SOUTH AUSTRALIA'S RECYCLING ACTIVITY SURVEY 2018-19 REPORT

Government of South Australia
Green Industries SA

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Acknowledgement of country

We acknowledge and respect the Traditional Custodians whose ancestral lands we live and work upon and we pay our respects to their Elders past and present. We acknowledge and respect their deep spiritual connection and the relationship that Aboriginal and Torres Strait Islanders people have to Country. We also pay our respects to the cultural authority of Aboriginal and Torres Strait Islander people and their nations in South Australia, as well as those across Australia.

About data used in this report

The resource recovery data presented in this report was collected from a survey sent to 117 organisations in South Australia (SA) that are involved in collecting waste material for recycling.

This resource recovery data describes the quantity of waste resources collected in SA over the 2018-19 financial year for the purpose of recycling, excluding net losses of these materials arising from resource recovery and/or re-processing activities. Comparisons are made to the last reported financial year (2017-18).

Estimates of reporting accuracy have been used to ensure that resource recovery data is reported to an appropriate level of certainty.

This data provides a comprehensive and reliable account of SA's resource recovery. Combined with landfill disposal data collected by the South Australian Environment Protection Authority, it enables assessment of SA's resource recovery performance including diversion rate. This includes comparing SA's performance with the State's Waste Strategy targets as well as benchmarking this performance against other jurisdictions in Australia.

Further information about the Survey Methodology is included in **Appendix 1** of this report. This information includes a description of how the survey data was compiled and analysed to produce the assessment results and findings presented in this report.

About this report

This report has been prepared by Rawtec Pty Ltd (Rawtec) for Green Industries SA to present the results and findings from the 2018-19 South Australian Recycling Activity Survey.

The information contained within this document is based upon sources, experimentation and methodology which at the time of preparing this document were believed to be reasonably reliable and the accuracy of this information subsequent to this date may not necessarily be valid. This information is not to be relied upon or extrapolated beyond its intended purpose by a third party unless it is confirmed in writing by Green Industries SA that it is permissible and appropriate to do so.

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Executive Summary

Introduction

Each year since 2003-04, Green Industries SA has measured recycling activity and waste disposal to landfill in South Australia (SA) to assess the State's performance against South Australia's Waste Strategy. This report presents the results from the SA Recycling Activity Survey for 2018-19.

Summary of 2018-19 results

In the 2018-19 financial year, the SA landfill diversion rate increased for the seventh year in a row. While the State's total recovered tonnes decreased by 3% from the 2017-18 financial year, there was also a 5% reduction in tonnes sent to landfill. SA therefore achieved a total diversion rate of 83.8% (of waste material diverted to resource recovery). This diversion rate is above other states and territories and remains at this level due to a continuation of large infrastructure projects which divert high volumes of Masonry materials.

In 2018-19, the industry continued to be affected by China's waste and recycling policy 'National Sword', which came into effect early 2018 impacting plastics and fibre. The ongoing impact of these international decisions was evident in this year's survey, with a reduction in recovered Cardboard & Paper, and a shift towards energy recovery for Plastics. Recycling collected from regional areas also reduced due to the added challenge of transport costs on top of a reduction in commodity prices for these materials.

Despite this adversity, the recycling sector has responded to international changes to ensure the ongoing recovery of these materials. For example, building new infrastructure and changing processes to increase the quality of recovered materials and reduce contamination, and working with government on initiatives that drive up demand of recyclables onshore.

Although recovery dropped slightly for Organics, the outlook for this material is positive. Buyers continue to recognise the benefits of recovered Organics products, which is driving up demand. Reprocessing of Masonry (including soils) also decreased slightly from the 2017-18 financial year. Continuation of large SA infrastructure projects will help keep Masonry recovery at high levels, although this is expected to decline as these projects reach completion. There is also a push towards direct re-use of soils and asphalt on site. This is positive from an environmental perspective as less waste is presented for disposal but will likely reduce the recycling rates for these materials.

There was a slight increase in glass overall with steady demand for recycled cullet for bottle manufacture and an increase in glass to road base.

By the numbers

The total resource recovery for SA in 2018-19 was 4.34 million tonnes (see **Table 1** on page 6). This was comprised of:

- 3.12 million tonnes of 'Standard Reporting Materials' (including Metals, Organics, Cardboard & Paper, Glass and Plastics),
- 1.22 million tonnes of 'Separately Reported Materials' & Clean Fill (including soil, sand and rubble, which can fluctuate significantly across reporting years),
- Total landfill disposal for SA was 0.84 million tonnes.

Table 1

Summary of 2018-19 Recycling Activity results for resource recovery, landfill disposal, total waste generated and total diversion (waste to resource recovery) achieved in SA.

2018-19 Recycling Activity Data Account Summary			
	Standard reporting materials*	Separately reported materials & Clean Fill	**TOTAL (All materials)**
Resource recovery, tonnes	3.123 million	1.215 million	4.338 million
Landfill disposal, tonnes	0.675 million	0.165 million	0.84 million
Waste generated, tonnes**	3.798 million	1.38 million	5.178 million
Diversion, % to resource recovery	82.2%	88.0%	83.8%

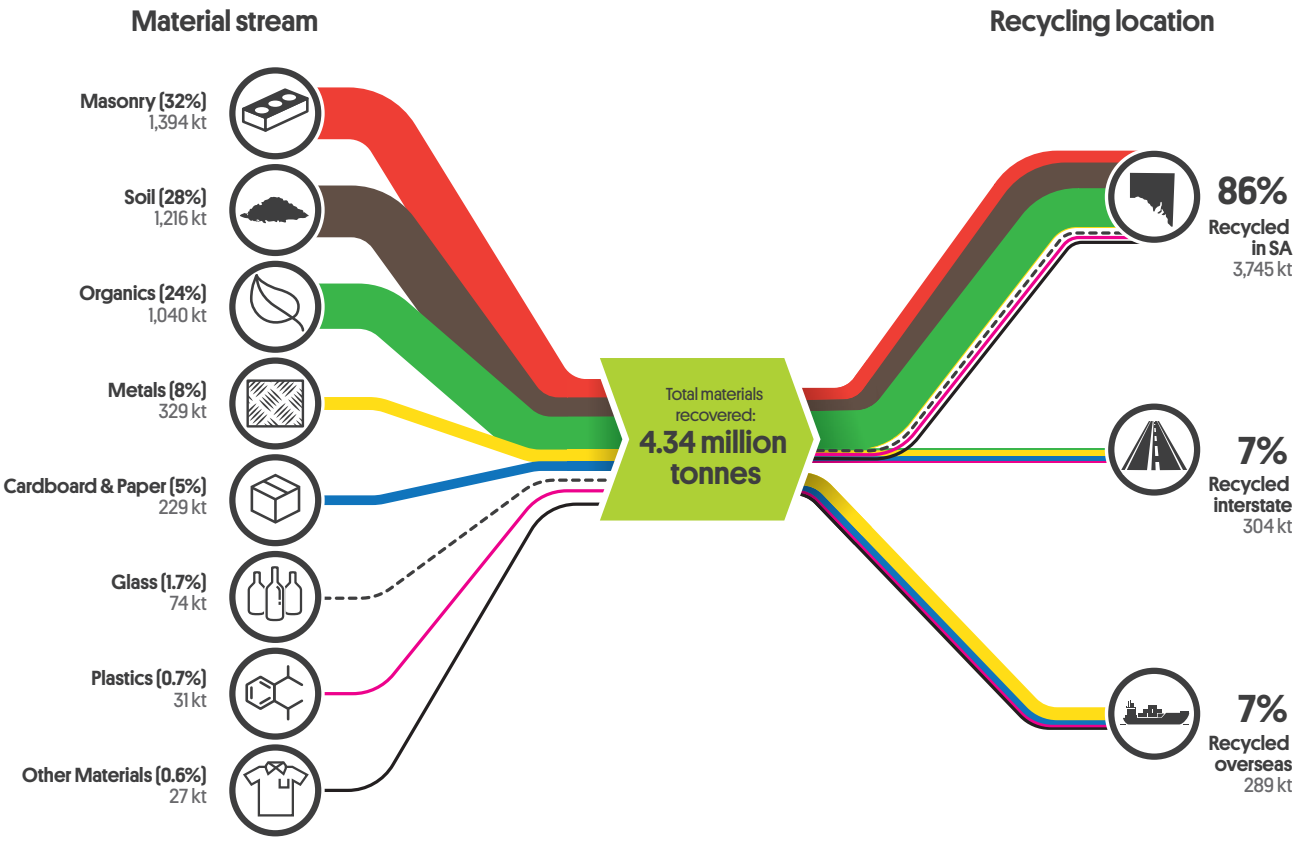
*Standard Reporting Materials and Separately Reported Materials & Clean Fill, as specified in Dept of Env and Energy (2015)

**Waste generated = Resource recovery + landfill disposal

Table 1 shows the diversion rate for Standard Reporting Materials is 82.2%, which is higher than 2017-18 (80.1%). This is due to lower landfill quantities. The diversion rate of Separately Reported Materials decreased from 93.2% in 2017-18 to 88.0% in 2018-19 due to both a reduction in resource recovered tonnes and an increase in tonnes to landfill of separately reported materials.

Figure 1

Contribution of different material categories to SA's resource recovery during 2018-19 and location sent for recycling. Quantities are stated in kilotonnes (kt). The top three material streams contributing to SA's recycling activity are Masonry, Soil and Organics (84% of SA's resource recovery).



Resource recovery by material category

Most of SA's resource recovered material was from three material streams, Masonry (32%), Soil (28%) and Organics (24%), totalling 84% of SA's recovery (**Figure 1**).

Most Masonry and Soil is generated from Construction and Demolition (C&D) activities, while Organics is largely generated by the Commercial and Industrial (C&I) sector with large volumes of Timber, Meat Rendering and other industry residues.

Metals remained the fourth greatest contributor by weight at 8% of all resource recovered streams in 2018-19. Most Metals were sourced from the C&I sector, although this year there was an increase in Metal recovery from the C&D sector due to the demolition of a large regional facility.

Cardboard & Paper remained at 5% of all recovery, and Glass increased from 1.3% in 2017-18 to 1.7% in 2018-19. These materials were sourced from the Municipal and C&I sectors.

Destination of recovered materials

SA continues to recycle most materials it recovers within the state (86%, **Figure 1**). In line with 2017-18, 7% of materials were sent interstate and 7% overseas to be recycled in 2018-19. Exported materials mainly included Metals and Cardboard & Paper with a small amount of Plastics also sold to overseas recycling markets.

Other key trends

When observing differences in material recovery from 2017-18 to 2018-19 (see **Section 3**) the biggest increases were seen in:

- Masonry (up 43,600 tonnes when not including soils), due to an increase in Concrete as all other materials in this category decreased. The Concrete increase was due to the Gateway South project.
- Glass, which increased by 14,000 tonnes due to an increase in demand for recovered glass in bottling manufacturing (accounting for around a third of the increase in tonnes) as well as glass to road base.

Reduced quantities were seen in:

- Soils (Clean Fill and Intermediate Waste Soil), due to the completion of the Torrens to Torrens project and an increase in the re-use of soil directly on site.
- Organics (down 59,100 tonnes) due to a drop in Timber from usual year to year fluctuations in this stream, and lower Meat Rendering volumes, due to the closure of a major meat rendering site.
- Cardboard & Paper (down 7,300 tonnes) due to lower volumes of recovered Cardboard & Waxed Cardboard, Magazines & Newsprint and Liquid Paperboard.
- Other Materials (down 14,000 tonnes) due to improved reporting for Foundry Waste and Leather & Textiles, and a slight decrease in Tyres & Rubber.

The quantity of materials sent for energy recovery in SA increased to 124,700 tonnes (up from 116,600 tonnes in 2017-18).

There was a decrease in the quantity of imported materials for resource recovery, from 200,700 tonnes in 2017-18 to 172,300 tonnes in 2018-19. This was due to a decrease in kerbside food and garden organics, as Victoria moves towards processing this stream at their own facilities.

The total value of recovered materials in SA is $348 million (down from $356 million). This reduction was due to reduced volumes of recovered materials, particularly Meat Rendering and to a lesser extent Steel, as well as reduced value for some commodities (the $/tonne value for Cardboard & Paper and Steel dropped slightly).

Performance against State targets

When considering the state's 2020 targets (see **Figure 1.1** on page 10):

- SA's landfilled tonnes (840,000 tonnes) are 33% lower than the baseline year (2002-03) when including contaminated soil, close to the 2020 target of a 35% reduction in waste to landfill.
- SA continued to exceed its 2020 target of 80% and 90% diversion for metropolitan C&I and C&D respectively, with C&I diversion at 88.2% and C&D at 91.4% overall (see **Table 2.11**).
- The MSW metropolitan diversion rate is at 57.0% which is a slight decrease from 58.5% in 2017-18. SA needs to increase this by over 10 percentage points to achieve its 2020 target of 70% (see **Table 2.11**).
- Waste generation per capita remains a significant challenge. In 2018-19, waste generation of Standard Reporting Materials is 2,170 kilograms per capita. This is an improvement from 2017-18 (2,260 kilograms per capita). However, SA has increased its waste generation per capita by 4% from the 2015 baseline (see **Table 2.10**). A large decrease is required to achieve the target of a 5% reduction in waste generation per capita by 2020.

Kerbside performance

Kerbside performance is a sub-set of MSW data. It only includes the three bins collected at kerbside and excludes non-kerbside container deposit legislation (CDL) returns, transfer stations, hard waste collection, E-waste and street sweepings.

An estimated 46% of materials by weight is collected for resource recovery via the comingled and organics bins. Performance is higher in metro councils (at 49%) compared to regional councils (at 37%).

Food waste continues to make up a significant proportion of material remaining in kerbside general waste bins (and in SA landfills), estimated at over 150,000 tonnes per year. Diverting more of this material via food and garden organic kerbside bins would lead to a large increase in kerbside performance and reduced costs for councils.

01 Introduction

At a glance:

- This report presents the findings from a survey of South Australian recyclers and re-processors on resource recovery of waste materials during the 2018-19 financial year.
- This data enables us to measure South Australia's performance against waste diversion goals and targets in South Australia's State Waste Strategy 2015-2020.
- The data has been compiled and reported in accordance with the National Guidelines for compiling waste and recycling data ("NWDCRS supporting documentation: SOPs, reporting tool user guide, and reporting guidance", Dept of the Environment and Energy 2015). Refinements have also been made considering the Improving national waste data and reporting document (Dept of the Environment and Energy, 2018).

1.1 Background

South Australia (SA) remains a leader in waste, recycling and circular economy initiatives. The State continues to develop strategies and actions that divert additional tonnes from landfill, increase the recovery of resources and help businesses to operate within a more circular economy.

SA's current State Waste Strategy (Green Industries SA, 2015) includes several targets relating to reduced waste generation and increased diversion from 2015 through to 2020 (**Figure 1.1** on page 10). In the final year of this strategy, it is important to continue to monitor the State's performance against these targets.

Assessing the State's performance against these targets requires measurement and collection of data for both resource recovery and landfill disposal of waste materials. To undertake this task, Green Industries SA conducts an annual survey with South Australian recyclers and re-processors on how they handle resources which would otherwise go to waste.

This report includes information about a range of waste streams. For each waste stream it covers recycling tonnages, the source of the waste (municipal (MSW), commercial and industrial (C&I) or construction and demolition (C&D)), and destination (SA, interstate or overseas). The notional reductions achieved in greenhouse gas emissions through recycling are also included.

Recyclers and re-processors report on key trends in resource recovery for the given financial year, market size and strength, barriers to increasing resource recovery and plans to expand or contract. Findings from these comments are included within the report.

This year the survey included an additional question. This asked for the number of full time equivalent (FTE) employees in each respondents' business across several employment classifications (for example sales, driver, administration). The results are included in **Section 2.5** on employment in the resource recovery industry in SA. A revenue summary is also included in the report, as is the market value of resource recovery in SA.

Importantly, the results of the survey are prepared according to the guidelines for compiling waste and recycling data (Dept of the Environment and Energy 2015), with consideration to the guidance for improving national waste data and reporting (Dept of the Environment and Energy, 2018). This ensures that SA's recycling data can successfully contribute to national recycling surveys and assessments undertaken by the Australian Government.

Figure 1.1 **Summary of South Australia's goals and targets for diversion from landfill.**
Reproduced from SA's State Waste Strategy 2015-2020 (Green Industries SA, 2015)

South Australia's Strategic Plan 2011 (Department of the Premier and Cabinet)
> 35% reduction in landfill disposal from 2002-03 level by 2020 milestone of 30% by 2017-18

Per capita waste generation target
>5% reduction in waste generation per capita by 2020 (from 2015 baseline)

Landfill diversion targets		
Year	**Metropolitan (% diversion)**	**Non-metropolitan**
Municipal solid waste (MSW) landfill diversion targets		
2009 (baseline)	55	Not applicable
2012	60	Maximise diversion to the extent practically and economically achievable.
2015	70	Maximise diversion to the extent practically and economically achievable.
2020	70*	Maximise diversion to the extent practically and economically achievable.
Commercial and industrial (C&I) landfill diversion targets		
2009 (baseline)	60	Not applicable
2012	65	Maximise diversion to the extent practically and economically achievable.
2015	75	Maximise diversion to the extent practically and economically achievable.
2020	80	Maximise diversion to the extent practically and economically achievable.
Construction and demolition (C&D) landfill diversion targets		
2009 (baseline)	80	Not applicable
2012	85	Maximise diversion to the extent practically and economically achievable.
2015	90	Maximise diversion to the extent practically and economically achievable.
2020	90	Maximise diversion to the extent practically and economically achievable.

*MSW target comprises 60% diversion from high performing bin systems contributing to an overall MSW target of 70%.

02 Overall 2018-19 Recycling Activity Statistics

At a glance:

- This section summarises the key outcomes and statistics obtained from analysis of the 2018-19 SA Recycling Activity Survey data. The outcomes and statistics include:
  - » Resource recovery and landfill disposal, which includes the overall results and by type of material, source sector, geographical origin, re-processing destination, at kerbside, re-processed for material recovery or energy production in SA and market value;
  - » SA's performance against State goals and targets for waste management;
  - » SA's resource recovery performance relative to other states and territories in Australia;
  - » Full time equivalent (FTE) employment in the SA waste and resource recovery sector by employment classification.

2.1 Resource recovery and landfill disposal

2.1.1 Overview

In 2018-19 SA's recycling industries reported 4.34 million tonnes of material diverted to resource recovery (**Table 2.1** on page 12). This is a 3.4% decrease from material diverted to resource recovery in 2017-18 (4.49 million tonnes). In 2018-19 total resource recovery included:

- 3.12 million tonnes of 'Standard Reporting Materials' – which includes traditionally reported material categories of Metals, Organics, Cardboard & Paper, Glass, Plastics, Masonry, etc, and;
- 1.22 million tonnes of 'Separately Reported Materials & Clean Fill' – reported data for soil, sand, rock, rubble[1].

Standard Reporting Materials decreased by 0.6% (to 3.12 million tonnes) and Separately Reported Materials & Clean Fill decreased by 9.7% (to 1.22 million tonnes) in 2018-19. Given the lower recovery rate and increased population rate, per capita values have also decreased. Recovered materials is now 2,475 kg/p/yr (down from 2,585 kg/p/yr in 2017-18) and

1 These materials are considered separately because they can fluctuate significantly across reporting years and between different States and Territories.

overall waste generation per capita 2,960 kg/p/yr (down from 3,090 kg/p/yr in 2017-18).

Material recovered per dollar of Gross State Product (GSP) also decreased, by 4.7% to 40.2 tonnes per $1 million of GSP in 2018-19 (compared to 42.2 tonnes per $1 million of GSP in 2017-18).

Although SA resource recovered tonnes decreased from 2017-18 to 2018-19, the decrease in tonnes to landfill has led to a slight increase in diversion rate. This is now 83.8%, which is slightly up from 83.6% in 2017-18. This outcome is the highest resource recovery rate achieved since the beginning of this survey.

Table 2.1 **Annual South Australian resource recovery and landfill disposal quantities diversion performance for 2018-19, 2003-04 (first survey year) and since 2014-15.** This table presents a breakdown of Standard Reporting Materials and Separately Reported Materials & Clean Fill in accordance with reporting guidelines (Dept of the Environment and Energy, 2015).

	2003-04	2014-15	2015-16	2016-17	2017-18	2018-19	Change	
							17-18 to 18-19	03-04 to 18-19
RESOURCE RECOVERY (TONNES)								
Standard Reporting Materials	1,880,000	2,760,000	2,950,000	2,880,000	3,143,000	3,123,000	-0.6%	66.1%
Separately Reported Materials & Clean Fill	162,000	940,000	960,000	1,521,000	1,346,000	1,215,000	-9.7%	650.0%
TOTAL (for SA)	**2,042,000**	**3,700,000**	**3,910,000**	**4,401,000**	**4,489,000**	**4,338,000**	**-3.4%**	**112.4%**
LANDFILL DISPOSAL (TONNES)								
Standard Reporting Materials	1,258,000	724,000	772,000	739,000	783,000	675,000	-13.8%	-46.3%
Separately Reported Materials & Clean Fill	20,000	180,000	118,000	134,000	98,000	165,000	68.4%	725.0%
TOTAL (for SA)	**1,278,000**	**904,000**	**890,000**	**873,000**	**881,000**	**840,000**	**-4.7%**	**-34.3%**
WASTE GENERATION (TONNES)								
Standard Reporting Materials	3,138,000	3,484,000	3,722,000	3,619,000	3,926,000	3,798,000	-3.3%	21.0%
Separately Reported Materials & Clean Fill	182,000	1,120,000	1,078,000	1,655,000	1,444,000	1,380,000	-4.4%	658.2%
TOTAL (for SA)	**3,320,000**	**4,604,000**	**4,800,000**	**5,274,000**	**5,370,000**	**5,178,000**	**-3.6%**	**56.0%**
DIVERSION/RECOVERY RATE (%)								
Standard Reporting Materials (ONLY)	59.9%	79.2%	79.3%	79.6%	80.1%	82.2%	2.7%	37.2%
TOTAL (for SA)	**61.5%**	**80.4%**	**81.5%**	**83.4%**	**83.6%**	**83.8%**	**0.2%**	**36.2%**
SA Population (persons)	1,534,000	1,698,900	1,708,200	1,723,500	1,736,400	1,751,700	0.9%	14.2%
PER CAPITA DIVERSION/RESOURCE RECOVERY (KG/PERSON/YR)								
Standard Reporting Materials (ONLY)	1,230	1,650	1,730	1,670	1,810	1,780	-1.7%	44.7%
TOTAL (for SA)	**1,330**	**2,205**	**2,290**	**2,555**	**2,585**	**2,475**	**-4.3%**	**86.1%**
PER CAPITA LANDFILL DISPOSAL (KG/PERSON/YEAR)								
Standard Reporting Materials (ONLY)	820	430	450	430	450	390	-13.3%	-52.4%
TOTAL (for SA)	**830**	**535**	**520**	**505**	**505**	**480**	**-5.0%**	**-42.2%**
PER CAPITA WASTE GENERATION (KG/PERSON/YEAR)								
Standard Reporting Materials (ONLY)	2,050	2,080	2,180	2,100	2,260	2,170	-4.0%	5.9%
TOTAL (for SA)	**2,160**	**2,740**	**2,810**	**3,060**	**3,090**	**2,960**	**-4.2%**	**37.0%**
SA Gross State Product [a] (GSP) ($millions)	83,202	102,333	102,602	104,125	106,477	107,990	1.4%	29.8%
PERFORMANCE METRICS PER $GSP (TONNES/$MILLION GSP)								
TOTAL SA Diversion/Resource Recovery [b]	24.5	36.2	38.1	42.3	42.2	40.2	-4.7%	63.7%
TOTAL SA Landfill Disposal [b]	15.4	8.8	8.7	8.4	8.3	7.8	-6.0%	-49.4%
TOTAL SA Waste Generation [b]	39.9	45.0	46.8	50.7	50.4	47.9	-4.9%	20.2%

Notes:

(a) Reference year for GSP chain volume measures (which removes the inflation effects on GSP values) is reported as 2018-19 (ABS 2019).

(b) Total tonnes of diversion, landfill and waste generation in per $GSP metrics include both Standard Reporting Materials and Separately Reported Materials & Clean Fill.

2.1.2 Comparison with 2003-04

Figure 2.1 displays the increase in diversion rate and materials recovered over time, as well as the change in landfill disposal (for Standard Reported Materials and Separately Reported Materials & Clean Fill). Percentage changes from the 2003-04 financial year are stated.

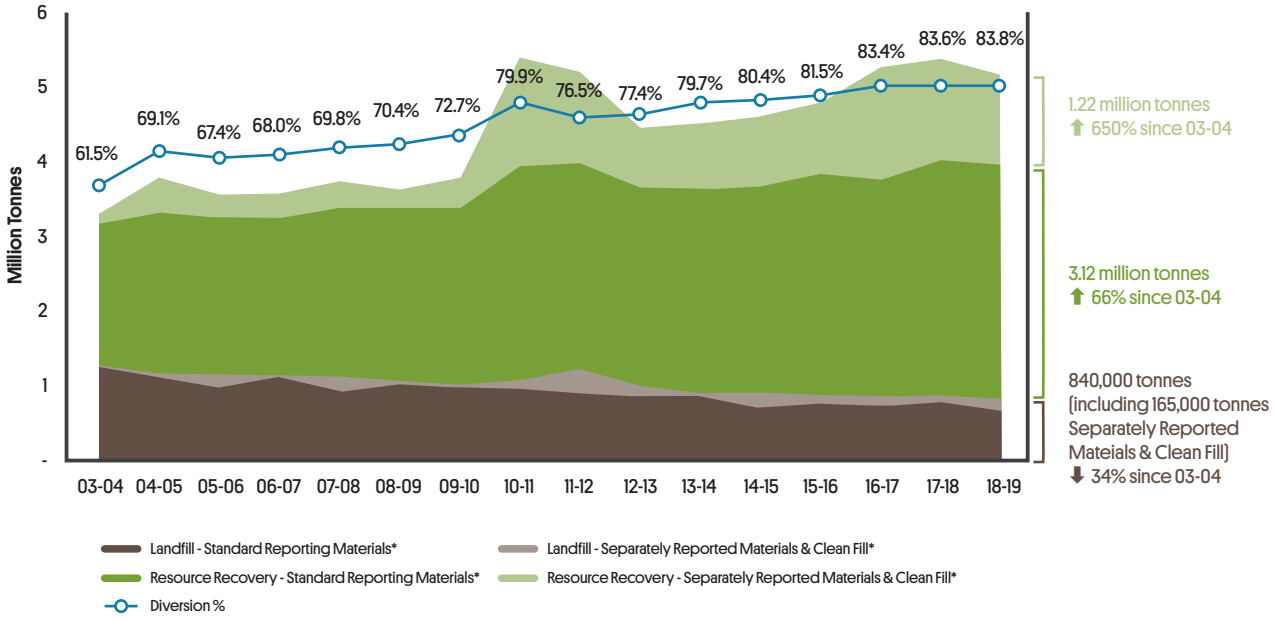
Changes from 2003-04 to 2018-19 include:

- An increase in resource recovery over time. However, this increase has been only marginal over the past three years.
- Recovery of Standard Reporting Materials has increased from approximately 2 million tonnes to 3 million tonnes a year.
- Separately Reported Materials has also increased over this time, from less than 200,000 tonnes in 2003-04 to over 1.2 million tonnes in 2018-19.
- Diversion rate has increased by 22.3 percentage points over this period.
- The quantity of material sent to landfill has decreased by 34% from 2003-04.

The decrease in material sent to landfill is driven by Standard Reporting Materials, which have reduced by 46% from 2003-04 quantities. Separately Reported Materials & Clean Fill to landfill has increased by 725%, from 20,000 tonnes in 2003-04 to 165,000 tonnes in 2018-19.

Figure 2.1

Trend in resource recovery and landfill disposal in SA since 2003-04.
* Reporting of both resource recovery and landfill disposal is divided into Standard Reporting Materials and Separately Reported Materials & Clean Fill categories.



2.1.3 Recovery by material type

Information about the recovery of materials overall and from 2003-04 to 2018-19 can be found in **Figures 2.2, 2.3** and **Table 2.2**. **Section 3** of this report details changes by material category, but some notable changes by waste stream include:

- Most recovered materials (86%, **Figure 2.3**) were re-processed in SA. This was mostly Masonry, Separately Reported Materials & Clean Fill (Soils) and Organics.
- Although most Masonry materials decreased in quantity, there was a slight net increase in Masonry overall. This was due to an increase in Concrete recovery, as Asphalt, Bricks and Plasterboard all decreased. As can be seen in **Figure 2.3** most Masonry recovery is from C&D activity, which has remained strong with State infrastructure upgrades, although certain projects are starting to reach completion.
- Separately Reported Materials & Clean Fill reduced slightly due to reduced recovery of Clean Fill and Intermediate Waste Fill, most from the C&D sector.
- Metals decreased only slightly (1% or 3,000 tonnes). This was due to a small decrease in price of Steel on average across the 2018-19 financial year, and trade tensions between China, Turkey and the US causing a slight slowing of trading into overseas metals markets.
- Organics (**Figure 2.3**) is mostly derived from the C&I sector, decreased for another year (down by 59,000 tonnes from 2017-18). This was due to the closure of a meat rendering facility (operations moved interstate), and decreases in the timber recycling market from year by year variations. Commercial food organics recovery increased, although there remains a significant opportunity to recover food waste from landfill.
- Cardboard & Paper decreased by 7,300 tonnes. All materials in this category except Printing & Writing Paper decreased with stricter contamination requirements overseas, leading to less being available for sale to these markets.
- Glass increased significantly, predominately due to the use of glass in road base. There was also an increase due to the additional demand for recycled glass in bottle manufacture.
- Other Materials (down 8,100 tonnes) decreased due to a reduction in Foundry Waste quantities, a slight decrease in recovered Tyres, and improved reporting of Other Materials (Foundry Waste and Leather & Textiles).
- The 40.2 tonnes per $1 million gross domestic product seen in **Figure 2.2** below is a decrease from the past two financial years.

Figure 2.2 Trend in resource recovery for SA by material category since 2003-04, including tonnes per $m of Gross State Product (GSP).

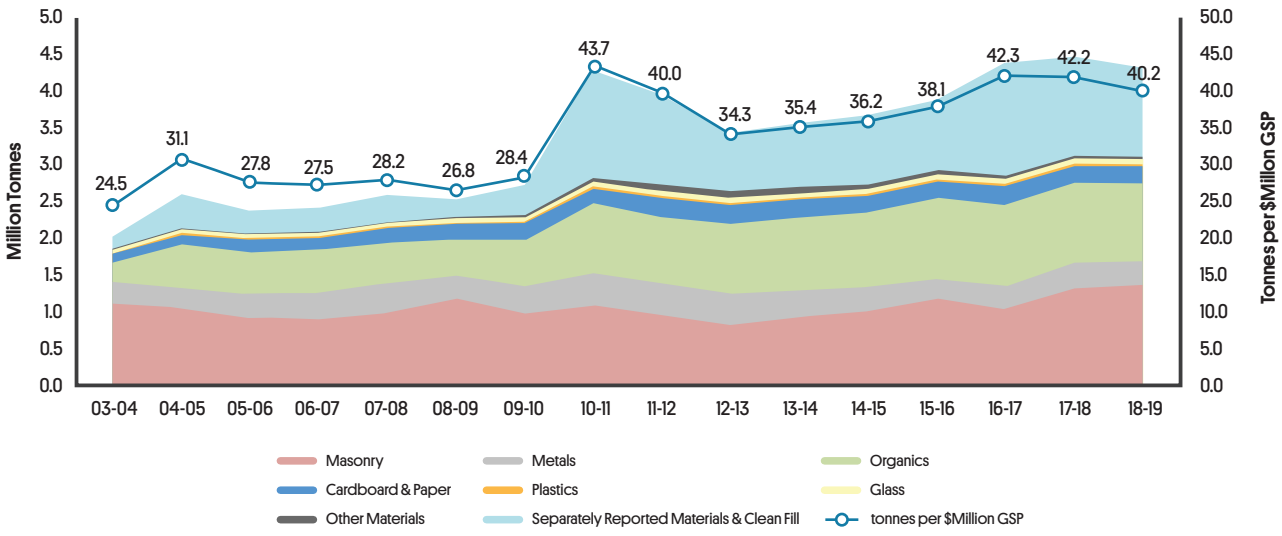


Figure 2.3

2018-19 SA Recycling Activity materials, showing their source sector and destinations for recycling. The most voluminous streams remain as Soil, Masonry and Organics. Most recovered resources are from the C&D sector (64%) and most volumes are recycled in SA (86%).

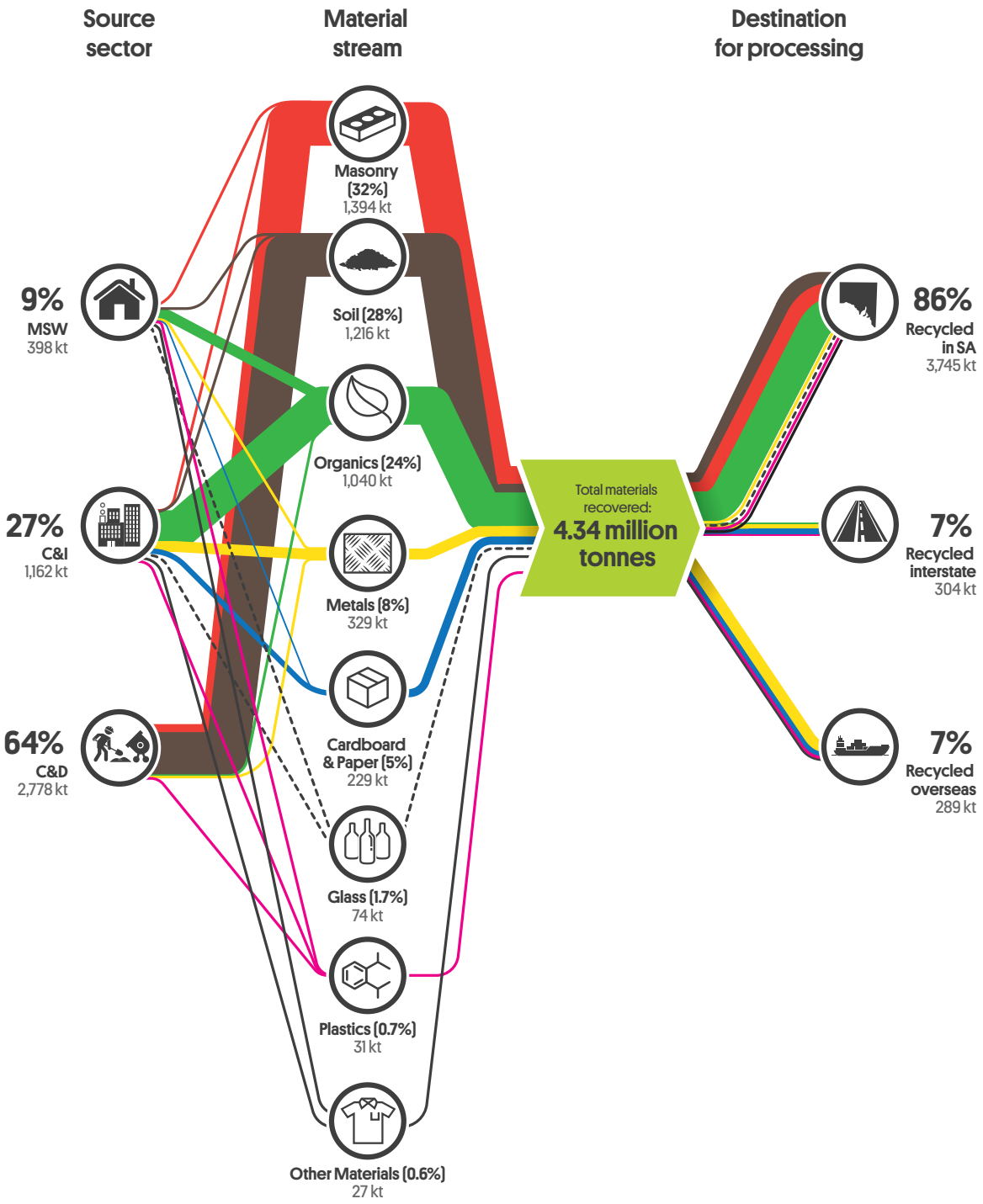


Table 2.2

Reported material quantities (tonnes) being diverted for resource recovery in SA for 2018-19, preceding 5 years, and first Survey year, 2003-04. This table shows the changes in resource recovery of waste materials which have occurred in SA during these periods, including the percentage increase or decrease between 2017-18 and 2018-19. The data is presented in accordance with national reporting guidelines (Dept Environment and Energy, 2015).

