



Unlocking circular economy for tyres

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Australia's National Science Agency





Circular economy roadmap

A report for the
Department of
Industry, Science, Energy
and Resources

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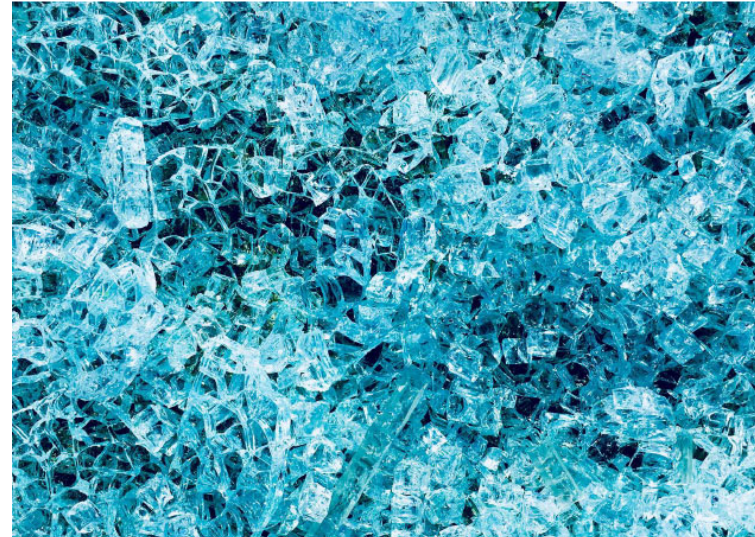


Australia's National
Science Agency

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Circular economy roadmap for plastics, glass, paper and tyres

Pathways for unlocking future growth opportunities for Australia
JANUARY 2021





Sustainable Development Goals and circular economy





Background: Policy Context

Australia's
National Waste
Policy 2018



Australia's
National Waste Policy
Action Plan 2019



Council of Australian
Governments (COAG)
Response Strategy 2019:
Phasing out exports of
waste plastic, paper,
glass and whole tyres





Circular economy roadmap aims

To identify:

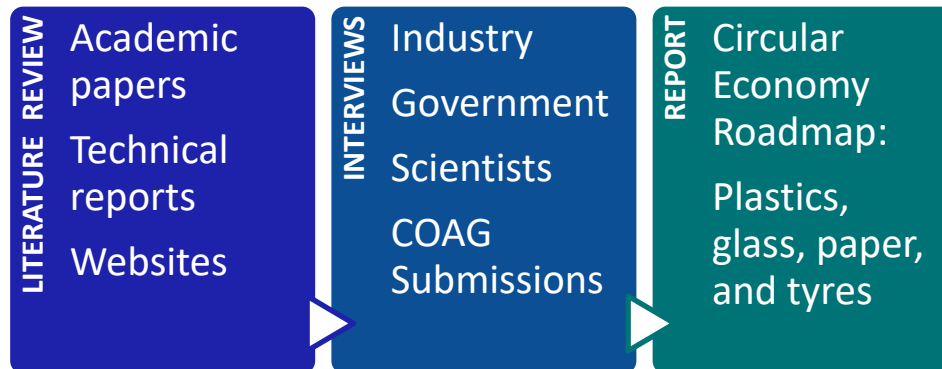
- Challenges
- Opportunities
- Enabling strategies

