



Circular Economy Market Report

2024

RECYCLING VICTORIA

We acknowledge and respect Victorian Traditional Owners as the original custodians of Victoria's land and waters, their unique ability to care for Country and deep spiritual connection to it.

We honour Elders past and present whose knowledge and wisdom has ensured the continuation of culture and traditional practices.

DEECA is committed to genuinely partnering with Victorian Traditional Owners and Victoria's Aboriginal community to progress their aspirations.



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Executive summary

The Victorian Government has committed to a long-term target of net zero greenhouse gas emissions by 2045 and an emissions reduction target of 75 to 80% by 2035.

Achieving these targets is a shared responsibility across all sectors of the economy including the Australian, state, and local governments, the goods and services industry, waste, recycling, and resource recovery sector, and the community. By reducing our waste, we also reduce our greenhouse gas emissions footprint and build a circular, more sustainable, and climate resilient economy.

Victoria is projected to add 4.7 million people from 2018 to 2056, reaching a population of 11.2 million. This represents annual average growth of 125,000 people, at a rate of 1.5% per annum. Greater Melbourne is projected to grow by about 4 million people, increasing from 5 million in 2018 to 9 million in 2056. Over the same period, Victoria's regions are expected to grow by just over 700,000 from 1.5 million to 2.2 million.

Without mitigation, this growth will place greater pressure on our environment including through higher levels of waste generation. Victoria also needs a reliable and robust market to avoid precious materials and embodied energy being lost to landfill.

Recycling Victoria's long-term vision is for a world class circular economy system that helps build a sustainable future for all Victorians. This vision will be built on the foundations of sustainability, leadership, collaboration, and accountability.

Recognising that our purpose is to support the development of a circular economy, future work will require partnership and collective effort from state and local governments, waste, recycling, and resource recovery sector, industry, businesses, and community.

In a linear economy, raw natural resources are mined, processed and transformed to a product that is thrown away after use. The direct opposite of this is a circular economy which aims to close the gap between the production and the natural ecosystems' cycles. To create a circular economy, systematic changes are needed at all stages of the supply chain, from production design to disposal (see diagram below). From waste to value, Victoria is using this pathway to grow a cleaner and smarter State.

The Circular Economy Market Report responds to Recycling Victoria's commitment to greater market transparency and building confidence for future investment, with a view to enabling stronger circular economy opportunities and interventions.

This report provides best available information about the performance of material circularity in Victoria including priorities in relation to the circular economy market overall, as well as recommended focus areas for further investigation to improve circularity for each material stream.

Going forward, Recycling Victoria remains committed to expanding Victoria's waste data systems which will inform better decision-making and allow the government to monitor progress towards a circular economy.

Recovery rates of individual material streams are the current available proxy to provide insights into Victoria's circular economy. While it is a good representation of the overall circular economy environment, there are gaps within the material resource flow data. Once addressed, circularity will be easier to measure, monitor and progress. It is a Recycling Victoria priority to progress the development of a new circular economy metric to better monitor and measure Victoria's material circularity.

Resource recovery rates across Victoria vary depending on the material stream. This report outlines the current recovery rates and identifies the unique challenges and opportunities to improve circularity for each stream.

This year's review of the Victorian circular economy market has identified a number of material streams that are continuing to challenge the sector, such as textiles, plastics and tyres. It is recommended that government and sector collaboration, focus and effort continue towards exploring and finding improvements in these areas.

The review also identified problematic emerging material streams such as batteries, wind turbines and photovoltaic panels. Recycling Victoria will continue to focus efforts to increase understanding of each of these and identify stronger circular economy opportunities.

This inaugural report delivers against the Recycling Victoria Strategic Plan, which includes the provision of regular, timely and quality market data and insights to identify key investments, gaps, issues and opportunities, with a view to enabling stronger circular economy opportunities. The preparation of this market report is an annual legislative responsibility under the *Circular Economy (Waste Reduction and Recycling) Act 2021* (the CE Act).

Overview

Introduction

Recycling Victoria

Our long-term vision is for a world-class circular economy system that helps build a more sustainable future for all Victorians.

Recycling Victoria commenced in July 2022 to provide leadership, stewardship and to provide oversight and support the transition to a circular economy. Its strategic priorities for 2023 to 2026 include providing strategic market information for greater market transparency, and confidence to enable stronger circular economy opportunities.

Victoria is developing a waste and resource recovery system that minimises waste generation and maximises resource recovery.

Everyone has a part to play - without collaboration between industry, community, and local, state and Commonwealth governments, we cannot achieve the required transition to a new system of resource management and move closer to a circular economy.

Recycling Victoria supports the transition to a more sustainable model of resource management within Victoria, to enable stronger circular economy opportunities outcomes for the community. This inaugural Circular Economy Market Report is an important part of the Recycling Victoria Strategic Plan.

Recycling Victoria's vision is supported by its strategic objectives which aim to:

1. **Contribute** to a strong and robust circular economy.
2. **Increase** the resilience of the Victorian waste and resource recovery system.
3. **Enable** sector investment and growth.
4. **Build** system capacity and capability.

Recycling Victoria's vision and strategic objectives each support the *Recycling Victoria: a new economy* policy for the management of waste and recycling within Victoria, which sets a plan to transition Victoria to a circular economy through the following goals:

- Design to last, repair and recycle.
- Use products to create more value.
- Recycle more resources.
- Reduce harm from waste and pollution.

The Circular Economy Market Report directly contributes to the first three goals, by measuring and understanding the circularity of material streams generated within Victoria, identifying barriers and opportunities within each stream to achieve circularity, and identifying emerging new material streams entering the Victorian market.

Background

Victoria is growing rapidly. By 2046, it is estimated that Victoria's use of extractive resources to build infrastructure, provide services and to make and transport our products and food will almost double, and our waste generation will increase by about 40%.¹

Increasing inequality, climate change and scarce resources are challenging our planet and society. These challenges require systemic change in the logic of value creation to shape new, more responsible business models. In summary, we need to produce more with less, and create less waste.

We also recognise that decisions and policies about waste avoidance, reduction, management, and recycling can impact the health and wellbeing of Traditional Owners and Aboriginal Victorians. Having the appropriate waste management systems and infrastructure in place can contribute to caring for Country and supporting Victoria's transition to a circular economy, in line with the Victorian Government's *Recycling Victoria: a new economy* policy.

Governments around the world are making the shift to a more circular global economy, and many businesses are employing circular economy principles. Responding to this is important for Victoria's international competitiveness.

The circular economy is an alternative economic model that seeks to address these challenges (refer Figure 1). It is a system where products are designed, marketed, and delivered with a reduced reliance on raw or virgin materials, are made to be reusable, durable, repairable, and shareable, and have an extended life cycle.²

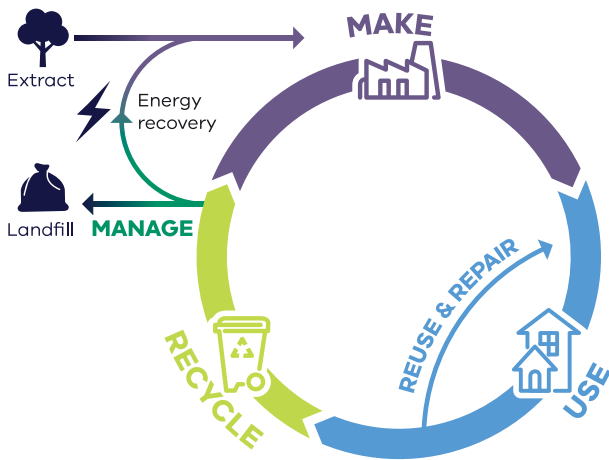


Figure 1:
Resource flows in a circular economy (Source: Recycling Victoria – a new economy policy 2019)

A circular economy aims to keep products and materials at their highest value for as long as possible to reduce the need for virgin materials and keep overall material use within the planetary boundaries.

The circular economy has become a mainstream focus for industry development, resource security and waste and resource recovery policies around the world. The European Union has taken a strong lead with Closing the loop - an EU action plan for a circular economy, supported by national strategies in Denmark, Finland, France, Germany, the Netherlands and Slovenia.

Transition towards a circular economy is taking place at all levels of government in Australia. The Australian Government is supporting this transition with action via the National Waste Policy, and collaboration across the states and territories via the Environment Ministers Meeting, and the Circular Economy Ministerial Advisory Group.