ID	Material	2003-04	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19	Change (%) 17-18 to 18-19
	Masonry								
1	Asphalt	100,000	148,000	170,000	210,000	270,000	286,000	269,000	-6%
2	Bricks	165,000	63,000	55,000	53,000	42,000	102,000	74,000	-27%
3	Concrete	877,000	760,000	820,000	940,000	750,000	960,000	1,049,000	9%
4	Plasterboard		1,000	1,100	1,400	1,400	1,500	1,100	-27%
	Subtotal	**1,142,000**	**972,000**	**1,046,100**	**1,204,400**	**1,063,400**	**1,349,500**	**1,393,100**	**3%**
	Metals								
7	Steel	264,200	320,000	280,000	230,000	275,000	299,000	297,000	-1%
8	Aluminium	19,000	14,000	18,000	18,000	17,000	14,000	14,000	0%
9	Non-ferrous metals	13,000	18,000	20,000	19,000	18,000	19,000	18,000	-5%
	Subtotal	**296,200**	**352,000**	**318,000**	**267,000**	**310,000**	**332,000**	**329,000**	**-1%**
	Organics								
10	Food Organics	0	7,000	7,600	7,900	8,100	9,100	12,000	32%
11	Garden Organics	130,100	260,000	259,000	255,000	293,000	257,000	257,000	0%
12	Timber	116,700	180,000	220,000	273,000	250,000	270,000	242,000	-10%
13,14,15,16	Other Organics	0	550,000	530,000	570,000	562,000	563,000	529,000	-6%
	Subtotal	**246,800**	**997,000**	**1,016,600**	**1,105,900**	**1,113,100**	**1,099,100**	**1,040,000**	**-5%**
	Cardboard & Paper								
17	Cardboard & Waxed Cardboard	91,000	180,000	149,000	151,000	170,000	162,000	160,000	-1%
18	Liquid Paperboard	0	3,100	1,800	1,700	1,200	1,200	800	-33%
19, 20, 21	Magazines & Newsprint	32,701	33,000	62,000	61,000	69,000	62,000	54,100	-13%
22	Printing & Writing Paper	12,300	24,000	19,000	14,000	9,000	11,000	14,000	27%
	Subtotal	**136,001**	**240,100**	**231,800**	**227,700**	**249,200**	**236,200**	**228,900**	**-3%**
	Plastics								
23	Polyethylene Terephthalate	0	4,200	4,400	4,200	4,200	4,800	5,000	4%
24	High Density Polyethylene	0	3,200	4,500	4,800	4,500	6,100	5,900	-3%
25	Polyvinyl Chloride	0	300	300	300	10	60	100	67%
26	Low Density Polyethylene	0	3,400	3,600	3,700	4,100	3,200	2,000	-38%
27	Polypropylene	0	2,000	1,700	1,600	1,400	800	600	-25%
28	Polystyrene	0	410	250	300	300	330	500	52%
29	Mixed &/or Other Plastics	8,607	9,000	12,000	13,000	14,000	15,800	17,000	8%
	Subtotal	**8,607**	**22,500**	**26,800**	**27,900**	**28,500**	**31,100**	**31,100**	**0%**
	Glass								
30	Glass	45,600	56,000	61,000	64,000	67,000	60,000	74,000	23%
	Other Materials								
40	Foundry Waste	0	51,600	40,800	34,400	24,500	9,600	6,000	-38%
41	Leather & Textiles	4,080	4,000	4,000	4,000	4,000	5,500	2,400	-56%
42	Tyres & Other Rubber	88	21,300	18,500	18,400	19,900	20,000	18,600	-7%
	Subtotal	**4,168**	**76,900**	**63,300**	**56,800**	**48,400**	**35,100**	**27,000**	**-23%**
	Total of above materials	**1,879,376**	**2,716,500**	**2,763,600**	**2,953,700**	**2,880,000**	**3,143,000**	**3,123,000**	**0%**
39	Fly Ash	0	114,000	146,000	100,000	0	0	0	NA
5	Clay, Fines, Rubble & Soil – Clean Fill	162,400	590,000	660,000	760,000	1,307,000	1,052,000	937,000	-11%
6	Clay, Fines, Rubble & Soil – Intermediate Waste Soil[1]	NRS[2]	170,000	130,000	100,000	214,000	294,000	278,000	-5%
	Total Clay, Fines, Rubble & Soil	162,400	760,000	790,000	860,000	1,521,000	1,346,000	1,215,000	-10%
	Total Reported	**2,041,776**	**3,590,000**	**3,700,000**	**3,910,000**	**4,401,000**	**4,489,000**	**4,338,000**	**-3%**

Notes:

1 'Intermediate Waste Soil' is a soil classification used in SA (South Australia EPA, 2009) (Draft Waste Classification Guidelines) which is indicative of 'minor contamination' (as opposed to major contamination), separating this type of soil from Waste Derived Fill (WDF, or 'clean fill'). Intermediate Waste Soil can be used as WDF for construction fill or purposes without remediation or treatment but only when subject to a site-specific risk-based assessment verified by an independent auditor.

2 NRS – Not reported separately

3 Totals may not equate to sums due to rounding.

2.1.4 Source sector outcomes

The sector origin of waste and recyclables in 2018-19 for both recovered resources and unrecovered resources to landfill can be seen in **Figure 2.3** on page 15 and graphically in **Figure 2.4** on page 18.

Municipal (MSW) sources contributed the lowest amount of resource recovered (398,000 tonnes), but the highest volume to landfill (362,000 tonnes). This led to a diversion rate of around 52%. MSW had the same diversion rate in 2017-18. Resource recovery decreased in all areas except Glass for MSW in 2018-19. **Figure 2.5** on page 18 shows that Organics was the highest contributor to MSW resource recovered tonnes.

The C&D sector contributes the highest volumes of resource recovery, with 2.8 million tonnes recovered in 2018-19. This is 64% of all resource recovered tonnes, and with an estimated 307,000 tonnes sent to landfill, this is a diversion rate of 90% (compared to 90.9% in 2017-18). Masonry, which includes Separately Reported Materials & Clean Fill, Asphalt, Bricks, Concrete and Plasterboard, is the highest proportion of C&D's recovered material (**Figure 2.5**).

The C&I sector had a similar diversion rate to the C&D sector, increasing from 85.4% in 2017-18 to 87.2%. The 1.2 million tonnes of C&I recovered resources was mainly Organics, followed by Metals and Paper & Cardboard.

Table 2.3 **Source sector origins (by weight, tonnes and %) of SA recovered materials and waste to landfill, 2018-19, and diversion rates (%).**
Source data for resource recovery by source sector was obtained from the 2018-19 Recycling Activity Survey data.
Source data for landfill disposal by source sector during 2018-19 was obtained from Green Industries SA.

Sector Origin	Resource Recovery		Landfill		Diversion (%)
	tonnes	(%)	tonnes	(%)	
Municipal	398,000	9%	362,000	43%	52.4%
C&I	1,162,000	27%	171,000	20%	87.2%
C&D	2,778,000	64%	307,000	37%	90.0%
Total [1]	**4,338,000**	**100%**	**840,000**	**100%**	**83.8%**

1 Some totals may not equate precisely due to rounding

Figure 2.4 **Contribution to resource recovery in SA by source sector for 2018-19 and trend since 2007-08**
(note percentages may not equate due to rounding)

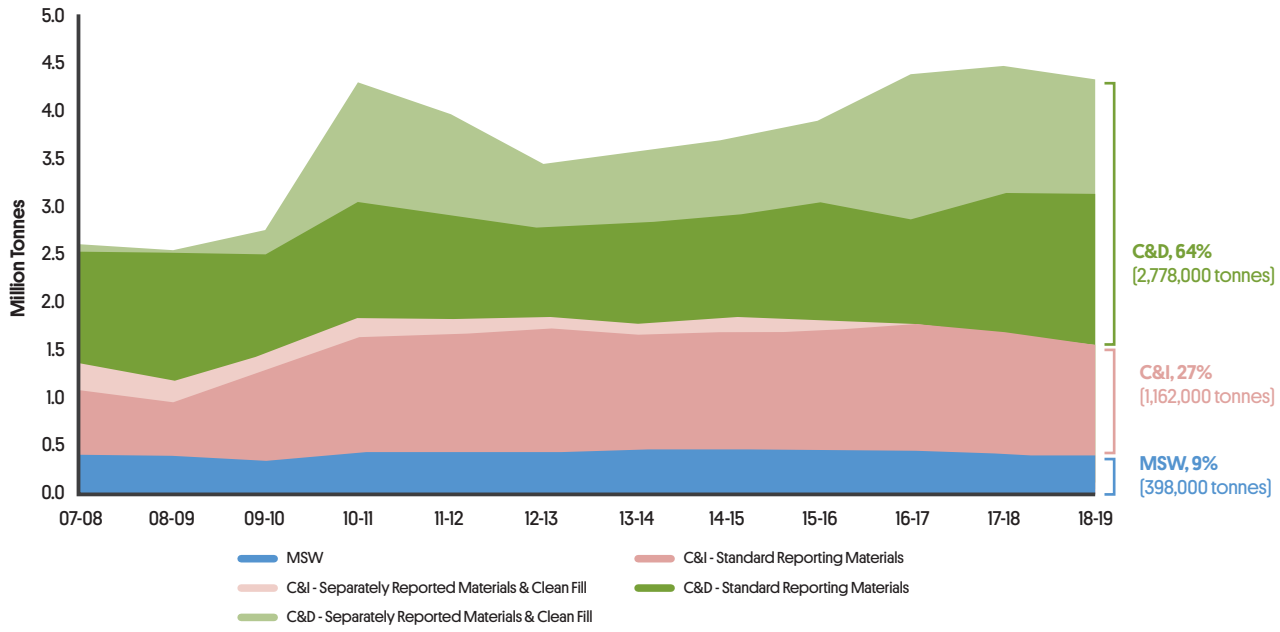
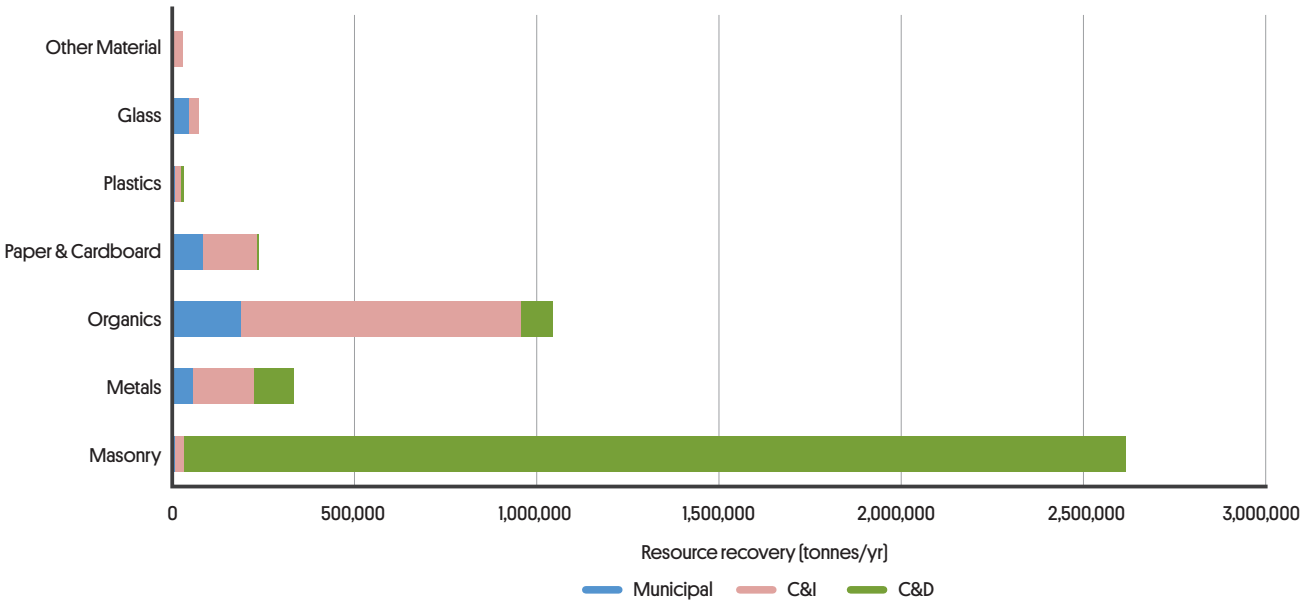


Figure 2.5 **Sector origin of SA recovered materials according to material category (by weight, tonnes), SA 2018-19.**
This figure shows the source sector splits for resource recovered materials by source sector (MSW, C&I and C&D)



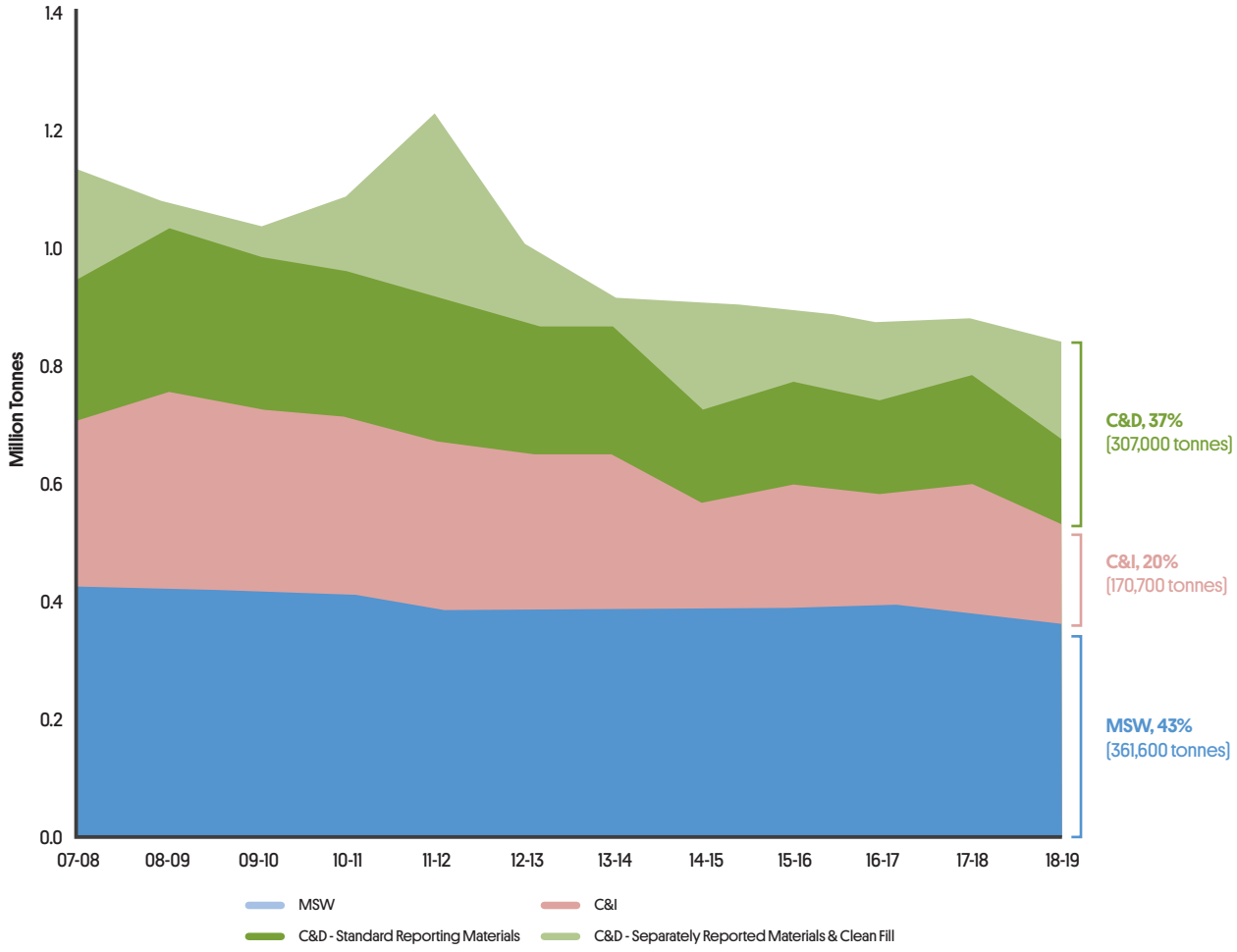
2.1.5 Landfill Disposal

Landfill disposal in South Australia decreased from 881,000 tonnes in 2017-18 to 840,000 tonnes in 2018-19 (see **Figure 2.6** below).

All sectors reduced their disposal to landfill. The decrease in C&D to landfill was due to the C&D Standard Reporting Materials, despite an increase in contaminated soil (Separately Reported Materials & Clean Fill) to landfill in the C&D sector.

Figure 2.6

Contribution to landfill disposal in SA by source sector for 2018-19 and trend since 2007-08.
This figure shows the tonnes of landfilled materials by source sector (MSW, C&I and C&D) over time.
Note percentages may not equate due to rounding.



2.1.6 Geographical origin

Figures 2.7 and **2.8** on pages 21 and 22 show the indicative locations in SA of main sites for recyclers/ re-processors reporting resource recovery data to Green Industries SA Recycling Activity Survey.

The Adelaide metropolitan area contributed the higher proportion of resource recovered tonnes (3.8 million tonnes or 87%), and tonnes to landfill (609,000 tonnes or 73%) in 2018-19. There was a slight increase in metropolitan diversion rate, from 85.3% in 2017-18 to 86.1% in 2018-19.

Regional SA continues to contribute substantially to resource recovery with 13% of the 4.3 million tonnes recovered from these sources. Of the landfilled tonnes, 28% was from regional sources. The slight decrease in resource recovered tonnes from regional sources in combination with a small increase in landfilled tonnes has led to a decrease in diversion rate for regional SA (71.2% compared to 74.3% in 2017-18). In line with previous years, most regional resource recovery arises from Organics (65%), primarily from processing of primary products (e.g. wine, timber, meat).

Table 2.4 **Geographical origins (by weight, tonnes and %) of SA recovered materials and waste to landfill, 2018-19, and diversion rates (%).** The separate contributions by metropolitan and regional areas to resource recovery and landfill disposal in SA are shown in this Table.

Sector Origin	Resource Recovery		Landfill[1]		Diversion
	tonnes[2]	(%)	tonnes	(%)	
Metro	3,767,000	87%	609,000	73%	86.1%
Regional	571,000	13%	231,000	28%	71.2%
Total	**4,338,000**	**100%**	**840,000**	**100%**	**83.8%**

1 Landfill data was provided by Green Industries SA

2 Sums may not equate due to rounding. Rounding also influences diversion rates

Figure 2.7

Approximate geographical location of main sites for recyclers/re-processors in SA.
This map was produced by Green Industries SA during the 2016-17 Recycling Activity Survey Year. Refer Figure 2.8 for enlargement of metropolitan Adelaide area

Waste and Resource Recovery Infrastructure in South Australia

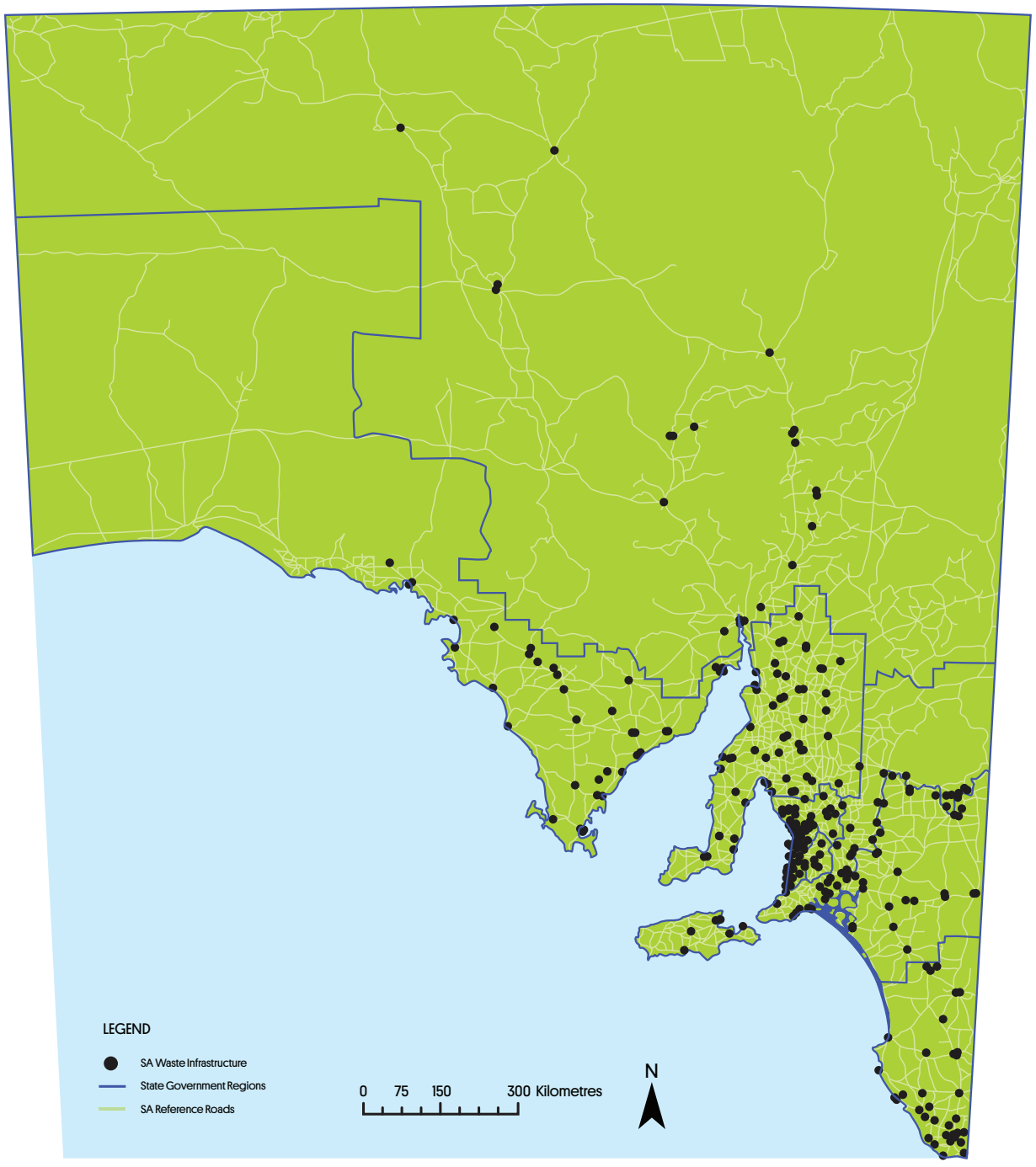
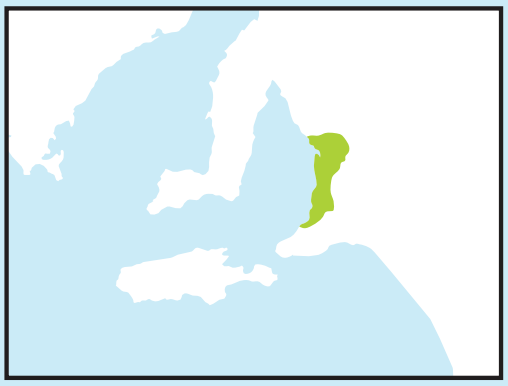
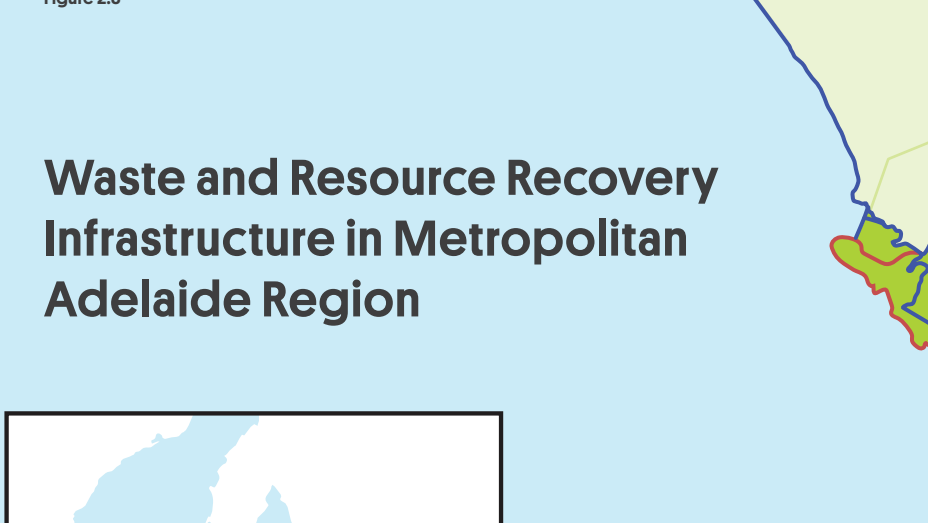


Figure 2.8

Approximate geographical location of main sites for recyclers/re-processors in Adelaide.
This map was produced by Green Industries SA during the 2016-17 Recycling Activity Survey Year.

Waste and Resource Recovery Infrastructure in Metropolitan Adelaide Region





Northern Adelaide

Western Adelaide

Adelaide

Eastern Adelaide

Southern Adelaide

LEGEND

- Compositing Facility Open Windrow [7]
- Construction & Demolition Processing Facility [17]
- Drop off facility [27]
- E-Waste Processing Facility [4]
- Hazardous Waste Facility [11]
- Landfill [3]
- Material Recovery Facility [10]
- Medical Waste Disposal [3]
- Other [6]
- Other Processing Facility Medium Tech [33]
- Soil Storage and Remeddiation Facility [1]
- Transfer Station [69]
- CDL Depots [41]
- Local Government Areas
- State Government Regions
- SA Reference Roads

0 5 10 20 Kilometres

N

2.1.7 Destination for Recovered Materials

The Recycling Activity Survey asks respondents to report on the destination of the recovered materials. In 2018-19 the majority (86%) of recovered materials were re-processed in SA (**Table 2.5** below and **2.6** on page 25). This is unchanged from 2017-18.

The tonnages and proportion of materials sent interstate and overseas for reprocessing were also unchanged from 2017-18 (7%).

Local processing of Masonry and Organic materials is the norm (**Figure 2.9** and **Table 2.6**). A high proportion of recovered Glass and Other Materials are also commonly re-processed in SA for sale as a recycled product for manufacture (e.g. glass bottle making) or energy recovery (e.g. tyre derived fuel).

Despite the National China Sword Policy continuing to impact international sale of selected recyclables throughout the 2018-19 financial year, the proportion of Cardboard & Paper sent overseas increased (from 39% to 49%). With the closure of one business that previously recovered this material, the remaining organisations sent higher proportions of Cardboard & Paper to overseas markets.

The proportion of Metals and Plastics sent overseas decreased from 2017-18 to 2018-19; from 62% to 51% for Metals, and 30% to 27% for Plastics. The reprocessing location of Plastics shifted substantially towards local ones (in SA), from 34% in 2017-18 to 51% in 2018-19, predominately due to increases in energy recovery for this commodity. Glass also had interstate recovery in this financial year due to glass to road base opportunities interstate.

Table 2.5 **Final reported destination (by weight, tonnes and %) of SA sourced materials, 2018-19.** The destination is where material is sent for re-processing. Most resource recovered material in SA is locally re-processed to use in the manufacture of new products

Destination	Quantity	
	tonnes	%
SA	3,746,000	86%
Interstate	303,000	7%
Overseas	289,000	7%
Total[1]	**4,338,000**	**100%**

1 Sums and percentages may not equate due to rounding.

Figure 2.9 **Destination of SA recovered materials according to material category (by weight, tonnes), 2018-19 compared with 2017-18.** Most materials are re-processed within SA, but significant quantities of some materials are exported interstate or overseas.

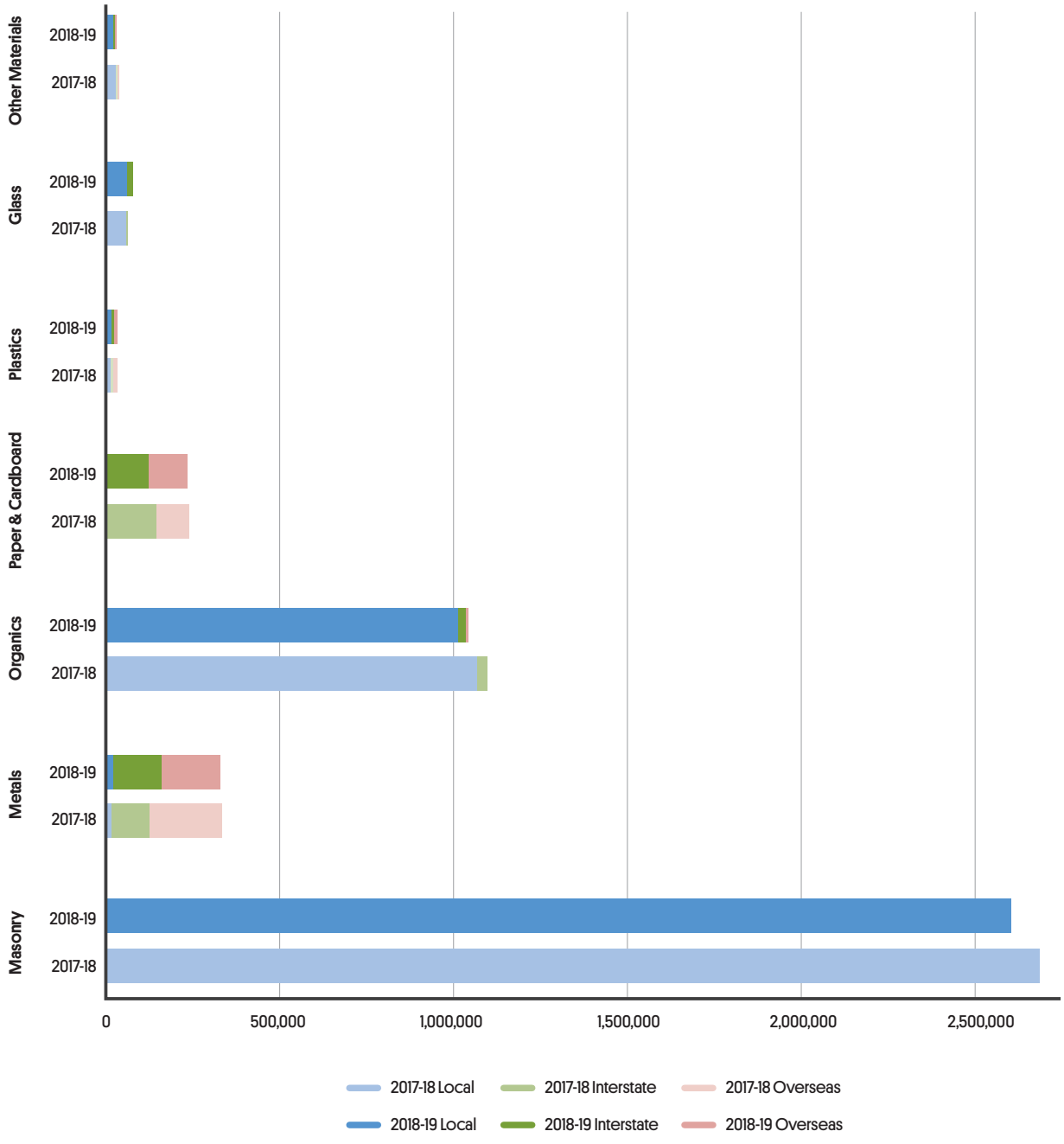


Table 2.6 **Destination (%) of SA sourced materials by stream, 2018-19.** The order of materials is based on the proportion recovered in SA. All Masonry and Separately Reported Materials & Clean Fill and most Organics, Other Materials and Glass are recovered here.

	% of material recovered[1]		
Material	**SA**	**Interstate**	**Overseas**
Masonry	100%	0%	0%
Separately Reported Materials & Clean Fill	100%	0%	0%
Organics	98%	2%	0%
Other Materials	85%	13%	2%
Glass	80%	20%	0%
Plastics	51%	22%	27%
Metals	6%	42%	51%
Cardboard and Paper	1%	51%	49%
Total	**86%**	**7%**	**7%**

1 Percentages may not sum to 100% due to rounding.

2.1.8 Energy recovery

Energy recovery is useful for waste that is deemed unsuitable or not cost-effective for material recovery. Some industries produce energy from waste by-products generated on their own sites, which is not reportable under national reporting guidelines (Dept Environment and Energy, 2015). There are also several waste companies that collect and re-process waste materials, which are then sent overseas and/or interstate for energy recovery. For example, tyres are often shredded and sent overseas as a replacement for coal in cement kilns. This circumstance is still technically deemed as 'material recovery' as any potential energy recovery from the recovered waste material occurs later, once it is exported outside of SA. Resource recovery considered as 'energy recovery' in this report is therefore classified as: *SA-derived waste materials recovered and used for the purpose of energy production in SA, instead of being sent for landfill disposal*[2].

SA produced energy from recovered materials with 125,000 tonnes in 2018-19, an increase over 112,000 tonnes in 2017-18 (**Table 2.7** on page 26). This included energy recovery through refuse derived fuel/ processed engineered fuel, anaerobic digestion, and pyrolysis. Materials included Timber, Mixed Plastics and Other Organics.

Table 2.7 also shows the overall diversion rate for all materials is 83.8%, which includes 81.4 percentage points from materials recovery and 2.4 percentage points from energy recovery. Energy recovery therefore contributes a small amount (2.4%) to the State's total diversion rate, larger than in 2017-18 (2.1%).

The overall diversion rate for Standard Reporting Materials is 82.2%, which includes 78.9 percentage points from material recovery and 3.3 percentage points from energy recovery. Separately Reported Materials & Clean Fill recovery was 88% for the State in 2018-19 and did not include energy recovered tonnes.