Using a circular economy lens





Three stage research process





Public and private
sector
organisations
contributed
through >80
interviews

Alcoa; Anglo American; Ausroads; Australian Electric Car Manufacturing Pty Ltd; Australian Food and Grocery Council (AFGC); Australian Forest Products Association (AFPA); Australian Glass and Window Association; Australian Motor Industry Federation/Motor Trades Association of Australia; Australian Packaging Covenant Organisation (APCO); Australian Paper Recovery; Australian Road Research Board (ARRB); Australian Tyre Industry Council (ATIC); Australian Tyre Recycling Association (ATRA); Bandag/Bridgestone; Barwon South West Regional Resource Recovery Group; BASF; BMB Tyre Traders; BSV Tyre Recycling Australia; Chamber of Minerals and Energy of Western Australia; Chemistry Australia; Chip Tyre; D&N Rubber Refinery; Deakin University; Department of Environment, Land, Water and Planning of Victoria; Department of Primary Industries, Parks, Water and Environment; Department of Transport Victoria; Downer Group; Ecoflex International; Edith Cowan University; Elanem; EPA Tasmania; EPA Western Australia; 5R – Window glass recycling; Flexiroc; Green Distillation Technologies; Ground Science; Growcom; Industry Edge; Integrated Recycling; IQRenew; JLW Services; Lendlease; Licella; Local Councils Association; Local Governments NSW; Lomwest Enterprises of WA; Martogg Companies; Metro Trains; MG Tyres; National Waste and Recycling Industry Council (NWRIC); Novum Energy Australia Pty Ltd; Northern Territory EPA; Orora Glass; OPAL Packaging; Owens Illinois; Pearl Global Limited; PlasTech Recycling Limited (NewTech Poly); Qld Government, Department Environment and Science; Queensland University of Technology; QLD Government, QLD Government Transport and Main Roads; Dept State Development, Manufacturing, Infrastructure and Planning; Ray Johnson Scrap Tyre Disposals; REPLAS; S&J Australian Scrap Tyre Disposals; South32; Stanwell; Tama Australia; Tangaroa Blue; Tyre Stewardship Australia (TSA); Tyrecycle; University of Melbourne; University of New South Wales; University of South Australia; University of Technology Sydney; Victorian Waste Management Association (VWMA); Vinyl Council of Australia; Waste and Recycling Industry Association of Western Australia; Waste Contractors and Recyclers Association of NSW (WCRA); Waste Management and Resource Recovery Association Australia (WMRR); Waste Recycling Industry Association Queensland (WRIQ); World Wildlife Fund (WWF).