Victoria has undertaken significant policy and legislative reform to limit the impacts of population growth on the environment and change how we manage materials within Victoria.

The CE Act 2021 enables better and more recycling, recovery and reuse of our precious resources, less waste in landfill, and a recycling system that Victorians can rely on.

Recycling Victoria – a new economy policy creates a way forward for Victoria, including setting targets to define success and measure progress and action to transition to a more circular economy.

Moving closer to a circular economy has the potential to deliver numerous benefits to Victoria, including:

- significantly reducing greenhouse gas emissions by reducing material extraction and consumption
- strengthening food security (the ability to produce food for current and future generations)
- job creation and industry development
- reducing air, land, and water pollution
- improving human health and wellbeing
- greater protection of biodiversity
- regenerating the natural environment.

Increasing circularity cannot be achieved simply by recycling and resource recovery; it must be driven by minimising any waste in the first instance, driving better product design, sharing, repairing, and re-use, which leads to circular production, consumption, and resource recovery outcomes (Figure 1).

Progressing towards Victoria’s circular economy contributes to the broader global shift to greater sustainable development, based on the United Nations 17 Sustainable Development Goals (SDGs) and targets, which aim to make cities and human settlements inclusive, safe, resilient, and sustainable, ensure sustainable consumption and production patterns, and take urgent action to combat climate change and its impacts. Future work will advance Victorian circular economy measurements and support future policy and regulatory work identified in the CE Act.



Figure 2:
The 12 Sustainable Development Goals aligned with Recycling Victoria’s objectives and actions (Source: Recycling Victoria Strategic Plan 2023–2026)

These SDG targets aim, amongst other things, to make cities and human settlements inclusive, safe, resilient, and sustainable, ensure sustainable consumption and production patterns, and take urgent action to combat climate change and its impacts. Goals 4, 6, 7, 8, 9, 11, 12, 13, 14, 15, 16 and 17 are directly related to the work of Recycling Victoria (refer to Figure 2).

Scope

The circular economy market is defined by the CE Act as the market for waste, recycling, or resource recovery services within the circular economy.

This inaugural Circular Economy Market Report provides an overview of the current circular economy market within Victoria and covers the 2022–23 financial year. As this is the first Circular Economy Market Report, in some cases the data sets will precede 2022–23 to capture a baseline for future reporting.

This report will continue to evolve in future years, as further important work is done to expand measurement of Victoria’s material streams. This report will utilise available resource recovery rates as a measure of the circular economy market, understanding the current limitations to fully reporting the circularity of each material stream.

Measuring circularity includes:

- sharing
- repair
- re-use
- recycling
- energy recovery (linked to resource recovery activities).

Market overview and performance

Victoria generated a total 15.8 million tonnes of material in the 2020–21 financial year, with 11.0 million tonnes recovered for reprocessing. This resulted in a state-wide recovery rate of 70% (refer Table 1 and Figure 3).

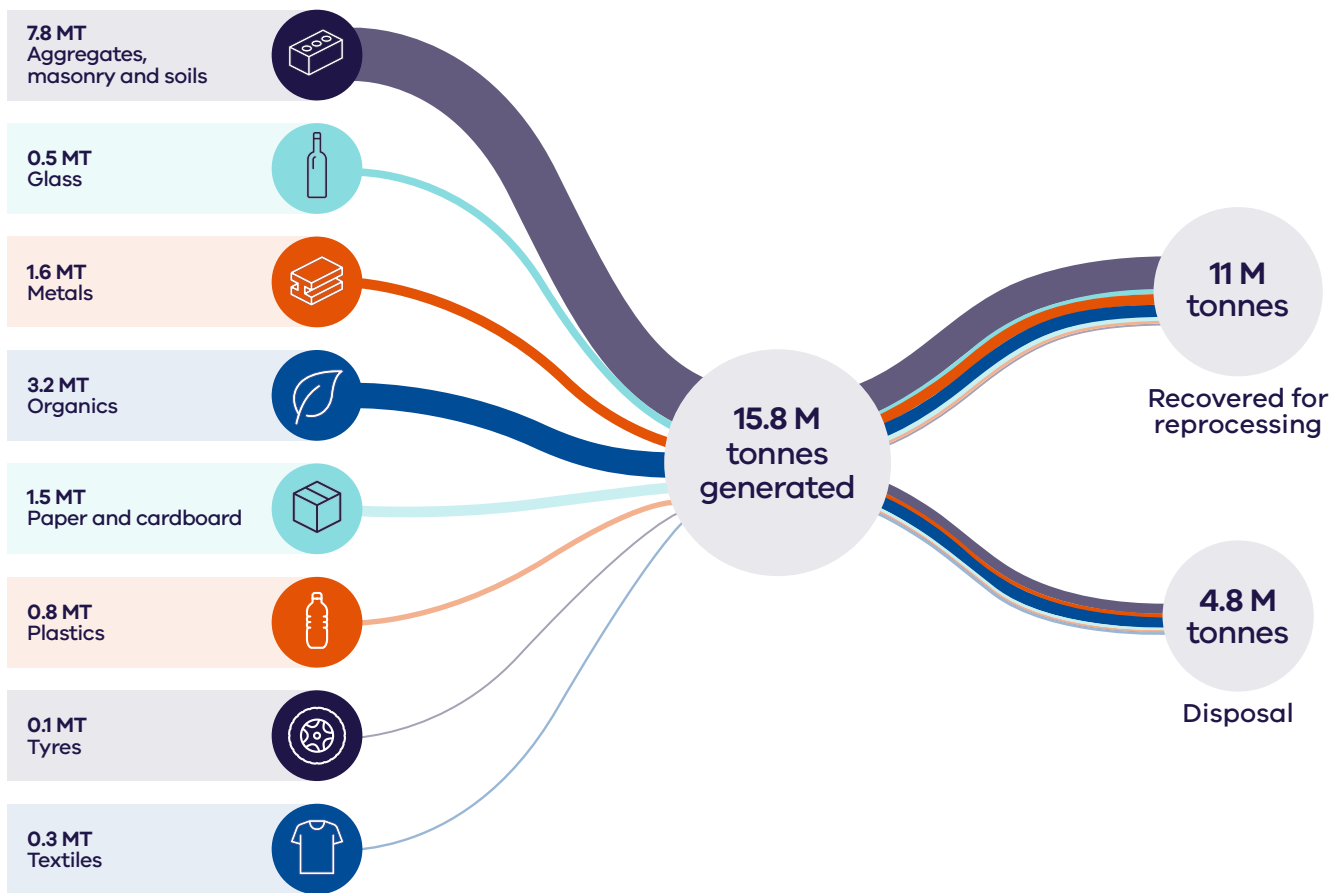


Figure 3: Materials generated, recovered for processing, and disposed of in 2020–21 (million tonnes)

To best identify and deliver actions to enable the transition towards a circular economy, details within each part of the sector are required. This assists in identifying targeted areas for improved circularity and allows for meaningful measurement of progress of any actions.

This inaugural Circular Economy Market Report breaks down the materials within the Victorian circular economy into eight key material streams (aggregates, masonry and soil, glass, metals, organics, paper and cardboard, plastics, tyres, textiles). This report also identifies and reviews emerging materials entering this market.

Each of the 8 material stream reviews in this report consider developments and changes within the market, the performance of each segment of the market, as well as issues, challenges and areas for greater circularity. An important consideration within each of these 8 key material streams is their source, and how they are collected.

The 8 key material streams represented in Figure 3 are sourced from the 3 sectors which are:

- household or municipal solid waste (MSW)
- commercial and industrial waste (C&I)
- construction and demolition waste (C&D)

Almost half of all waste materials generated within Victoria stems from the C&D sector. The C&I sector contributes over a third of all waste material generated, with households contributing to the remaining 20% of total waste generation in Victoria (refer Table 1).

Material originating from each separate sector has varied recovery rates (refer Table 1). The C&D sector has the highest recovery rate of the 3 sectors, with MSW having the lowest overall recovery rate (refer Table 1).

There are considerable improvements within all 3 sectors. Of these 3 sectors, the commercial and industrial sector (C&I) has the largest ability to influence circular economy outcomes. These include waste minimisation via design and manufacture and ensuring the ability to recycle and reuse products created.