Energy recovery is anticipated to continue to grow over the next 5 to 10 years, from sources such as additional anaerobic digestion facilities, pyrolysis of agricultural waste, and/or large-scale diversion of the municipal waste/C&I residuals away from landfill to waste-to-energy plants.

2 This necessarily excludes energy recovery from landfill gas arising from waste already disposed to landfills.

Table 2.7 **Resource recovery (tonnes) for material recovery and energy production, from SA sourced materials reported during 2018-19.** Reported tonnes are for energy recovery in SA from waste materials diverted from landfill. These 'energy recovery' tonnes do not include materials that are re-processed and sent interstate and/or overseas for energy recovery, which is still deemed as material recovery.

		Standard Reporting Materials	Separately Reported Materials & Clean Fill	TOTAL (All materials)
Material recovery	Quantity, tonnes	3.00 million	1.22 million	4.21 million
	Diversion rate, %	78.9%	88.0%	81.4%
Energy recovery	Quantity, tonnes	124,666	0	124,666
	Diversion rate, %	3.3%	0.0%	2.4%
Total (resource) recovery	**Quantity, tonnes**	3.12 million	1.22 million	4.34 million
	Diversion rate, %	82.2%	88.0%	83.8%

2.1.9 Imported materials

Imported waste materials brought into SA for resource recovery and/or re-processing are separately identified during SA's Recycling Activity survey, to ensure that they are not counted towards SA's recycling performance. **Table 2.8** on page 27 shows the interstate movements of recovered materials and does not include already re-processed materials imported for manufacturing.

In 2018-19 there was a decrease in overall tonnes of imported waste, from 200,700 tonnes in 2017-18 to 172,500 tonnes in 2018-19. This is predominately due to a reduction in kerbside organics from Victoria as there is a push in this state to re-process the material in Victoria instead of sending it to SA. Despite the overall decrease, there were small increases in materials brought in from interstate for Metals (increase of 5,700 tonnes), Plastics (1,400 tonne increase) and Glass (1,200 tonne increase). Importation of Non-Ferrous Metals from across Australia into SA increased due to new infrastructure able to re-process this material into a value-added product rather than sending the material directly overseas from each state for re-processing. Plastics imported from interstate increased due to a large project in NSW generating high volumes of plastics which were sent to SA, taking some CDL plastics from NT and NSW, and the re-opening of a plastics recycling plant in SA in 2018-19 which takes plastics from across Australia. Demand for colour separated glass cullet is high and with glass beneficiation and glass bottling plants available in SA, there was a slight increase in Glass imported from interstate to be turned into cullet.

Table 2.8 **Waste materials reported as imported to SA for resource recovery in 2018-19, including estimated accuracy of data.**
Organics and Glass comprised the highest tonnes of imported waste materials. The highest quantities came from Victoria.

Material Stream	Interstate								Overseas	TOTAL	Est Accuracy (%)
	VIC	NSW	ACT	QLD	NT	WA	TAS	State not identified			
Masonry	-	-	-	-	-	-	-	-	-	-	
Metals	10,500	7,100	-	500	9,100	-	-	-	-	27,200	2%
Organics	68,000	-	-	-	-	-	-	-	-	68,000	11%
Cardboard and Paper	-	-	-	-	-	-	-	-	-	-	
Plastics	600	900	-	400	100	-	-	-	-	2,000	6%
Glass	-	19,500	-	-	-	-	-	38,700	-	58,200	1%
Other materials	9,600	100	-	-	500	-	-	100	6,800	17,100	1%
Total	**88,700**	**27,600**	**-**	**900**	**9,700**	**-**	**-**	**38,800**	**6,800**	**172,500**	**5%**

2.1.10 Market value of resource recovery

The market value of recovered resources in SA for 2018-19 was estimated based on survey responses. These indicated the value per tonne for each material stream that was reprocessed within their respective organisations, and public data.

Metals is the greatest contributor to the market value of resource recovery in SA at $174 million. This is slightly down from the $177 million in 2017-18 due to a lower commodity value on average and lower recovered tonnes. Organics remains the second greatest contributor, estimated at $96 million. This also decreased from 2017-18. Despite an increase in the value per tonne of Meat Rendering, the recovered tonnes for this stream decreased due to the closure of a reprocessing plant, lowering the overall value of Organics across the State. Cardboard & Paper was similar to the $40 million reported in 2017-18 and is now estimated to be $39 million. Glass increased slightly due to increases in the estimated value per tonne for sale of recovered Glass and reprocessed Glass in 2018-19.

Overall, the resource recovery sector in SA has an estimated worth of $348 million. This is slightly lower than the 2017-18 financial year due to an overall reduction in recovered tonnes and decreases in the value per tonne of Steel and Paper & Cardboard (all other values remained the same or increased slightly). Further details on the value of each of these streams is included on page 29 in **Table 2.9**. A comparison with previous years can be found in **Section 6**.

Figure 2.10 **Estimated market value of resource recovered material in SA during 2018-19.**
Organics continues to contribute the second greatest proportion of all materials behind Metals.

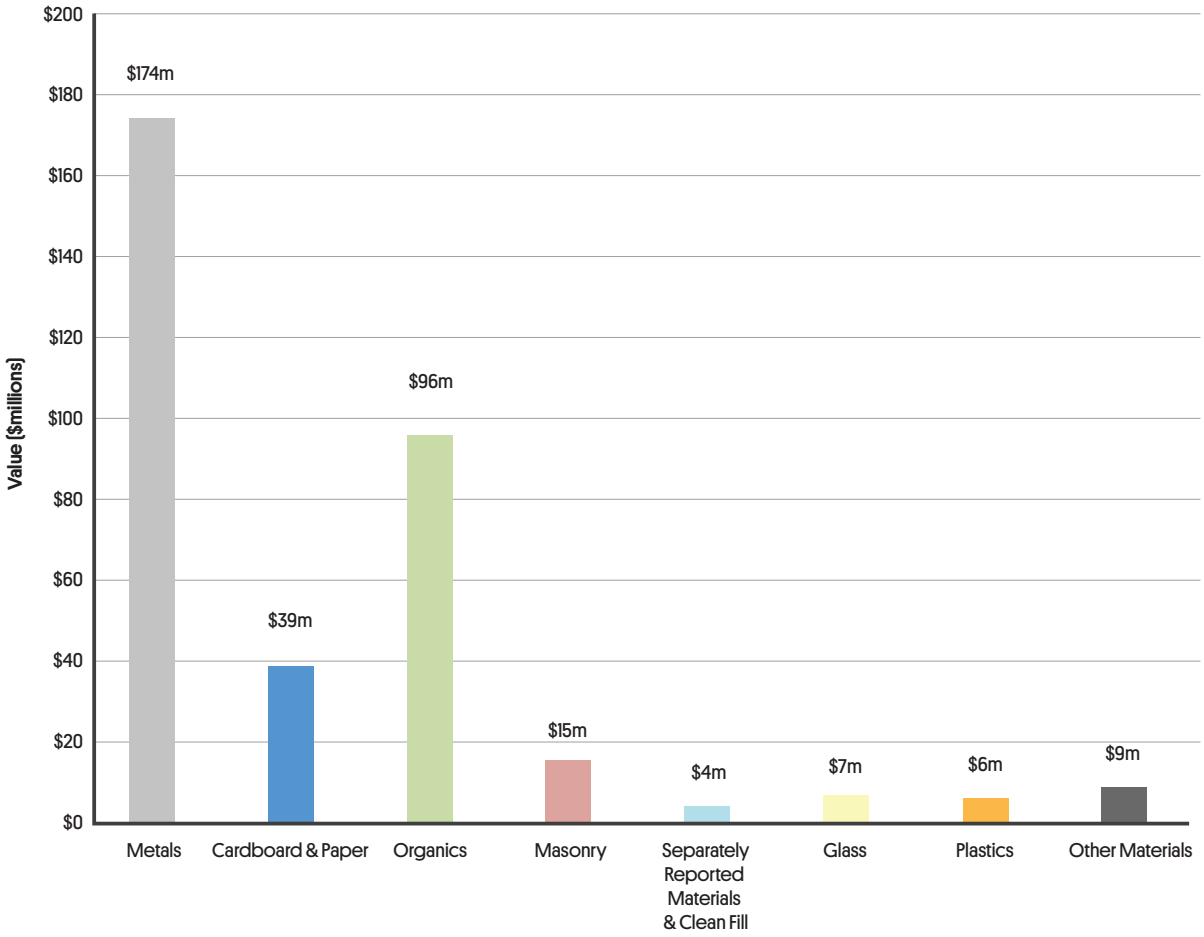


Table 2.9 **Assumed values for recovered materials in SA during 2018-19 used to estimate resource market value.**

Material category	Estimated on-sale price ($/tonne)	Price data source
Masonry	$11	Based on RAS survey results
Metals – Steel	$330	Based on RAS survey results and commodity data
Metals – Non-ferrous including Aluminium	$2,378	Based on RAS survey results and commodity data
Organics – Meat Rendering	$850	Based on RAS survey results
Organics – Garden, Food and Timber	$35	Based on RAS survey results
Paper & Cardboard	$165	Based on RAS survey results and SV Market Bulletin February 2019
Plastics	$185	Based on RAS survey results and SV Market Bulletin February 2019
Glass	$91	Based on RAS survey results
Other Materials (including Tyres & Other Rubber, Leather & Textiles and Foundry Sands)	$312	Based on RAS survey results
Separately Reported Materials & Clean Fill	$3	Based on RAS survey results

Please note these values are based on a range of sources including:

- Consultations with industry in October and November 2019
- 2018-19 survey responses (the survey asked participants to provide a price per tonne for each material recovered, reflecting the commodity price or market value for that material), and
- Publicly available information on market values of recovered materials.

In some cases, the weighted average of all streams within a material category was used to estimate the on-sale price. For example, the price for selected plastics streams is higher than mixed plastics. These weighted averages (the on-sale price for each plastic stream as well as the tonnes recovered) was calculated to be $185 per tonne for all plastics.

2.2 Performance against State Waste Strategy Targets

2.2.1 Landfill Reduction Target

SA has a goal of reducing waste to landfill by 35% by 2020 (baseline: 2002-03). The inclusion or exclusion of contaminated soils in this calculation impacts on SA's performance against this target.

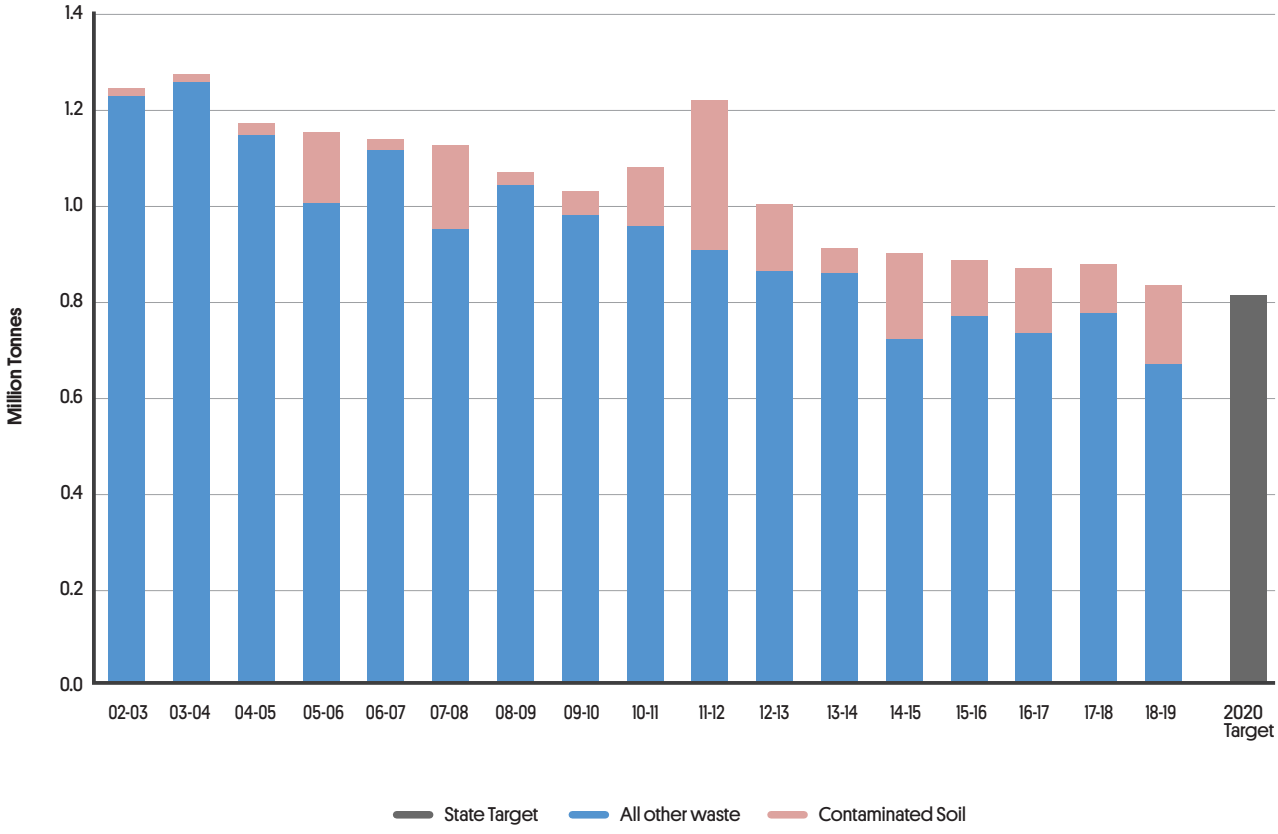
When including contaminated soil:

- SA's landfill quantities (at 840,000 tonnes) are 33% lower than the baseline year (2002-03). This is 2 percentage points under the 2020 target (of a 35% reduction).

When excluding contaminated soil:

- SA's landfill quantities (at 675,000 tonnes) are 45% lower than the baseline year (2002-03). This means SA has surpassed its 2020 target of a 35% reduction in landfill by 2020.

Figure 2.11 **Landfill disposal: Trend in SA since 2002-03 and the State Waste Strategy Target.**
This figure shows how landfill disposal in SA has changed since 2002-03 relative to SA's landfill reduction target. The separate contribution to landfill disposal of contaminated soil is also identified and the historical trend of landfill disposal excluding contaminated soil is illustrated.



2.2.2 Per capita Waste Generation Reduction Target

South Australia's Waste Strategy 2015-2020 (Green Industries SA, 2015) sets a state-wide per capita waste generation target of:

- **> 5% reduction in waste generation per capita by 2020 (baseline: 2015)**

Waste generation continues to remain a challenge for the state. In 2018-19 SA is generating an average of 2,170 kilograms per person per year of Standard Reporting Materials, which is 4.3% greater than the 2014-15 baseline year for this target. The target is a 5% reduction (**Table 2.10**).

Assuming the same population, waste generation per capita for Standard Reporting Materials would need to reduce by a further 194 kilograms per capita in 2019-20 to reach the target.

Table 2.10 **2018-19 Recycling Activity results per capita waste generation vs. State Waste Strategy target**

Per capita Waste Generation (kg/person/yr)											2020 Target
	10-11	11-12	12-13	13-14	14-15	15-16	16-17	17-18	18-19	% Change	
Standard Reporting Materials	2,300	2,210	2,120	2,130	2,080	2,180	2,100	2,260	2,170	**4.3%** Increase from 2014-15	5% Reduction from 2014-15
Separately Reported Materials & Clean Fill	950	930	550	550	660	630	960	830	790		
TOTAL	3,250	3,140	2,670	2,680	2,740	2,810	3,060	3,090	2,960	**8.0%** Increase from 2014 -15	

2.2.3 Metropolitan Diversion Targets

SA's performance against the metropolitan diversion targets in South Australia's Waste Strategy 2015-20 (Green Industries SA, 2015) are included in **Table 2.11** below.

In 2018-19 there were increases in C&I and C&D (excluding Separately Reported Materials & Clean Fill):

- MSW – Diversion rate decreased for another year from 58.5% in 2017-18 to 57.0% in 2018-19. This remains below the 2015 and 2020 Target of 70%.
- C&I – Diversion rate increased from 82.6% in 2017-18 to 88.2% in 2018-19. This remains above the 2020 Target of 80%.
- C&D excluding Separately Reported Materials & Clean Fill - Diversion rate increased from 90.9% in 2017-18 to 93.4% in 2018-19. This is now well above the 2020 Target of 90%.
- C&D overall - The total C&D sector diversion rate decreased slightly, from 91.9% in 2017-18 to 91.4% in 2018-19. This remains above the 2015 and 2020 Target of 90%.

Table 2.11 Metropolitan diversion by source sector: 2018-19 Recycling Activity results and metropolitan diversion targets in SA's Waste Strategy 2015-2020 (Green Industries SA, 2015).

Source Sector	2018-19 Diversion Achieved	Metro Diversion Target	
		By 2015	By 2020
MSW	57.0%	70%	70%
C&I	88.2%	75%	80%
C&D – Excluding Separately Reported Materials & Clean Fill	93.4%	90%	90%
C&D – Total	91.4%		

2.3 Local Government Recovery

Local Government recovery is included to provide information on the recycling performance of South Australian households based on what is disposed in kerbside bins. This data is different to MSW data included elsewhere in this report as Local Government recovery only includes the three bins collected at kerbside. It excludes non-kerbside container deposit legislation (CDL) returns, transfer stations, hard waste collection, E-waste, street sweepings and textiles. This section may be expanded in future Recycling Activity Surveys.

2.3.1 Overall volumes collected through kerbside

The breakdown of quantities collected at kerbside by stream is shown in **Table 2.12**. Overall tonnes collected in SA in 2018-19 were 648,000, with 54% of this from residual waste bins. Organics (25%) and Recyclables (20%) waste collected at kerbside was similar to the 2017-18 financial year, although the total tonnes (648,000) have reduced (682,000 in 2017-18). The recovery rate at kerbside in SA has remained at 46%.

The diversion rate at metropolitan councils (49%) has remained consistent with 2017-18 while regional councils are diverting slightly less (37.0% in 2018-19 compared to 37.5% in 2017-18).

Food waste makes up a significant proportion of material remaining in kerbside residual waste bins (and in SA landfills), estimated at over 150,000 tonnes per year. Diverting more of this material via the green kerbside organics bins would lead to a large increase in kerbside performance.

Table 2.12 **Tonnes collected at kerbside in South Australia, 2018-19***

Collection	SA Overall		Metro		Regional	
	2018-19 overall (tonnes)	Proportion of total	2018-19 Metro (tonnes)	Proportion of total	2018-19 Regional (tonnes)	Proportion of total
Residual Waste	350,900	54.2%	250,900	51.3%	100,000	63.0%
Organic	164,700	25.4%	136,600	27.9%	28,100	17.7%
Recyclables	132,400	20.4%	101,700	20.8%	30,600	19.3%
Total Materials	**648,000**	**100%**	**489,200**	**100%**	**158,700**	**100%**
Recovery Rate	45.8%		48.7%		37.0%	

* Rounded figures only. Regional figures are estimations based on population proportions. This rate does not include other aspects of MSW such as resident waste drop-offs, non-kerbside CDL returns, hard waste, or street sweepings.

2.3.2 Waste and resource recovery per capita and household

Table 2.13 includes population and household information at a sub-region level, as well as the kilograms of waste generated per capita and recovery rate for each region.

In 2018-19 there was a reduction in the kg/capita of waste, with South Australians generating 377 kilograms of waste per person on average across kerbside bins (in 2017-18 this was 396 kg/capita).

Councils in Adelaide's Central Eastern region again achieved the highest recovery rate (53%), followed by the Western region (50.5%) which compared to the average of 46% across the state. The Northern region and Regional councils had the lowest recovery rate at around 44% and 37% respectively. Some Councils within these regions only offer opt-in organics services (or no organics services), which may lower the recovery rate at kerbside.

Table 2.13 **Population, waste generation and kg per capita per year and recovery rate data, by region**

Sub-region	Population[3]	Total kerbside waste generated 18-19, tonnes	Kg/capita waste (all three streams) 18-19	Recovery rate
Central Eastern[1]	266,801	99,448	373	53.4%
Northern[2]	359,693	129,910	361	44.3%
Southern[3]	331,050	127,084	384	47.7%
Western[4]	340,639	132,755	390	50.5%
Total, Metro	**1,298,183**	**489,197**	**377**	**48.7%**
Total, Regional[5]	438,239	158,700	362	37.0%
Total, South Australia	**1,736,422**	**647,897**	**373**	**45.8%**

1 Central Eastern = Adelaide, Adelaide Hills, Burnside, Campbelltown, Norwood Payneham and St Peters, Prospect, Unley, Walkerville

2 Northern = Gawler, Playford, Salisbury, Tea Tree Gully

3 Southern = Marion, Mitcham, Onkaparinga

4 Western = Charles Sturt, Holdfast Bay, Port Adelaide Enfield, West Torrens

5 Regional data is an estimation only

3 ABS (2017)

2.3.3 Coverage

The coverage[4] of kerbside collections is summarised in **Table 2.14** below and is based on figures used in the 2017-18 report:

- 98.7% of SA households have a residual waste service.
- 96.5% have a comingled recycling service, and
- 91.1% have access to an organics recycling service. Some of these households have a food and garden organics service, whereas others have a garden waste only service. Some areas have opt-in organics services and take up rates vary.

Table 2.14 **Kerbside bin coverage across South Australia**

Stream	Number of services in SA	Coverage (%)
Residual	708,486	98.7%
Recycling	693,195	96.5%
Organics	654,394	91.1%
Total households in SA	**718,023**[1]	**100.0%**

1 As of June 2018, Series II (see http://www.abs.gov.au/AUSSTATS/abs@.nsf/DetailsPage/3236.02011%20to%202036?OpenDocument)

4 Coverage is the proportion of households across the state that have that particular kerbside bin service

2.4 Comparative performance (with other jurisdictions)

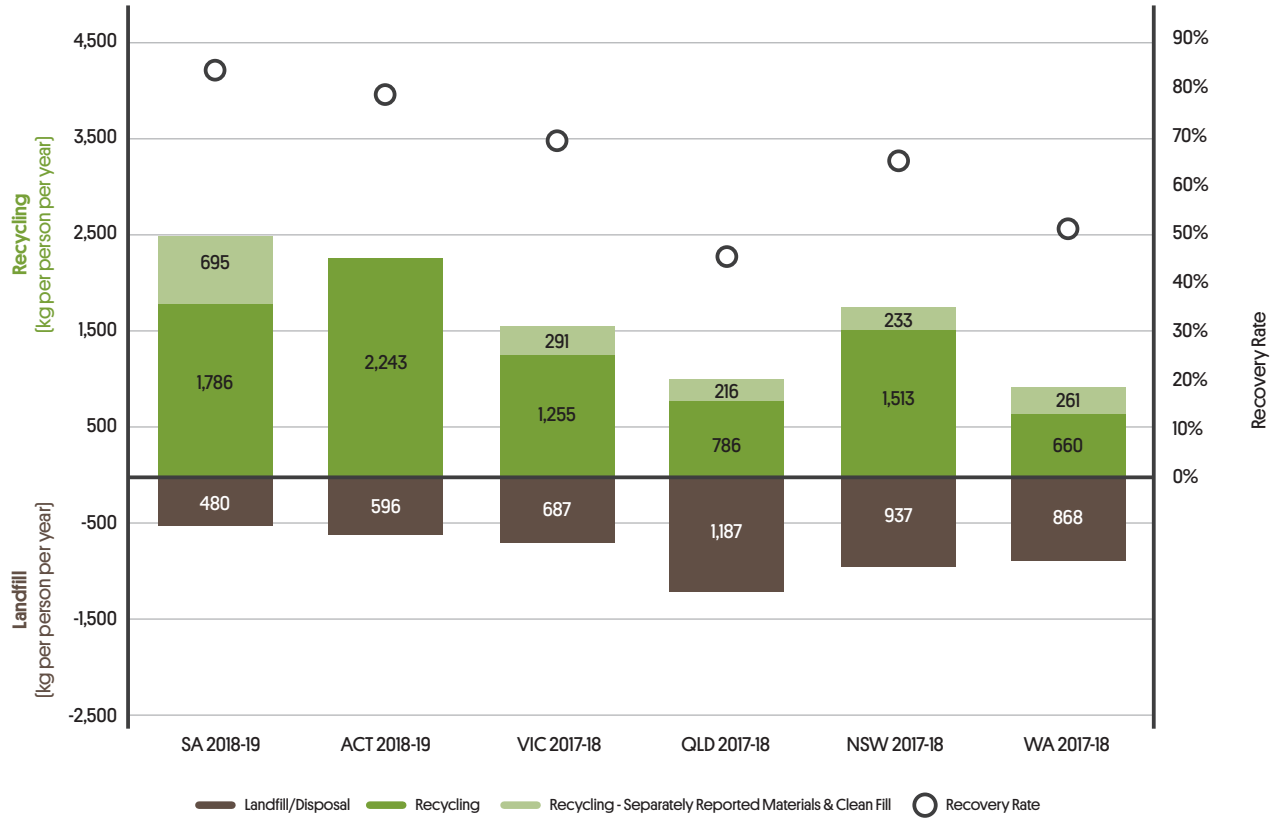
SA's waste and resource recovery performance was compared with other States and Territories in Australia (see **Figure 2.12**).

Positive findings were that in 2018-19, SA had:

- The highest reported diversion (at 83.8%), with ACT not far behind at 79%
- The highest per capita resource recovery (2,480 kg/p/yr)[5]
- The highest per capita resource recovery for standard reporting material only (compared to states that report this figure), at 1,790 kg/p/yr, and
- The lowest per capita landfill disposal rate at 480 kg/p/yr.

However, SA again reported high overall per capita waste generation rates. In 2017-18 SA had the highest waste generation in Australia at 3,092 kg/p/yr and although this has reduced to 2,961 kg/p/yr, it remains the highest of all states. Note that comparisons with other states should be interpreted with caution given the data is from different years and there are various methods for reporting the results depending on the state.

Figure 2.12 **Comparison of reported per capita (kg/person/yr) resource recovery and landfill disposal and recovery (%) by state or territory.** These figures are based on the latest currently available data. The per capita data for resource recovery is differentiated according to Standard Reporting Materials and Separately Reported Materials & Clean Fill scopes in line with the national reporting guidelines (Dept Environment and Energy, 2015). Note: Reported recovery for ACT does not show a breakdown between Standard Reporting Materials and Separately Reported Materials & Clean Fill, and thus, these quantities are aggregated in the Recycling category of reported per capita data.



5 Estimated waste generation, recycling and landfill disposal were based on most current and best available data for each State/Territory. Furthermore, not all Australian states and territories collect and report this data in conformance with the reporting guidelines (Dept Environment and Energy, 2015).
Further details explaining how SA data was benchmarked against recycling data reported by other states and territories are provided in the Methodology section of this report.

2.5 Employment in the SA Resource Recovery Sector

Table 2.15 below summarises SA employment figures overall based on data captured in the 2018-19 survey[6]. Employment numbers have remained steady since 2017-18 at 1,850 overall (**Table 2.15**). There has been a slight shift towards casual/part time/ contract work (additional employment unable to be converted to FTE), from 174 in 2017-18 to 212 in 2018-19. Please note this is a sub-set of total employment in the SA's waste and resource recovery industry which is estimated at 4,800 people across a wide spectrum of jobs (direct and indirect).

Survey respondents were also asked to provide data on annual sales revenue for the 2018-19 financial year. In total, the annual revenue is estimated at $622 million, a decrease from $662 million in 2017-18. This is likely to be an underestimation of the value of the industry due to the limited number of responses[7].

Table 2.15 **2018-19 Recycling Activity results of FTEs in SA associated with material collection, resource recovery and/or recycling (including comparison with 2017-18).** Note that is a sub-set of employment in the SA industry, with data from 73 organisations used in the 2018-19 results (28 of these were from 2017-18). It also does not include indirect employment.

Year	2018-19	2017-18
Employment type	Number	Number
Full time Equivalent (FTE)	1,638	1,657
Additional employment, unable to be converted to FTE	212	174
Total	**1,850**	**1,831**

The 2018-19 recycling activity survey also asked respondents to report on employment classifications. These are included in **Table 2.16** below. It should be noted that these values do not equate to **Table 2.15** figures as respondents did not necessarily ensure these sums matched or did not complete both components of the survey. Where possible this was explored and clarified with respondents. As can be seen in **Table 2.16**, the majority of FTEs in the resource recovery sector reported by respondents were machine operators (28%), followed by unskilled employees (24%).

Table 2.16 **2018-19 Recycling Activity results of FTEs by employment classification in SA associated with material collection, resource recovery and/or recycling (including comparison with 2017-18).** Note that is a sub-set of employment in the SA industry and that sums may not equate due to rounding.

Year	2018-19	Proportion
Employment type	Number	%
Unskilled	285	24%
Administration	160	14%
Construction /design	5	0.4%
Driver	153	13%
Machinery operator	328	28%
Technical support	40	3%
Sales/ marketing	52	4%
Supervisor	102	9%
Other	49	4%
Total	**1,173**	**100%**

6 Not all participating organisations provided a response to this question. For Table 2.15, 45 responses were received, and an additional 28 responses were used from 2017-18. This figure is an underestimate of the entire industry in South Australia, as not all waste, recycling and resource recovery organisations were surveyed and of those that were, not all provided a response. In addition, the data was obtained through survey responses only, and more comprehensive figures could be found through further investigations by Green Industries SA.

7 In total, data from 39 organisations was used. Of these, 25 organisations provided data in 2018-19 and the remaining 14 were from organisations that provided data in previous years.

03 Material Resource Recovery (Activity) Reports

At a glance:

- This section presents the key findings from analysis of 2018-19 Recycling Activity Survey data by material type. These resource recovery reports are presented according to traditionally accepted material sectors as listed below, which align with the national reporting guidelines (Dept Environment and Energy, 2015). Where relevant, the reports differentiate between resource recovery for material recovery and energy recovery.

1. **Masonry [refer pg. 40 of this report]**
   - Asphalt
   - Bricks
   - Concrete
   - Plasterboard
   - Clay, Fines, Rubble & Soil
   - Clay, Fines, Rubble & Soil-Intermediate Waste Soil
2. **Metals [refer pg. 44]**
   - Steel or Ferrous Metals
   - Aluminium
   - Non-ferrous Metals (exc. Aluminium)
3. **Organics [refer pg. 48]**
   - Food Organics
   - Garden Organics
   - Timber
   - Other Organics
4. **Cardboard & Paper [refer pg. 52]**
   - Cardboard and Waxed Cardboard
   - Liquid Paperboard
   - Magazines & Newsprint
   - Printing & Writing Paper
5. **Plastics [refer pg. 56]**
   - Polyethylene Terephthalate (PET)
   - High Density Polyethylene (HDPE)
   - Polyvinyl Chloride (PVC)
   - Low Density Polyethylene (LDPE)
   - Polypropylene (PP)
   - Polystyrene (PS)
   - Mixed &/or Other Plastics (MIX)
6. **Glass [refer pg. 60]**
7. **Other Materials [refer pg. 62]**
   - Fly Ash
   - Foundry Sands
   - Leather & Textiles
   - Tyres & Rubber

- This data enables us to measure the performance of South Australia against waste diversion goals and targets in South Australia's Waste Strategy 2015-20.

3.1 Masonry

Highlights:

- Masonry material recovery decreased by 3% from 2017-18 tonnes, from 2.7 million tonnes to 2.6 million tonnes in 2018-19.
- Large volumes were generated from state government infrastructure projects, particularly the Northern Connector and Gateway South projects.
- All this material was re-processed in SA.
- There is growing demand for rubble with recycled material content.
- Volumes of masonry material recovered are project dependent. The completion of some major SA infrastructure projects and a push towards re-using materials directly on site (rather than recycling) could lower recovery of Masonry volumes in future periods.

Masonry recovery decreased in the 2018-19 financial year (2.6 million tonnes) by 3% from the 2017-18 financial year (2.7 million tonnes). Major State Government projects continued to generate large volumes of Masonry re-processing, for example the Northern Connector and Gateway South projects.

Most of SA's recovered Masonry materials continues to be Total Clay, Fines, Rubble & Soil (Clean Fill and Intermediate Waste Soil[8], at 47%), followed by Concrete which increased as a proportion, from 36% to 40% (see **Figure 3.1** on page 41).

The completion of the Torrens to Torrens project and a push towards re-use of soils directly on site has led to a slight reduction in volumes of recovered Clay, Fines, Rubble & Soil (from 1.34 million tonnes in 2017-18 to 1.22 million tonnes in 2018-19).

8 Intermediate Waste Soil (IWS) is a soil classification used in SA (South Australia EPA, 2009) (Draft Waste Classification Guidelines) to indicate 'minor contamination' (as opposed to major contamination), which separates this soil type from Waste Derived Fill (WDF) (commonly known as 'Clean Fill').

Table 3.1 **Quantity (tonnes) of Masonry material recovered in SA during 2018-19, including estimated reporting error (in tonnes & %).**
This table includes separate reporting of Clean Fill and Intermediate Waste Soil in the total Clay, Fines, Rubble & Soils.

Item	Net Recovery[1]	Reporting Error	
	tonnes	tonnes	%
Asphalt	269,000	52,000	19%
Bricks	74,000	5,000	7%
Concrete	1,049,000	94,000	9%
Plasterboard	1,100	140	13%
Total Clay, Fines, Rubble & Soil[2]	1,215,000	366,000	30%
Clay, Fines, Rubble & Soil – Clean Fill[2]	937,000	331,000	35%
Clay, Fines, Rubble & Soil – Intermediate Waste Soil[2]	278,000	35,000	13%
Total	**2,608,100**	**517,000**	**20%**

1 Net recovery excludes re-processing losses.

2 The 'Clay, Fines, Rubble & Soil' material category does not include stockpiled material where reuse may not occur and also only relates to material that has been diverted from landfill

Figure 3.1 **Changes in percent composition of recovered Masonry (by weight), SA, between 2017-18 and 2018-19.**

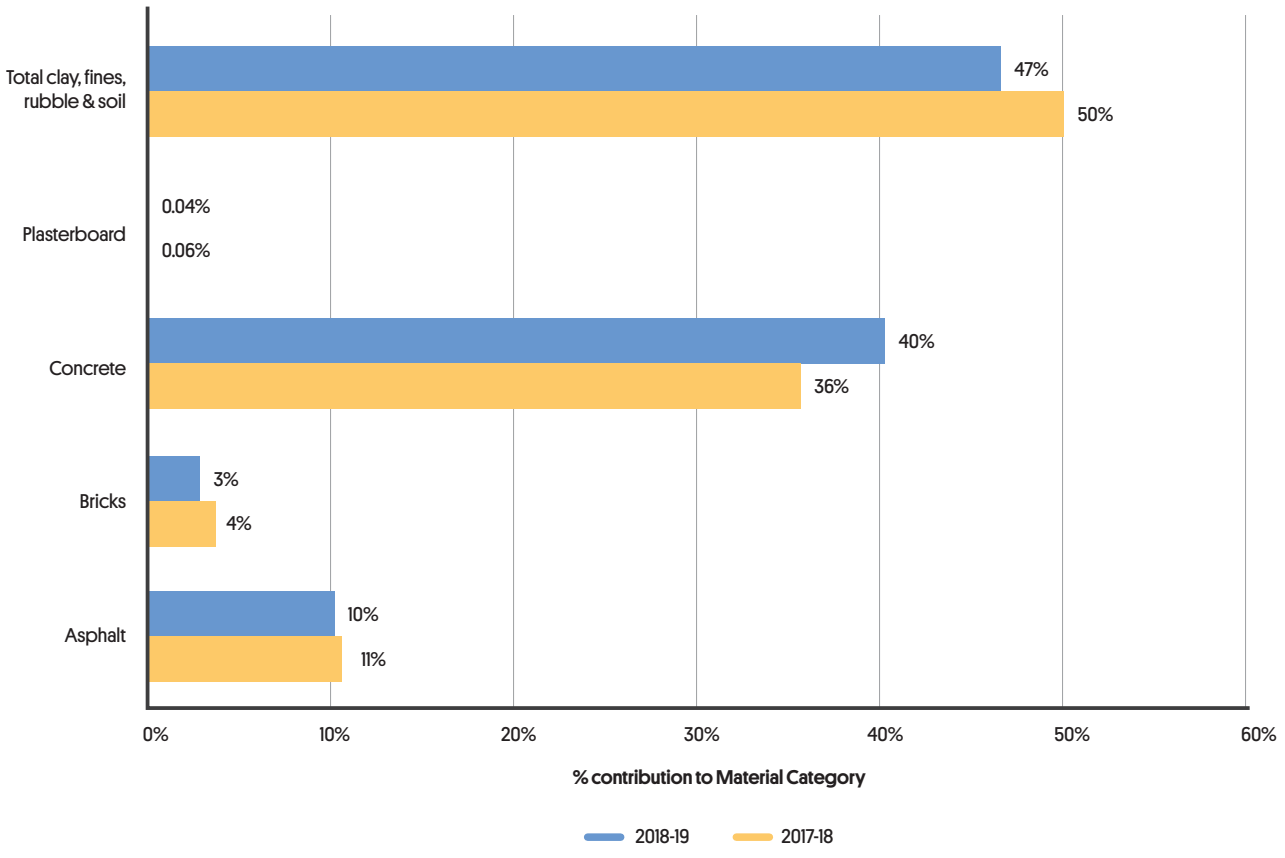


Figure 3.2 **Changes in reported recovered Masonry quantities since 2003-04 – Concrete and Total Clay, Fines, Rubble & Soil.**
Concrete increased for another year, while Total Clay, Fines, Rubble and Soil decreased for the second year in a row.

