economy is a broad economic transformation. Measuring elements of the transition is essential for monitoring progress and ensuring accountability.[33] However, the large scope of the transition presents complexity when defining measurements to monitor progress. At a high level, governments in Australia are committed to a waste hierarchy that extends from most-preferred actions (i.e., avoiding waste) to least-preferred actions (i.e., disposing of waste).[34] Measuring the transition to a circular economy is typically grouped per each waste activity (see Figure 3).

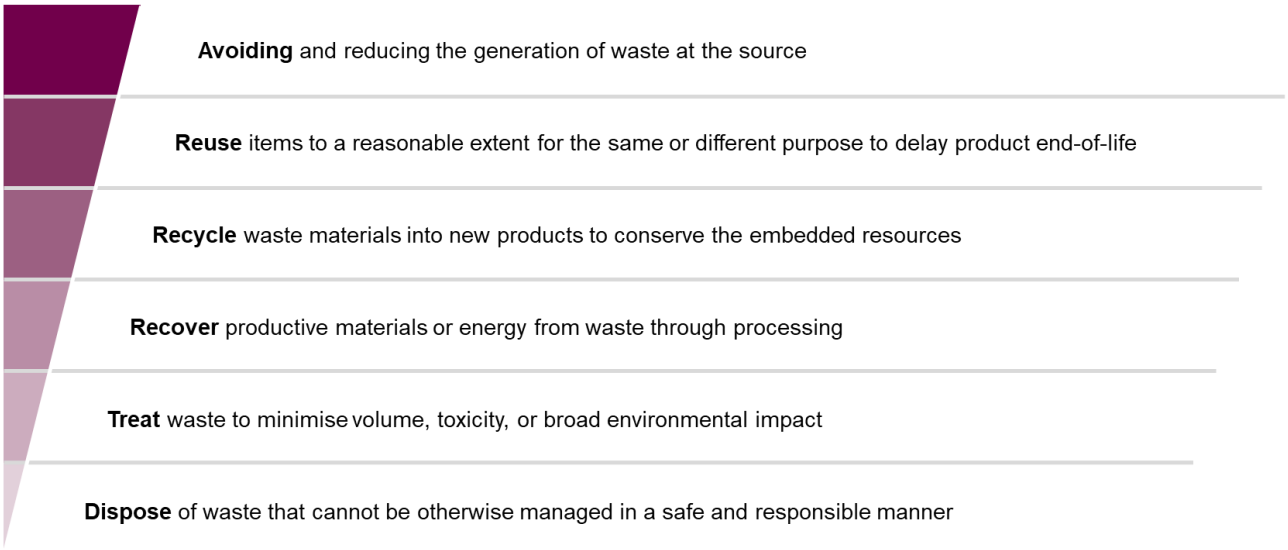
[31] Kaksonen, A. H., Gazeau, B., Caceres Ruiz, A. M., Cheng, K. Y., Minunno, R., Zaman, A., & Boxall, N. J. (2024). *Best practice case studies for increasing value recovery from end-of-life tyres and conveyor belts.* Retrieved from: https://www.nespsustainable.edu.au/sites/default/files/documents/IP5.02_Stage%202%20tyre%20and%20conveyor%20belt%20case%20study%20report%20final-20240716.pdf

[32] Government of Western Australia Department of Water and Environmental Regulation. (2024). *National end-of-life tyres options project.* Retrieved from TSA.

[33] The importance of measuring socioeconomic indicators is recognised by the Australian Government. See: Australian Government. (2023). *Measuring what matters: Australia's first wellbeing framework.* Retrieved on 22 October 2024 from https://treasury.gov.au/sites/default/files/2023-07/measuring-what-matters-statement020230721_0.pdf, p. 8.

[34] For example, see: NSW EPA. (2024). *The waste hierarchy.* Retrieved on 22 October 2024 from https://www.epa.nsw.gov.au/your-environment/recycling-and-reuse/warr-strategy/the-waste-hierarchy

Figure 3: Waste hierarchy



Source: NSW EPA, 2024, The waste hierarchy

The Australian Bureau of Statistics currently has several quantified macro circular economy measures. They are:[35]

- Waste generation per person
- Proportion of waste recovered for reuse, recycling, or energy
- Circularity rate
- Material footprint per capita
- Material productivity.