Table 1: Victorian waste and resource recovery market summary 2020–21³

Source	Generated		Recovered for reprocessing		Disposal		Recovery rate	
	Tonnes	Change from previous year	Tonnes	Change from previous year	Tonnes	Change from previous year	%	Change from previous year
MSW	3.1 M	↓	1.4 M	↓	1.7 M	↓	46%	↓
C&I	4.9 M	↑	2.9 M	↑	2.0 M	~	60%	↑
C&D	7.7 M	~	6.6 M	~	1.1 M	~	86%	~
Total	15.7 M	↑	11 M	↑	4.7 M	↓	70%	~

Sector turnover and commodity/material value

The value of the Victorian waste, recycling and resource recovery sector is estimated at over \$4.4 billion.⁴ This value will continue to grow quickly as Victoria transitions to a stronger circular economy.

The total market value of recovered materials is estimated at \$1.2 billion (Figure 4).

Commodity values and market trends continually change and are tracked in regular market reports prepared by Recycling Victoria and published on the Recycling Victoria Data Hub | vic.gov.au (www.vic.gov.au)

Commodity values are driven by multiple factors including:

- international commodity values (e.g., metals, oil/plastics, paper/cardboard)
- landfill gate fees and landfill levies (aggregates, masonry & soil, organics)
- virgin materials costs (glass)
- product stewardship arrangements (CDS, E-Waste)
- end market stage of development (organics).

The market value for each material provides some level of insight into the circularity of each sector; the material value and its price relative to the virgin material shapes its circularity opportunity. For example, metals have a high commodity value

due to high cost and demand for these materials and this drives resource recovery. Conversely, the cost to recover and process plastics to a quality to replace virgin material is currently higher than the cost of the virgin fossil fuel-based plastics for most polymers.

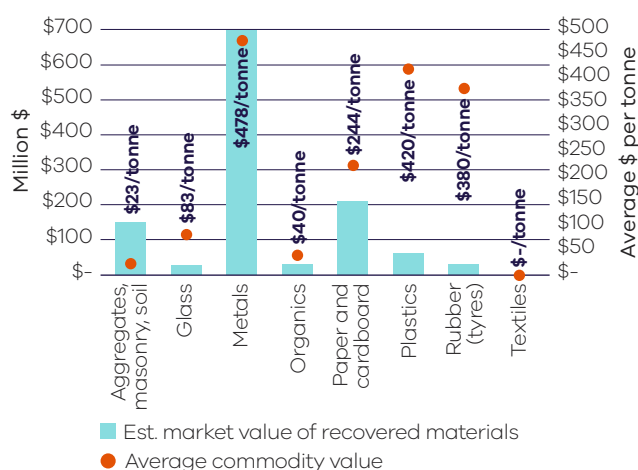


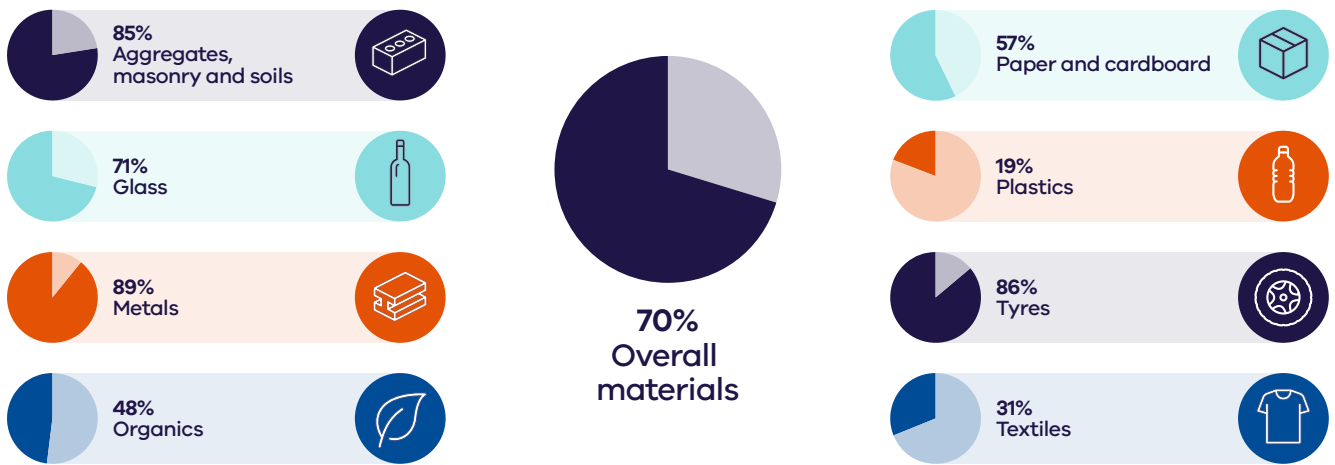
Figure 4: Estimated market value of recovered materials in 2020–21. The market value of each stream is estimated by multiplying the tonnes of that stream recycled by the average commodity/material sale price.

Materials circularity

Acknowledging the limitations of measuring circularity with resource recovery rates (Table 2), there are numerous material streams which are performing much better than others within the Victorian market.

Currently metals, aggregates, masonry and soils, and tyres are the highest performing material streams within Victoria, with textiles and plastics the lowest.

Table 2: Individual material resource recovery



Not all material streams can achieve full circularity. A range of factors including chemical composition of a material, contamination issues, economic viability, and existing quality control requirements across some sectors (including engineering standards) prevent some material streams from achieving circularity.

An early review of each of the 8 key material streams within Victoria has been undertaken, to assess at a high level the ability for each material stream to become fully circular (refer Table 3). Items that can either be reused or made back into their original form (glass bottle to glass bottle etc.) have been classified as high to very high in circularity potential. Items listed with medium to low circularity potential are material streams that cannot be remade into their original use, or easily reused, and may rely on waste to energy solutions to minimise their disposal to landfill. Table 3 also summarises areas for greater circularity for these key materials within the Victorian circular economy.

Areas for greater material circularity

Table 3: Areas for greater material circularity

Material	Current resource recovery rate	Circularity potential	Areas for greater circularity;
 Aggregates, masonry and soil	Medium – High	Very High	<ul style="list-style-type: none"> soils banks to manage recovery and supply over project timelines construction materials highest and best use via initial design, modular construction, building for repair/reuse/refurbishment and end-of-life deconstruction
 Glass	Medium	High	<ul style="list-style-type: none"> recovered packaging glass returned to glass packaging lower grade recovered glass to replace virgin construction materials reusable glass packaging
 Metals	High	High	<ul style="list-style-type: none"> precious metals recovery
 Organics	Low – Medium	High	<ul style="list-style-type: none"> food waste recovery from both MSW and C&I sectors
 Paper and cardboard	Medium	High	<ul style="list-style-type: none"> reusable packaging
 Plastics	Very Low	Medium	<ul style="list-style-type: none"> reduced packaging reusable packaging energy recovery aggregated or mixed lower value plastic streams
 Tyres	High	Medium	<ul style="list-style-type: none"> increased safe re-treading for truck and passenger tyres tyre derived fuel applications
 Textiles	Low	Medium	<ul style="list-style-type: none"> designing for longer life and repair local reuse.

Material reuse and repair

Material and product reuse is widely used to extend the life of many items within Victoria.

Charitable recycling enterprises have spread across the state for over a century, enabling customers to purchase goods including clothes and household items, while allowing people to support not-for-profit organisations that help their local community.

Community leadership and state government funding has seen continued progress in the development of new repair and reuse projects. These programs include repairing and sharing of toys, clothes, nursery items and establishing repair cafes.

Many schools have established second-hand uniform and textbook shops, allowing families more affordable access to school supplies.

The ability to measure and report how much material is reused and/or repaired is currently limited. There are emerging methods which will help to measure this in the future and will be explored in future reports.



Material stream discussion





Aggregates, masonry and soil

The overall recovery rate for aggregates, masonry and soil in Victoria is 85%, consistent with other high performing jurisdictions in Australia. This is largely driven by the C&D sector, with the MSW and C&I sectors generating a low volume of material.

Most individual materials within this category have a very high recovery rate. Soils and natural materials and plaster have a much lower recovery rate.

Developments and changes

The major development for aggregates, masonry and soil is the Victorian Government's *ecologiQ* initiative, supported by the *Recycled First* policy, which has led to end-market pull-through of aggregates and masonry into large government infrastructure projects. The *Recycled First* policy is a first of its kind in Australia and has driven extra demand for recovered material in the building and construction sector through government procurement levers. Nationally this policy is seen as a very positive and influential government initiative.