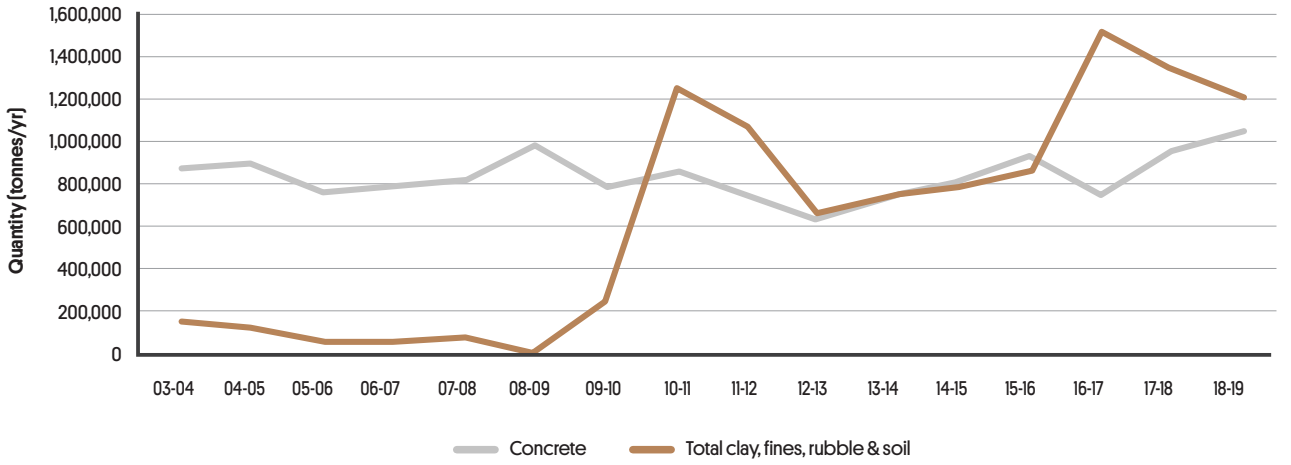
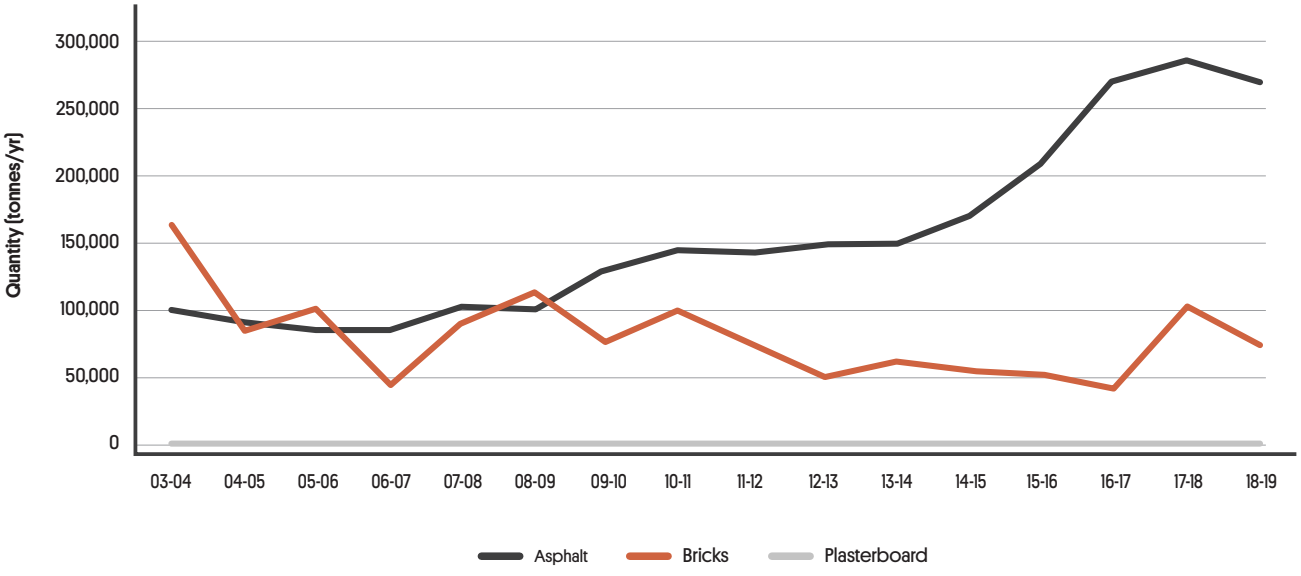


Figure 3.3 **Changes in reported recovered Masonry quantities since 2003-04 – Asphalt, Bricks and Plasterboard.**
All three materials in this Figure decreased in the 2018-19 financial year.



C&D continues to contribute most (99%) to recovered Masonry materials with only small quantities reported from Municipal and C&I sources. The majority of Masonry was generated in Metropolitan regions (98%), which is in line with last year. **Table 3.2** also shows the re-processing location, which is once again 100% in SA.

Table 3.2 **Sector and geographical origins and re-processing locations for recovered Masonry in SA in 2018-19.**
The metropolitan region and C&D sector provided the source of most recovered Masonry for SA, which was locally re-processed.

Item	Sector Origin (%)			Geographical Origin (%)		Re-processing Location (%)		
	Municipal	C&I	C&D	Metro	Regional	SA	Interstate	Overseas
Asphalt	0%	0.5%	99.5%	95%	5%	100%	0%	0%
Bricks	0.4%	1.8%	97.8%	93%	7%	100%	0%	0%
Concrete	0.7%	0.6%	98.7%	97%	3%	100%	0%	0%
Plasterboard	7.6%	1%	91.3%	90%	10%	100%	0%	0%
Total Clay, Fines Rubble & Soil	0.3%	1%	98.7%	99%	1%	100%	0%	0%
Clay, fines, rubble & soil - IWS (separately reported)	0%	0.2%	99.8%	100%	0%	100%	0%	0%
Total clay, fines, rubble & soil	0.2%	0.9%	98.9%	99%	1%	100%	0%	0%
Total	**0.4%**	**0.7%**	**98.9%**	**98%**	**2%**	**100%**	**0%**	**0%**

The outlook for recovery of Masonry materials is positive from the demand side, however supply of recovered Masonry materials is expected to decline over time as projects reach completion.

- As volumes are project dependent, the recovery of this material is expected to decline as civil projects are completed.
- Masonry materials available for recovery are also expected to reduce over time due to other factors mentioned in the 2017-18 report, including changing material composition of buildings, with demolished houses getting lighter per unit, and less waste generated in asphalt profiling, plus re-use of soils on site.
- The commercial viability of Masonry materials reprocessing is strengthened by the SA Solid Waste Levy. The Metropolitan Levy was $76/tonne at the start of 2017-18 and increased to $100/tonne in June 2018, with further increases in the 2019-20 financial year. Recovery of C&D materials is more cost-effective than sending the material to landfill.
- The demand for recycled Masonry material is expected to remain strong in SA. Industry reported an increase in demand for rubble containing recycled material content.

3.2 Metals

Highlights:

- The recovery of Metals in 2018-19 was 329,000 tonnes (slightly down from 332,000 tonnes in 2017-18).
- The quantity of Steel decreased due to slightly lower scrap prices, as well as international trade tensions in the financial year.
- Completion of a facility that processes Non-Ferrous Metals led to an increase in importation of Non-Ferrous Metals from interstate. However, Non-Ferrous Metals from SA sources decreased slightly.
- The reduction in Metals overall was insignificant and far smaller than anticipated. Large scale demolition jobs that resulted in high volumes of Steel helped SA achieve the results reported. Industry also reported that SA performed well compared to other states, although recovery rates are not anticipated to remain this high.
- Markets for recovered Metals are expected to decline slightly in the 2019-20 financial year due to further decreases in prices of scrap, and the slowing of international trade due to tensions.

An estimated 297,000 tonnes of Steel (90% of total Metals), 14,000 tonnes of Aluminium and 18,000 tonnes of Non-ferrous Metals were recovered in 2018-19 (**Table 3.3**). In total, there was 329,000 tonnes of recovered Metals from SA. This is down by 3,000 tonnes from 2017-18 levels.

The reduction of Steel volumes by 1% (or 2,000 tonnes) from 2017-18 is driven by slightly lower prices as well as international trade tensions (US, China and Turkey in particular), slowing international trading. Overall, this change is insignificant, and industry reported a similar steel trading year to the 2017-18 financial year, which is a stronger result than some other states.

Aluminium recovery was similar to 2017-18, while Non-ferrous Metals decreased by 5% (or 1,000 tonnes). New SA infrastructure that processes Non-ferrous Metals led to an increase in interstate imports of this material, however the volume from SA processed decreased. This may be due to having additional supply of Non-ferrous Metals from interstate.

Table 3.3 **Quantity of Metals (tonnes) recovered in SA during 2018-19, including estimated reporting error (tonnes & %).** Steel remained the dominant contributor to recovered Metals in SA.

Item	Net Recovery[1]	Reporting Error	
	tonnes	tonnes	%
Steel	297,000	21,000	7%
Aluminium	14,000	1,000	7%
Non-ferrous Metals	18,000	3,000	17%
Total	**329,000**	**25,000**	**8%**

1 Net recovery excludes re-processing losses

Figure 3.4 **Changes in reported recovered metal quantities since 2003-04 – Steel.**
Although recovery fell from 2011-12 to 2015-16, some of these losses were regained in the last three financial years.

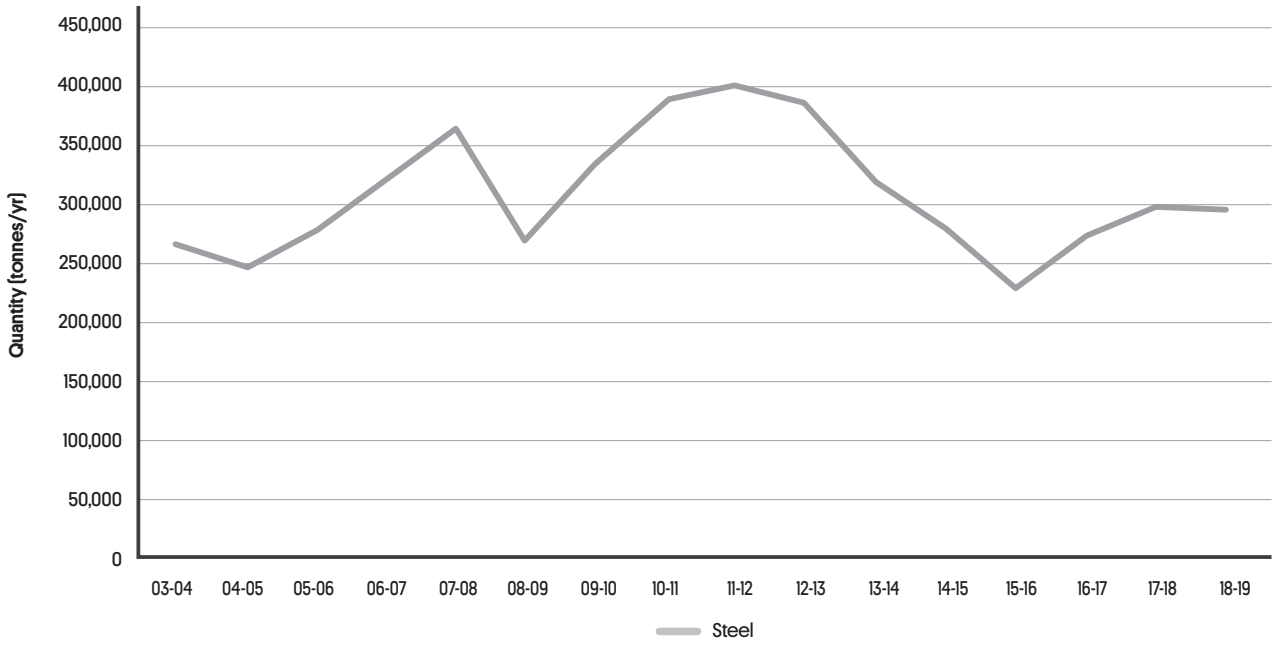
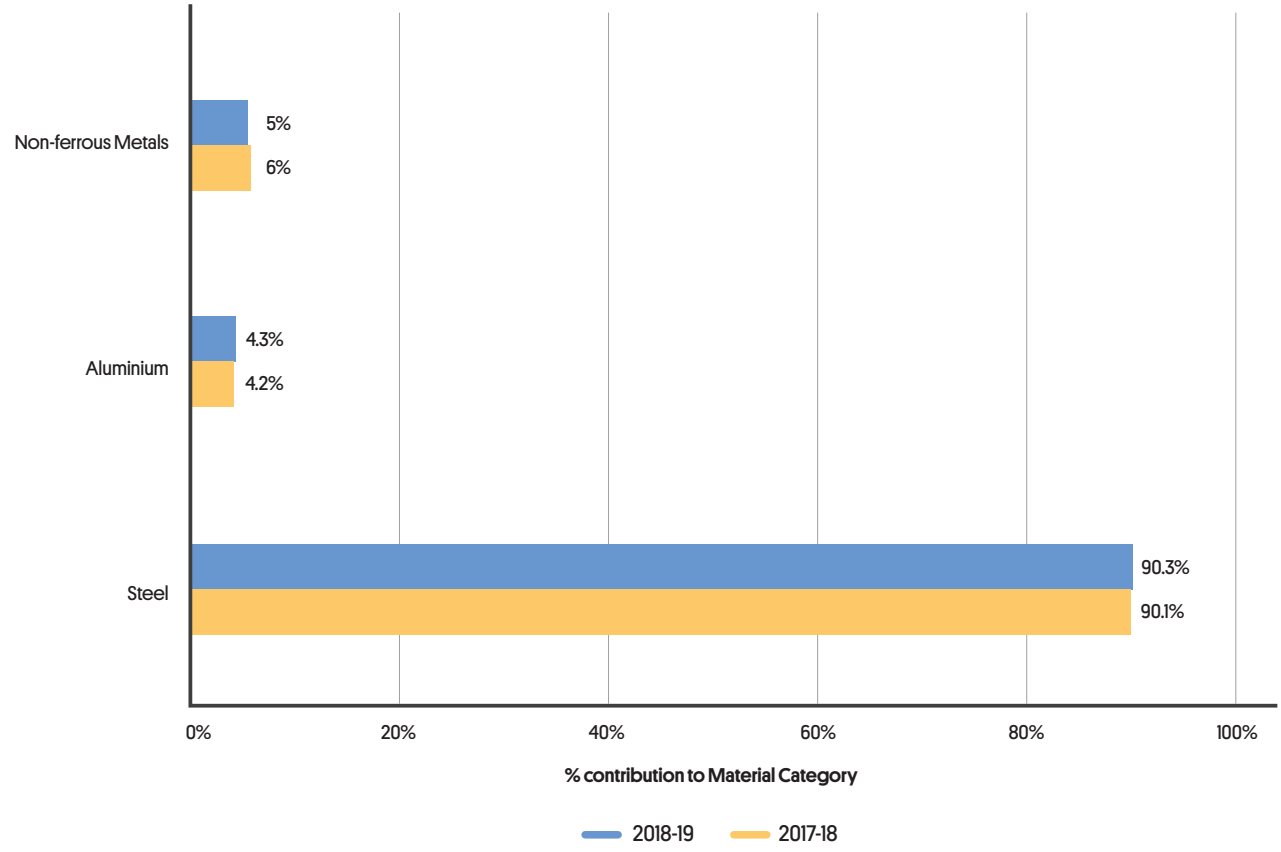


Figure 3.5 **Changes in reported recovered metal quantities since 2003-04 – Aluminium and Non-ferrous Metals.**
Recovery of Non-ferrous has decreased slightly and Aluminium remained the same from 2017-18.

Figure 3.6 **Changes in percent composition of recovered Metals (by weight), SA, between 2017-18 and 2018-19.**
Steel composition increased slightly to 90.3% while Aluminium remained the same and Non-ferrous decreased to 5%.



Steel continued to constitute the majority (90%) of Metal recovery with Non-ferrous Metals 5% and Aluminium 4% of all recovered Metals (**Figure 3.6** above).

An estimated 51% of Metal volumes were sourced from the C&I sector (**Table 3.4** on page 47), with remaining volumes sourced from the MSW sector (17%) and C&D sector (32%). The proportion from the C&D sector increased this year from 16% in 2017-18 due to recovered Steel from a demolition job in regional SA, which also impacted the proportion of regional tonnes (now 27% overall, previously 19%). In addition to the tonnes reported below, SA captured or re-processed 27,000 tonnes from interstate (39% from Vic, 33% from NT, 26% from NSW and 2% from Qld, see **Table 2.8**).

Only 6% of Metals were re-processed locally in SA, with no Aluminium processed here (last year 9% was reported - this reduction is due to improved reporting). Interstate re-processing increased by 9 percentage points to 42% due to increased demand for recovered metals (mostly in Victoria). This led to a decrease in Metals sent overseas (from 62% in 2017-18 to 51% in 2018-19).

Table 3.4 **Sector and geographical origins and re-processing locations for recovered Metals in SA during 2018-19.** C&I was the major sector origin for recovered Metals. Reprocessing in SA has reduced with most recovered Metals sent interstate or overseas. Note that sums may not equate due to rounding.

Item	Sector Origin (%)			Geographical Origin (%)		Re-processing Location (%)		
	Municipal	C&I	C&D	Metro	Regional	SA	Interstate	Overseas
Steel	16%	50%	34%	71%	29%	6%	45%	49%
Aluminium	40%	55%	6%	82%	18%	0%	12%	88%
Non-ferrous Metals	27%	58%	15%	84%	16%	5%	23%	71%
Total	**17%**	**51%**	**32%**	**73%**	**27%**	**6%**	**42%**	**51%**

In summary, although the last survey anticipated declines in scrap metal from reduction in the manufacturing sector in SA, recovered Metals tonnes remained similar to those in 2017-18. Reports from industry indicated SA performed well compared to other states, and C&D works helped keep re-processed tonnes in line with last year. Decreases in upcoming years are anticipated due to reduced price for scrap metal and trade tensions overseas, as well as Britain leaving the European Union.

SA has a 'floc' levy for the residual resulting from re-processing of scrap steel which is less than the landfill levy. This increased after the reporting period, from $62 per tonne in 2018-19 to $70 per tonne in 2019-20. This will increase operating costs involved with reprocessing scrap steel. Business ventures planned in the state (for example manufacturing of electric cars) may help the Metals recycling industry.

3.3 Organics

Highlights:

- Recovered Organics fell for the second year in a row, from 1.1 million tonnes in 2017-18 to 1.04 million tonnes in 2018-19.
- This decrease was due to a fall in Meat Rendering due to the closure of a major facility and a reduction in Timber processing.
- Increases occurred in commercial food collection, miscellaneous organics and bio solids, as well as in energy recovered organics for both Timber and Other Organics.
- Most Organics recovered in SA (98%) are locally reprocessed.
- The outlook for recovered organics remains positive. Farmers are increasingly interested in soil health, which is driving higher demand for some recycled organics products.
- Challenges for re-processors include meeting demand, contamination of incoming tonnes and continuing to improve education on the benefits of products made from recovered Organics.

The total quantity of recovered Organics in SA decreased slightly from 1.1 million tonnes in 2017-18 to 1.04 million tonnes in 2018-19 (see **Table 3.5** on page 49). This is a decrease of 5% from 2017-18 (59,000 tonnes).

Figures 3.7, 3.8 and **3.9** (pages 49 and 50), which track the performance of each Organics material stream over time, demonstrate that the decrease this year is from Timber and Meat Rendering, down by 10% and 15% respectively. According to industry sources, Timber fluctuations year by year are expected, but the drop in Meat Rendering volumes is due to the closure of a facility and operations moving to Victoria.

Miscellaneous Organics increased 5% (**Figure 3.9** on page 50) which included organics recovered for energy, while Waste Grease & Fat decreased 18%. Some of the organics previously labelled Waste Grease & Fat may have been re-classified as Miscellaneous Organics by industry. The net change from 2017-18 to 2018-19 for Other Organics was 34,000 tonnes down, predominately due to Meat Rendering.

Food Organics (**Figure 3.8** on page 49) volumes increased for another year, up 32% or 2,900 tonnes from 2017-18. Larger amounts of food are recovered from C&I sources. According to industry, an increase in landfill levy assisted in driving up demand for this service.

Food waste recovered from municipal sources is included within the Garden Organics volumes. This material remained consistent with 2017-18 (257,000 tonnes). Most volumes of Food Organics in SA (estimated at more than 150,000 tonnes) are still disposed to landfill.

Bio-Solids increased due to high demand from farmers for this recovered product.

Table 3.5 includes energy recovered tonnes. Comparisons to last year show there were increases in Timber and Other Organics used for energy recovery. Licenced capacity increased at an energy from waste facility that accepts mixed Timber and Plastics, and a separate facility has begun timber pyrolysis trials.

During 2018-19, an additional 68,000 tonnes of Organics was imported to SA for resource recovery (not included in **Table 3.5**). All of this material originated from Victoria and was lower than last year due to a push for Victoria to process its own organics generated at kerbside.

Table 3.5

Quantity of Net Organics (tonnes) recovered in SA during 2018-19, including estimated reporting error (tonnes & %). Use of Timber and Miscellaneous Organics for energy production in SA is presented in this table by columns to show recovery for material and energy recovery.

Item	Material Recovery	Energy Recovery	Net Recovery[1,2]	Reporting Error	
	tonnes	tonnes	tonnes	tonnes	%
Food Organics	12,000	-	12,000	2,000	17%
Garden Organics	257,000	-	257,000	39,000	15%
Timber	152,000	90,000	242,000	38,000	16%
Other Organics	508,000	21,000	529,000	81,000	15%
Meat Rendering	196,000	-	196,000	35,000	18%
Waste Grease & Fat	90,000	-	90,000	14,000	13%
Waste Sludge & Bio-solids	51,000	-	51,000	11,000	22%
Miscellaneous Organics	171,000	21,000	192,000	21,000	12%
Total	**929,000**	**111,000**	**1,040,000**	**160,000**	**15%**

1 Net recovery excludes re-processing losses

2 Net recovery = Material Recovery + Energy Recovery

Figure 3.7

Changes in reported recovered organics quantities since 2003-04, not including Food Organics.

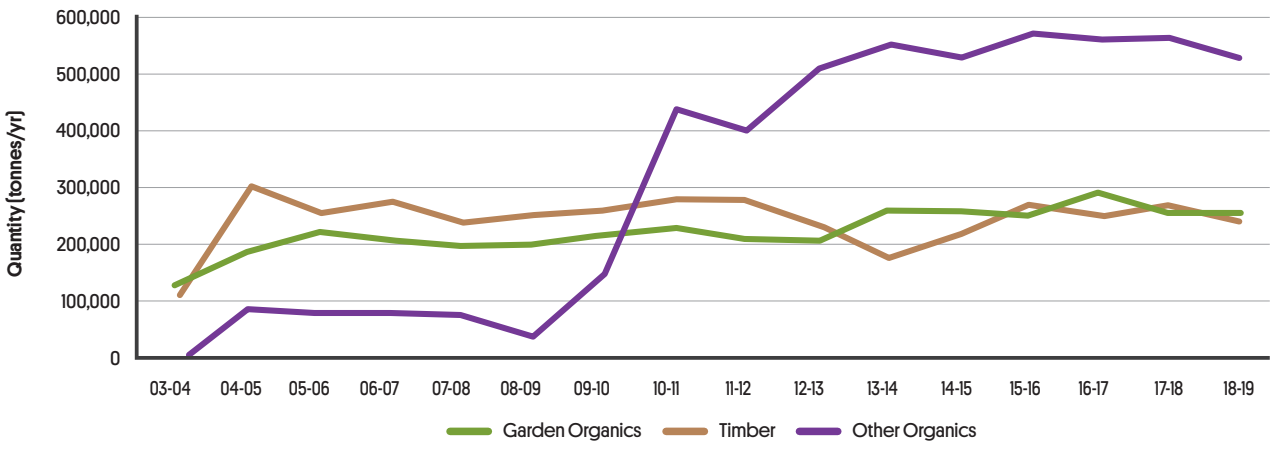


Figure 3.8

Changes in reported recovered organics quantities since 2003-04 – Food Organics. Food Organics has continued to increase since 2013-14.

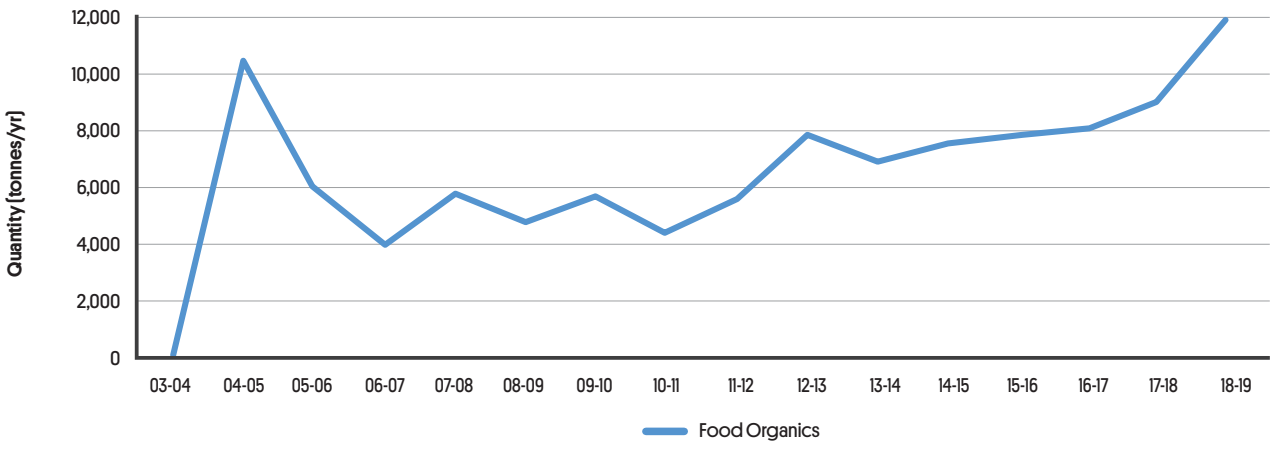


Figure 3.9

Changes in reported recovered Other Organics quantities since this data became available (2009-10).
Meat Rendering reduced significantly, and Waste Grease & Fat reduced again, while Waste Sludge & Bio-Solids and Miscellaneous Organics have increased.

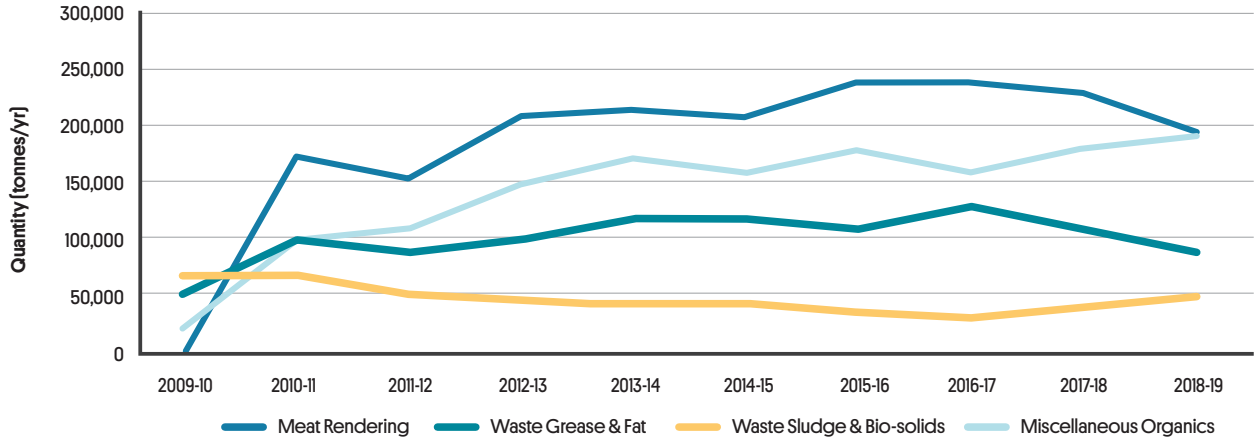
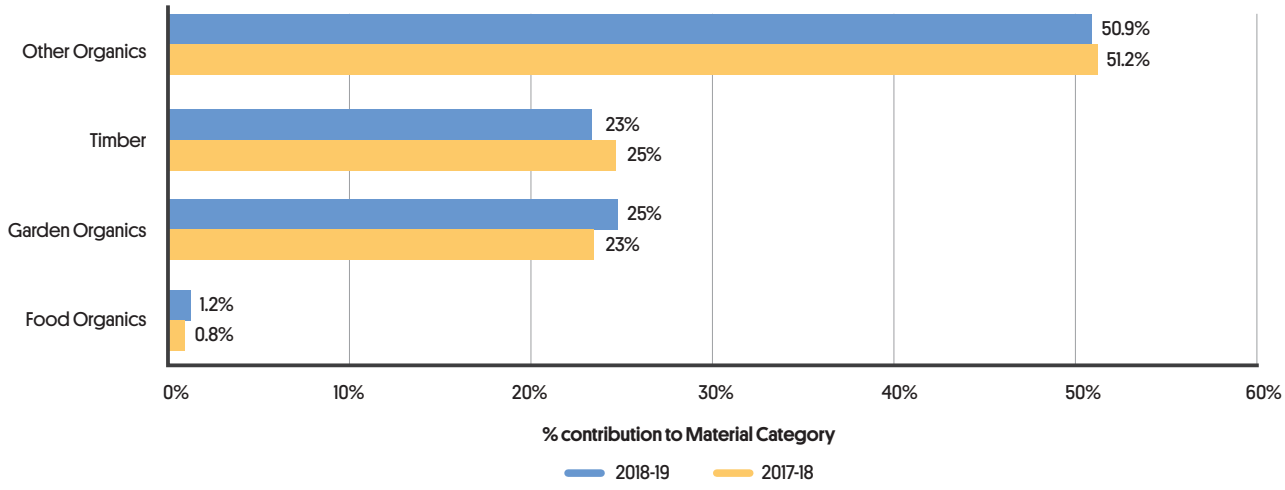


Figure 3.10

Changes in percent composition of recovered Organics (by weight), SA, between 2017-18 and 2018-19.
Food Organics increased its contribution to this material as well as Garden Organics, although this increase was due to a reduction in tonnes of Timber and Other Organics, as Garden Organics tonnes remained the same.



Other Organics (Meat Rendering, Grease Trap, Bio-solids, etc.) continued to constitute the majority (51%) of Organics recovery (**Figure 3.10** on page 50). Food organics increased in the proportion of all Organics for another year. Timber and Garden Organics were also significant contributors, making up 23% and 25% respectively of reported Organics recovery.

Table 3.6 below demonstrates the sector, geographical origin and re-processing location of the recovered Organics. The majority (73%) of recovered Organics originated from C&I sources. There was a slight increase in the proportion of Metro tonnes (from 57% in 2017-18 to 64% in 2018-19).

Small quantities (8%) were sourced from the C&D sector, which were the Timber and Garden Organics streams.

The majority (98%) of Organics was re-processed in SA, with a small percentage sent interstate for reprocessing.

Table 3.6 **Sector and geographical origins and re-processing locations for recovered organics in SA during 2018-19.**
C&I is still the major source sector for organics and regional areas contribute substantially to resource recovery. Nearly all re-processing of waste organics occurs in SA. Note percentages may not sum to 100% due to rounding.

Item	Sector Origin (%)			Geographical Origin (%)		Re-processing Location (%)		
	MSW	C&I	C&D	Metro	Regional	SA	Interstate	Overseas
Food Organics	0%	100%	0%	90%	10%	100%	0%	0%
Garden Organics	74%	21%	5%	89%	11%	100%	0%	0%
Timber	0.3%	69.3%	30.3%	66%	34%	100%	0%	0%
Other Organics	0%	99.9%	0.1%	51%	49%	96%	4%	0%
Total	**18%**	**73%**	**8%**	**64%**	**36%**	**98%**	**2%**	**0%**

The outlook for Organics recovery remains positive:

- Re-processors continue to report that demand for end products often exceeds supply. Farmers are increasingly interested in soil health, which is driving higher demand for some recycled organics products.
- Food Organics recovery continues to increase. However, there are still significant volumes of Food Organics ending up in SA's landfills that can be recovered.
- Quantities of kerbside collected organics from interstate have declined and may continue to decrease as Victoria increases the number of processing facilities and encourages local re-processing of this material.
- Several investments in infrastructure within SA for organics processing are currently in their early stages such as infrastructure to de-package organics, make granulated fertiliser and biochar.

The competition for feedstock remains high. An ongoing challenge for some re-processors is contamination of incoming organics. Industry also highlighted that ongoing education as to the benefit of organics recycling is important and can always be improved. The recent increases in landfill levy should help further increase organics recovery.