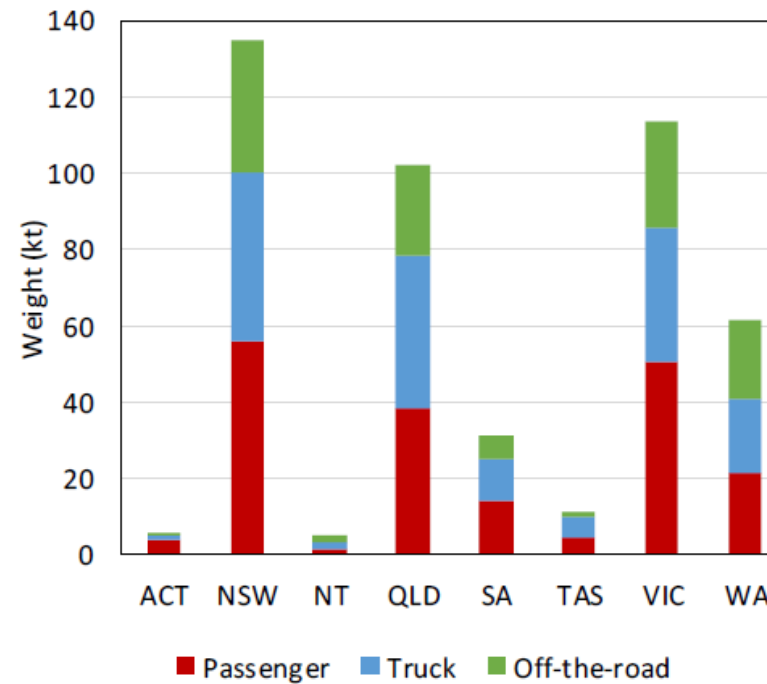
FINDINGS





Used tyre arisings in 2018-2019

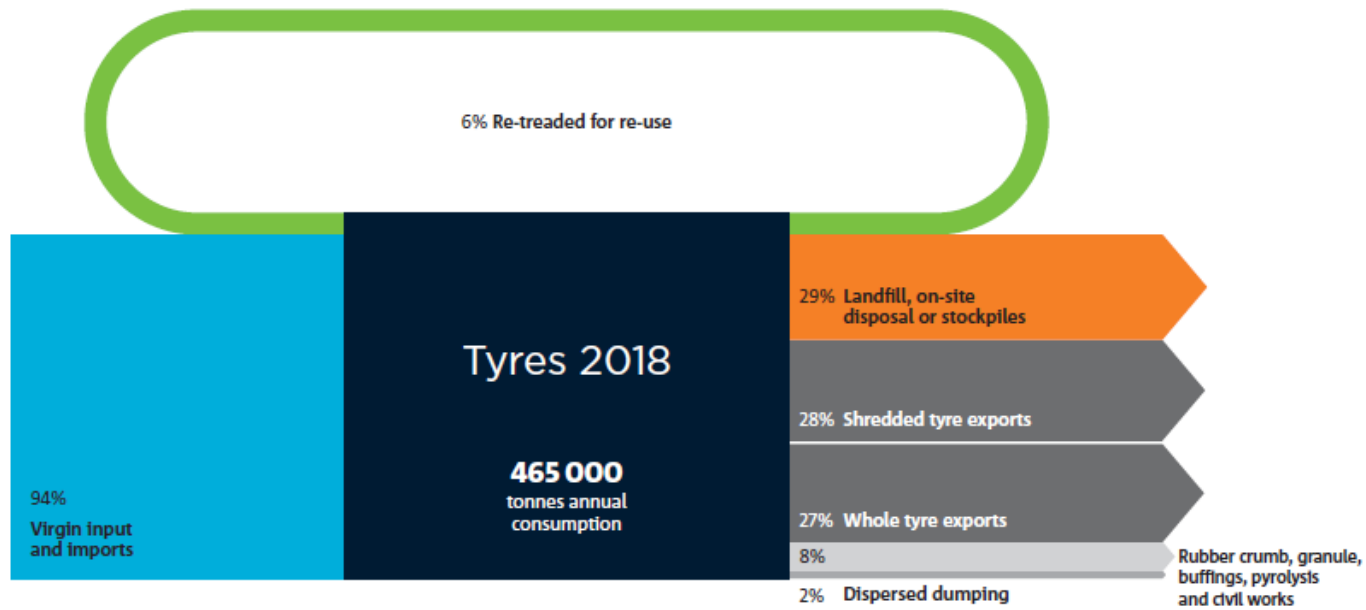
- Australians generate 56 million end-of-life tyres annually
- Total: 465 kt in 2018-19
- Excludes tyre wear losses (15% of tyre weight)



Data from: Randell, P., Baker, B., O'Farrell, K. (2020). Used tyres supply chain and fate analysis. Prepared for Tyre Stewardship Australia by Randell Environmental Consulting in association with Envisage Works and Brock Baker Environmental Consulting.