Market performance

The sector includes various commercial collectors (e.g., skip bins, larger bulk collections) and 48 C&D waste recyclers.⁵ All materials are processed within Victoria into end products like civil construction materials, road base, asphalt and concrete products. Building and demolition wastes are recovered from most large projects. In smaller projects mixed material loads are often sent directly to landfill which loses the embedded energy with many of these products and maintains reliance on virgin materials. Smaller construction projects often experience higher costs per unit to use recycled materials and face regulatory management barriers and market inertia/risk aversion in adopting recycled materials compared to large projects.

Market issues and challenges

Resource recovery of aggregates, masonry and soils is well established and high performing across most material streams. There are low recovery rates in some streams that require improvements and the uptake of recovered materials in construction needs to further increase (refer Table 4).

Planning and construction changes in the built environment can improve the circularity of this material stream, including embedding circularity at the design stage to value and facilitate refurbishment first, reuse of material in its current form to enable highest and best use of processed materials.

One of the limitations to circularity is the need to carefully manage contaminated material (soils), and the need for expanded understanding of applications and structural suitability of recycled products. Oversupply of soil due to insufficient capacity and geographical spread of end markets would need to be managed in the future.

Areas for greater circularity – aggregates, masonry and soils

The greatest areas for improved circularity for this material stream are:

- end markets and increased uptake of recycled materials in construction projects
- specifications that promote end-markets with a focus on achieving the highest (environmental) order beneficial use of recovered materials
- soil bank options to cater for peaks and troughs of larger infrastructure projects.
- innovative and higher quality sorting capacity
- treatment of contaminated soil
- maintain construction materials at their highest and best use through design, modular construction, building for repair/reuse/refurbishment and deconstruction at end-of-life
- minimising waste, prioritizing building refurbishment options where possible.

Table 4: Generation and recovery of aggregates, masonry and soil⁶

Stream	Generated		Recovered for reprocessing	Recovery Rate
	Tonnes	Proportion		
MSW	86,800	1%	11,600	13%
C&I	298,100	4%	33,900	11%
C&D	7,383,500	95%	6,536,700	89%
Total	7,768,400		6,582,200	85%

Material	Generated		Recovered for reprocessing	Recovery Rate
	Tonnes	Proportion		
Asphalt	945,500	12%	939,700	99%
Bricks	1,139,500	15%	1,024,600	90%
Concrete	2,741,900	35%	2,673,400	98%
Plaster	81,900	1%	32,600	40%
Rubble	823,800	11%	792,300	96%
Soils and natural materials	2,035,900	26%	1,119,500	55%

Case study

Recycled First policy (ecologiQ)

Victoria's Big Build is a suite of significant road and rail infrastructure projects across metropolitan Melbourne and regional Victoria. It encompasses major projects such as the North-East Link, Suburban Rail Loop, Level Crossing Removal, Metro Tunnel and others. The Big Build collectively has a budget of \$100 billion and has led to the creation of more than 20,000 jobs across the state. The ecologiQ initiative was pioneered in 2019 when Major Road Projects Victoria drew a crucial connection between Victoria's transport projects and the reform of Victoria's recycling system. The aim of ecologiQ is to integrate recycled and reused content across Victoria's transport infrastructure projects and making the use of greener materials business-as-usual.

A key driver for this change is the *Recycled First* policy. This Australian-first policy requires tenderers and contractors delivering major projects to optimise and commit to the use of recycled materials. The *Recycled First* policy encourages innovation and supports a vibrant and sustainable Victorian market for reused and recycled materials in transport infrastructure construction. This policy demonstrates that effective use of recycled materials can enhance circular economy outcomes and divert waste from landfill.

The ecologiQ program delivers the policy and provides wrap around support to government, regulators, projects and industry to help them meet the requirements of the Policy. ecologiQ provides technical support and a range of resources including reference guides to support the use of recycled and reused materials. The guides provide an overview of industry standards for materials and construction type.

A successful *Recycled First* project is the completion of the McGregor Road and Healesville-Koo Wee Rup Road interchanges as part of the [Pakenham Roads Upgrade](#). Approximately 100,000 tonnes of recycled dirt, rock and clay which was excavated from the Level Crossing Removal Project's Mont Albert Road site in Surrey Hills was reused in this project. This material now forms part of the foundations of freeway ramps and embankments near Pakenham. This arrangement prevents usable material from going to landfill as well as reducing the need for new materials to be quarried.

Under the *Recycled First* policy, 3.5 million tonnes of recycled and reused materials have been committed over the next few years across 52 projects. This is more than enough to fill the Melbourne Cricket Ground.

Source: Victoria's Big Build





Glass

Recycling of glass in Victoria is well established with positive transition to higher circularity. Generation and recovery are relatively similar between the MSW and C&I sectors. Packaging glass recycles 81% of total volumes generated with the remaining 'other glass' not currently being recovered.

Developments and changes

The introduction of the Victorian Container Deposit Scheme (CDS) in November 2023, and separation of glass at kerbside will further support glass-to-glass recycling and help recovered Victorian glass compete with high quality glass recovered in other jurisdictions. There is a strong market shift to increase the recycled glass content in glass container manufacture driven by emissions reduction and circularity benefits. Recovered glass may also improve in quality depending on how each Materials Recovery Facility (MRF) recovers CDS glass.

Sixteen local government areas have introduced a glass-only kerbside bin with a further 12 introducing a glass drop-off service. This is expected to increase as part of the standardisation of household recycling across Victoria.

Industry has provided additional beneficiation (the process of sorting, cleaning and crushing glass) capacity within Victoria recently, through expansion of an existing facility to now process 200,000 tonnes per year.⁷ Interstate capacity supports overall glass circularity and there has been expansion of a South Australian facility, with an annual capacity of 150,000 tonnes and a new facility commissioned in Sydney that will reduce glass coming to Victoria and free up local beneficiation capacity.

It is expected that packaging recycled content will increase due to growing producer commitments, consumer expectations and the National Packaging Targets 2025.

Market performance

The market demand for glass-based construction materials remains high. The glass recovery sector is serviced by two beneficiation plants, 6 glass crushing processors and one packaging manufacturing plant.

All recovered glass is processed within Victoria into glass cullet back into glass packaging, or otherwise crushed glass/glass fines into construction materials. Recovered glass packaging markets in Victoria are stable and improving but current glass generation exceeds demand into new glass packaging. This is expected to improve over the next few years as the recycled content in glass manufacturing increases. A significant proportion of sorted glass, especially lower quality from MRFs, is processed into aggregate construction materials.

Market issues and challenges

Glass has a high circularity opportunity, with the ability to remanufacture glass packaging into new glass packaging, using around 20-30% less energy compared to glass from virgin silica sand.

The implementation of the Container Deposit Scheme and glass-only bins in Victoria will result in an increase in the supply of clean glass to the sector, suitable for glass-to-glass remanufacture. This is an opportunity for higher uses of the glass material stream in Victoria.

Current maximum recycled content of glass packaging has been reported at approximately 30-40%, however with this new supply of clean glass, and new technology developments, there is the potential to achieve a 70% recycled content composition of new glass containers.⁸

Domestic glass-to-glass recycling is dependent on limited remanufacturers. Their scale provides some security, but there is a dependency and limited export potential. The processing of lower grade material into construction materials to replace virgin material also assists the construction sector to become more circular. Stronger circularity can be gained from shifting business models from single use packaging to re-use to reduce the overall consumption of glass.

Areas for greater circularity – glass

The greatest areas for improved circularity for this material stream are:

- increased Victorian glass beneficiation capacity
- recovered glass into construction materials to support the market for lower grade glass that is not suitable for glass-to-glass recycling
- exports of beneficiated glass may become a viable if high-quality beneficiated glass increases significantly
- kerbside collection and processing contracts to support highest environmental end-use of this glass.



Table 5: Generation and recovery of glass⁹

Stream	Generated		Recovered for reprocessing	Recovery Rate
	Tonnes	Proportion		
MSW	254,800	54%	174,800	69%
C&I	213,800	45%	159,900	75%
C&D	4,200	<1%	–	0%
Total	472,800		334,700	71%

Material	Generated		Recovered for reprocessing	Recovery Rate
	Tonnes	Proportion		
Packaging glass	411,700	87%	334,600	81%
Other glass	61,000	13%	–	0%



Metals

Victoria is the second largest waste metal generator in Australia and has a high recovery rate at 90%, but there remains a large residual stream of 'shredder floc' to landfill. The C&I sector contributes significantly to this material stream, supplying 79% of total metals generated, while recovering 93%. The unrecovered volumes from the MSW and C&D sector are relatively low (5% of total material stream generated) but could help to increase recovery even higher and establish Victoria at the forefront of the nation.