At the micro level of tyres, TSA has recorded several measurements.[36] They include:

- Used tyre generation volumes
- Tyre disposal rates
- Tyre recovery rates, per type of recovery activity
- Tyre recovery rates, per type of tyre
- Used tyre importing and exporting.

Used tyres contain significant productive materials that can be both re-used, recycled, and recovered (see Figure 3). There is currently a need for establishing a metric that can measure Australian commercial interests in tyre recovery. The Organisation for Economic Co-operation and Development has published a comprehensive conceptual framework and indicators for monitoring the progress of the transition towards a circular economy in 2024.[37] It contains 19 circular economy themes that have corresponding core indicators. One theme ('market developments and new business models') is relevant to the Australian context and contains three indicators (see Table 2).

[35] ABS. (2024). *Circular economy.* Retrieved on 22 October 2024 from https://www.abs.gov.au/statistics/measuring-what-matters/measuring-what-matters-themes-and-indicators/sustainable/circular-economy

[36] Published in: TSA. (2023). *Australian tyre consumption and recovery – 2022-23.* Retrieved on 22 October 2024 from https://www.tyrestewardship.org.au/wp-content/uploads/2023/11/Australian-Tyre-Consumption-2022-23.pdf

[37] OECD. (2024). *Monitoring progress towards a resource-efficient and circular economy.* Retrieved on 22 October 2024 from https://doi.org/10.1787/3b644b83-en

Table 2: OECD circular economy measurements for the Australian context

Indicator	Subthemes	Measurements	Realisation steps
(1) Gross value added of circular economy sectors	Circular economy entrepreneurship and products	• Circular economy new business registration • Circular economy new trademarks and patents • Circular economy certification of companies	• Define measurement boundaries • Improve quality and availability of data accounts • Develop practical guidance on how to use measurements
(2) Jobs in circular economy sectors	Employment markets and jobs	• Jobs in sharing economy • Reuse and repair activities	• Define measurement boundaries • Improve quality and availability of data accounts • Develop practical guidance on how to use measurements
(3) Markets for recycled materials	Recycling markets	• Diversity of recycled material markets • Size of recycled material markets	• Define measurement boundaries • Improve quality and availability of data accounts • Develop practical guidance on how to use measurements

The three indicators represent international best-practice. To improve their applicability in the Australian context, they can be augmented to increase their comprehensiveness and relevance (see Table 3).

Table 3: Augmentations of OECD indicators for application in the Australian context

Indicator	Contextualisation	Augmentations
(1) Gross value added of circular economy sectors	Gross value added refers to the value of an output less the cost of intermediate inputs (e.g., raw materials, services). It is useful to record the net contribution of a producer, industry, or sector to a total measure (e.g., GDP). However, it can be misleading as it does not reflect the efficiency of the inputs	• Monitor the inputs and factors of production used and their opportunity cost, to contextualise the efficiency of the gross value added
(2) Jobs in circular economy sectors	Jobs in the circular economy are likely to have a propensity for being high-skilled jobs, which plays to Australian labour force strengths. However, this is not always the case, and a more complete measure should incorporate the attributes and additionality of new employment.	• Monitor the counterfactual employment of circular economy labour force • Monitor the skill complexity and productivity of new employment
(3) Markets for recycled materials	Markets should be considered in local, state, national, and international contexts.	• Monitor the strength of markets for Australian recovered resources at the local, state, national and international scale

4 EXPECTED BENEFITS

4.1 Range of circular economy benefits

Circular economy actions provide benefits that can be evaluated using various accepted policy evaluation frameworks. These include a cost benefit analysis/welfare economics framework, economic impact methods such as computable general equilibrium (CGE) or Input-Output modelling, among others.

Using a CBA framework, the benefits of increasing circular economy outcomes span:

- Economic
  - Productivity growth through investment in R&D, technology and innovation
  - The potential for increasing business profits/producer surplus through higher value-adding processes
  - Consumer cost saving/consumer surplus through extended durability and product life
  - Workforce skills/human capital
- Environmental
  - Reduced harm to human health and the environment
  - Greenhouse gas emission reductions
- Social
  - Reuse opportunities for charitable purposes.
- Among others.