3.4 Cardboard & Paper

Highlights:

- In 2018-19 overall quantities of recovered Cardboard & Paper decreased by 3% from 2017-18 due to the ongoing impact of the National China Sword Policy.
- While the value of mixed Cardboard & Paper dropped, the net value of Cardboard & Paper only decreased slightly from 2017-18 as the price of clean cardboard remained relatively high.
- Nearly all (99%) of Cardboard & Paper continues to be sent interstate or overseas for re-processing.
- SA re-processors continue to respond to China Sword by improving the quality of recovered Cardboard & Paper via infrastructure upgrades and additional separation measures.

Cardboard & Paper recovered in SA in 2018-19 (228,900 tonnes) reduced 3% from 2017-18 values (**Table 3.7** below).

The overall decrease is due to a 1% fall in Cardboard & Waxed Cardboard, reduced recovery of Liquid Paperboard (LPB, from 1,200 tonnes to 800 tonnes) and Magazines & Newsprint (from 62,000 tonnes to 54,100 tonnes, **Figure 3.11** and **3.12** on page 53). Demand and the international price for recovered LPB is low and the recyclability of this product is a challenge. LPB that has the container deposit legislation (CDL) applied to it is the main source of recovered LBP. Given lower contamination rate requirements from overseas, lower grade Cardboard & Waxed Cardboard and Magazines & Newsprint are not captured as frequently to be reprocessed. Printing & Writing Paper increased (up 27%) due to expanded reporting by industry, rather than actual changes in volumes recovered.

During 2018-19 no Cardboard & Paper was imported into SA for resource recovery, which is consistent with previous years.

Table 3.7 **Quantity of Cardboard & Paper (tonnes) recovered in SA during 2018-19, including estimated reporting error (tonnes & %).** Cardboard & Waxed Paper and Magazines & Newsprint remained the dominant contributors in this sector.

Item	Net Recovery[1]	Reporting Error	
	tonnes	tonnes	%
Cardboard & Waxed Cardboard	160,000	6,550	4%
Liquid Paperboard	800	220	27%
Magazines & Newsprint[2]	54,100	4,320	8%
Printing & Writing Paper	14,000	1,940	14%
Total	**228,900**	**13,030**	**6%**

1 Net recovery excludes re-processing losses

2 Magazines & Newsprint includes Phone Books.

Figure 3.11

Changes in reported recovered Cardboard & Paper quantities since 2003-04 – Cardboard & Waxed Cardboard, Magazines & Newsprint and Printing & Writing Paper. Cardboard & Waxed Cardboard slightly decreased, Magazines & Newsprint decreased more substantially, and Printing & Writing Paper increased slightly (due to expanded reporting).

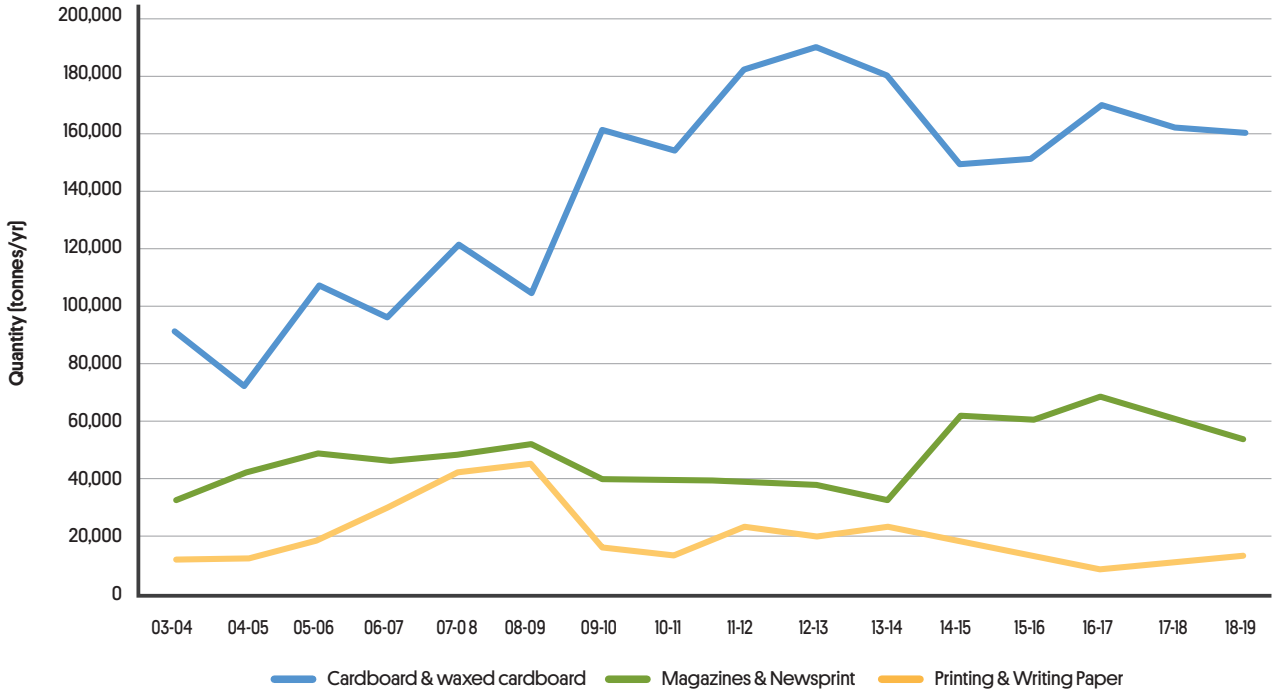


Figure 3.12

Changes in reported recovered Cardboard & Paper quantities since 2003-04 – Liquid Paperboard. Liquid Paperboard decreased from 2017-18 levels.

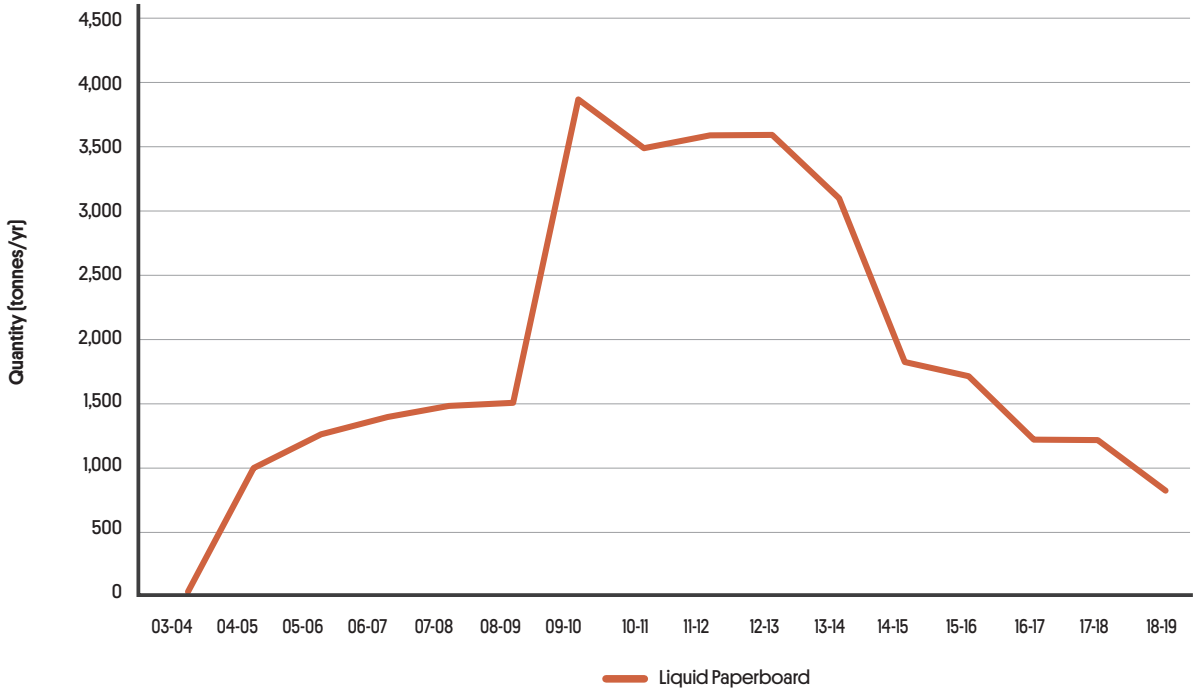
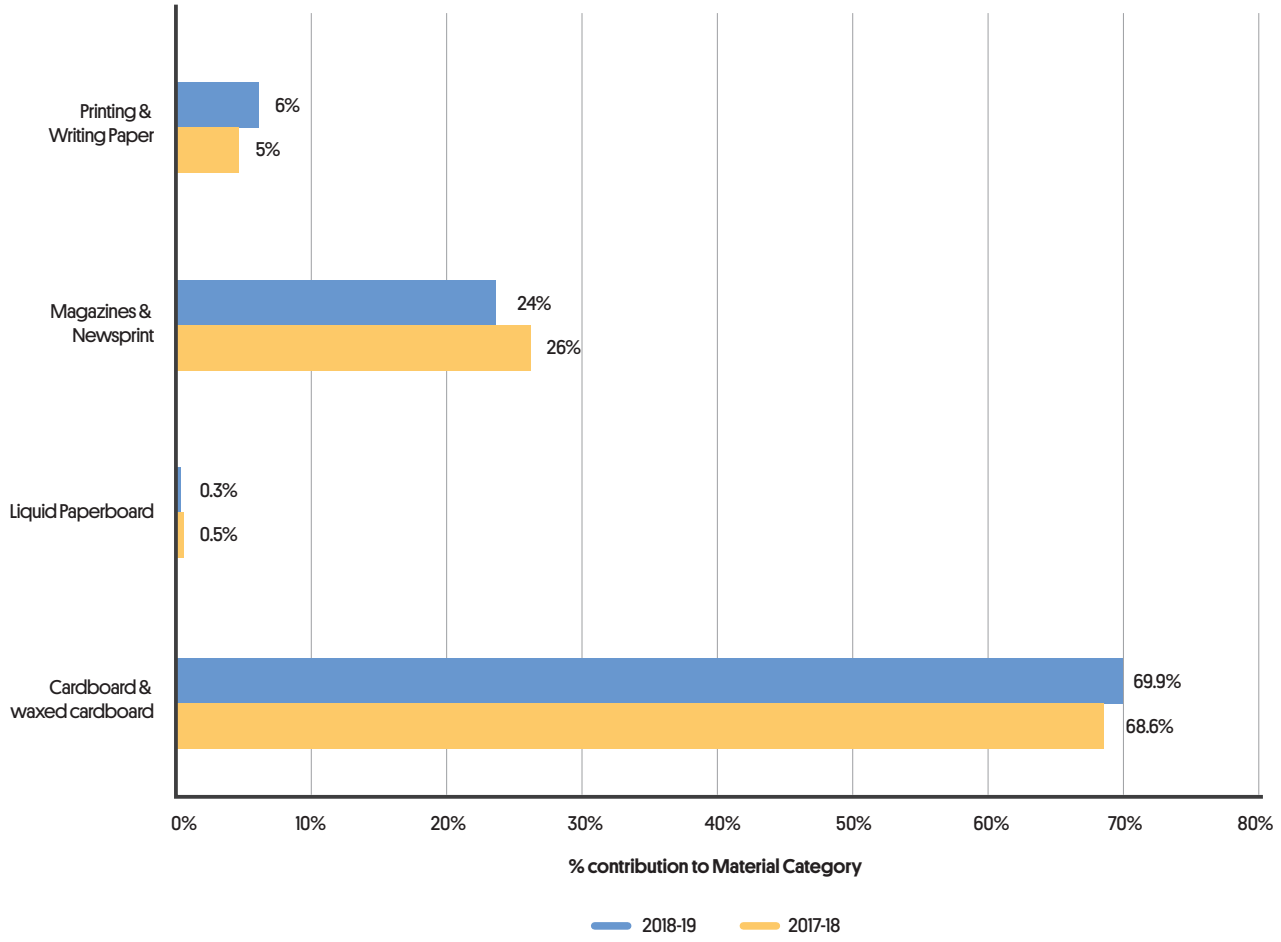


Figure 3.13

Changes in percent composition of recovered Cardboard & Paper (by weight), SA, between 2017-18 and 2018-19.
Slight increases in the percentage contribution of Printing & Writing Paper and Cardboard & Waxed Cardboard occurred while percentage contributions from others decreased.



As can be seen in **Figure 3.13** above, from 2017-18 to 2018-19 there was a slight increase in the percentage contribution of Printing & Writing Paper (from 5% to 6%) due to expanded reporting which increased the tonnes reported for this stream, and Cardboard & Waxed Cardboard (from 68.6% to 69.9%) due to a greater reduction in the recovered tonnes from the remaining streams. The percentage contributions from LPB and Magazines & Newsprint decreased due to a reduction in recovered tonnes.

Sources and destinations of recovered materials in 2018-19 are shown in **Table 3.8**. The sector origin aligns with those of 2017-18, where approximately two thirds of Cardboard & Paper is from C&I sources (driven by Cardboard & Waxed Cardboard, and Printing & Writing Paper), and approximately one third from MSW sources.

The majority of recovered Cardboard and Paper was from Metro sources (87%), and the destination was split between interstate (51%) and overseas (49%), with very small volumes remaining in SA (1%), mainly for reprocessing into kitty litter.

More Cardboard & Paper was sent overseas, due to higher prices for clean Cardboard & Waxed Cardboard, especially when able to sell into Chinese markets if contamination levels could be achieved. In addition, the closure of an interstate material recovery facility (MRF) that accepted a proportion of comingled recyclables in SA in the 2018-19 financial year resulted in material shifted to different SA MRFs. These MRFs have alternative markets including additional overseas markets for Cardboard & Paper.

Table 3.8 **Sector and geographical origins and re-processing locations for recovered Cardboard & Paper in SA during 2018-19.** C&I generated approximately two thirds while MSW generated a third of this stream, mostly in metropolitan Adelaide. 99% of materials are sent interstate and overseas for re-processing. Note that percentages may not equate to 100% due to rounding.

Item	Sector Origin (%)			Geographical Origin (%)		Re-processing Location (%)		
	MSW	C&I	C&D	Metro	Regional	SA	Interstate	Overseas
Cardboard & Waxed Cardboard	18%	82%	0.4%	89%	11%	0.02%	39%	61%
Liquid Paperboard	79%	21%	0%	86%	14%	0%	30%	70%
Magazines & Newsprint	86%	14%	0%	84%	16%	2%	76%	22%
Printing & Writing Paper	32%	68%	0%	76%	24%	0%	93%	7%
Total	**35%**	**65%**	**0.3%**	**87%**	**13%**	**1%**	**51%**	**49%**

South Australian re-processors are responding to China Sword by improving the quality of recovered Cardboard & Paper via infrastructure upgrades and additional personnel, as well as developing onshore markets for recovered materials.

The Australian Federal Government's ban on the export of non-sorted paper and cardboard would create an additional step in preparing mixed paper and cardboard for overseas sale. Australia is at capacity of recovered Cardboard & Paper. Although efforts are in place to increase onshore demand for recycled Cardboard & Paper, it is expected that international markets will still be required to ensure the ongoing recycling of these materials.

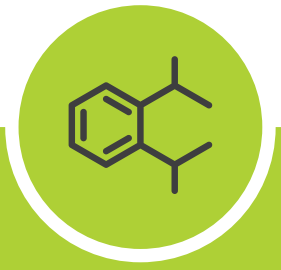
The price of mixed paper and cardboard has fallen substantially, which has led to some reductions in the Magazines & Newsprint category as the lower grade materials are not recovered. LPB also continues to remain a challenge to sell due to its low value and difficulty to recycle, and so recovery has reduced to mostly the tonnes of LBP CDL that SA produces.

The closure of SKM has changed the destination of selected Cardboard & Paper streams captured at kerbside, due to different operating models of the remaining SA MRFs that are now accepting material that previously ended up at SKM.

Future volumes of Cardboard & Paper are less predictable for a range of reasons:

- A continual fall of the price of mixed paper cardboard and clean cardboard.
- Additional volumes of cardboard packaging as online purchases increase.
- Less cardboard generated by SA's manufacturing industry with reduced activity.
- More Cardboard & Paper recovered from businesses as their recycling performance improves.
- Lower volumes of print media (e.g. Magazines and Newspapers) as digital consumption of news media continues to increase.
- The COAG ban on export of mixed Cardboard & Paper.

3.5 Plastics



Highlights:

- Plastic recovery in 2018-19 was 31,100 tonnes, similar to 2017-18.
- There was a further shift towards energy recovery in SA away from recycling. However, the re-opening of a plastics processing facility in SA part way through the financial year helped keep recycling locally and bring in additional tonnes from interstate.
- China Sword continues to greatly impact international markets for mixed plastics in particular.
- Higher grade plastics such as PET and HDPE retained their higher value.
- Local reprocessing of plastics is expected to increase given the re-opening of a local plastics reprocessing facility during the 2018-19 financial year.

The total quantity of recovered Plastics in SA in 2018-19 remained similar to last year's reported 31,100 tonnes. The proportion of Plastics sent for energy recovery increased substantially from 9,300 tonnes (30%) in 2017-18 to 14,500 tonnes (47%) in 2018-19 (**Table 3.9**). This is likely due to an increase in licenced capacity at the energy recovery facility, and a reduction in the price of recovered mixed plastics.

With the re-opening of a local plastics processing facility, SA imported additional tonnes from interstate compared to 2017-18. This is expected to increase in 2019-20 given this facility will have operated for an entire year.

Mixed &/or Other Plastics constituted the majority (55%) of reported Plastics recovery (**Figure 3.14**). HDPE (19%) and PET (16%) remain significant contributors to the overall recovery of Plastics, while LDPE has dropped from 10% to 6% in 2018-19, due to a reduction in the value of this commodity leading to commercial operators collecting fewer tonnes.

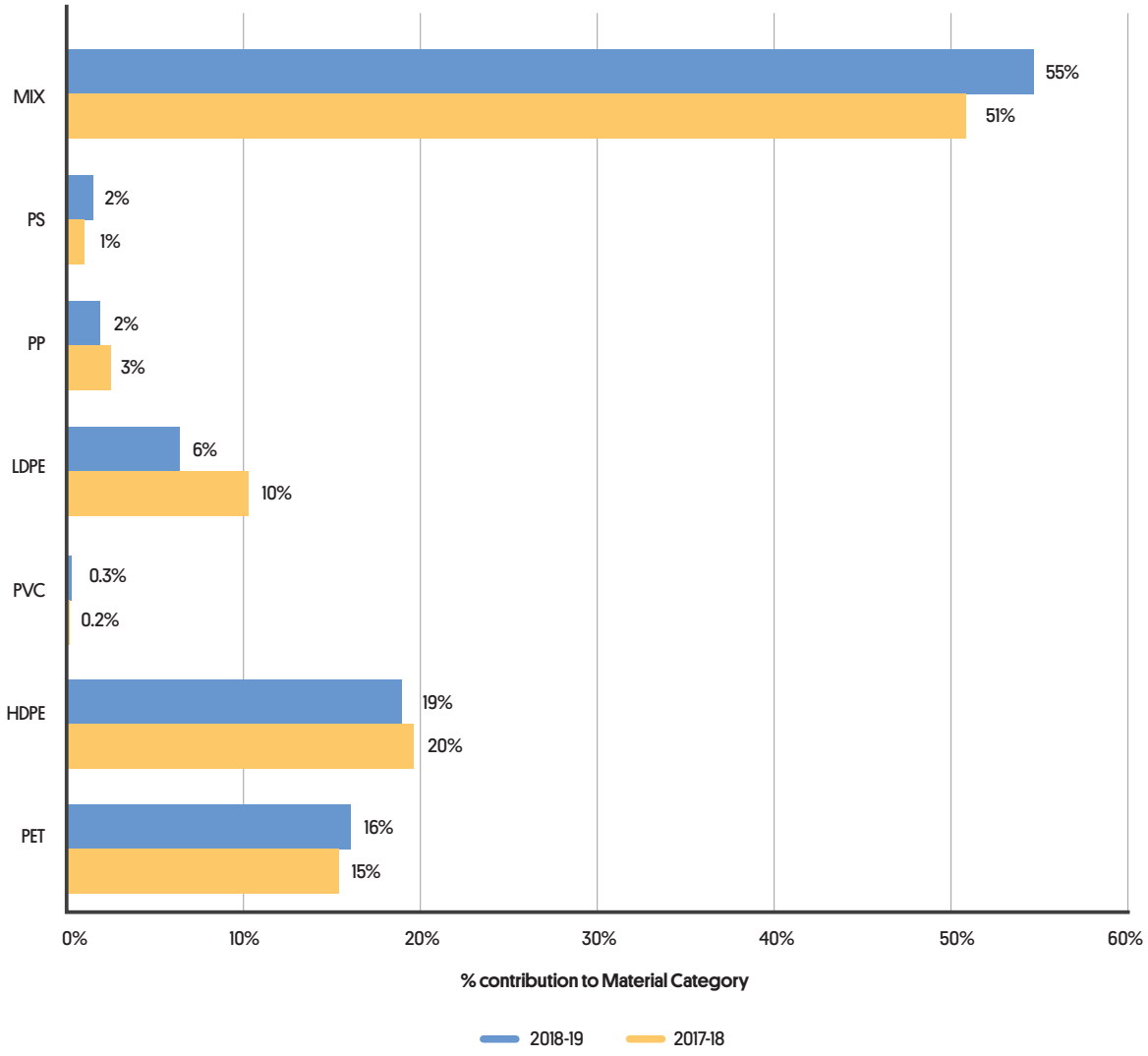
Table 3.9 **Quantity of Plastics recovered (tonnes) in SA during 2018-19, including estimated reporting error (tonnes & %).** Net resource recovery in 2018-19 remained similar to the previous year.

Item	Material Recovery	Energy Recovery	Net Recovery[1,2]	Reporting Error	
	tonnes	tonnes	tonnes	tonnes	%
Polyethylene Terephthalate (PET)	5,000		5,000	668	13%
High density Polyethylene (HDPE)	5,900		5,900	905	15%
Polyvinyl Chloride (PVC)	100		100	12	12%
Low density Polyethylene (LDPE)	2,000		2,000	788	39%
Polypropylene (PP)	600		600	119	20%
Polystyrene (PS)	500		500	74	15%
Mixed &/or Other Plastics (MIX)	2,500	14,500	17,000	1,998	12%
Total	**16,600**	**14,500**	**31,100**	**4,600**	**15%**

1 Net recovery excludes re-processing losses

2 Net recovery = Material Recovery + Energy Recovery

Figure 3.14 **Changes in percent composition of recovered Plastics (by weight), SA, between 2017-18 and 2018-19.**
Mixed Plastics remained a significant contributor to resource recovery and increased to 55% of all Plastics in 2018-19.



Mixed Plastics quantities recovered has increased in recent years, while HDPE and PET have increased more slowly (**Figure 3.15** on page 58). The trends with both LDPE and PP have shown a decline, PP since 2012-13 and LDPE since 2016-17.

PVC and PS (**Figure 3.16**) fluctuate year to year dependent on projects, particularly in the C&I sector, but both showed increases in 2018-19.

Notably, this is the first time since 2011-12 there has not been an increase in the overall recovery of Plastics (**Figure 3.17**).

Figure 3.15 **Changes in reported recovered Plastics quantities since 2003-04 – PET, HDPE, LDPE, PP and MIX.**
Mixed plastics remains a significant contributor to plastics recovery by weight and continues to increase.

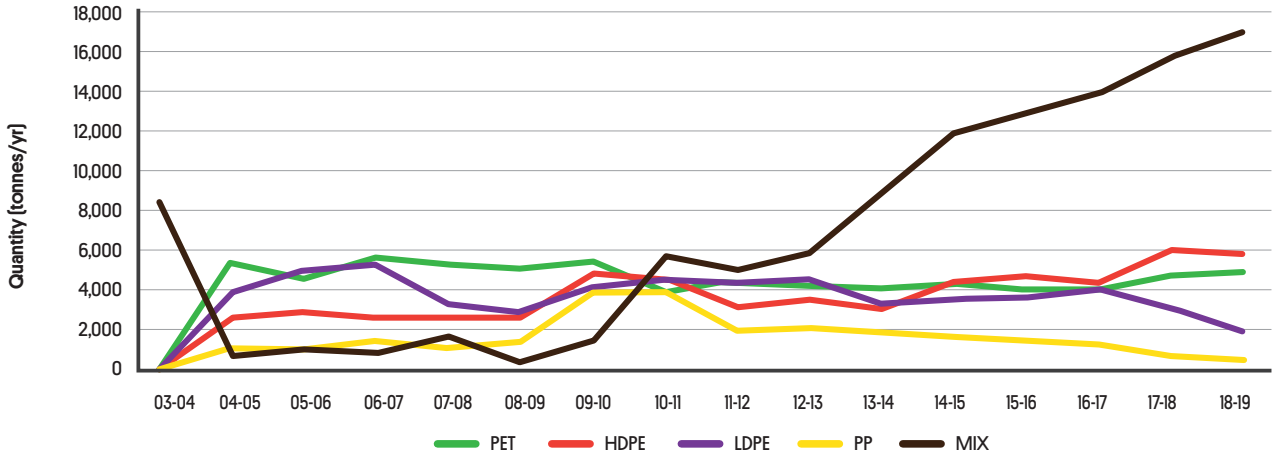


Figure 3.16 **Changes in reported recovered Plastics quantities since 2003-04 – PVC and PS.**
PVC and PS both increased in 2018-19.

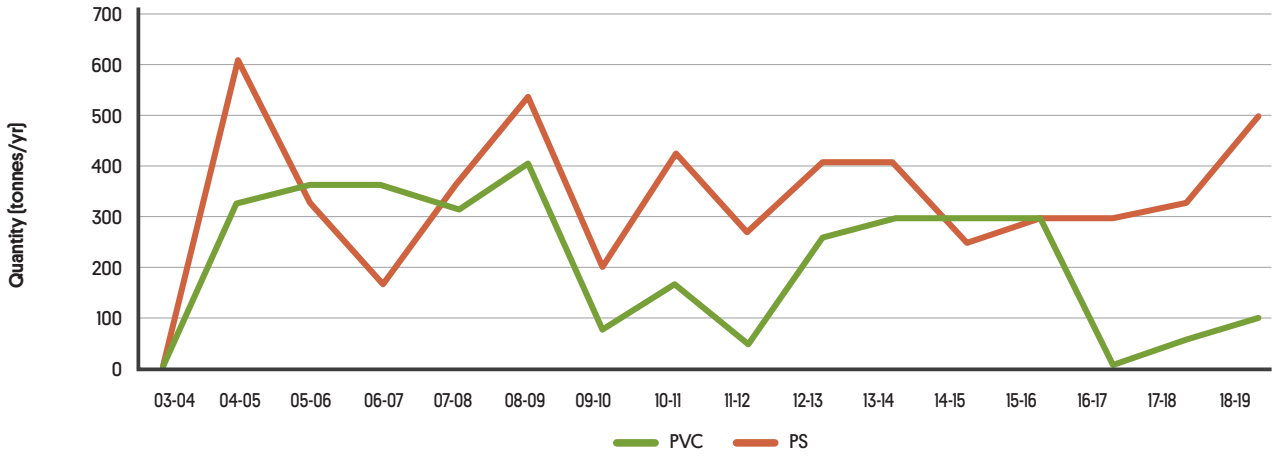
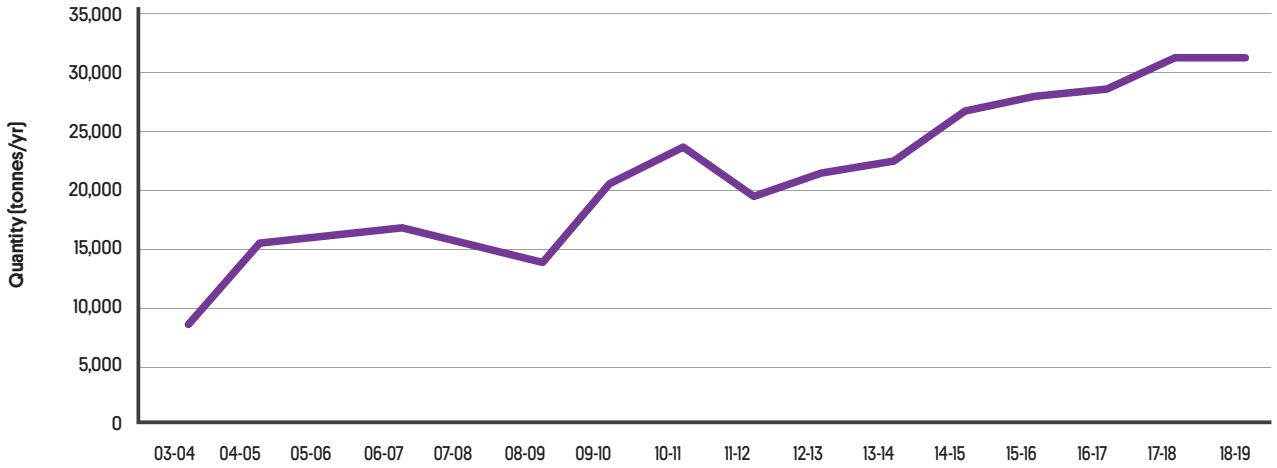


Figure 3.17 **Changes in reported recovered Plastics quantities since 2003-04 – all Plastics.**
Overall quantity of recovered plastics remained consistent with 2017-18.



Around a third of plastics is sourced from the MSW sector, 43% from the C&I sector, and 22% from the C&D sector (**Table 3.10**). All C&D plastics are mixed plastics and PS. Metropolitan Adelaide is the source of most plastics (91%). More Plastics were re-processed in SA, 51% in 2018-19, due to a significant increase in mixed plastics to energy recovery as well as the re-opening of a local plastics processing firm.

Table 3.10 **Sector and geographical origins and re-processing locations for recovered plastics in SA in 2018-19.**
Around a third of plastics is from the MSW sector, 43% from C&I and 22% from the C&D sector (all mixed plastics and PS). Metropolitan Adelaide is the source of most plastics. There has been a substantial increase in plastics re-processed in SA.

Item	Sector Origin (%)			Geographical Origin (%)		Re-processing Location (%)		
	MSW	C&I	C&D	Metro	Regional	SA	Interstate	Overseas
Polyethylene Terephthalate (PET)	60%	40%	0%	82%	18%	1%	77%	21%
High density Polyethylene (HDPE)	61%	39%	0%	87%	13%	12%	25%	63%
Polyvinyl Chloride (PVC)	4%	96%	0%	83%	17%	20%	0%	80%
Low density Polyethylene (LDPE)	0%	100%	0%	77%	23%	4%	7%	89%
Polypropylene (PP)	35%	65%	0%	87%	13%	38%	31%	31%
Polystyrene (PS)	2%	82%	17%	100%	0%	6%	2%	92%
Mixed &/or Other Plastics (MIX)	24%	36%	40%	97%	3%	88%	7%	5%
Total	**35%**	**43%**	**22%**	**91%**	**9%**	**51%**	**22%**	**27%**

In 2018-19, sources of recovered Plastics remained steady with the previous reporting period. A major change was the shift of recovered Plastics re-processed in SA versus overseas. Reasons for this included:

- A local energy recovery facility that accepts mixed plastics increased its licenced acceptable volumes.
- The price of mixed plastics reduced significantly, motivating collectors to seek alternative re-processing locations.
- A local plastics re-processing firm re-opened in SA, which accepts a range of different streams.

It is anticipated that local re-processing of Plastics will increase as the re-opened plastics processing firm is operational for a full financial year, and other sites plan to build infrastructure to process plastics prior to sale as pellets or flake.

The price of PET and HDPE remains strong and there is still significant demand across Australia and overseas for these streams.

Plastics is anticipated to remain consistent but not without its challenges:

- The generally lower price of virgin plastics (compared for recycled plastics) is a barrier for companies.
- There are sufficient facilities in Australia to process all polymers into manufacturing grade Plastics or use for energy recovery.
- Demand in Australia for recycled Plastics continues to rise, but there is still more opportunity in this space.
- The value of Plastics, particularly mixed plastics and LDPE is likely to remain low or at a cost to recover.
- Local re-processing is likely to increase as local facilities receive more material. This will likely include plastics from interstate and local plastics.
- Although electricity prices have reduced, increases to previous prices would impact the cost of recycling in SA.

3.6 Glass

Highlights:

- In 2018-19 the total quantity of recovered Glass was 14,000 tonnes higher than 2017-18, increasing to 74,000 tonnes.
- Interstate imports also increased, from 57,000 tonnes in 2017-18 to 58,200 tonnes.
- There is strong demand for recovered Glass for bottle re-manufacturing and glass to road base for recovered lower grade/mixed glass.
- Most Glass was sourced from the MSW sector and was re-processed locally.
- Recovered Glass is expected to remain in high demand.

Glass recovered in 2018-19 totalled 74,000 tonnes which is the highest it has been since the survey commenced (**Figure 3.18** on page 61). All recovered Glass was packaging, including glass bottles and jars (see **Section 5** for additional information on packaging). A further 58,200 tonnes of Glass was imported to SA from other states.

Demand for Glass was high in 2018-19, resulting in an increase in price for sorted Glass. SA beneficiation plants accepted additional tonnes of Glass from SA and from interstate to meet bottle remanufacturing demand. More glass fines/unsorted glass were recovered to meet demand for road base materials. The net increase in Glass recovery from 2017-18 to 2018-19 was therefore 14,000 tonnes.

Table 3.11 **Quantity of Glass recovered (tonnes) in SA during 2018-19, including estimated reporting error (tonnes & %).**

Item	Net Recovery [1]	Reporting Error	
	tonnes	tonnes	%
Glass	**74,000**	**9,100**	**12%**

1 Net recovery excludes re-processing losses

Figure 3.18

Changes in reported recovered Glass quantities since 2003-04 – Glass.
Glass quantities increased to their highest levels since 2003-04.

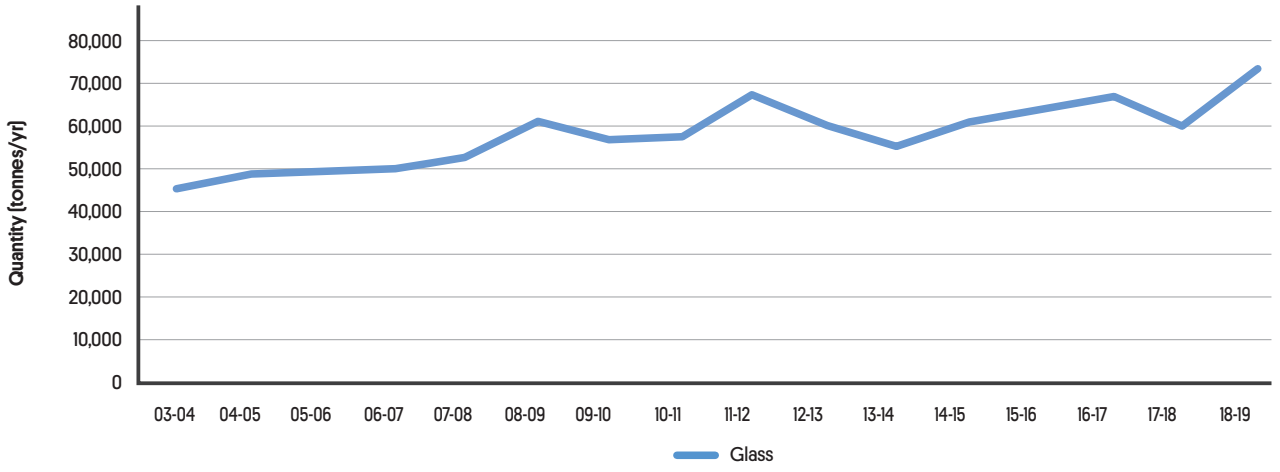


Table 3.12

Sector and geographical origins and re-processing locations for recovered Glass in SA in 2018-19.
All resource recovery occurs from Municipal and C&I sources, most of which is re-processed locally.