Recovered metals are predominantly non-packaging (e.g. structural steel) and only a very small amount of packaging, which is largely sold into export markets.

Developments and changes

Commodity prices, industry revenue and export viability have been impacted by fluctuations in the exchange rate, base metals price index and the world steel price. There has been increased investment in domestic recycling capabilities to lift the industry's output and increased demand from downstream industries, particularly the manufacturing and construction sectors.

Steel and aluminium cans are only a small fraction of overall metals recovery. These separated materials are a valuable source of revenue for MRFs. It is expected that the CDS will increase recovery and collection of aluminium cans.

Interstate movements have an overall impact on metal circularity and investigators at aluminium smelters in Tasmania and Queensland are examining possible upgrades to take aluminium beverage cans. A Queensland site will trial plasma gasification of automotive shredder residue to reduce the amount of shredder floc going to landfill.

Future onshore processing of scrap steel may emerge with green electric arc production at steelworks being implemented at some sites.

Market performance

Recovery takes place at around 450 collection facilities across the state and 9 metals recovery facilities. This includes packaging from households, commercial businesses and hospitality, components from furniture, appliances and e-waste, industrial manufacturing, end-of-life vehicles and construction and demolition activity.

There are two metals reprocessing/remanufacturing plants and around 65% of the total metals generated are reprocessed within Victoria. Metals are vulnerable to international commodity prices but generally the market remains strong. Two dominant Victorian metal recyclers provide resilience for the sector and there is a range of smaller collectors and aggregators that have established supplier/offtake relationships with the major processors or smaller direct export arrangements.

Global steel and aluminium markets have readily and consistently absorbed metal packaging from Australian kerbside systems.¹⁰

Market issues and challenges

Metals recovery and reprocessing is well established, and the industry is mature and has high capital investment. Increasing local metal processing using renewable energy (e.g. electric arc furnace) is an opportunity to increase the circularity and reduce embodied emissions.

There remains a dependence on export, with minimal local processing of baled steel. This is an opportunity for local innovation¹¹.

Prioritising recovery of precious metals from electronic waste and batteries is challenging but would support the transition to a low carbon future.

The Australian Steel Institute has called for an export regulation of unprocessed steel similar to recent waste exports. The impact on local processing capacity is unclear but in 2020–21 about half of recovered metals were exported.

Lithium-ion batteries can be hidden in recovered metals and cause fires.

Metals may be considered 'low priority' relative to other materials because of high recovery rates. However, large volumes of metals are still sent to landfill and increasing recovery can reduce energy and resource intensity.

Areas for greater circularity – metals

The greatest areas for improved circularity for this material stream are:

- Victorian reprocessing options for steel and aluminium packaging could be explored to increase local end-markets
- Victorian manufacturing ventures with metal re-processors (for items such as lithium-ion batteries)
- recovery of precious and rare earth metals in e-waste
- processing of residual streams to recover remaining metals.



Table 6: Generation and recovery of metals¹²

Stream	Generated		Recovered for reprocessing	Recovery Rate
	Tonnes	Proportion		
MSW	279,600	18%	221,400	79%
C&I	1,200,100	77%	1,104,700	92%
C&D	76,100	5%	54,600	72%
Total	1,555,800		1,380,700	89%

Material	Generated		Recovered for reprocessing	Recovery Rate
	Tonnes	Proportion		
Aluminium	191,500	12%	143,300	75%
Ferrous	1,284,600	83%	1,157,700	90%
Other metal	79,700	5%	79,700	100%



Organics

The organics sector continues to develop in Victoria to address both municipal Food Organics and Garden Organics (FOGO) and commercial/industrial food recycling streams.

Overall recovery in Victoria is low (48%) compared to other Australian jurisdictions. This is largely due to low recovery of food waste (12%) and wood/timber (39%). Recovery of garden organics (77%) and other organics (74%) is significantly higher, but still relatively low compared to high performing jurisdictions. Increasing the market and circularity of organics remain major opportunities. Organics recovery and reuse has significant climate change benefits for the state.

Developments and changes

Increases in population and services have meant a steady rise in organics recovery since 2010.

Recovered FOGO volumes are expected to increase as local government areas introduce FOGO services with industry support through Victorian Government grants. There are a few new facilities being developed that have received government support and funding.

Market drivers include government strategy/policy, emissions reduction benefits, soil health benefits and increased public interest.

Market performance

The sector continues to develop and is becoming more mature with a growing number and diversity of urban and regional processors. There are 80 organics pre-processors and 8 anaerobic digestion (AD) facilities in Victoria.

Current end markets include agriculture/horticulture, land rehabilitation, retail products, landscaping, biofilter material, energy generation.

Local reprocessing (99% of materials) produces pasteurised products (soil conditioners, soil blends, mulches), composted products (compost, soil blends, soil conditioners), 'raw' mulches, potting mixes, 'overs' (by-product from the screening process) and biochar.

Formal (Australian Organics Recycling Association) and informal networks (business to business) are mature.

Additional processing capacity and end market demand will be needed to achieve greater than 70% diversion in the future. Producing end products suitable for broad end market use will increase overall demand and improve circularity.

Market issues and challenges

There is limited source separation and recovery from both the MSW and C&I sectors development of processing infrastructure and more diverse end markets. Reducing contamination in incoming materials will also improve recovery.

Continued efforts to reduce the generation of food waste (on farm, food manufacturing, retailers, and households) is important.

Areas for greater circularity – organics

The greatest areas for improved circularity for this material stream are:

- end market specifications enabling quality compost for Victorian agriculture/soils
- product terminology, product specifications, market research and networks (including field trials) with potential end users
- alignment between feedstock processing capacity/ location and end market demand/growth
- food waste recovery from C&I sector
- best practice tools, processes, education and exclusion systems to reduce kerbside contamination
- contamination management guidelines and continual improvement of AS 4454 (the Australian Standard for composts, soil conditioners and mulches)
- specifications for uses for lower quality outputs that may be applied to less sensitive but beneficial uses.



Table 7: Generation and recovery of organics¹³

Stream	Generated		Recovered for reprocessing	Recovery Rate
	Tonnes	Proportion		
MSW	1,428,000	45%	667,400	47%
C&I	1,591,200	50%	843,400	53%
C&D	150,300	5%	100	<1%
Total	3,169,500		1,510,900	48%

Material	Generated		Recovered for reprocessing	Recovery Rate
	Tonnes	Proportion		
Food organics	960,400	30%	116,200	12%
Garden organics	899,300	28%	691,800	77%
Other organics	558,000	18%	413,600	74%
Wood/timber	751,900	24%	289,400	38%

Case study

Procuring composting infrastructure for the City of Greater Bendigo region to improve circularity

With the Eaglehawk Landfill site estimated to reach its full capacity by early 2024, the City of Greater Bendigo brought its circular economy thinking to the fore to provide new ways of handling recyclable materials. To divert recyclable materials from going to landfill, council has identified food and garden organics (FOGO) as one of the key material streams that will require an alternative service for the local residents.

The City of Greater Bendigo manages about 20,000 tonnes of FOGO annually and there is a need to develop an improved composting service that is close to the municipality, to minimise transport costs and emissions.

One such solution was the establishment of a privately owned local composting site within 25km of Bendigo. A 6-hectare City of Greater Bendigo owned site was selected after the completion of a co-design infrastructure solution procurement process, as the site for a new in-vessel composting facility

The site has several features that made it an attractive proposition for the city. It is located about 12 kilometres away from central Bendigo, well within the targeted region, and is adjacent to the Bendigo Livestock Exchange with adequate buffer zones already in place to minimise impact on local residents.

The City of Greater Bendigo entered into a 20-year service agreement and lease with Western Composting Technology (WCT) to establish a circular economy in the region through a new FOGO processing and recirculation facility. With the guaranteed supply of FOGO material, this arrangement provides investment confidence to WCT to deliver sufficient capacity and capability to manage the FOGO waste collected from the City as well as from smaller (by population) councils adjacent to Bendigo.

The facility is scheduled for commissioning by October 2024 and is expected to reduce emissions by 16% in comparison to the current kerbside organics disposal system.

Compost ready for use





Paper and cardboard

Victoria's recovered paper and cardboard market and supply chain is mature; however, there is opportunity to improve the current overall recovery rate (57%). Whilst this current Victorian performance is consistent with other well performing jurisdictions, there is a particular opportunity to increase cardboard recovery in the C&I sector.