4.2 Effectiveness of policy mechanisms in unlocking benefits

Government action to improve circular economy outcomes can span economic taxes/levies (e.g., landfill levies), market-based mechanisms (e.g., Packaging Recovery Notes in the United Kingdom), direct funding (e.g., Recycling Modernisation Fund) and/or regulation, including Regulated Product Stewardship.

Voluntary Product Stewardship schemes are a potential alternative to direct government action. They involve voluntary action by a subset of industry participants to coordinate and invest in circular economy outcomes. Interest in voluntary schemes was revitalised through the Australian's government's National Product Stewardship Investment Fund (NPSIF), which provided a total of $20 million in grants to industry to design, develop and improve the implementation of product stewardship schemes.

While voluntary approaches have their place, they tend to focus on diverting waste from landfill and utilising existing pathways and infrastructure, working within the limitations of the current system for marginal improvement.

Voluntary approaches also have limited ability to adequately implement upstream interventions such as design for circularity, which can in turn tackle waste avoidance and prevention head-on. They also lead to a lack coordinated and at-scale investment in R&D and innovation, due to the aforementioned free riding effects. These investments are crucial to incentivise the sorts of fundamental changes required to reap the long-term benefits of circular economy outcomes.

Referring back to the barriers outlined in Table 1, regulated product stewardship:

- Can build in explicit incentives to reduce **negative externalities**
- Address **imperfect information** through consumer awareness, verified compliance reporting of collection and recycling standards, among other information provision
- Address the market failure of **positive spillovers** by ensuring all industry participants contribute to and benefit from investments in R&D, feasibility studies and innovation
- Provide a scale of funding to more effectively exploit short-term long-term opportunities.

Well defined regulation can therefore meet multiple policy objectives effectively, while individual policy instruments tend to focus on isolated barriers or opportunities in a non-coordinated manner.

The Western Australian Government's Discussion Paper on National End-of-Life Tyres (EOLT) Options found that of the options to address circular economy opportunities for EOLT, including off-the-road tyres, conveyer belts and tracks, *"only 'comprehensive' approaches could address the wide range of issues with EOLTs, with a regulated product stewardship scheme considered the most capable option"*.

4.3 Indicative modelling of short and long-term benefits

There are a range of tyre recycling methods that promote circular economy principles.[38] They extend from incorporating a high degree of material circularity (e.g., promoting sustainable designs), a low degree of material circularity (e.g., shredding tyres into granules for sports fields), to no degree of circularity (e.g., dumping tyres illegally).

Devulcanisation is an emerging technological process that can recycle used rubber materials into a productive resource.[39] Vulcanisation is a stage in the production of tyres that introduces sulphur to 'cure' the rubber and create a stronger material.[40] Devulcanisation is essentially the reverse process that aims to 'regenerate' the elasticity of the rubber and produce a re-mixable rubber material. Devulcanisation typically cannot revert the material to a level comparable with virgin rubber but devulcanised rubber products nevertheless perform similarly.

Devulcanisation is an emerging process and is not currently operating at scale worldwide.[41] In a 2024 study conducted by two Netherlands-based universities, it was noted that there is no established market for devulcanised rubber and there is no clear reference price for the sale of derived products. However, several respondents in the study noted that they had experienced a rise in the number of companies showing interest in purchasing devulcanised rubber and several product sales had occurred. In this context, in line with the broad shift to a global circular economy, the method of devulcanisation to produce rubber-derived products represent a potential commercial opportunity in Australia. Australian companies are currently exploring this technology for commercial application.

As part of this report, indicative financial modelling of the devulcanisation process has been undertaken to demonstrate the potential viability of establishing a market for the production of devulcanised rubber and the sale of derived products.[42] Table 4 displays indicative financial modelling of devulcanised rubber processing. Considering the lack of precedent market price and the nature of the process as an emerging technology, several assumptions have been applied to generate an indicative commercial return per kilogram of devulcanised rubber-derived product. The modelling indicating that the per-kilogram costs are about $0.29 (AUD) and per-kilogram revenue is about $0.44 (AUD), suggesting a per-kilogram profit of $0.15 (AUD). While the modelling is underscored by a range of basic assumptions, it demonstrates that under the right conditions, emerging technologies represent a potential for commercial viability.