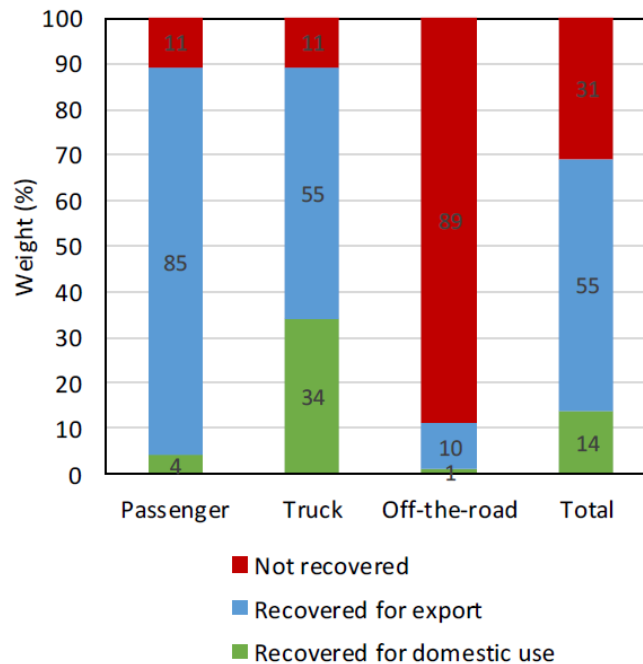
Tyre flows in 2018-2019



Data from: Randell, P., Baker, B., O'Farrell, K. (2020). Used tyres supply chain and fate analysis. Prepared for Tyre Stewardship Australia by Randell Environmental Consulting in association with Envisage Works and Brock Baker Environmental Consulting.



Fate of used tyres in Australia 2018-19

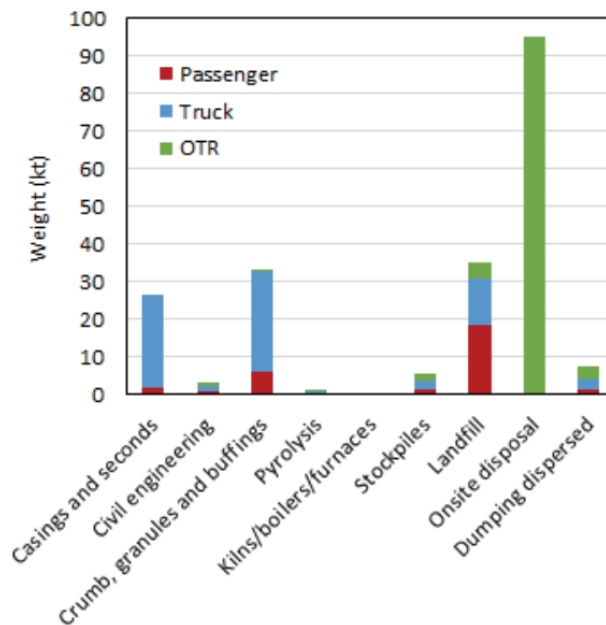


- 14% recovered for domestic use
- 55% recovered for export
- 31% was sent to landfill, stockpiled, dumped or buried on-site

Data from: Randell, P., Baker, B., O'Farrell, K. (2020). Used tyres supply chain and fate analysis. Prepared for Tyre Stewardship Australia by Randell Environmental Consulting in association with Envisage Works and Brock Baker Environmental Consulting.



Fate of Australian tyres disposed of or processed for domestic use by tyre type in 2018–19



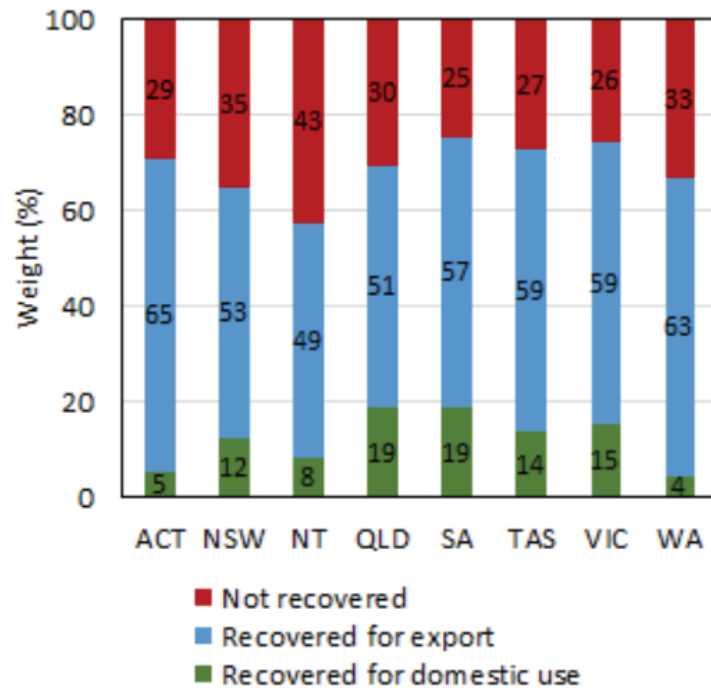
Out of tyres disposed of or processed for domestic use:

- Most truck tyres were recovered for casings and seconds as well as production of crumb, granule and buffings
- Bulk of passenger tyres were disposed of in landfills
- Most off-the road tyres were disposed onsite

Data from: Randell, P., Baker, B., O'Farrell, K. (2020). Used tyres supply chain and fate analysis. Prepared for Tyre Stewardship Australia by Randell Environmental Consulting in association with Envisage Works and Brock Baker Environmental Consulting.



The fate of tyres in Australian jurisdictions in 2018-19



- Share of domestic recycling highest in QLD and SA lowest in WA
- Recovery for export highest in ACT and lowest in NT
- Overall highest recovery in SA and lowest in NT

Data from: Randell, P., Baker, B., O'Farrell, K. (2020). Used tyres supply chain and fate analysis. Prepared for Tyre Stewardship Australia by Randell Environmental Consulting in association with Envisage Works and Brock Baker Environmental Consulting.



Capabilities for used tyre processing and manufacturing of tyre-derived products and fuels in Australian jurisdictions

PRODUCTS	ACT	NSW	NT	QLD	SA	TAS	VIC	WA
Casings and seconds								
Baling								
Civil engineering								
Shredding								
Crumb, granules, buffings								
Steel								
Nylon/rayon fabric								
Chemical processing for syngas, carbon black/char and fuel oil		*					*	*

*As of 2020, not yet conducted at commercial scale

Source: adapted from Genever et al., 2017 and Randell et al., 2020



Regulatory framework for used tyres



- Basel convention 1992
- OECD Council Decision on the Control of Transboundary Movements of Wastes Destined for Recovery Operations 2001
- Customs Act 1901
- Hazardous Waste (Regulations of Exports and Imports) Act 1989
- National Environmental Protection (Movement of Controlled Waste between States and Territories) Measure 1998
- Product Stewardship Act 2011
- National Waste Policy 2018
- National Waste Policy Action Plan 2019
- Waste Export Ban 2019



Enabling acts, regulations and/or guidelines for used tyre management across Australian jurisdictions

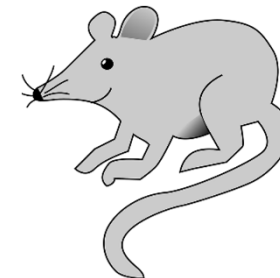
REGULATION	ACT	NSW	NT	QLD	SA	TAS	VIC	WA
Tyre storage	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Fire safety of tyres	No	Yes	No	Yes	Yes	No	Yes	No
Tyre transport	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes
Tyre tracking	No	Yes	No	Yes	Yes	Yes	No	Yes
Tyre disposal	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Tyre landfill levies	Yes	Yes	No	Yes	Yes	No	Yes	Yes
Tyre reuse	No	Yes	No	No	Yes	No	No	No
Tyre recycling	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes
Energy recovery from tyres	No	Yes	No	No	Yes	No	Yes	Yes

Source: data from Randell et al., 2020



Hazards from poorly managed tyres

- Fire hazard
- Pests
- Tyre-derived microplastics





Key challenges for value recovery from tyres

1. Voluntary instead of mandatory and regulated Tyre Stewardship Scheme

2. Lack of import levies for some tyre imports

3. Lack of quality standards for imported tyres

4. Inconsistent policies, regulations and permitting

Product stewardship





Key challenges for tyres (continued)

5. Inconsistent and non-transparent disposal fees for used tyres

6. Long transport distances and disconnected supply chains

7. Incomplete tracking of tyre transportation and export

8. High infrastructure costs, lack of available funding and slow permitting of tyre recyclers





Key challenges for tyres (continued)