The circularity potential of paper and cardboard is highest when most grades of material are recycled back into their original product, but the net import of cardboard doesn't match the domestic consumption of recovered materials. This remains a national challenge that results in export of the surplus material.

Developments and changes

The balance between C&I and MSW collections has changed due to e-commerce and home deliveries. This means less source separated collections and potential issues with contamination.¹⁴

Other consumption patterns continue to change. Local market conditions and cost-of-living issues are limiting consumption of paper and corrugated packaging. Consumption of newsprint is declining, and supply is becoming less reliable and there are fewer opportunities to reprocess.¹⁵

Exports have reduced due to improvements in local recycling into established products and overseas restrictions, and Australia's final 'white paper' plant closed in 2023, due to unreliable supply.¹⁶

Growth in demand for sustainable fibre-based solutions to replace other forms of packaging is anticipated over the coming decade.

Market performance

Victoria has 10 paper and cardboard recovery facilities and 6 paper and cardboard reprocessors.

Materials are reprocessed locally in Victoria with 65% of the recovered total. Material is turned into newsprint, printing and communication products, tissue products, packaging and industrial products and other products like kitty litter, compost insulation and building products.

Australia-wide volume of paper and paperboard available for recovery is significantly greater than total consumption, largely due to product imports arriving in corrugated boxes.¹⁷

Domestic manufacturers of paper and cardboard drive recovery (collection, sorting, handling, and re-supply) of paper and cardboard. Increases in material from MSW collections may increase difficulty to collect and separate the resource for recovery by these manufacturers.¹⁸

Market issues and challenges

The *National Recycling and Waste Reduction (Export – Paper and Cardboard) Rules 2020* take effect in 2024. Mixed or unsorted recovered paper, most of which is collected at kerbside, is proposed for export regulation.

Increased circularity of paper and cardboard depends on reducing consumption (including imports of material) and transitioning to reusable models (especially for packaging). Transport distances associated with an over-reliance on the 'hub and spoke' model can also reduce recovery and recycling. MSW material (mixed paper) has limited value but continuous supply. This mixed paper stream is significant in volume, however, has limited end markets locally.¹⁹

Areas for greater circularity – paper and cardboard

The greatest areas for improved circularity for this material stream are:

- sorting and strategic diversion of specific grades
- improved sorting capability to meet export regulation²⁰
- specifications for paper/cardboard materials to be appropriately exported
- alternate packaging product to replace packaging with a low recovery rate
- targeted community education
- high quality cardboard recovery from C&I sector
- local processing of the MSW stream.



Table 8: Generation and recovery of paper and cardboard²¹

Stream	Generated		Recovered for reprocessing	Recovery Rate
	Tonnes	Proportion	Tonnes	%
MSW	515,900	34%	230,100	45%
C&I	975,100	65%	616,300	63%
C&D	19,300	1%	10,800	56%
Total	1,510,300		857,200	57%

Material	Generated		Recovered for reprocessing	Recovery Rate
	Tonnes	Proportion	Tonnes	%
Cardboard	660,800	44%	514,700	78%
Liquid paperboard	67,000	4%	–	0%
Newsprint and magazines	14,600	1%	14,600	100%
Other paper (mixed)	560,800	37%	316,900	57%
Printing and writing paper	207,100	14%	10,900	5%



Plastics

Overall recovery rate in Victoria is low (19%), consistent with that seen in other Australian jurisdictions.

Victoria's plastics are largely generated within the MSW and C&I sectors (97%). The source of this plastic is 66% non-packaging and 34% packaging. Around 28% of consumed plastics remains in use within the plastics sector (adding to stocks). Almost half of all plastics sent to landfill originate from packaging.²²

Improvements in the recovery rate of plastics related packaging have slowly progressed since the implementation of China's National Sword Policy, noting the complexities with this material stream.

Therefore, recovery rate of the main packaging polymer types ranges between 19-30%. Problematic plastic polymers, including PVC and other plastics (mixed plastics) are recovered at a significantly lower rate at 4% and 8% respectively.

There is a decline in the use of PVC and other problematic polymer types that are difficult to recover, however overall plastics material recovery is likely to remain low in the short to medium term.

Developments and changes

Export restriction of unprocessed single polymer plastics was introduced July 2022. There remains insufficient capacity and capability within Victoria, as well as most other Australian jurisdictions to process PET packaging, flexible LDPE packaging and plastics recovered from e-waste which highlights the importance of reducing packaging from entering the system.

In November 2022, REDcycle announced that collections of soft plastics from major supermarkets would cease following challenges with recycling of the material and end market demand. The Australian Government is leading the design of a new scheme that will mandate obligations for packaging design based on international best practice and make industry responsible for the packaging, including soft plastics, they place on the market.

There is increasing national agreement through the national Environment Minister's Meeting (EMM) forum on the need for mandatory product stewardship for packaging, including how packaging is designed, establishing minimum recycled content requirements, and prohibiting the use of harmful chemicals. Product stewardship in this sector is a critical driver for more circular outcomes by creating certainty and demand for recovered materials.

The Victorian Government, in conjunction with the Australian Government has been investing in new recycling capability and capacity for plastics to support the transition to the national export ban of all unsorted and un-reprocessed plastic, which commenced on 1 July 2022. Until new investments come online, there will remain a processing shortfall in Victoria.

There are also efforts through this EMM forum to establish a national traceability framework for recovered materials. The framework is key to increasing reuse of recycled plastics and other materials, and to create certainty within the sector that when Australian businesses want to use recycled materials or buy products made from recycled materials, they can have confidence about what they are buying.

Victoria's single use plastic bags, including plastic bags and a range of single-use food service items, plus cotton bud sticks, came into effect in February 2023.

Industry voluntary phase-out of problematic plastics including PVC and PS based rigid packaging and difficult-to-recycle flexible plastics is occurring in Australia.

Industry is using more readily recyclable polymers (PET, HDPE and PP), replacing these more problematic materials in rigid packaging throughout the Australian market.

There is also some change by industry in Victoria, regarding the composition of problematic flexible (soft) packaging, and a reduction of composite films containing PET or nylon layers.

Challenges with plastics is not unique to Victoria or Australia. The UN Environment Assembly resolution to end plastic pollution will be finalised by 2024 which will develop a legally binding instrument on plastic pollution, including in the marine environment. Change to European Union recycling regulation (2022/1616) requires all food contact materials be manufactured with a suitable recycling technology from July 2023 to the same standard as newly manufactured plastics.

Market performance

There are 48 plastic re-processors in Victoria. Of the plastics recovered for reprocessing in Victoria, 60% is processed locally.

Industry end markets include new packaging (PET, HDPE, PP, some commercial LDPE), non-packaging products, building materials, timber substitute products (PET, HDPE, PP, mixed), plumbing fittings (PVC), export (PET, HDPE, LDPE, PS) and liquid hydrocarbon fuels is currently being established.

There is insufficient reprocessing capacity within Victoria for packaging grades of rigid PET, rigid PP, flexible LDPE and PS/EPS to absorb material that may have previously been exported and to improve circularity outcomes.

Significant state and national investments in recycling infrastructure are already underway which will result in improvements to local reprocessing for PET, PP and LDPE over the next 1–2 years.²³

Industry is developing additional sorting and processing infrastructure within Victoria within the next 5 years for packaging grades of rigid PET, rigid HDPE, LDPE, rigid PP and PS.

Market issues and challenges

Overall, plastics circularity is low and there remain significant challenges with generation and processing capacity for both packaging and non-packaging sources of plastics.

Areas for greater circularity – plastics

The greatest areas for improved circularity for this material stream are:

- further reduction of virgin plastics consumption
- improve product design for recycling and re-use outcomes
- minimise use of difficult-to-recycle plastics including business-to-consumer PVC, composite flexible and PS packaging
- continue to ban the manufacture and use of avoidable, and problematic plastic items, especially single use items
- increase processing capability and capacity where needed to aim for the highest order beneficial recycling outcomes
- increase understanding of currently landfilled plastics flows to identify potential end-markets
- support research sector / industry on projects that result in improved circularity of materials
- continue to support the development of a national traceability framework
- continue to support the development of a national framework for product stewardship.