Item	Sector Origin (%)			Geographical Origin (%)		Re-processing Location (%)		
	MSW	C&I	C&D	Metro	Regional	SA	Interstate	Overseas
Glass	64%	36%	0%	85%	15%	80%	20%	0%

Two thirds of Glass was recovered from MSW sources and the remaining third from the C&I sector (**Table 3.12** above). This is similar to 2017-18 with only a 1% increase in Glass from MSW sources. The majority of Glass was from metropolitan sources and re-processed in SA (80%), with the balance (20%) sent interstate. A 5% increase in interstate tonnes to 20% in 2018-19, was due to lower grade or mixed Glass being sent to road base interstate.

The outlook for recovery of Glass is expected to remain strong:

- Glass bottling companies continue to demand higher proportions of recovered Glass in their manufacturing process.
- A significant part of the Glass recovery arises from glass bottles returned as part of SA's CDL system. This source of Glass is of high quality and able to be turned to cullet and used by glass bottle manufacturers.
- Lower grade Glass can continue to be sent to road base. However, this is a lower value option. The potential expansion of products under the SA CDL scheme would likely increase volumes of high-quality source separated Glass that can be used for bottle remanufacture.

3.7 Other Materials

Highlights:

- Other Materials recovered in SA decreased from 35,600 tonnes in 2017-18 to 27,200 tonnes in 2018-19.
- This was driven by more accurate reporting for Foundry Waste and Leather & Textiles, not a reduction in the recovery of these materials. However, there was a slight drop in Tyres & Other Rubber.
- The outlook for future resource recovery of Other Materials is expected to remain stable.

The total quantity of recovered Other Materials reported for SA during 2018-19 was approximately 27,200 tonnes (**Table 3.13** below). With no coal powered power stations, SA produced no Fly ash (**Figure 3.20** on page 63), while Foundry Waste reduced for another year (from 9,600 to 6,000, see **Figure 3.19** on page 63). The changed quantities were due to improved reporting, not a decrease in the recovery of this stream.

Leather & Textiles also decreased but this was again due to improved reporting, as it was determined that a higher proportion of the clothing sent overseas is sold as clothing, not recycled into rags. Tyres & Other Rubber also decreased by 7% from 20,000 tonnes in 2017-18 to 18,600 tonnes in 2018-19. A major SA tyre collection company was purchased at the start of the 2018-19 financial year and this may have impacted the volumes collected to be recycled.

An additional 17,100 tonnes of Other Materials were imported into SA for resource recovery, 40% of which was from overseas. Most of the remaining imports were from Victoria.

Table 3.13 **Quantity of Other Materials (tonnes) Net recovered in SA during 2018-19, including estimated reporting error (tonnes & %).** Tyres & other rubber remains the greatest contributor to Other Materials.

Item	Net Recovery [1]	Reporting Error	
	tonnes	tonnes	%
Fly ash	0	0	NA
Foundry Waste	6,000	800	13%
Leather & textiles	2,600	400	15%
Tyres & other rubber	18,600	200	1%
Total	**27,200**	**1,400**	**9%**

1 Net recovery excludes re-processing losses

Figure 3.19 **Changes in reported recovered Other Materials quantities since 2003-04 – Foundry Waste, Leather & Textiles, and Tyres & Other Rubber.**
All streams dropped, but Leather & Textiles and Foundry Waste decreases were due to improved reporting.

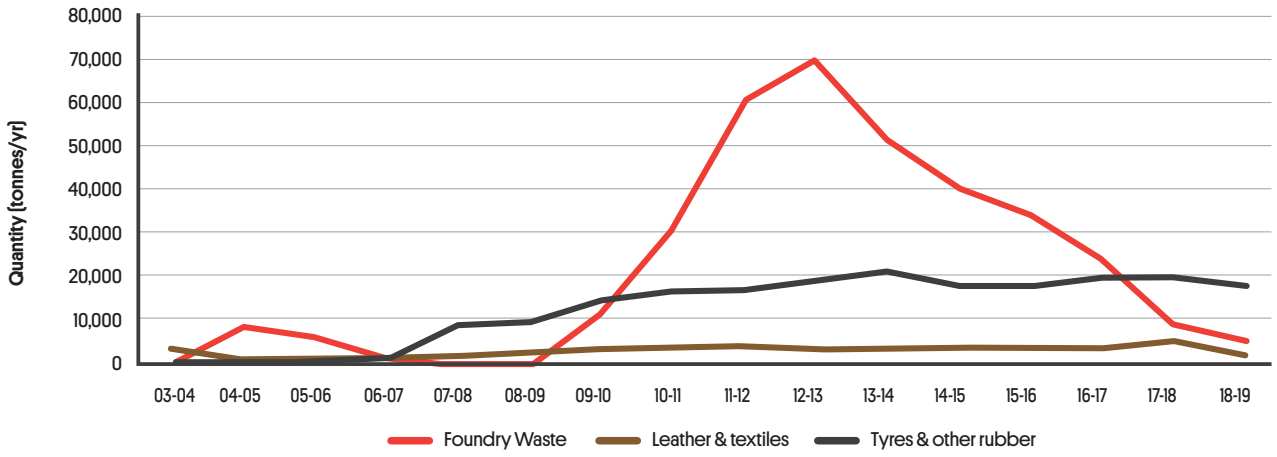


Figure 3.20 **Changes in reported recovered Other Materials quantities since 2003-04 – Fly Ash.**
No Fly Ash has been recovered since the closure of the Port Augusta Power Station.

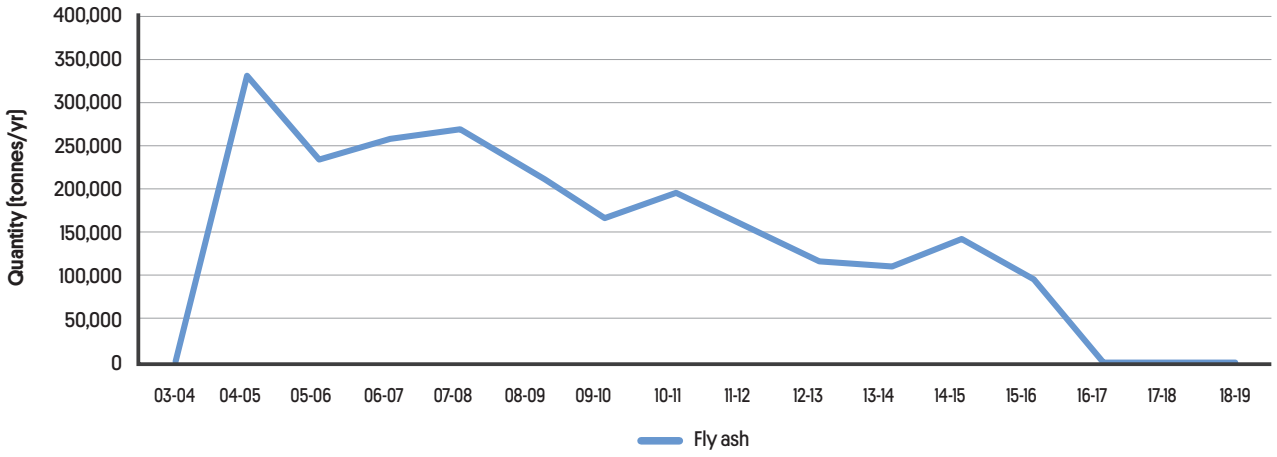
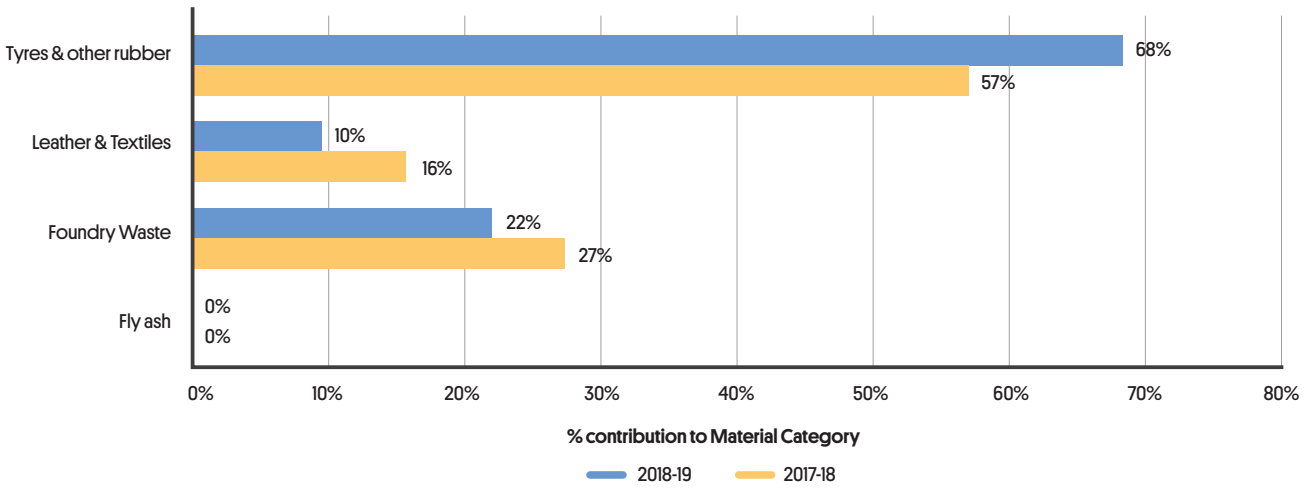


Figure 3.21 **Changes in percent composition of recovered Other Materials (by weight), SA, between 2017-18 and 2018-19.**
Proportions of Tyres & other rubber increased due to decreases in Leather & Textiles and Foundry Waste.



Tyres & Other Rubber remains the biggest contributor to Other Materials, increasing from 57% in 2017-18 to 68% in 2018-19 (**Figure 3.21**). Improved reporting for Foundry Waste and Leather & textiles has led to decreases in the tonnes recovered for these materials, and subsequently the percentage contribution to Other Materials (22% and 10% respectively).

Most Other Materials are from the C&I sector (91%, **Table 3.14** below). Contributors to this were Foundry Waste and Tyres & Other Rubber, with no Leather & Textiles as they are 100% MSW. Tyres & Other Rubber is reported as C&I in line with national reporting. Most Other Materials are from Metro Adelaide (76%), although this has decreased from 2017-18 (90%) due to an increase in Regional sources for all Other Materials recovered. This was due to a regional SA foundry producing higher volumes of Foundry Waste in 2018-19, and the resource recovery industry collecting some additional tyres from regional sources.

All reported Foundry Waste was re-processed in SA for cement production (**Table 3.14**). All Leather & Textiles was re-purposed into rags locally, and the majority of Tyres & Other Rubber were processed here for sale overseas as shredded rubber (77%) or sent interstate to be crumbed (20%). Small proportions of Tyres and Other Rubber were sent directly overseas (3%) in 2018-19.

Table 3.14 **Sector and geographical origins and re-processing locations for recovered Other Materials in SA in 2018-19.**
Most Other Materials are produced by the C&I Metropolitan Sector and are re-processed here in SA.

Item	Sector Origin (%)			Geographical Origin (%)		Re-processing Location (%)		
	MSW	C&I	C&D	Metro	Regional	SA	Interstate	Overseas
Fly Ash	NA	NA	NA	NA	NA	NA	NA	NA
Foundry Waste	0%	100%	0%	79%	21%	100%	0%	0%
Leather & Textiles	100%	0%	0%	85%	15%	100%	0%	0%
Tyres & Other Rubber	0%	100%	0%	74%	26%	77%	20%	3%
Total	**9%**	**91%**	**0%**	**76%**	**24%**	**85%**	**13%**	**2%**

The majority of Tyres & Other Rubber were processed in SA before being sent overseas for energy recovery, with the remainder sent interstate to be granulated into a material appropriate for civil application, or directly overseas without pre-processing (only 3%).

The outlook for future resource recovery of Other Materials is expected to remain steady. Fly Ash is expected to remain at zero tonnes per annum, and Tyres & Other Rubber and Leather & Textiles quantities the same. Foundry Waste depends on manufacturing and industrial activity in the state, which is expected to remain stable or potentially decline in future.

04 Electronic and Electrical Waste

At a glance:

- The total volumes of recovered E-waste was 5,200 tonnes, a 16% increase from the previous year.
- Computer recycling increased, as a number of large businesses rolled out new computers as a part of a three to four-year computer replacement cycle.
- The outlook for E-waste is an anticipated decline in recovery due to continued light weighting of E-waste (particularly computers and televisions), and a push towards refurbishment.

SA recovered 16% more (approximately 5,200 tonnes) E-waste in 2018-19. This was driven by a number of large businesses rolling out new computers as a part of a three to four-year computer replacement cycle. According to industry sources, this may decrease in future as this program may move towards refurbishment rather than replacement/ recycling. Other E-waste increased due to the ongoing use of the Unplug and Drop centres around SA, as well as an SA mixed E-waste reprocessing infrastructure trial in SA in 2018-19. Compact Fluorescent Lamps increased by 33%, due to expansion of a collection agency's premises in SA and the processing facility interstate. Televisions decreased by 6%, likely due to light weighting of TVs. Industry sources say that many of the older, heavier televisions have already been brought in for recycling in previous years. Therefore, although the number of items being recycled continues to increase, the weight is decreasing as the items become lighter.

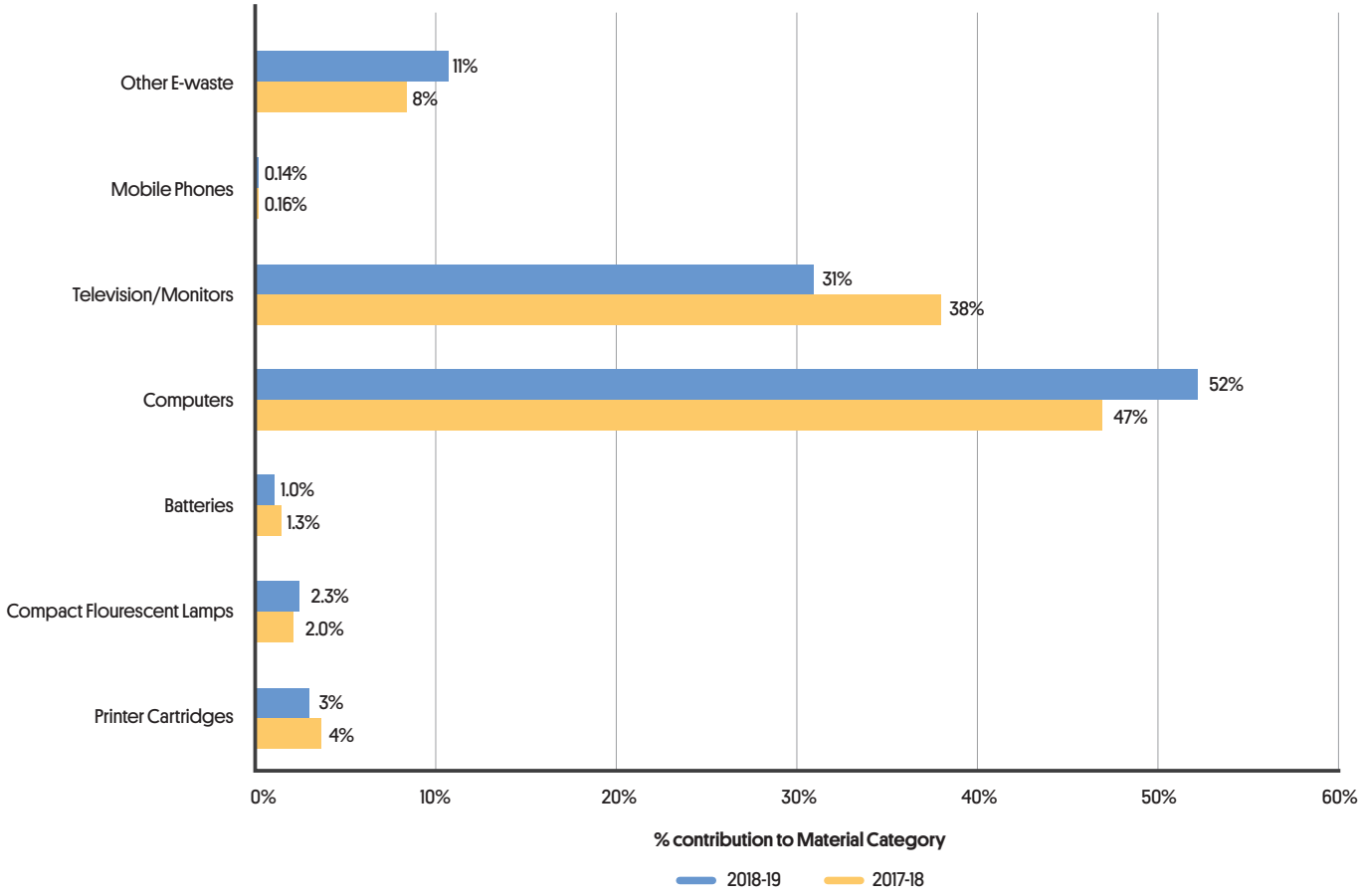
Table 4.1 **Changes in reported quantities of E-waste between 2017-18 and 2018-19[1].** Computers, Other E-waste and Compact Fluorescent Lamps all increased.

Item	2017-18 tonnes	2018-19 tonnes	% change 17-18 to 18-19
Printer Cartridges	160	150	-6%
Compact Fluorescent Lamps	90	120	33%
Batteries	60	50	-17%
Computers	2,100	2,700	29%
Televisions / Monitors	1,700	1,600	-6%
Mobile Phones	7	7	0%
Other E-waste	370	550	49%
Total	**4,500**	**5,200[2]**	**16%**

1 Tonnes recovered excludes re-processing losses

2 This value has a reporting error of 728 tonnes (+/-14%).

Figure 4.1 Changes in percent composition of recovered E-waste (by weight), SA, between 2017-18 and 2018-19.



With increased recovery of Computers, the percentage contribution of this category improved to 52% in 2018-19 (**Figure 4.1**). Televisions/Monitors decreased to 31% while Other E-waste is now 11% of all recovered E-waste.

Table 4.2 on page 67 shows most E-waste (59%) during 2018-19 was sourced from MSW sources. This is a decrease from last year (68%), due to the expansion of the organisation Computer recycling program previously mentioned.

Most E-waste is from Metro sources (86%) and is re-processed here in SA (60%). This is a decrease from 2017-18 (71% reprocessed here), due to the Computer recycling program linking with an interstate recycler.

The destination mainly reflects the location where the E-waste is dissembled or separated into its metal, plastic and other material constituents, which are disposed to SA or interstate aggregators/merchants. These aggregators/merchants then determine where the constituent materials will be re-processed. It is understood that smelting of E-waste to break it down to its constituent parts (e.g. lead, copper etc) will continue to increase, as the development of a large smelter completes its upgrade in regional SA. However, for E-waste sent to other destinations, it can be challenging to accurately discern the ultimate reprocessing destination for E-waste materials.

Table 4.2 **Sector and geographical origins and re-processing locations for recovered E-waste in SA in 2018-19.**
MSW remains the main sector, and most of the E-Waste was recovered from metropolitan areas. Initial reprocessing of the majority occurred in SA.

Item	Sector Origin (%)			Geographical Origin (%)		Re-processing Location (%)		
	MSW	C&I	C&D	Metro	Regional	SA	Interstate	Overseas
Total E-waste	59%	41%	0%	86%	14%	60%	40%	0%

The recovery of E-waste items is anticipated to remain steady. While the End-Of-Life (EOL) National TV/ Computer Recycling Scheme increases its recovery targets[9], and drop off points across the state continue to expand (e.g. Unplug and Drop), there may be a push towards Computer refurbishment which would reduce recycled E-Waste, and electronic items continue to weigh less per unit.

The recycling target for industry will rise to 80% by 2026-27[10]. State, territory and/or local governments are responsible for the remainder of the waste.

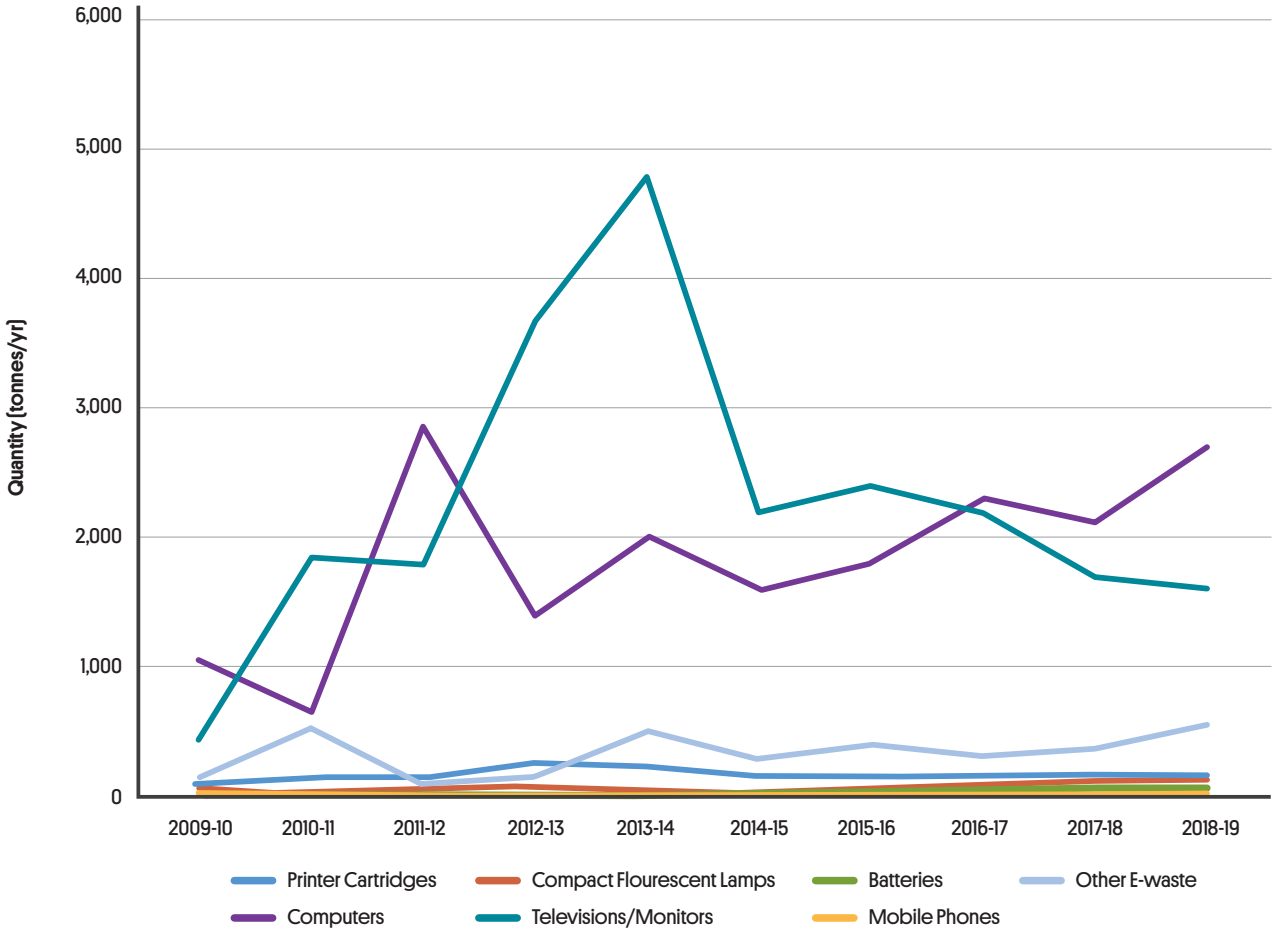
Figure 4.2 on page 68 shows the trends for each E-Waste stream from 2009-10.

9 Under this scheme, industry is responsible for recycling EOL TV/Computer E-waste up to a recycling target set per co-regulatory arrangements established with the Australian Government (Australian Department of Environment, 2014).

10 See ANZRP, 2017

Figure 4.2

Changes in quantities of recovered E-waste (by weight), SA, between 2009-10 and 2018-19.
TVs/Monitors and Computers remain the major contributors to E-waste in SA, with Computers now significantly greater than TVs/Monitors.



05 Packaging Materials

At a glance:

- An estimated 246,600 tonnes of packaging were recovered in 2018-19.
- The increase in volumes from 2017-18 (236,600 tonnes) is due to the increase in volumes of Glass captured.
- SA's Container Deposit scheme continues to make a substantial contribution to the recovery of packaging materials in SA (17% of all packaging). This may increase as the SA Government reviews the CDL scheme.
- The Federal Government Plastics Packaging Bill includes packaging targets which may impact recovered packaging in SA.

5.1 Total Packaging

Packaging quantities are a subset of the individual material data presented in **Section 3**. SA recovered 246,600 tonnes of packaging in 2018-19 of which CDL contributed 17%, with the remaining 83% (205,000 tonnes) from other sources (**Table 5.1**). Packaging is an important proportion of the total amount of recycling activity reported in SA for some of these individual materials such as Glass, some plastics and LPB. All recovered LPB and PET were packaging, and 95% of LDPE and 90% of Cardboard were packaging.

The tonnes of packaging recovered in 2018-19 increased 5% from 2017-18, due to Glass recovery which increased substantially in 2018-19 (for bottle manufacturing and to road base).

The Federal Government Plastics Packaging Bill may impact the volume of packaging recovered for recycling by industry. Packaging targets include[11]:

- all packaging used in Australia will be reusable, recyclable or compostable by 2025;
- 70% of packaging used in Australia will be recycled or composted by 2025;
- 70% of plastic packaging used in Australia will be recycled or composted by 2025;
- all packaging used in Australia will include, on average, 30% recycled content by 2025.

11 See Allens (2019).

Table 5.1

Estimated packaging recovery, SA 2018-19. Cardboard and glass remain dominant contributors to packaging recovery. Packaging increased in 2018-19 due to Glass recovery. Packaging constitutes significant proportions of resource recovery for some materials, such as PET, LDPE, PP, PVC, glass, cardboard and LPB. Note some numbers may not equate due to rounding.

Packaging Material	Origin (tonnes)		Total packaging (tonnes)	Packaging as a proportion of total material recovered
	CDL[1]	Other		
Steel Cans		2,400	2,400	0.8%
Aluminium Cans	3,800	80	3,900	28%
Cardboard Packaging		144,000	144,000	90%
Liquid Paperboard Cartons	525	275	800	100%
PET Packaging	3,700	1,300	5,000	100%
HDPE Packaging	260	4,100	4,400	75%
PVC Packaging		15	15	15%
LDPE Packaging		1,900	1,900	95%
Polypropylene Packaging		447	447	75%
Polystyrene Packaging		420	420	84%
Other Plastics Packaging		9,300	9,300	55%
Glass bottles & Jars	33,000	41,000	74,000	100%
Total	**41,400**	**205,100**	**246,600**	

1 Data provided by the South Australian Environmental Protection Authority.

5.2 Container Deposits

There are currently five Australian states and territories that have a container deposit system for return of recyclable beverage bottles and cans. These states and territories include:

- SA (introduced in 1977)
- NT (introduced in 2012)
- NSW (introduced in 2017)
- ACT (introduced in 2018)
- Qld (introduced in 2018).

All of Australia will likely have a scheme in the next five years. The SA Government is also considering expanding the CDL to include additional items such as wine and spirit bottles. This would impact the tonnes of CDL collected in the state. In 2018-19, glass containers again represented the highest proportion (by weight) at 80% of returned deposit containers in SA (**Figure 5.1**). Aluminium and PET both represented 9% by weight, and HDPE and LPB 1%. The average return rate for container deposits dropped by 2 percentage points from 2017-18 to 81% (by weight) in 2018-19. This is approximately 542 million containers (estimated as sold in SA during 2018-19).

Figure 5.1 **Relative proportions of returned recycled deposit containers (by weight), SA 2018-19**
Glass remains the major contributor by weight.

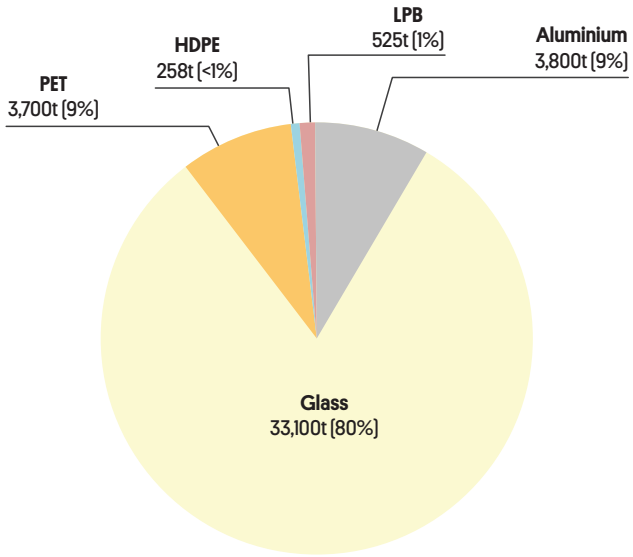


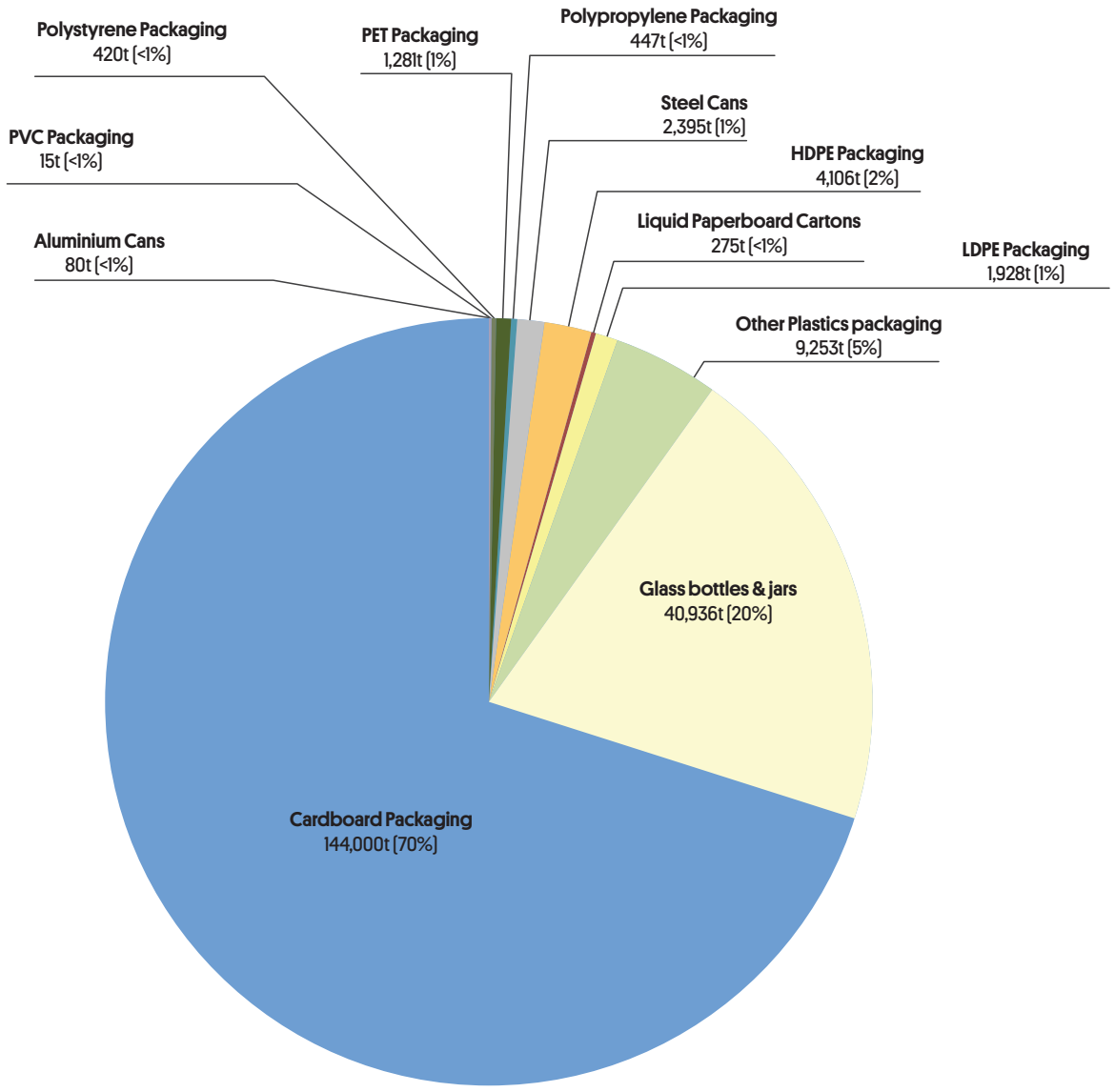
Table 5.2 **Return rates for recycled deposit containers, SA 2018-19.**
SA continues to achieve high return rates of recycled deposit containers, with a slightly lower return rate than 2017-18.

Material	Recovered (tonnes)	Return rate (%)
Aluminium	3,800	83%
Glass	33,100	83%
PET	3,700	68%
HDPE	258	64%
LPB	525	49%
Total	**41,383**	**81%**

5.3 Other Packaging Materials

The relative proportions of non-CDL recovered packaging material can be seen in **Figure 5.2**. In line with 2017-18, Cardboard was the highest contributor (70%), which decreased from 2017-18 (75%), due to an increase in Glass bottles & jars recovery, which is now 20% (previously 13%). Following Glass bottles & jars and Cardboard Packaging is Other Plastics (5%), and HDPE packaging (2%).

Figure 5.2 **Relative proportions of recovered other packaging materials by weight, SA 2018-19.**
Cardboard and Glass materials are the major contributors to recovery for other packaging materials.
The contribution of Glass has increased from 13% to 20% in one year due to improved recovery of this stream.



06 Resource Recovery Value

At a glance:

- The resource value of recovered materials in 2018-19 was estimated at $348 million, a decrease of 2% from 2017-18 ($356 million).
- This decrease is due to the lower value of Cardboard & Paper, a reduction in volumes of Meat Rendering in SA, and a slight decrease in the value and recovered volume of Steel.
- The dollar per tonne rate for the remaining materials increased, and the net effect on the average value for recovered materials was an increase from $92 per tonne in 2017-18 to $93 per tonne in 2018-19.
- Metals remains the largest contributor to the overall value, at 50% of the total resource recovery value in SA. Organics remains the second, at 27% of the total.

The overall value of recovered resources in SA in 2018-19 was $348 million (**Table 6.1** on page 74). Although the per tonne value increased from $92 in 2017-18 to $93 in 2018-19, the overall total value decreased by $8 million. This was due to a reduction in recovered tonnes, particularly Meat Rendering, as well as lower per tonne values for Metals and Cardboard & Paper.