9. Unaudited operators

10. Lack of consistent standards and specifications for tyre-derived products and fuels

11. Competition of domestic tyre-derived products with subsidised imports and other products

12. Lack of knowledge and preference for business as usual





Opportunities for circularity for tyres

- Avoidance
- Design
- Reduction of consumption
- Collection, transport and tracking
- Remanufacturing and reuse
- Recycling
- Use of tyre-derived products and fuels





Avoidance

- Implementing distance work and replacing face-to-face meetings with virtual ones
- Replacing tyre-based transport with other transportation forms where possible





Design

- Designing tyres that require less materials, are more durable and easily remanufactured, recycled or safely used as fuel
- Manufacturing tyres from bio-derived renewable materials





Reducing consumption of tyres

- Encouraging people to use public transport systems, carpooling, taxis, ride-sharing systems
- Investing in light transport vehicles which have small tyres





Collection, transport and tracking

- Developing collection systems for all families of tyres (including e.g., off-the-road, motorcycle and bike tyres)
- Reverse logistics to minimise transport costs
- Developing software to optimise transport logistics
- Implementing online tyre tracking across the country and include exported tyres





Remanufacturing and reuse of tyres

- Retreading tyres for reuse
- Remanufacturing used tyres to alternative uses, such as structures for water tanks, evaporation control devices and modules for civil engineering





Recycling used tyres

- Using tyre casings or tyre-bales for civil-engineering applications
- Mechanical processing of used tyres to produce shred, rubber granules, buffings and crumb, textile and steel
- Thermochemical processing of used tyres to syngas, oil, steel, carbon black and/or char