Table 9: Generation and recovery of plastics²⁴

Stream	Generated		Recovered for reprocessing	Recovery Rate
	Tonnes	Proportion		
MSW	408,500	52%	87,800	21%
C&I	358,200	45%	55,600	16%
C&D	22,700	3%	3,300	15%
Total	789,400		146,700	19%

Material	Generated		Recovered for reprocessing	Recovery Rate
	Tonnes	Proportion		
PET (1)	115,300	15%	34,300	30%
HDPE (2)	184,300	23%	34,200	19%
PVC (3)	67,600	9%	2,800	4%
LDPE (4)	119,000	15%	26,900	23%
PP (5)	125,700	16%	26,900	21%
PS (6)	35,300	4%	9,600	27%
Other plastics (7)	142,200	18%	12,000	8%





Tyres

Victoria's recovery rate for end-of-life tyres is high (84%). Victoria has a developed market for end-of-life tyres, including the use of tyre crumb in roads. End-of-life tyre generation in Victoria exceeds the demand of materials recycled, with over 25% of processed end-of-life tyres exported to energy recovery facilities overseas. This is consistent with tyre recovery in other Australian jurisdictions.

Developments and changes

The Australian export ban of whole baled end-of-life tyres came into effect in 2021, excluding processed tyre crumbs, buffings, granules or shreds, which may still be exported. Demand for tyres crumb in roads throughout Australia has reduced, creating some uncertainty within the sector.

Tyre Stewardship Australia has committed over \$9M in market development activities across Australia.

Victoria's Recycle First Policy, implemented in 2020, has progressed pathways for preferential use of crumb tyres and tyre-derived aggregate in Victoria's Big Build projects.

Changes to strengthen the existing stewardship framework for end-of-life tyres are underway in Australia, including options to for mandatory producer responsibilities.

Improving circularity of this material stream is also a focus outside of Australia. International change in policy, including in New Zealand, is occurring, aimed at improving the circularity of tyres. The New Zealand mandatory product stewardship scheme comes into effect 1 March 2024. This new scheme may result in increased imports of processed tyres to Australia and will require monitoring.

Market performance

Victoria has 3 end-of-life tyre facilities, and 3 tyre derived fuel facilities.

Over half (56%) of recovered material is processed locally, with end markets including tyre derived fuels, crumb, granule or buffings, re-treaded tyres, casings and seconds and civil engineering applications (using whole tyres).

There is a reliance on Victoria to export processed end-of-life tyres to offshore markets for use as an alternative fuel.²⁵

Market issues and challenges

Re-use of heavy vehicle and aviation tyres is occurring via re-treading processes. New technologies, including pyrolysis, are emerging in Australia.

The lack of solutions can result in illegal dumping of tyres, including from commercial operators.

The overall circularity of tyres is limited, as there is no capability within Australia or overseas to undertake direct tyre-to-tyre reprocessing.

Opportunities are emerging to increase the re-treading of car tyres (re-use), to reduce consumption and improving material circularity of tyre by exploring vehicle tyres as a service. This model is currently applied within the aviation industry, where customers do not purchase the physical tyres, but the use of the tyre (e.g., kilometres travelled, hours of use). This model creates an incentive for manufacturers to develop higher quality/ long life products, which in turn reduces the volume of end-of-life tyres.

Areas for greater circularity – tyres

The greatest areas for improved circularity for this material stream are:

- Australian product stewardship system
- data sharing across Australian jurisdictions, to improve quality and measurements of end market products
- business models, including tyres as a service to minimise waste and keep materials at their highest use for longer.



Table 10: Generation and recovery of tyres²⁶

Stream	Generated		Recovered for reprocessing	Recovery Rate
	Tonnes	Proportion	Tonnes	%
MSW	5,900	6%	3,400	58%
C&I	100,000	94%	88,200	88%
C&D	300	<1%	–	0%
Total	106,200		91,600	86%

Material	Generated		Recovered for reprocessing	Recovery Rate
	Tonnes	Proportion	Tonnes	%
Off the road tyres	15,400	14%	15,400	100%
Other tyres	43,300	41%	29,900	69%
Passenger tyres	34,700	33%	33,400	96%
Truck tyres	12,900	12%	12,900	100%



Textiles

Victoria's recovery and processing of textiles is the lowest of all material streams (13%), which is consistent with other Australian jurisdictions. Reprocessing of textiles in Victoria is limited predominantly to carpets.

The generation of textiles in Victoria is approximately 40% clothing and apparel. Soft furnishings, carpet, bedding, and other application areas each contribute over 10% of the total textiles generated in Victoria.²⁷

There is a reuse market within Victoria for clothing and apparel, which is reliant on the charitable recycling sector.

Developments and changes

Clothing donation services (charitable and commercial) receive the equivalent of 50% weight of total new clothing²⁸ sold in Australia. By weight, 13% of new clothing collected via donations is reused in Australia, with a further 27% exported. The equivalent of 59% by weight of total new clothing is sent to landfill. Cheap new clothing/fast fashion is more challenging to reuse for charities due to its lower durability.

Post-consumer recycling occurs on a minimal scale. Manual sorting is expensive, and inconsistency of feedstock creates challenges. Textile recycling technology is rapidly developing internationally which will present improved circularity options.

Business-to-business recycling happens on a larger scale but is much more expensive than landfill and relies on goodwill.

The voluntary National Clothing Product Stewardship scheme 'Seamless' launched in June 2023. The industry led scheme has a plan for clothing circularity by 2030. The voluntary nature of the scheme may change to mandatory if insufficient clothing manufactures/importers sign up for the scheme.

Market performance

There are two textile recyclers within Victoria.

Recovery of clothing textiles is reliant on a network of clothing donation services. End products for recycling textiles include insulation, acoustic panelling, cushion inserts and carpet.

Australia is reliant on export markets for sorted clothes, with over 100 kilo tonnes of discarded textiles exported from Australia in 2020–21.²⁹

Declining cost and quality of clothing from large clothing retailers (fast fashion), has increased the consumption of textiles within Victoria and other Australian jurisdictions.

Donations of unwearable garments has created an increase in disposal costs for charities, putting further pressure on the sector.

Market issues and challenges

To reduce waste and improve the circularity of textiles, the increase of repairability and reuse capability is essential. Fast fashion trends undermine the message to reduce consumption and cheap, low-quality clothing limits these repair and re-use opportunities.

Areas for greater circularity – textiles

The greatest areas for improved circularity for this material stream are:

- reuse via clothing donation services (charitable and commercial)
- improved collections or consumer access to donation bins
- education for better quality donations and avoid unwearables
- designing for longer life, reuse and repair to drive towards an overall reduction in consumption
- onshore processing of clothing that reaches end-of-life and cannot be reused/repared
- markets for recycled textiles.

Table 11: Generation and recovery of textiles³⁰

Stream	Generated		Recovered for reprocessing	Recovery Rate
	Tonnes	Proportion		
MSW	136,300	42%	50,200	37%
C&I	174,200	54%	47,900	27%
C&D	10,800	3%	–	0%
Total	321,300		98,100	31%

Material	Generated		Recovered for reprocessing	Recovery Rate
	Tonnes	Proportion		
Clothing	168,800	53%	50,200	30%
Other textiles	152,600	47%	47,900	31%

Emerging materials and products

There is a range of emerging materials in Victoria, including photovoltaics (solar panels), batteries and wind turbines which are reaching end-of-life. These emerging materials require further assessment to address the impending volume, environmental and technical challenges they will pose if circular economy outcomes cannot be identified to manage each of these material streams.

These materials have been identified across many other Australian jurisdictions as potential risks to the environment and are being considered for inclusion in current and future Australian Product Stewardship Schemes.

Photovoltaics ^{31, 32}

Victorian consumption of photovoltaic (PV) panels (solar panels) is estimated to triple from 33,000 tonnes each year to 94,000 tonnes by 2035.

Most PV panels are currently processed for some form of recycling in Victoria. Recycling occurs at either a dedicated PV panel recycler or metal recyclers which recover materials from the inverters. Additional capacity to recycle this material stream is planned within Victoria by 2025.

Small PV devices including toys, decorations and other household items are increasingly entering the Victorian market.

The separate components of this material stream have varied levels of end markets. There is a mature market for the metal components, a developing market for the precious metals including lithium, limited market for the glass laminate, and extremely limited market for the related plastic components.

Further exploration is needed on the management of this emerging material stream. Extended Producer Responsibility could provide improved economic model for resource recovery and recycling.

Batteries

The number of electronic materials, including batteries, has been increasing at a rate of almost 3 times any other material stream in Victoria, consistent with other Australian jurisdictions.