Without investment to adequately explore these emerging options and whether they are aligned to Australia's comparative advantages, they will remain untapped opportunities.

[38] TSA. (2024). *Analysis of the material circularity of management options for tyres and conveyor belts.* Retrieved from https://www.tyrestewardship.org.au/reports-facts-figures/material-circularity-of-management-options-for-tyres-and-conveyor-belts/, p. 13.

[39] For more information, see: Roetman, E., Joustra, J., Heideman, G., & Balkenende, R. (2024). *Does the Rubber Meet the Road? Assessing the Potential of Devulcanization Technologies for the Innovation of Tire Rubber Recycling.* Sustainability, 16(7), 2900.

[40] TSA. (2024). *Analysis of the material circularity of management options for tyres and conveyor belts.* Retrieved from https://www.tyrestewardship.org.au/reports-facts-figures/material-circularity-of-management-options-for-tyres-and-conveyor-belts/, p. 31.

[41] Roetman, E., Joustra, J., Heideman, G., & Balkenende, R. (2024). *Does the Rubber Meet the Road? Assessing the Potential of Devulcanization Technologies for the Innovation of Tire Rubber Recycling.* Sustainability, 16(7), 2900, p. 11.

[42] Financial modelling is high-level and indicative only. It is recommended that a comprehensive cost-benefit analysis is undertaken to fully understand the commercial advantages and disadvantages of devulcanisation.

Table 4: Indicative financial modelling of devulcanised rubber processing

Indicative financial modelling of devulcanised rubber processing			
Assumptions	**Unit**	**Value**	**Source**
Asset life of devulcanisation technology	*No. years*	20 years	*RPS assumption*
Processing ability to devulcanise rubber (one machine)	*Tonnes p.a.*	4,000	*TSA, August 2024, Analysis of the Material Circularity of Management Options for Tyres and Conveyor Belts, p. 32*
Energy cost per kilowatt hour	*KWh, AUD*	$0.20	*RPS assumption*
Energy usage (one machine)	*KWh per kilogram*	0.25	*TSA, August 2024, Analysis of the Material Circularity of Management Options for Tyres and Conveyor Belts, p. 32*
Cost	**Unit**	**Value**	**Source**
Capital expenditure			
Capital expenditure of one standard devulcanisation machine	*AUD, per machine*	$4,470,939	*TSA, August 2024, Analysis of the Material Circularity of Management Options for Tyres and Conveyor Belts, p. 32* *Converted from USD*
Amortized capital expenditure per kilogram	*AUD, per kilogram*	$0.13	*Calculation*
Fixed costs			
Fixed costs as a percentage of capital costs	*Percentage*	10%	*RPS assumption*
Fixed costs per kilogram	*AUD, per kilogram*	$0.11	*RPS assumption*
Variable costs			
Energy costs per kilogram	*AUD, per kilogram*	$0.05	*Calculation*
Other costs per kilogram	*AUD, per kilogram*	$0.05	*RPS assumption (equivalent to energy costs)*
Total costs			
Total costs per kilogram	*AUD*	$0.29	*Sum*
Revenue	**Unit**	**Value**	**Source**
Market price of virgin rubber	*AUD, per kilogram*	$2.96	*Trading Economics, Rubber market price* *Converted from USD*
Relative price of devulcanised rubber against virgin rubber	*Percentage*	15%	*RPS assumption*
Market price of devulcanised rubber	*AUD, per kilogram*	$0.44	*Calculation*
Profit	**Unit**	**Value**	**Source**
Cost of devulcanised rubber	*AUD, per kilogram*	$0.29	-
Revenue of devulcanised rubber	*AUD, per kilogram*	$0.44	-
Gross profit of devulcanised rubber	*AUD, per kilogram*	$0.15	*Calculation*

In 2023-24, Australia produced 537,000 tonnes of used tyres.[43] About 66 per cent of tyres were processed, indicating around 187,000 tonnes of tyres were not recovered in this period. Considering this volume in the context of the indicative financial modelling, the operation of 25 devulcanisation machines that can process

[43] TSA. (2024). *Australian Tyre Consumption and Recovery – 2023-24.*

100,000 tonnes of vulcanised recycled rubber per annum (representing around 130,000 used tyres) results in a financial profit of about $15 million. Similarly to the preceding table, this logic is underpinned by several basic assumptions but irrespectively demonstrates the potential for commercial viability, under the right conditions, in an Australian context. Table 5 displays the logic of this comparison.