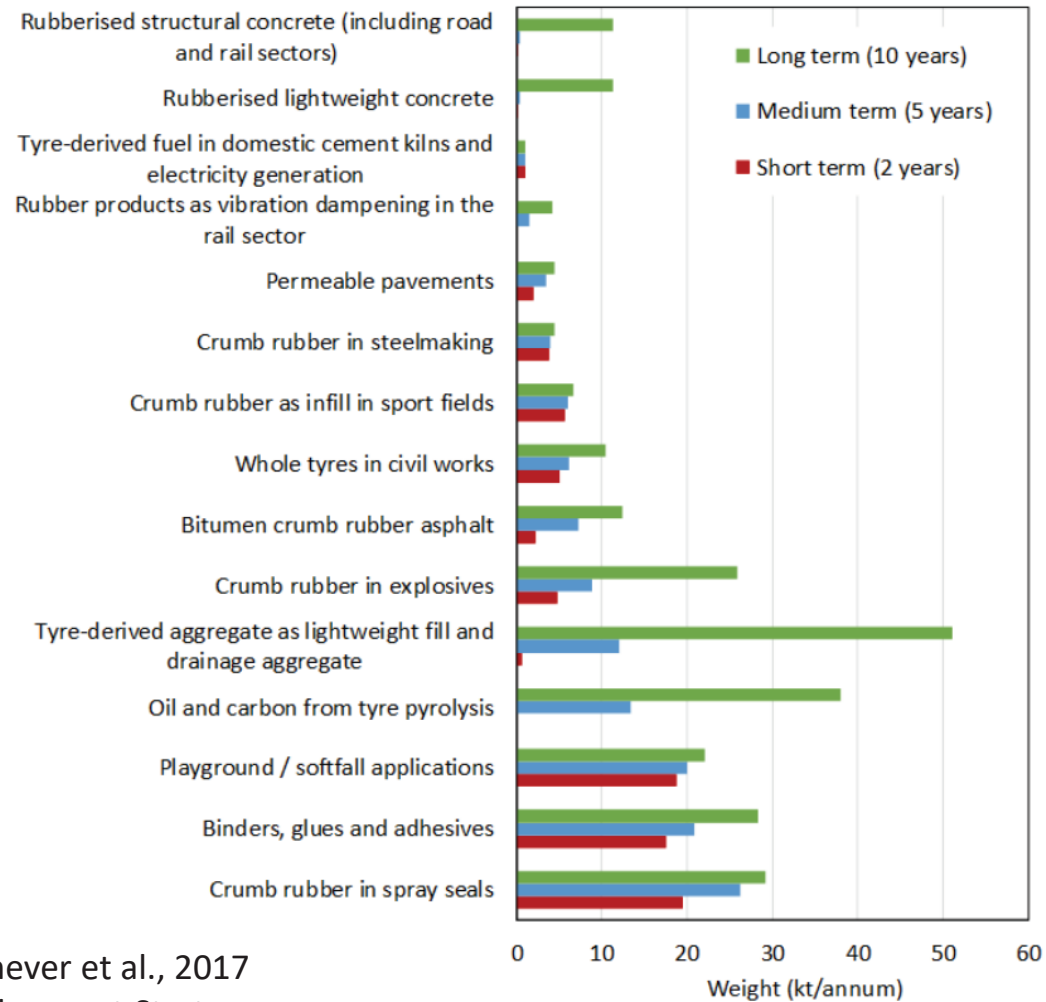
Use of recyclates

- Using tyre-derived products in civil engineering, surfaces, seals, moulded products, explosives and plastics
- Using tyre shred, tyre-derived oil, syngas and steam as energy





Potential market size of tyre-derived product opportunities



Source: data from Genever et al., 2017
National Market Development Strategy



Integrated circular economy strategies

Six groups of strategies:

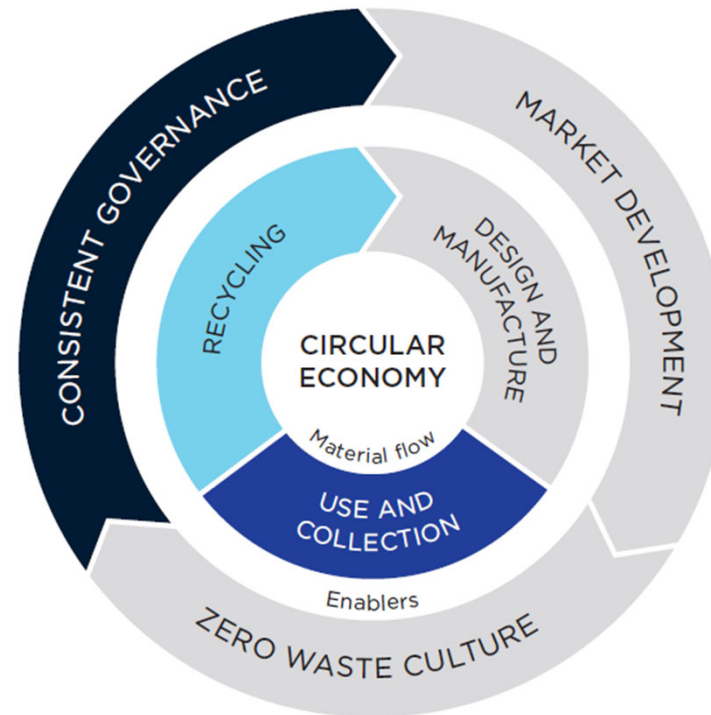
- Three relate to **material flow**
 - Retaining material through use and collection
 - Upscaling and innovating recycling technologies
 - Innovating design and manufacture
- Three relate to **enablers**
 - Developing markets for secondary materials
 - Streamlining nationally consistent governance
 - Fostering a national zero-waste culture





Strategy priorities for tyres

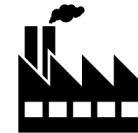
- Streamlining nationally consistent governance
- Retaining material through use and collection
- Innovating and upscaling recycling technologies
- Developing markets for secondary materials





Future recommendations: Short term (2022)