In response to this growing trend, Victoria introduced a ban of electronic waste (e-waste) from landfill in 2019, which included batteries.

In 2020, Victoria became the first state to have a lithium battery processing facility in Australia.

The Australian voluntary battery stewardship scheme commenced in 2022, with the aim of diverting 90% of collected batteries from landfill. This industry scheme excludes items including large PV system lithium-ion batteries, or embedded batteries (batteries built into devices, and unable to be separated by the consumer).

There is considerable growth in the use of electric vehicle batteries within Victoria. These electric vehicle batteries typically last 8–10 years, and contain elements (including lithium and copper), which are essential in the world's transition to a low-carbon economy.

Ways to reuse and re-purpose electric vehicle batteries are under development in Victoria, with a new facility scheduled for commissioning in Victoria in 2024.

Areas for greater circularity include collection points for batteries to prevent inappropriate disposal, as well as advances in recycling technologies, within an overall economically underpinned model.

Areas for greater circularity – batteries

The greatest areas for improved circularity for this material stream are:

- collection points for lithium-ion batteries
- local battery remanufacturing from recovered precious metals e.g. lithium ion
- product stewardship (also include device with embedded batteries)
- development into local lithium-ion battery recycling.



Wind turbines

Victoria's wind power infrastructure became operational in the last decade and has a typical 20-year lifespan. By 2034, an estimated 15,000 tonnes of composite waste from decommissioned wind farms will have been created, and up to 4000 tonnes in any given year.³³

Wind turbine blades have gone through multiple iterations of difficult to recycle materials, first fibreglass, then carbon-fibre. There is currently no clear large scale recycling option for carbon-fibre in Australia.³⁴

Approximately 85–94% of a wind turbine (by mass) is recyclable³⁵ however the cost impost to undertake this process is currently prohibitive.³⁶

To improve circularity of wind turbines, repair options are under development. Barriers to realising this option include design intellectual property barriers, and economic viability.³⁷

Guidance for the decommissioning of wind turbines is being developed including by WindEurope, a key European wind energy industry body. The Australian Clean Energy Council released a report in 2017, outlining environmentally and socially responsible practices for decommissioning wind farms.³⁸

Extended producer responsibility schemes have improved collection, reuse and recycling markets overseas for clean energy technologies (usually for batteries) and could also be beneficial for wind turbines in Australia.³⁹

Manufacturers (including Siemens Gamesa and General Electric) are developing new blades that can be recycled (through a chemical process) as part of their commitment to zero-waste turbines by 2040.⁴⁰

There could be potential for creation of a new market for recycling composite waste from multiple sectors including wind, construction, electronics, transportation, and marine sectors.⁴¹

Further exploration is needed of the management of this emerging material stream, including the option for a Producer Responsibility Scheme, which could provide an improved economic model for resource recovery and recycling.

Victorian Government actions towards a circular economy

The Victorian Government is making significant contributions to transitioning to a circular economy. Recent reforms focussed on the resource recovery and recycling space, include the following key achievements (as covered in the relevant material section of the report).

Container deposit scheme

Victoria's container deposit scheme (CDS) was launched on 1 November 2023. This will improve the separation and recovery of eligible containers to allow them to be reprocessed into their highest and best use.

The CDS operates on a split responsibility governance model, with a Scheme Coordinator (VicReturn) and Network Operators. The state has been divided into 3 zones, North, East and West, and will be managed by a Zone Operator responsible for payments and refunds. At full build, due in mid to late 2024, there will be around 600 collection points across the state. The longer-term recovery for the system is estimated at over 2 billion containers returned each year.⁴²

Four waste and recycling streams

The staged transition to 4 waste and recycling streams continues across the state and will help to increase the recovery rates of these materials. To date, 16 LGAs have introduced glass-only kerbside bins⁴³, with a further 12 introducing community drop-off services for glass. Forty LGAs currently have FOGO services and another 18 have garden organics services (29 councils with no service).

\$4.69 million has been granted to support this transition for 71 recipients through the Circular Economy Household Education Fund.⁴⁴



***Recycled First* policy**

This Australian-first policy requires tenderers and contractors delivering major projects to optimise and commit to the use of recycled materials. The *Recycled First* policy encourages innovation and supports a vibrant and sustainable Victorian market for reused and recycled materials in transport infrastructure construction.

This policy demonstrates that effective use of recycled materials can enhance circular economy outcomes and divert waste from landfill (refer case study page 15).

Conclusion

This inaugural Circular Economy Market Report has been designed to provide insights and progress to both government and industry on the circularity of key material streams within Victoria.

This report has identified that Victoria is at the early transition phase towards achieving circularity within the circular economy market, which is consistent with many other jurisdictions within Australia.

To transform our economy into a modern, resource-efficient and competitive market, areas for greater circularity within each material stream have been highlighted within this report.

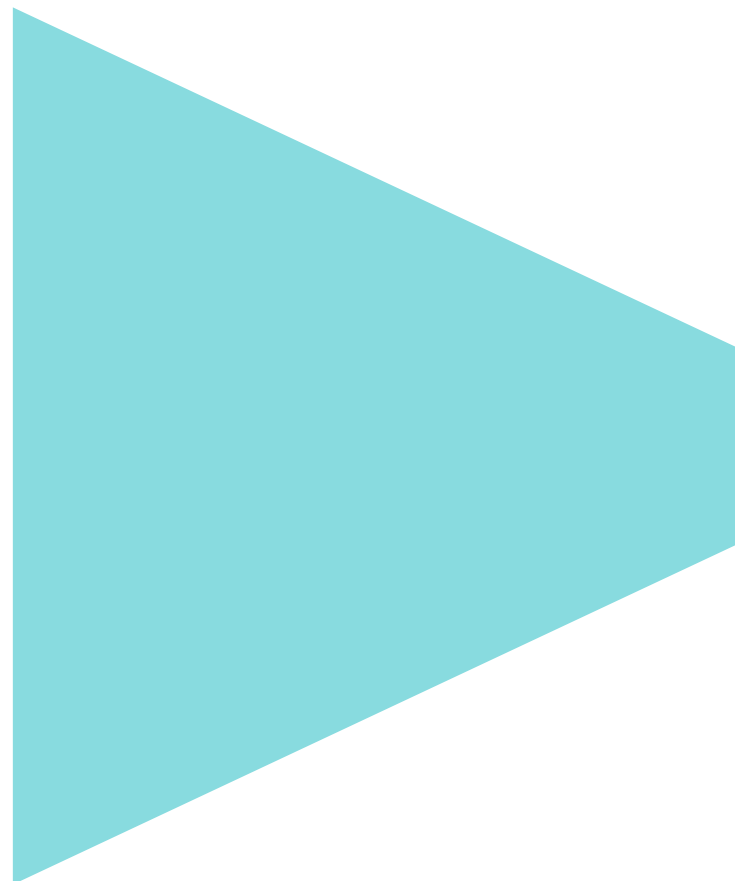
To prioritise and develop future actions associated with the transition to a circular economy, it is critical to develop clear measurements, benchmarks and impact assessment of new initiatives that are fit for purpose. Creation of a new metric to achieve this outcome will be a significant milestone for Victoria, as no other Australian jurisdiction currently has a metric that effectively measures material circularity.

There are opportunities to learn from international experiences, including the European Union, which is leading the change towards a more circular economy.

Recycling Victoria has outlined 3 critical priorities for the next 12 months, to be reported in the next edition of the Circular Economy Market Report:

- progress the development of a new circular economy metric to best monitor and measure Victoria's material circularity
- further investigation of identified emerging material streams
- maintain efforts towards future improvements in challenging material streams with low circularity such as textiles, plastics and tyres.

The Circular Economy Market Report will continue to evolve as key actions are progressed and new data is identified and reported to reflect the transition to a stronger circular economy in Victoria.





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Glossary

AD	Anaerobic Digestion
C&D	Construction and demolition
C&I	Commercial and Industrial
CDS	Container Deposit Scheme
EPR	Extended producer responsibility
FOGO	Food Organics Garden Organics
GO	Garden Organics
HDPE	High density polyethylene
LDPE	Low density polyethylene
LGA	Local government area
MRF	Materials Recovery Facility
MSW	Municipal Solid Waste
PET	Polyethylene terephthalate
PP	Polypropylene
PS/EPS	Polystyrene and expanded polystyrene
PV	Photovoltaics
PVC	Poly-vinyl chloride
RV	Recycling Victoria





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