Figure 6.1 (on page 75) provides a breakdown of the value of the materials by their sub-categories. Metals was again approximately 50% of the value of all resource recovered tonnes, followed by Organics at 27%. At $39 million, all Cardboard & Paper was the third greatest contributor to resource recovery value. Cardboard & Paper – Other reduced from $5.4 million in 2017-18 to $1.6 million in 2018-19 due to a significant drop in the price of mixed paper and cardboard following on from the National Sword Policy in China. Plastics is now reported as one category, as mixed plastics is now a cost to recover, due to the flow-on effects of China's National Sword.

It is important to recognise that the value of materials recovered for recycling can vary significantly from year to year and between jurisdictions depending on a range of factors. These factors can include:

- The type of waste material and industrial product for which it can be recycled or reused;
- The commodity market prices for virgin material that they replace;
- Whether the material will be reprocessed locally or exported overseas;
- The quality of the material, including the extent of source separation and/or pre-processing which might have occurred;
- The demand for the recovered product;
- Regulatory environment, and
- Local waste management and resource recovery practices.

Table 6.1 **Assumed market values, quantities and estimated resource value for resource recovered material, 2018-19[a].**

Material category	Resource recovery (tonnes)	Estimated on-sale price[a] ($/tonne)	Estimated Resource Value ($ millions)[c]	Price data source[a]
Masonry	1,393,100	$11	$15.4	Based on RAS survey results
Metals – Steel	297,000	$330	$98.0	Based on RAS survey results and commodity data
Metals – Other (non-ferrous including Aluminium)	32,000	$2,378	$76.1	Based on RAS survey results and commodity data
Organics – Meat Rendering[b]	98,000	$850	$83.3	Based on RAS survey results
Organics – Garden, Food and Timber[b]	352,300	$35	$12.3	Based on RAS survey results
Cardboard & Paper	228,900	$165	$38.6	Based on RAS survey results and SV Market Bulletin March 2019
Plastics	31,100	$185	$5.8	Based on RAS survey results and SV Market Bulletin March 2019
Glass	74,000	$91	$6.7	Based on RAS survey results
Other Materials[d]	27,000	$312	$8.5	Based on RAS survey results
Separately Reported Materials & Clean Fill	1,215,000	$3	$3.6	Based on RAS survey results
TOTAL ALL Materials	**3,748,600**	**$93**	**$348**	

Notes:

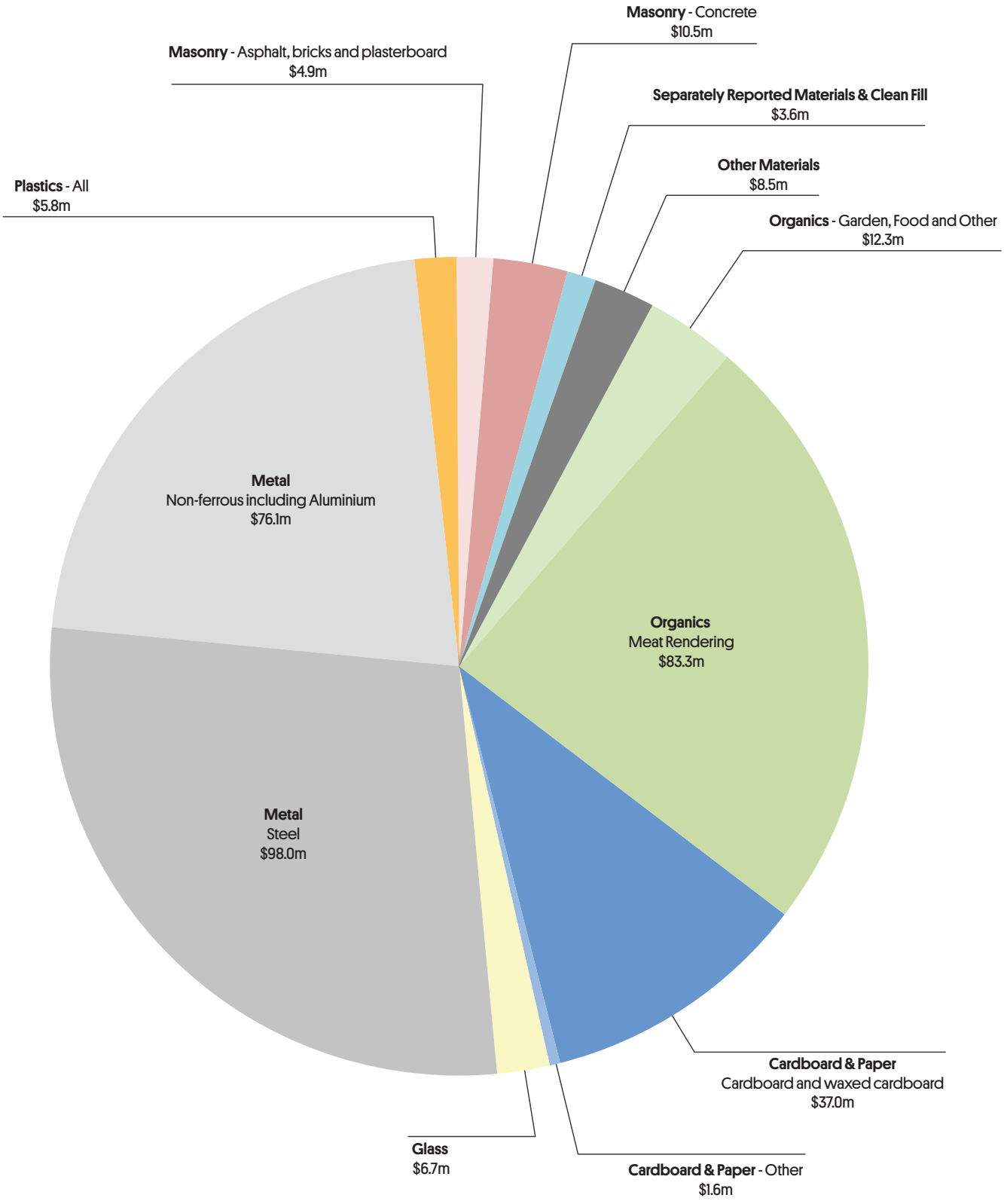
(a) Refer to Survey Methodology in Appendix 1 for additional information on resource recovery value assumptions and methodology. Note that 2016-17 was the first year that participants were asked to provide information on the commodity price or value of each material. This provided more accurate estimations for the on-sale price provided here. The on-sale price is calculated based on the price of each stream under the broader material categories.

(b) Note that the resource recovery tonnes for organics is reduced due to loss of weight during the re-processing phase and therefore the volumes that can be sold, and that tonnes of resource recovered waste grease and fat, waste sludge and biosolids, and miscellaneous organics were not included in the total.

(c) Note that sums may not equate due to rounding.

(d) Other Materials includes Foundry Sands, Tyres and Leather & Textiles. The estimated on-sale price is based on the weighted average price of all materials within this category (on-sale price per tonne and tonnes), which varies depending on the material. The price per tonne for Other Materials increased in 2018-19 and 2017-18 compared to 2016-17 due to inclusion of the on-sale price of Tyres and Leather & Textiles, as these values were reported by industry in 2017-18.

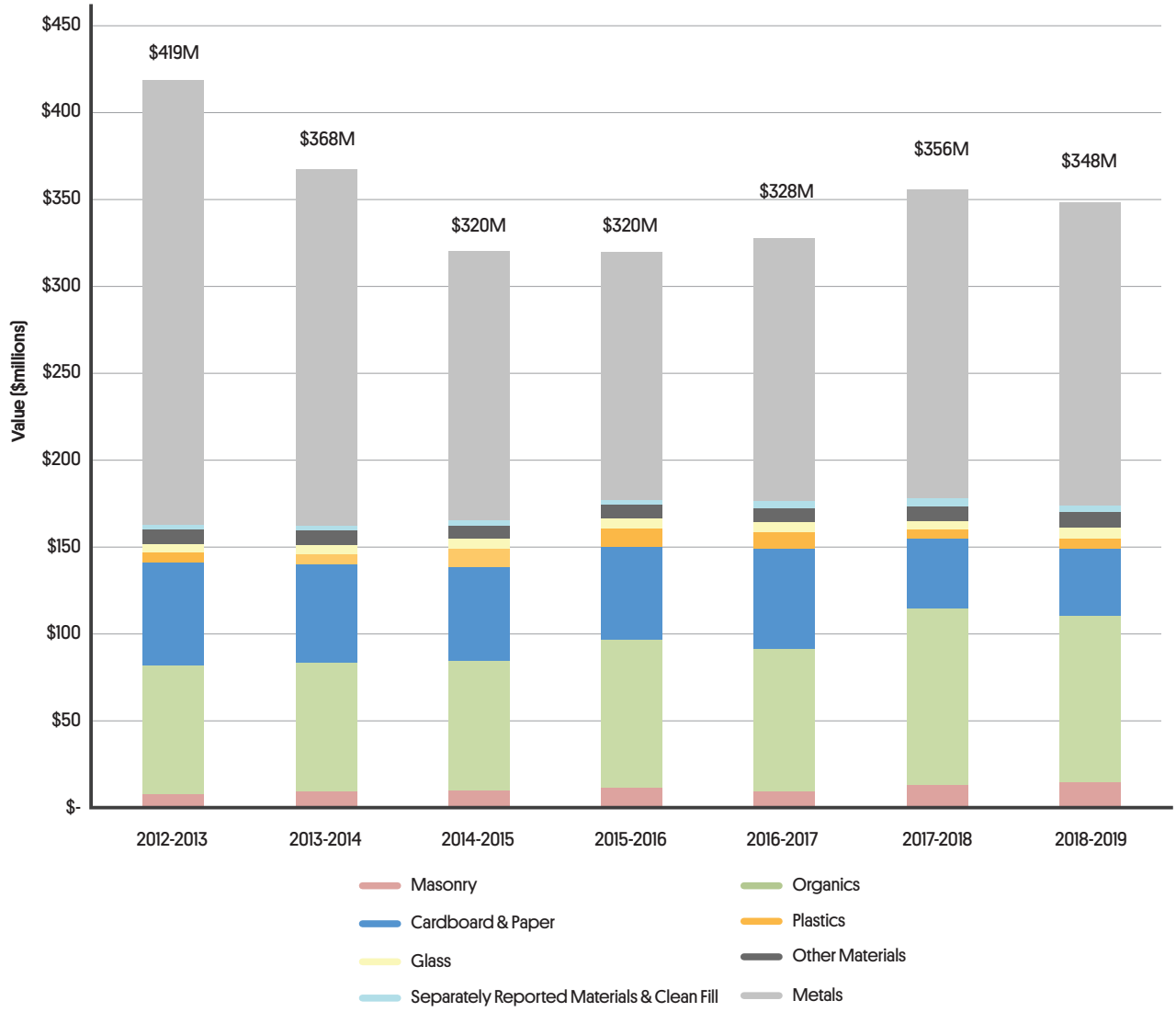
Figure 6.1 **Estimated market value of resource recovered materials in SA from the 2018-19 Recycling Activity Survey[12]**



12 Plastics is presented as one category in 2018-19, as mixed plastics was a negative number (a cost to recover). The combined value is based on a weighted average of the value of each plastic stream and the proportion of this stream of total plastics.

Figure 6.2 below compares the estimated market value of resource recovered materials in SA from 2012-13 to 2018-19. The value of Resource Recovery to South Australia reduced slightly from 2017-18 to 2018-19, from $356 million to $348 million. Fluctuations from 2012-13 are predominately due to changes in the value of the Metals market as well as an increase in the value of Organics from 2016-17 to 2017-18, and a decrease in Cardboard & Paper following China's National Sword Policy. This continued to have an impact on the value of recovered resources in 2018-19. The $8 million reduction of market value from 2017-18 to 2018-19 is predominately due to fewer tonnes of recovered meat rendering, and slightly lower net prices for Cardboard & Paper and Metals (Steel).

Figure 6.2 **Estimated market value of resource recovered materials in SA, 2012-13 to 2018-19**



07 Environmental Benefits of Recycling

At a glance:

- The resource recovery in this year's Recycling Activity survey was projected to achieve the following environmental benefits from recycling of these materials.
  - **Greenhouse Gas Savings** – 1.31 million tonnes of CO_2-e.
  - **Cumulative Energy Demand saved** – 15,200 TeraJoules (TJ).
  - **Water Savings** – 8,200 Megalitres (ML).
- Slightly reduced environmental benefits accrued due to the recovery of material in 2018-19.

7.1 Greenhouse gas savings (or avoided emissions)

Recycling reduces Greenhouse Gas (GHG) emissions primarily by:

- Decreasing the amount of energy, particularly fossil fuels, used by industry to make products compared with using virgin raw materials.
- Reduced emissions of greenhouse gases achieved from diverting recovered materials from landfills which biologically decompose in landfills and generate methane.

The total estimated greenhouse gas savings from recycling in SA during 2018-19 is about 1.31 million tonnes of CO_2-e (**Tables 7.1** and **7.2** and **Figure 7.1** on pages 78 and 79). This is a slight decrease from the 1.37 million tonnes of GHG savings in 2017-18, due to less recovery in 2018-19. The same emissions factors applied in 2017-18 were used in compiling these savings.

Organics contributed approximately 50% of the estimated GHG savings for all recyclables in SA, despite representing 24% of recovered tonnes. Recycling Timber and Other Organics in particular saves on GHG emissions. This was followed by Metals (at 29%) and Masonry (11%). The total GHG savings are considered approximately equivalent to:

- About 1.95 million trees would have to be planted to absorb the same amount of CO_2.
- The greenhouse gas emissions that 302,000 cars would produce in a year[13].
- Approximately 19% of SA's total Community sector[14] GHG emissions in 2011

13 Ave car GHG emissions value ≈ 5 tonnes CO_2-e/yr, one tonne of recycled material ≈ 1.49 trees; Source: SA 2008-09 Recycling Activity report (Zero Waste SA, 2010)

14 The Community sector includes GHG emissions associated with residential stationary energy use and passenger vehicle use; Source: Report on the operation on the 'Climate Change and Greenhouse Gas Emissions Reduction Act' 2007 (SA DEWNR 2015).

Table 7.1 **Estimated environmental benefits as a result of recycling in SA, 2018-19[a]**

	Material	Material Quantity	GHG Emissions Saved[a]	Energy Saved[a]	Water Saved[a]
		tonnes	tonnes CO_2-e	TJ LHV	ML
	Masonry				
1	Asphalt	269,000	8,100	640	240
2	Bricks	74,000	1,500	20	90
3	Concrete	1,049,000	21,000	370	1,340
4	Plasterboard	1,100	0	0	0
5, 6	Clay, fines, rubble & soil	1,215,000	106,900	1,730	530
	Metals				
7	Steel	297,000	130,700	2,360	-700
8	Aluminium	14,000	233,300	2,890	410
9	Non-ferrous metals	18,000	15,800	650	110
	Organics				
10	Food Organics	12,000	3,000	0	10
11	Garden Organics	257,000	57,500	-80	1,440
12	Timber	242,000	326,700	2,600	-10
13, 14, 15, 16	Organics - Other	529,000	254,400	1,150	120
	Cardboard & paper				
17	Cardboard & waxed cardboard	160,000	27,000	70	1,780
18	Liquid Paperboard	800	100	0	10
19, 20, 21	Magazines & Newspaper	54,100	24,600	20	590
22	Printing & Writing Paper	14,000	18,200	-10	150
	Plastics				
23	Polyethylene terephthalate	5,000	6,000	280	340
24	High density polyethylene	5,900	4,900	300	130
25	Polyvinyl chloride	100	0	0	0
26	Low density polyethylene	2,000	1,700	100	50
27	Polypropylene	600	200	20	20
28	Polystyrene	500	200	20	10
29	Mixed &/or Other plastics	17,000	5,300	510	450
	Glass				
30	Glass	74,000	39,100	330	70
	Other Materials				
39	Fly Ash	0			
40	Foundry Waste	6,000			
41	Leather & Textiles	2,400			
42	Tyres & Other Rubber	18,600	19,900	1,190	970
	Total[b]	**4,338,000**	**1,306,100**	**15,160**	**8,150**

Notes:

(a) Refer to Survey Methodology in Appendix 1 for additional information on environmental benefits analysis assumptions and methodology.

(b) Note numbers may not equate due to rounding.

Table 7.2 Estimated greenhouse gas savings as a result of recycling in SA, 2018-19[a]

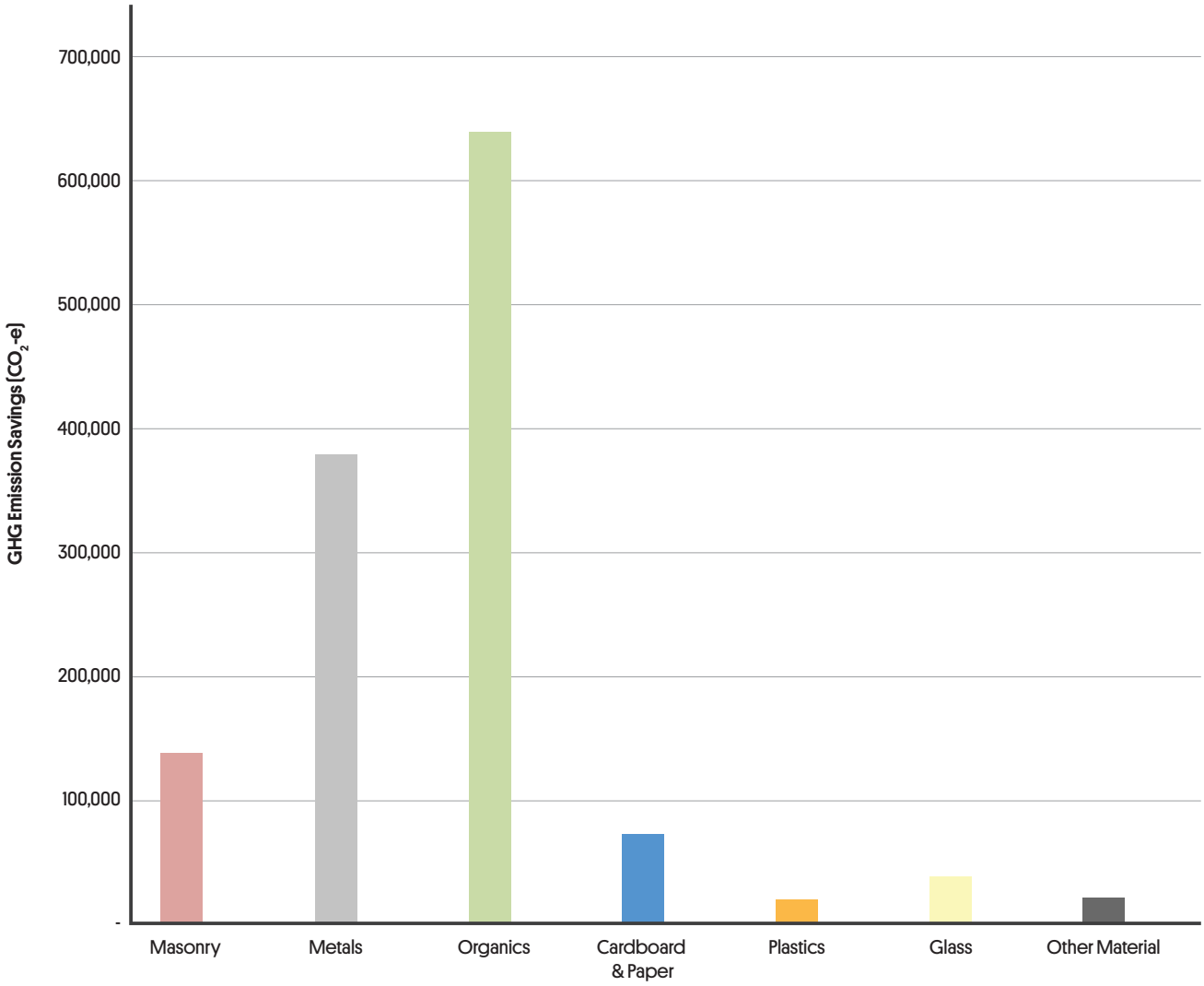
Sector Origin	GHG Emissions Saved[a]	Equivalent trees planted required for carbon absorption[a]	Equivalent cars off the road (1 year)[a]
	tonnes CO_2-e		
Masonry	137,500	206,000	31,800
Metals	379,800	568,000	87,700
Organics	641,600	959,000	148,200
Cardboard & paper	69,900	104,000	16,100
Plastics	18,300	27,000	4,200
Glass	39,100	58,000	9,000
Other Material	19,900	30,000	4,600
Total [b]	**1,306,000**	**1,952,000**	**302,000**

Notes:

[a] Refer to Survey Methodology in Appendix 1 for additional information on environmental benefits analysis assumptions and methodology.

[b] Note numbers may not sum due to rounding.

Figure 7.1 Avoided greenhouse gas emissions (by material category), as a result of recycling in SA 2018-19



7.2 Energy Savings

The total projected energy savings (in Terajoules or TJ[15]) from recycling in SA during 2018-19 was about 15,200 TJ (**Table 7.1** on page 78, **Table 7.3** on page 81 and **Figure 7.2** on page 81). This is slightly lower than 2017-18 where recycling contributed to approximately 15,800 TJ of energy savings. This reduction is due to less recovery of recyclables in 2018-19.

Considering individual streams:

- Metals contributed 39% of projected energy savings, even though it represents only 8% of material being recovered in SA. This is because less energy is required to recover metals than to manufacture it from raw materials, particularly Aluminium.
- Organics also contributed a high proportion of energy savings, at 24% of energy savings, predominately due to the energy required to create timber from virgin products.
- Despite contributing 60% by weight of all recyclables in SA, Masonry is 18% of overall energy savings due to recycling. This is mainly driven by Clean Fill and Intermediate Waste Soil given the high volumes recovered and relatively high energy savings per tonne of recycled material.
- Plastics contributed a high proportion of overall energy savings at 8% considering this stream comprises just 1% of all recovered materials. Making plastics from virgin products consumes substantial amounts of energy. PET and HDPE save the highest amount of energy after Aluminium and Tyres per tonne recycled (see **Table A4.1** on page 110).
- These energy savings are considered approximately equivalent to:
  - » Energy use by 286,000 average households in one year[16].
  - » The energy supplied by 2.5 million barrels of oil.
- The energy savings from SA's recycling activity during 2018-19 equate to:
  - » Approximately 4.5% of SA's total energy consumption reported for 2017-18[17]

15 1 Terajoule or TJ = 10^{12} Joules (J) = 1,000 Gigajoules (GJ)
16 Average household energy use value ≈ 53 GJ/yr; Source: 2018 Australian Energy Update (Australian Government Department of the Environment and Energy, 2018)
17 Source: 2018 Australian Energy Update (Australian Government Department of Environment and Energy, 2019).

Table 7.3 Estimated energy savings as a result of recycling in SA, 2018-19 [a]

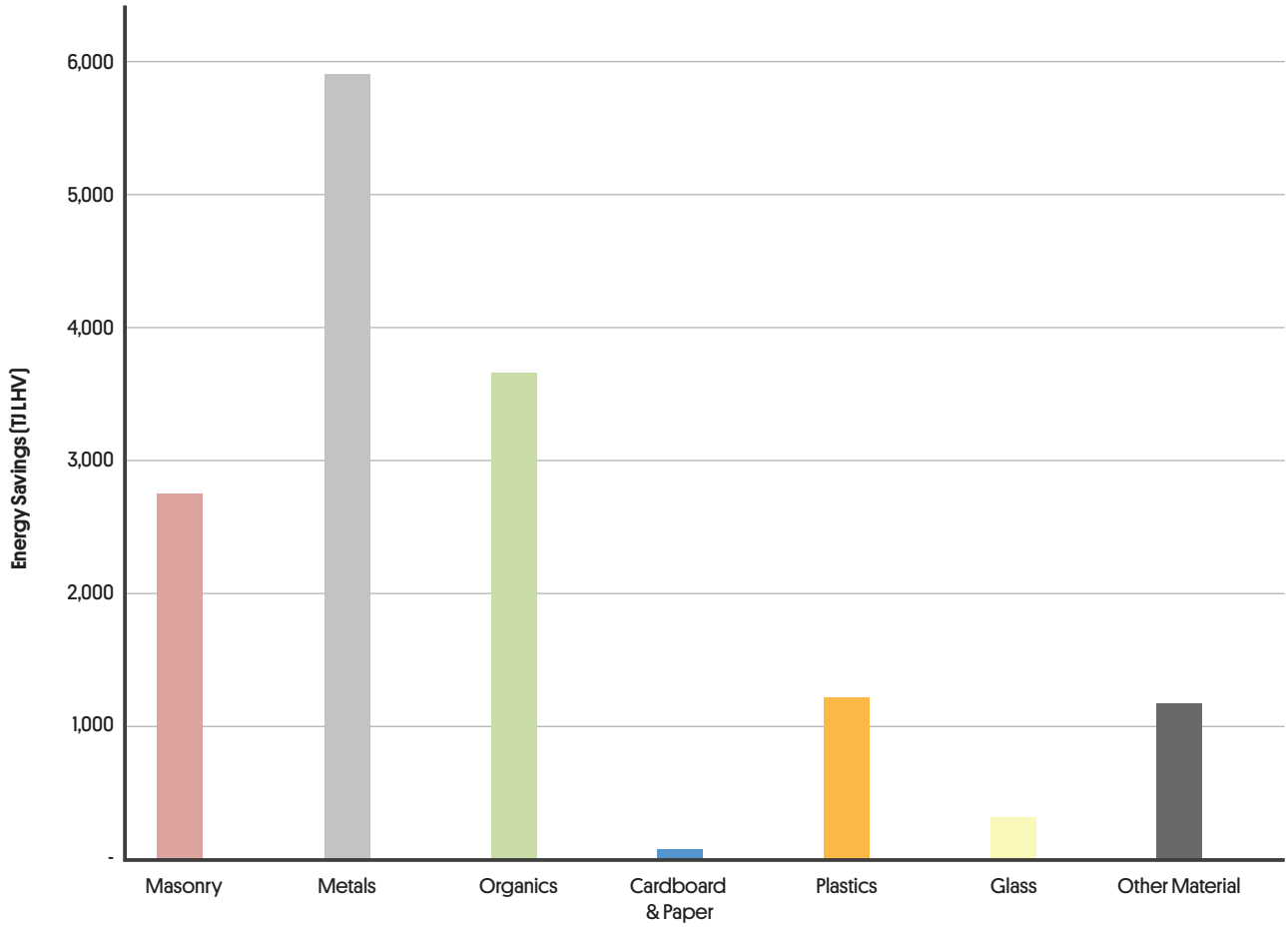
Sector Origin	Energy Saved	Equivalent households (1 year) [a]	Barrel of Oil Equivalents (BOE) [a]
	TJ LHV		
Masonry	2,760	52,100	451,000
Metals	5,900	111,400	964,100
Organics	3,670	69,300	599,700
Cardboard & paper	80	1,500	13,100
Plastics	1,230	23,200	201,000
Glass	330	6,200	53,900
Other Material	1,190	22,500	194,400
Total [b]	**15,160**	**286,200**	**2,477,200**

Notes:

(a) Refer to Survey Methodology in Appendix 1 for additional information on environmental benefits analysis assumptions and methodology.

(b) Note numbers may not sum due to rounding

Figure 7.2 Avoided energy consumption (by material category) as a result of recycling in SA, 2018-19



7.3 Water savings

The total projected water savings (in Megalitres or ML[18]) from recycling in SA during 2018-19 was approximately 8,200 ML (**Table 7.1** on page 78, and **Table 7.4** and **Figure 7.3** on page 83). This is a slight reduction from 2017-18 where recycling contributed water savings of 8,300 ML.

- Manufacture of virgin aluminium, plastics and tyres and cardboard and paper materials consumes large volumes of water per tonne (see **Table A4.1** on page 110). As there is also a high volume of Cardboard & Paper recovered in SA, this contributes most significantly (at 32%) to water savings achieved from recycling (see **Figure 7.3** on page 83).
- Masonry is the next greatest contributor overall, at 27% of all water saved from recycling in SA, followed by Organics at 19%
- Plastics and Other Materials contribute a high proportion of water savings, each at 12% of total water saved. This is despite each only contributing 1% of all recovered materials.
- Recycling of Steel consumes more water than it saves. As such, despite the recovery of Aluminium and Non-Ferrous Metals consuming less water than manufacturing these materials from virgin products, the net result for metal recovery in SA is a greater consumption of water.
- The overall water savings for SA's recycling activity during 2018-19 are considered approximately equivalent to:
  - » Water use by about 42,000 average Adelaide households in one year[19].
  - » The water contained in about 3,300 Olympic-sized swimming pools[20].
- The water savings from SA's recycling activity in 2018-19 equate to:
  - » 6% of Metropolitan Adelaide's total water consumption reported for 2018-19[19]

18 1 Megalitre or ML = 10^6 Litres (L) = 1,000 kilolitres (kL)
19 Average household water consumption value ≈ 197 kL/yr; Source: South Australian Water Corporation Annual Report 2018-19 SA Water (2019)
20 Olympic-sized pool value ≈ 2,500 kL/yr

Table 7.4 Estimated water savings as a result of recycling in SA, 2018-19[a]

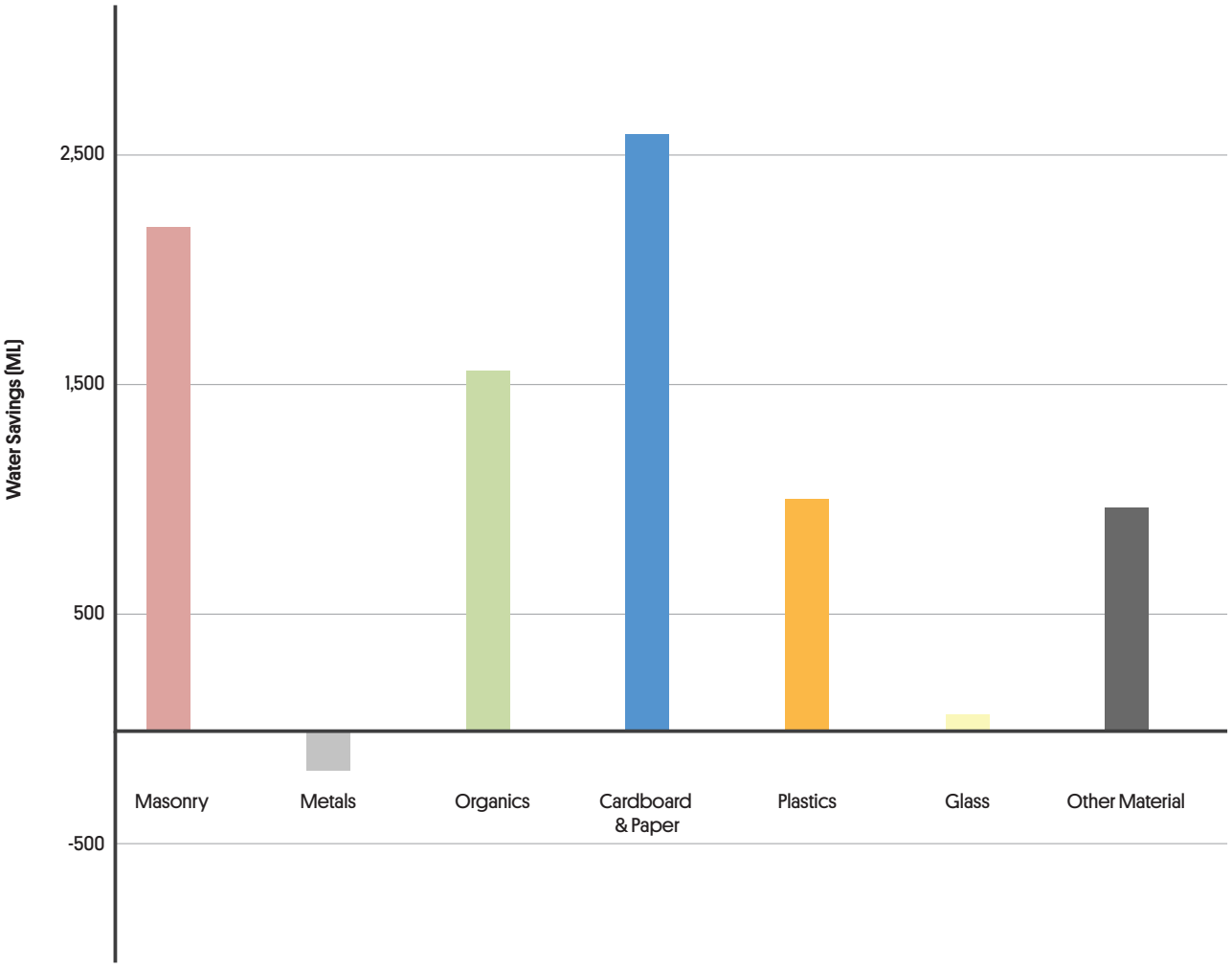
Sector Origin	Water saved	Equivalent households (1 year) [a]	Olympic Swimming Pools [a]
	ML		
Masonry	2,200	11,190	880
Metals	-180	-920	-70
Organics	1,560	7,930	620
Cardboard & paper	2,530	12,870	1,010
Plastics	1,000	5,090	400
Glass	70	360	30
Other Material	970	4,930	390
Total [b]	**8,150**	**41,450**	**3,260**

Notes:

(a) Refer to Survey Methodology in Appendix 1 for additional information on environmental benefits analysis assumptions and methodology.

(b) Note numbers may not sum due to rounding.

Figure 7.3 Avoided water consumption (by material category) as a result of recycling in SA, 2018-19



08 Acknowledgements

Green Industries SA and Rawtec would like to recognise and thank the following participants in the 2018-19 SA Recycling Activity Survey. The list below does not indicate all organisations who participated in the survey but those that agreed to be recognised.

- Adelaide Hills Region Waste Management Authority
- Advanced Plastic Recycling
- Agricycling
- Australian & New Zealand Recycling Platform Ltd (ANZRP)
- Electronic Recycling Australia
- Boral Australia
- Carter Holt Harvey (CCH) Woodproducts Australia
- CBS Bins
- Ceduna Recycling
- Chevron Glass
- Cleanaway
- Close the Loop Pty Ltd
- Coolfoam
- Department of Planning, Transport and Infrastructure (DPTI)
- Downer EDI Works Ltd
- Fleurieu Regional Waste Authority
- Foamex South Australia
- Green Triangle Recyclers
- Intercast & Forge
- Iron Mountain Australia
- Jeffries
- McMahon Services Australia
- MobileMuster
- Naracoorte Recyclables
- Normetals Pty Ltd
- Northern Adelaide Waste Management Authority (NAWMA)
- O-I Asia Pacific
- Old Red Brick Co
- OneSteel Recycling
- Orora
- Peats Soils & Garden Supplies
- Recycling Plastics Australia Pty Ltd
- Renewal SA
- ResourceCo Pty Ltd
- SA Water
- Sims Metal Management
- Southern Region Waste Resource Authority (SRWRA)
- Statewide Recycling
- St Vincent de Paul
- SUEZ
- Thomas Foods International
- Tarac Technologies
- Tyrecycle
- Van Schaik Organic Soils & Bark Suppliers Pty Ltd
- Visy Industries
- Whyalla Waste Resources and Recovery Centre
- YCA Recycling

09 Glossary[21]

Alternative fuel

A fuel usually derived from renewable sources, used as an alternative to fossil fuels.

Bio-solids

Waste organic solids derived from biological wastewater treatment plants.