Table 5: Indicative devulcanisation financial modelling results

Consideration of indicative devulcanisation financial modelling in context of non-recycled tyre volumes			
Used tyre volumes	**Unit**	**Value**	**Source**
Used tyres per annum in 2023-24 in Australia	*Tonnes*	537,000	*TSA, 2024, Australian Tyre Consumption and Recovery – 2023-24*
Used tyres recovery rate 2023-24	*Percentage*	66%	*TSA, 2024, Australian Tyre Consumption and Recovery – 2023-24*
Used tyres not recovered per annum	*Kilograms*	187,000,000	*Calculation*
Industry capacity	***Unit***	**Value**	***Source***
Capacity of one devulcanisation machine	*Tonnes p.a.*	4,000	*TSA, August 2024, Analysis of the Material Circularity of Management Options for Tyres and Conveyor Belts, p. 32*
Capacity of 25 devulcanisation machine	*Tonnes p.a.*	100,000	*Calculation*
Commercial viability	***Unit***	**Value**	***Source***
Gross profit of devulcanised rubber	*AUD, per kilogram*	$0.15	*Table 2*
Gross profit of devulcanised rubber with 25 machines p.a.	*AUD, p.a.*	$15,090,206	*Calculation*

It should be noted that in addition to any economic surplus that could accrue to producers, the diversion of tyres from less sustainable end-of-life management pathways provides non-market benefits.

5 RECOMMENDATIONS

This report provides two key recommendations:

1. When evaluating and prioritising circular economy actions, consider the long-run implications for Australian productivity and welfare, which crucially depends on investment in R&D and innovation. This is important to ensure that Australia positions itself strongly for opportunities arising from the global transition to a circular economy.
2. Evaluate regulated product stewardship as a policy option that is likely to, and has been proven to, be highly effective in addressing the barriers and opportunities identified in this report.

5.1 Positioning Australia for future opportunities

Long-run considerations include intergenerational demand and the incorporation of society's fully willingness to pay for sustainably recovered resources. In global markets, this demand is likely to be reflected over time as a premium for recovered resources relative to virgin material. For example, such premiums are already currently reflected in recycled plastic resin prices. Dynamically efficient economic outcomes reflect the demands of consumers across a long time period (e.g., several decades), and incorporate their preferences into current resource allocation.

Adopting such a long-run view is more likely to position Australia for future opportunities best aligned with our comparative advantages.

5.2 Regulated product stewardship as an effective policy option

Product stewardship, which can be voluntary, co-regulatory, or regulated, is an established and effective approach to allocating responsibility for the outcomes incurred across a products lifespan. While voluntary approaches have their advantages, regulated product stewardship more comprehensively addresses the barriers and opportunities that circular economy actions aim to address.

We recommend an evaluation of regulated product stewardship for used tyres in Australia. As a product, tyres have the following attributes that warrant prioritisation:

a. Australia generated 537,000 tonnes of used tyres in 2023-24. However, Australia only recovered 66 per cent of used tyres in 2023-24 and Australian tyre recovery rates had been declining since 2020-21. As a product, tyres represent a large opportunity by weight and value.
b. There are local markets for recovered resources from tyres. Moreover, there are several viable established methods of used tyre resource recovery in Australia and several emerging resource recovery processes. Used tyres are already being shredded or crumbed to provide composite inputs for other products and industrial activities (e.g., as aggregate material in roads). Proposed technologies, such as rubber devulcanisation, are emerging as potential options to revert used tyres into a re-mixable rubber material.
c. The more advanced methods are also likely to be better aligned with Australia's comparative advantages in higher skill, rather than lower cost, production. Regulated product stewardship provides more, and more potent, incentives for the R&D and innovation necessary to establish the feasibility of these emerging methods.
d. The availability of used tyres for processing in regional areas provides opportunities to address broader policy objectives, such as regional economic development.
e. Tyres, rubber and oil are integral inputs into the Australian economy. Recovering these resources provides sovereign circular economy capability that can provide resilience to adverse economic or other supply chain shocks.