- Implementing national mandatory and regulated or co-regulated tyre stewardship scheme
- Implementing minimum quality standards for imported tyres
- Harmonising mandatory and increased levies for all tyre imports
- Harmonising transparent and higher recycling fees to the price of new tyres, higher % of fee going to recyclers and consumers to receive a small refund when returning tyres for recycling
- Investing in tyre processing infrastructure and implement fast permitting for operators
- Investing in research, innovation, demonstration and scale up of tyre recycling and energy recovery technologies
- Investing in testing the performance of tyre-derived products (TDPs) and fuels (TDFs)
- Educating all levels of government, tyre operators and consumers





Future recommendations: Medium term (2025)

- Harmonising policies, regulations and permitting for tyre management and recycling across the country
- Harmonising banning of on-site disposal, dumping and landfilling of whole tyres and tyre-derived materials
- Implementing compulsory auditing and accreditation of all tyre retailers and tyre operators
- Implementing mandatory online tracking of tyre, tyre-derived product (TDP) and tyre-derived fuel (TDF) transports across the country and overseas to legitimate processing facilities
- Harmonising standards and specifications for TDPs and TDFs across Australian jurisdictions
- Implementing procurement policies and financial incentives to encourage the use of tyre retreads; and minimum % of domestic TDPs and TDFs in relevant applications





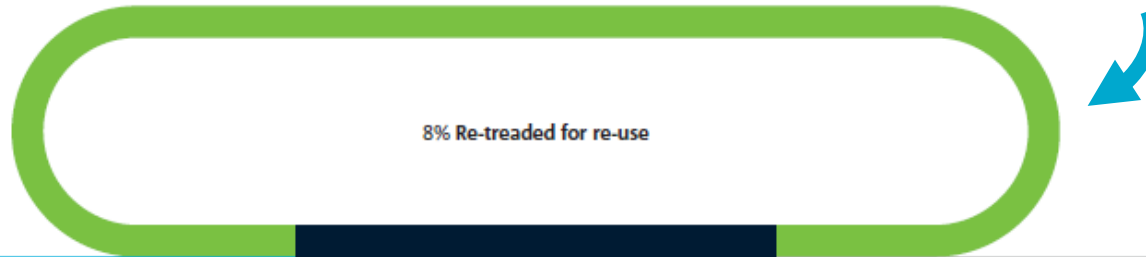
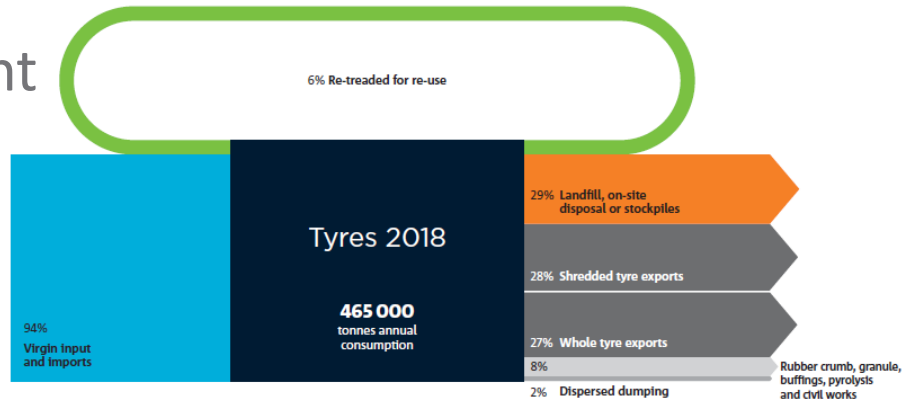
Future recommendations: Long term (2030)

- Investing in fast internet, virtual meeting technologies and non-tyre-based transport infrastructure
- Collaborating internationally across tyre value chain
- Investing in innovations that enable a more circular economy for tyres and innovation parks and business incubators
- Investing in market platforms to enable reverse logistics and link tyre recyclers to end users
- Supporting the set up consortia/community of practice for tyre operators
- Committing to advance a more circular economy for tyres





Where we want to be by 2030





Thank you

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