Clean Fill (also known as Waste Fill)

Reported in the survey as Clay, Fines, Rubble & Soil. Waste fill is defined in the Environment Protection (Fees and Levy) Regulations 1994 as: waste consisting of clay, concrete, rock, sand, soil or other inert mineralogical matter in pieces not exceeding 100 millimetres in length and containing chemical substances in concentrations (calculated in a manner determined by the Authority) less than the concentrations for those substances set out in Schedule 6 [of the Regulations], but does not include waste consisting of or containing asbestos or bitumen.

Container deposit

Sometimes referred to as container deposit legislation or CDL. A refundable charge imposed on a range of recyclable beverage containers. The deposit is included in the retail price and refunded when the container is returned to a collection point.

Commercial and Industrial waste (C&I)

Comprises solid waste generated by the business sector as well as solid wastes created by state and federal government entities, schools and tertiary institutions. Unless otherwise noted, C&I waste does not include waste from the Construction and Demolition (C&D) sector.

Construction and Demolition waste (C&D)

Includes waste from residential, civil and commercial Construction and Demolition activities, such as fill material (e.g. soil), asphalt, bricks and timber. C&D waste excludes construction waste from owner/occupier renovations, which are included in the municipal waste stream. Unless otherwise noted, C&D waste does not include waste from the commercial and industrial waste stream.

21 A number of the definitions in this Glossary were re-produced from the SA 2008-09 Recycling Activity survey (Zero Waste SA, 2010)

Energy recovery

Where waste materials are recovered and used for the purpose of energy production in SA, instead of being sent for landfill disposal. Some industries already produce energy from waste by-products they generate on their own sites, but this is excluded under the under the national reporting guidelines (Dept Environment and Energy, 2015). There are also several waste companies that collect and re-process waste materials, which are then sent overseas and/or interstate for energy recovery. This circumstance is still classified 'material recovery' as any potential energy recovery from the waste material occurs outside of SA. Energy recovery also necessarily excludes energy recovery from landfill gas arising from waste disposed to landfills.

E-waste

End-of-life electrical and electronic equipment, including computers, televisions, monitors, household electrical appliances, batteries (but not automotive), etc.

Ferrous metals

Metals with iron as the major constituent.

Fly ash

Inorganic residue of coal combustion in power stations.

Food organics

Organic waste derived from food preparation and/or surplus food.

Garden organics

Organics derived from garden sources e.g. grass clippings, tree prunings.

Greenhouse gasses (GHGs)

For the purposes of this report GHGs are the six gases listed in the Kyoto Protocol: carbon dioxide (CO_2), methane (CH_4), nitrous oxide (NO), hydrofluorocarbons (HFCs), perfluorocarbons (PFCs), and sulphur hexafluoride (SF_6).

High density polyethylene (HDPE)

A member of the polyethylene family of plastics and is used to make products such as milk bottles, pipes and shopping bags. HDPE may be coloured or opaque.

Industry organics

Organic materials recovered as a waste by-product of industrial processing of organically materials, e.g. wine, meat, dairy, etc.

Kerbside collection

Collection of household waste, recyclable materials (separated or co-mingled), and organic waste that are left at the kerbside for collection by local council collection services.

Liquid paperboard

Liquid paperboard is made from cardboard or paperboard with a liquid-proof wax, plastic or foil coating on one or both sides. It is commonly used for packaging of liquid materials, such as milk, fruit juice, cream and/or detergents or providing water resistance to other types of packaging.

Low density polyethylene (LDPE)

A member of the polyolefin family of plastics. It is a flexible material and usually used as film for packaging or as bags.

Municipal waste

Solid waste generated from domestic (household) premises and council activities such as street sweeping, litter and street tree lopping. May also includes waste dropped off at recycling centres, transfer stations and construction waste from owner/occupier renovations.

National Guidelines for compiling waste and recycling data

National Guidelines for compiling waste and recycling data (NWDCRS Supporting documentation: SOPs, reporting tool user guide, and reporting guidance. Department of the Environment and Energy 2015);

Non-ferrous metals

Those metals that contain very little or no iron, e.g. copper, brass, bronze, lead, etc.

Packaging

Material used for the containment, protection, marketing or handling of product.

Polyethylene terephthalate (PET)

A clear, tough, light and shatterproof type of plastic, used to make products such as soft drink bottles, film packaging and fabrics.

Polypropylene (PP)

A member of the polyolefin family of plastics. PP is light, rigid and glossy and is used to make products such as washing machine agitators, clear film.

Polystyrene (PS)

A member of the styrene family of plastics. PS is easy to mould and is used to make refrigerator and washing machine components. It can be foamed to make single use packaging, such as cups, meat and produce trays.

Polyvinyl chloride (PVC)

A member of the vinyl family of plastics. PVC can be clear, flexible or rigid and is used to make products such as fruit juice bottles, credit cards, pipes and hoses.

Post-consumer material

Material generated by households or by commercial, industrial and institutional facilities in their role as end-users of the product which can no longer be used for its intended purpose. This includes returns of material from the distribution chain.

Pre-consumer material

Material diverted from the waste stream during a manufacturing processes for re-processing at a different site. Excluded are waste materials that are reclaimed and reutilised within the same manufacturing processes that generated it as a matter of course to the efficient operation of the site (i.e. process scrap).

Recovered material

Material that would have otherwise been disposed of as waste, but has instead been collected and reclaimed as a material input, in lieu of a new primary material, for a recycling or manufacturing process.

Recycling

Material that has been re-processed from recovered (reclaimed) material by means of a manufacturing process and made into a final product or into a component for incorporation into a product. The term recycling is used to cover a wide range of activities, including collection, sorting, re-processing and manufacture into new products. Waste materials that are reclaimed and reutilised within the same manufacturing processes that generated it as a matter of course to the efficient operation of the site (i.e. process scrap) are not defined as recycling for the purpose of this study.

Re-processing

Changing the physical structure and properties of a waste material that would otherwise have been sent to landfill, in order to allow it to be reused or re-incorporated into manufactured products.

Reuse

Reuse involves recovering value from a discarded resource in its original state without re-processing or remanufacture.

Solid waste

Waste materials ranging from municipal garbage to industrial waste, but excluding gaseous, liquid, hazardous, clinical and intractable wastes.

Waste Hierarchy

An internationally recognised aspirational framework for managing waste generation and disposal that is a guiding principle of South Australia's Waste Strategy. Levels in order of precedence in the hierarchy include: Avoid, Reduce, Reuse, Recycle, Recover, Treat, Disposal.

10 Typical Sources & End Uses for Recovered Materials

Material	Source Products	End Products
Alternative fuel	Plastic & timber C&D-derived material, Dry comingled recyclables, Cardboard & paper, Tyres & rubber	Energy production for power & industrial heating
Auto-parts	Auto-parts salvaged from end-of-life motor vehicles	Auto-parts
Aluminium	Windows and doors, automotive engines, assorted industrial scrap and production scrap, aluminium cans, electrical cable, electronic and electrical waste	Valves and extrusions, consumer products, automotive parts, building industry and aluminium cans.
Asphalt	Roads, footpaths, car parks and kerbing	Road base, quarry rehabilitation material
Batteries	End-of-life lighting primary & secondary consumer batteries. Excludes automotive batteries	Shredding and/ or disassembly to plastic, metal and other constituents for re-processing
Bricks	Mainly walls and other general C&D activity	Primarily crushed for road base and drainage, but also directly reused
Cardboard & Waxed Cardboard	Mostly corrugated cardboard use for the packaging of industrial and consumer goods	Packaging
Clays, Fines, Rubble & Soil	General C&D, Earthworks for site preparation	Road base, batters/bunds, compost (bulking agent), quarry rehabilitation material
Clothes	Clothes donated to charities by the public or business	Clothes
Compact Fluorescent Lamps	End-of-life lighting	Disassembly to various material constituents for re-processing

Material	Source Products	End Products
Computers	End-of-life computer equipment, accessories and peripherals	Salvage and/or refurbishment for reuse of components, Shredding and/or disassembly to plastic, metal and other constituents for re-processing
Concrete	Slabs, footings, kerbing, channel and walls	Crushed as aggregate for road base and drainage, construction fill
Fly Ash	Residue from coal-fired power generation	Cement manufacture, fill, soil stabilisation, fertiliser production
Food	Surplus or out-of-date food donated to charities and sold, reused or supplied to the community	Food
Food Organics	Kerbside collected and commercial food wastes	Composted soil conditioners, potting mixes and mulches
Foundry Waste	Foundry waste materials including sands, dusts, slag and refractory ceramics	Cement manufacture, fill, manufactured soils, blending with composts
Garden Organics	Kerbside collected, other municipal, commercial garden organics	Composted soil conditioners, potting mixes and mulches
Glass	Building glass, Packaging – beer, wine, food	Bottle manufacture, reflective beads for road marking, aggregate for road base
High Density Polyethylene (HDPE)	Milk bottles, sheet liners and covers, manufacturing scrap, other packaging bottles, mobile garbage bins, drums, pipes, crates and pallets	Pallets, agricultural pipes, bins, industrial film, water tanks, crates and mixed polymer timber replacement products
Leather & Textiles	Clothes, other textiles	Cleaning cloths
Liquid Paperboard	Liquid paperboard LPB packaging, both container deposit (CD) and non-CD. CD LPB packaging (includes flavoured milk beverages and fruit juice flavoured beverages). Non-CD packaging includes milk and fruit juice packaging.	New paper and cardboard products and packaging
Low Density Polyethylene (LDPE)	Flexible film used as distribution packaging, packaging bottles and manufacturing scrap	Builders film, damp course linings, garbage bags, retail carry bags, mixed polymer timber replacement products, irrigation piping, timber replacement products and garden furniture

Material	Source Products	End Products
Magazines	Magazines Pre-consumer waste and post-consumer magazine material	Newsprint, paperboard, tissue, stationery and copy and printer paper
Mixed &/or Other Plastics (MIX)	Manufacturing scrap and domestic durables	Various, including composite materials for bollards and posts
Mobile Phones	End-of-life mobile phones, including accessories and batteries	Shredding and/or disassembly to plastic, metal and other constituents for re-processing
Newsprint	Both pre- and post-consumer newsprint and some magazine material. Includes magazines and TV guides printed on newsprint or improved newsprint.	Newsprint, packaging, cat litter, insulation, building products and composting
Non-ferrous Metals	Copper pipe, automotive batteries and cable, general industrial and production scrap, electrical cable	Many, including batteries, cables, valves and extrusions.
Other E-waste	All other end-of-life electrical and electronic equipment, including whitegoods	Shredding and/or disassembly to plastic, metal and other constituents for re-processing
Phonebooks	Phone books	Newsprint and packaging
Polyethylene Terephthalate (PET)	Soft drink bottles, fruit juice bottles	Soft drink bottles, other packaging applications, fibre applications
Polypropylene (PP)	Manufacturing scrap, rigid packaging applications, pallet strapping and automotive parts	Crates, boxes, plant pots, building materials, electrical cable cover, automotive parts, irrigation fittings and mixed polymer timber replacement products
Polystyrene (PS)	Manufacturing scrap, pipe supports, EPS freight packaging and rigid food packaging	Waffle pods, produce boxes, building materials, concrete reinforcement stools, extruded polystyrene and mixed polymer timber replacement products
Polyvinyl Chloride (PVC)	Manufacturing scrap	Floor coverings, pipes, electrical conduit, clothing, shoes, hose fitting and garden hoses
Printer Cartridges	Empty or redundant ink-jet or laser printers	Re-filled cartridges, disassembly to material constituents for re-processing
Printing & Writing Paper	Office paper and a small amount of packaging paper from office sources	Packaging and writing paper
Timber	Timber Barks, sawdust, wood/timber packaging, general wood/timber	Composted soil conditioners, potting mixes and mulches; Alternative fuel source
Tyres & Rubber	Tyres, other rubber products	New tyres, industrial adhesives and non-slip paints, road surfacing, brake pads, sporting and playground surfaces, alternative fuel for energy production
Televisions/Monitors	End-of-life CRT, LCD or LED televisions or computer monitors	Shredding and/or disassembly to plastic, metal and other constituents for re-processing

11

Abbreviations

C&D	Construction & Demolition
C&I	Commercial & Industrial
CO_2-e	Carbon dioxide equivalent
EOL	End of Life
GHG	Green House Gas
GSP	Gross State Product
HDPE	High Density Polyethylene
kg/p/yr	Kilograms per person, per year
kL	Kilolitre
LDPE	Low Density Polyethylene
LPB	Liquid Paper Board
ML	Megalitre
MRF	Material Recovery Facility
MSW	Municipal Solid Waste
PET	Polyethylene Terephthalate
PP	Polypropylene
PS	Polystyrene
PVC	Polyvinyl Chloride
SA	South Australia
t	Tonnes
TJ	Terajoule

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13 Document status

Revision	Date	Prepared by	Checked by	Approved by
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V2 – Draft	15/5/20	M Allan, M Tamlin, K Heinrich, M Rawson	M Rawson	K Heinrich
V3	25/5/20	M Allan, M Tamlin, K Heinrich, M Rawson	K Heinrich M Allan	M Allan

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A1 Appendix 1: Survey Methodology

Rawtec was engaged by Green Industries SA to undertake the Recycling Activity (survey) in South Australia (SA) for the 2018-19 financial year. This section summarises the approach and methodology used to conducting the survey.

- Rawtec was engaged to conduct the survey for 2018-19.
- This approach and methodology was similar to that used for the 2009-10, 2010-11, 2011-12, 2012-13, 2013-14, 2015-16, 2016-17 and 2017-18 recycling activity surveys, which were also undertaken by Rawtec.

A1.1 Selection of Materials

The materials to be surveyed for recycling activity was agreed with Green Industries SA – see **Appendix 3** for a complete list.

- This list was considered to include the majority (at least >95%) of the material types recovered in SA for re-processing.

A1.2 Survey Design & Delivery

A1.2.1 Survey Respondents

All known local (SA based) and interstate companies or organisations involved with recycling were identified.

- The final list included 117 organisations, which included survey respondents from 2017-18 and any newly identified companies involved with recycling activity in SA.

In broad terms, these organisations could be classified as follows.

1. **Industry-based Recycled Material Collectors, Aggregators and/or Re-processors**
   Companies or organisations in SA or interstate involved with collecting, aggregating, transporting, exporting and/or re-processing materials recovered in SA.
2. **Representative or Industry Bodies**
   Representative organisations for industry or material sectors involved with resource recovery or recycling that conduct their own surveys or collect data on recycling performance of these sectors.

3. **Government agencies/bodies**
   Commonwealth or South Australian government agencies concerned with collecting data or other statistics on recycling activity in SA.

   » Green Industries SA –

   - During 2010-11 Green Industries SA (previously Zero Waste SA) commenced collection of resource recovery data for organic material from SA composters through its Zero Waste SA Environment Users System (ZEUS)[22]

   » South Australian Government Environment Protection Authority (EPA) –

   - Data for recycled deposit containers and bottles collected in SA; and
   - Landfill disposal data.

   » Australian Department of Foreign Affairs & Trade (DFAT) Statistical Information Service

   - Australian Customs Export Data.

A1.2.2 Confidentiality

It was agreed with Green Industries SA that the names of, and data provided by industry-based recycling companies or organisations would be kept confidential in the public reporting of data except where the survey respondent indicated otherwise.

- Providing this assurance of confidentiality was deemed important to encouraging survey participation by the recycling industry.

A1.2.3 Survey Questionnaire

A survey questionnaire was developed and agreed with Green Industries SA. This survey questionnaire was in line with the 2017-18 questionnaire, except for moving question 3 to question 11a and the addition of one question (11b). This question asked respondents to indicate the main employment classifications within their company/ organisation. The classification options were:

- Unskilled
- Administration
- Construction/design
- Driver
- Machinery operator
- Technical support
- Sales/marketing
- Supervisor
- Other.

A1.2.4 Survey Deployment

The survey was deployed to survey respondents in September 2019.

- The deployment method was by email
- Following survey deployment, respondents were also contacted to confirm receipt of the survey and determine if they had any queries or required assistance with completing the survey. In some instances, it was discovered that the relevant company or organisation no longer existed or recycling activity had not occurred during 2018-19.

Each respondent was given several weeks to complete and return the survey.

- Outstanding survey returns were followed up by email and/or phone at least once, to encourage completion and submission by the respondent of the survey.

The collection of survey data was closed in mid-December 2019, although some data was received early 2020.

A1.2.5 Consultation

A selected number of recycling industry companies were given the opportunity to participate in direct face-to-face consultation as part of the 2018-19 Recycling Activity survey.

- These companies were usually key players in specific material categories. The more detailed information obtained from these consultations were used to guide survey data analysis and interpretation.

22 ZEUS is a web-based system that has been purpose developed by Green Industries SA to collect data from local government and industry on waste disposal and resource recovery within South Australia.

A1.3 Data Analysis

A1.3.1 Materials Analysis & Reporting

Data collected by the survey was analysed to determine the following for each material. This analysis was conducted according to the guidelines for national reporting (Dept Environment and Energy, 2015).

Quantity – The total reported quantity of that material recovered in SA for recycling or reuse.

Imported Waste Material – Separate identification of waste material imported from interstate and overseas, which is excluded from measuring SA's recycling performance

Energy Recovery – Separate identification of waste materials recovered and used for energy production in SA[23].

Destination – Where the material was sent for recycling:

- SA – Including what degree of re-processing occurred:
  - » Manufactured Product – Incorporated into a final consumer or market product.
  - » Recycled Product – Re-processed to a feedstock material to replace a virgin material used for manufacture.
- Interstate – Where the material might be re-processed or exported overseas.
- Export – Where the material was directly exported from SA to an overseas destination for re-processing.

Sector Origin –The reported sector origin from where the material was recovered:

- Municipal (MSW) – From kerbside collection, general public and/or via Council or other Municipal authority.
- Commercial & Industrial (C&I) – Collected from business or industrial activities (but excluding C&D).
- Construction & Demolition (C&D) – Collected from construction or demolition activities involved with building and/or infrastructure construction.

Geographical Origin – The reported geographical origin for recovered materials:

- Metropolitan area – From the metropolitan Adelaide area.
- Regional – From other areas outside the metropolitan Adelaide area.

In conducting the above analysis, the following principles were applied:

- Any materials imported into SA from other states and territories or overseas for re-processing were excluded.
- Great care was taken to avoid double counting of recovered materials which can occur where same material is handled multiple times by different parties before reaching its eventual destination.
- In almost all cases, direct industry estimates were relied upon to estimate the splits where reported data for materials were aggregated.
- In occasional instances where a survey respondent did not report data for the current year:
  - » Third party estimates of the respondent's recycling activity were identified from industry or other published sources; and/or
  - » The respondent's previous years' data, if available, was used to reasonably estimate recycling activity (only when such data was considered a reliable indication of current recycling activity).

23 See Glossary for further details.

A1.3.2 Accuracy of Reported Data

Survey respondents were asked to report on the accuracy of the data they were providing (e.g. could be accurate to, or have error of, ±2%). This accuracy data was used to determine an estimated reporting accuracy for each material[24].

- The estimated reporting accuracy for each material was used to select an appropriate number of significant figures that should reasonably apply to presentation of the reported data.

Where third party estimates and/or previous years' data were adopted for recycling activity, a greater error of appropriate value (i.e. usually between ±10-30%) was applied to reflect the greater uncertainty in the accuracy of this data.

A1.3.3 Per Capita Analysis & National Benchmarking

Metrics for per capita waste and recycling by SA and benchmarking of these metrics against similar data were calculated using the following data and assumptions.

- Population statistics were sourced from the Australian Bureau of Statistics (ABS) (2019 and 2018).
- The relevant reporting periods and sources of recycling activity data were:
  - SA: 2018-19, as reported in this survey;
  - ACT: 2018-19, as reported by: Transport Canberra and City Services Directorate Annual Report 2018-19 (ACT, 2019);
  - VIC: 2017-18, as reported by: Victorian Recycling Industry Annual Report 2017-18 (Sustainability Victoria, 2019);
  - WA: 2017-18, as reported by: Recycling Activity in Western Australia, 2017-18 (WA Waste Authority, 2019);
  - NSW: 2017-18, as reported by: NSW Waste Avoidance and Resource Recovery Strategy: Progress Report 2017-18 (NSW EPA, 2019);
  - QLD: 2017-18, as reported by: Recycling and Waste in Queensland 2018 (QLD Government, 2018).
- Adjustments were made to the above data to present recycling data in accordance with the national reporting guidelines (Dept Environment and Energy, 2015).

A1.3.4 Packaging Recovery Analysis & Reporting

Packaging data was taken directly from Recycling Activity survey data:

- Container deposit bottle and can packaging:
  - From 2018-19 CDL data reported by industry to the South Australian EPA.
- Cardboard packaging:
  - Derived from cardboard material recovery data which was adjusted to account for pre-consumer material.
- Other plastic packaging:
  - Derived from industry data for plastic packaging materials recovered by Adelaide MRFs and other sources.
- Other glass packaging:
  - Determined from balance between CDL data and industry-reported glass recovery and re-processing data.

A1.3.5 Environmental Benefits Analysis

A1.3.5.1 General Approach

- The methodology for this analysis was aligned as much as possible to the approach applied in previous recycling activity surveys developed for SA. The scope of environmental benefits analysis included the following metrics.

24 Standard error propagation techniques were applied for calculating errors when adding or subtracting data for reported resource recovery of materials

Greenhouse Gas Savings (quantified as tonnes of CO_2-e) – The reduction in greenhouse gas emissions achieved by replacing virgin materials with recycled materials.

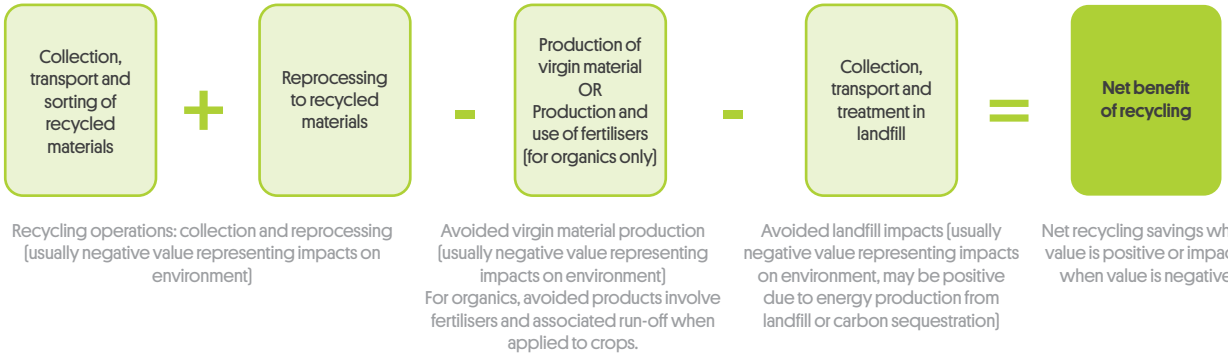
Cumulative Energy Demand Savings (as Terajoules (TJ) – The amount of energy saved, including all fossil, renewable, electrical and embodied energy, by using recycled materials.

Water Savings (as Megalitres (ML) H_2O) – The reduction in water consumption by substituting recycled materials that would otherwise be required if virgin materials had been used.

A1.3.5.2 Assumptions & Data Sources

The conversion and emission factors used to assess the benefits of recycling materials have been widely studied and established methods are developed to calculate them. These methods are based on Life Cycle Analysis (LCA) techniques. **Figure A1.1** below gives a useful illustration of how LCA techniques approach the assessment of resource recovery and recycling activities in order to calculate the benefits that can be achieved.

Figure A1.1 **Method for calculating the net environmental impacts in the recycling process. Source: NSW DECCW (2010)**



LCA techniques have previously been used to estimate conversion and emission factors for Australian situations including for SA. In view of this, a single material conversion and emission factor for each material was usually adopted. SA specific or source values were adopted first. Otherwise, conversion or emission factors from another source were used. In this situation, where there were multiple values available, the lower value was normally adopted in order to be conservative in the estimate of environmental benefits.

Sufficiently comprehensive and/or reliable conversion or emission factors data could not be identified for the following materials:

- Foundry Waste; and
- Leather & Textiles.

As a consequence, these materials were not included in the environmental benefits analysis.

A1.3.5.3 Qualifications & Limitations

The following qualifications and limitations should be recognised about the environmental benefits analysis presented in this report. These qualifications and limitations are not unique to the 2018-19 Recycling Activity survey and would also have applied to similar assessments conducted in previous Recycling Activity surveys.

1. Many of the conversion and emission factors adopted are not specifically calculated for SA, and in most cases, are derived from interstate studies, i.e. Victoria, NSW.

2. It is important to recognise that not all environmental benefits reported directly accrue to SA, because:

    - Some of the virgin materials that are replaced by recycling are not manufactured in SA, e.g. metals, plastics, cardboard & paper; and/or

    - The material recovered from SA for recycling is used to manufacture products that end up being consumed outside of the State, e.g. metals, plastics, cardboard & paper.

In view of the above, the assessment in this study represents a generalised estimate of the life cycle benefits involved with recycling of these materials and does not precisely depict the environmental benefits of recycling activity in SA.

A1.3.6 Resource Recovery Value

The value of waste materials recovered for recycling is influenced by:

- The type of waste material and industrial product in which it can be recycled or reused;

- The commodity market prices for virgin material that they replace;

- Whether the material will be re-processed locally or exported overseas;

- The quality of this material, including the extent of source separation and/or pre-processing which might have already occurred.

A number of recovered materials in SA are exported to international markets. In these markets, prices can be highly volatile and may fluctuate by up to 60-80% from year to year (Dept Environment and Energy, 2015).

Pricing for recovered materials re-processed locally, such as masonry, glass and organics, are usually more stable. But these prices too can vary considerably depending on local economic outlook and/or activity and between jurisdictions.

Plastics already source separated by polymer will have greater market value than mixed plastics. Glass recovered in SA from container deposit depots is more highly prized and valued than glass recovered from material recovery facilities interstate due to lower contamination. In the case of organics, which are putrescible, most recovered material must be composted before it realises a market value.

As a consequence, the value of recovered material can vary over time, between jurisdictions, and depending on local waste management and resource recovery practices. Price and/or value estimates are therefore usually based on highly aggregated average prices to take into account all of these factors.

For the purpose of this study, the assumed values of various recovered materials obtained in SA during 2018-19 are given in **Table 2.9**. These assumed values are based on:

- Consultations with industry in October and November 2019;

- 2018-19 survey responses;

- Publicly available information on market values of recovered materials;

- Where such market values for a recovered material were not presented above, the consultants' own estimate were used based on our knowledge and insight of the South Australian waste management industry and local markets for recycled materials.

A2 Appendix 2: Survey Participation

The following presents some survey statistics that may provide a useful insight into the recycling activity occurring in South Australia (SA) and the types of data and information sets that were returned and analysed in 2018-19.

A2.1 Survey Participation & Reported data

Table A2.1 on page 104 summarises the survey participation and reported data points for 2018-19.

- The survey questionnaire was successfully deployed to 117 or 99% of the initial list of 118 organisations identified as potentially involved with recycling activity in SA.
- The survey returns produced recycling activity data or information sets for 95 of these companies or organisations.
- Of these 95 data or information sets, the following types of activity were classified. Note: the activity type classifications are not mutually exclusive as many companies or organisations reporting data were involved with multiple activities and/or aspects of the resource recovery and/or recycling industry.
  - » Three reference &/or aggregated data sets from industry bodies or government agencies.
  - » 13 data sets came from companies or organisations that generated the material that was being recovered for recycling.
  - » 48 data sets were companies or organisations involved in collection or aggregation of recovered material.
  - » 39 data sets were for companies or organisations undertaking re-processing activities.
  - » 22 of these companies or organisations were also involved in manufacturing products from the recovered or re-processed material (either in SA or interstate).

Table A2.1 **Overall Survey Statistics**

Statistic		No.	(%)	% Basis
Sample Size		118	100%	
Surveys Deployed*		117	99%	of Sample Size
Survey Data Points		95	81%	of Surveys Deployed
Activity Type	Industry Reference Data	3	3%	of Survey Data Points
	Source	13	14%	of Survey Data Points
	Aggregator/Collector	48	51%	of Survey Data Points
	Recycler	39	41%	of Survey Data Points
	Manufacturer	22	23%	of Survey Data Points

A2.2 Industry Data Segmentation

Table A2.2 below summarises the reported industry data (excluding reference data) points or sets from companies or organisations by the following classifications. Again, these classifications are not mutually exclusive.

- Material Activity – The materials and/or industry sector the company or organisation was handling.
- Material Destination – Where were recovered materials sent?
- Waste Hierarchy[25] – At what level of the waste hierarchy were materials being handled?

Table A2.2 **Industry Sourced Data Statistics**

Statistic		No.	(%)
No. Industry-Sourced Data Points		95	100%
Material Activity	Masonry	16	17%
	Metals	27	28%
	Organics	25	26%
	Cardboard & paper	24	25%
	Plastics	26	27%
	Glass	13	14%
	Other Materials	9	9%
	E-waste	17	18%
	Reuse Materials	2	2%
Material Destination	SA	70	74%
	Interstate	27	28%
	Export	21	22%
Waste Hierarchy	Reuse	18	19%
	Recycle	89	94%
	Energy Recovery	3	3%

25 The waste hierarchy is an internationally recognised aspirational framework for managing waste generation and disposal that is a guiding principle of South Australia's Waste Strategy (ZWSA 2012). The levels presented here are not necessarily given in any particular order of preference, but it is widely accepted that the precedence should be: Reuse > Recycling > Energy Recovery.

A3 Appendix 3: Weighbridge data

Respondents were asked to indicate whether tonnes reported were measured by weighbridge[26] or another method. In addition, when previous survey responses were used in the 2018-19 analysis, the researchers determined whether the tonnes were measured by weighbridge based on information provided in the earlier survey responses.

This data was analysed by material stream and it is summarised in the table below[27]. As can be seen in the table, the overall percentage of waste measured via weighbridge is 76%. This is 1 percentage point lower than 2017-18, when weighbridge data was first collected. The streams with the highest proportion of weighbridge data were the same as last year; Glass at 99%, and Cardboard and Paper at 98% (driven by high proportion of Cardboard & Waxed Cardboard, which is the largest proportion of this stream and was found to be almost 100% measured by weighbridge). Metals and Organics, both estimated at 87%, were the next highest. Other materials, which included Foundry Sands, Leather & Textiles and Tyres & Other Rubber, had the lowest proportion measured by weighbridge in both 2017-18 and 2018-19, falling at 27% in both surveys. This low proportion is due to Leather & Textiles and Tyres & Other Rubber, as 100% of Foundry Sands was measured via weighbridge.

It is important to note that if data is measured by weighbridge it does not indicate accuracy, as it includes data from previous years. Although these previous datasets may be known to be measured by weighbridge, they are lower in accuracy, to account for uncertainty in the organisation's actual figures.

Table A3.1 **Proportion of tonnes reported measured by weighbridge**

Stream	% weighbridge out of reported tonnes, by weight
Masonry overall	71%
Metals overall	87%
Organics overall	87%
Cardboard and Paper overall	98%
Plastics overall	81%
Glass overall	99%
Other materials overall	23%
Total proportion of recycled materials measured via weighbridge	**76%**

26 Note weighbridge includes floor scales
27 Weighted averages are provided

A4

Appendix 4: 2018-19 Recycling Activity Survey Questionnaire

Survey Form – Recycling Activity in SA, 2018-19

Issued: 18 September 2019

1. Survey Company & Contact Details

Rawtec Pty Ltd (www.rawtec.com.au)

- **Matt Allan, Senior Consultant, p: (08) 8294 5571, e: matt.allan@rawtec.com.au**
- **Michaela Tamlin, Consultant, p: (08) 8294 5571, e: michaela.tamlin@rawtec.com.au**

2. Survey Questions for Period 1 July 2018 - 30 June 2019

1.	Please provide your company or organisation's contact address and details. Please also include the location(s) of your main facility(ies) for re-processing or handling of materials **Company/Organisation's Name:** **Contact Address:** **Location(s) of your main facility(ies) for re-processing or handling of materials:**
2.	Are you happy for your company to be recognised in the report as participating in the 2018-19 SA Recycling Activity survey? **(Please Circle/Highlight)** **[Yes / No]**
3.	Please fill in **Table 1** (overleaf) for each relevant material listed in **Table 2** (page 3). **This is the critical information required for the survey. All data will be kept confidential and anonymised for reporting purposes.**
4.	What is method for measuring of the data provided in **Table 1** **O** Weighbridge **O** Other please specify
5.	What is the estimated accuracy of the data provided in **Table 1, e.g. ±5%** **E.g. if weighbridge, a suitable accuracy may be 1%**

Table 1 **Material and tonnage data requested from industry**

ID	Material	**Data for 2018-19 Financial Year** (1 July 2018 – 30 June 2019)											**Approx. material value (2018-19)**
		MATERIAL SOURCE/INPUT						**MATERIAL DESTINATION/OUTPUT**				**RESIDUAL**	
		Total materials received for recycling in 2018-19 (in tonnes)	Materials received for recycling metro vs regional (in tonnes or %)		Source of material (in tonnes or %)			Destination of material for re-processing (in tonnes or as %)				% residual (if any) generated from recovery or re-processing to landfill	Approx. commodity price (if sold as a commodity) or approx. retail market price per tonne in 2018-19
			SA-Metro	SA-Regional	MSW	C&I	C&D	Your SA facility (ies)	Elsewhere in SA	Sent Interstate	Sent Overseas		
	EXAMPLE: Steel	*23,100*	*20,100*	*3,000*	*25%*	*70%*	*5%*	-	-	*23,100*	-	*10%*	*$200 per tonne*

Note: please state all quantities in metric tonnes (1000kg = 1 tonne)

Definitions:

MSW - Municipal - Domestic household sourced waste

C&I - Commercial and Industrial - Industry and business sourced waste

C&D - Construction and Demolition - Building, construction and demolition

Table 2 List of Materials 2017-18 Recycling Activity Survey

Category	ID	Material
A	**Masonry**	
	1	Asphalt
	2	Bricks
	3	Concrete
	4	Plasterboard
	5	Waste Fill (or "clean" fill) – **Clay, fines, rubble & soil** (which meets EPA's WDF criteria)
	6	Intermediate Waste Soil (or "contaminated" fill) – **Clay, fines, rubble & soil** (which meets EPA's Intermediate Soil criteria)
B	**Metals**	
	7	Steel
	8	Aluminium
	9	Non-ferrous metals
C	**Organics**	
	10	Food Organics
	11	Garden Organics
	12	Timber
	13	Meat Rendering
	14	Waste Grease & Fat
	15	Waste Sludge & Bio-solids
	16	Organics - Other
D	**Cardboard & paper**	
	17	Cardboard & waxed cardboard
	18	Liquid Paperboard
	19	Magazines
	20	Newsprint
	21	Phonebooks
	22	Printing & Writing Paper
E	**Plastics**	
	23	Polyethylene terephthalate [PIC 1]
	24	High density polyethylene [PIC 2]
	25	Polyvinyl chloride [PIC 3]
	26	Low density polyethylene [PIC 4]
	27	Polypropylene [PIC 5]
	28	Polystyrene [PIC 6]
	29	Mixed &/or Other plastics [PIC 7]
F	**Glass**	
	30	Glass
G	**Electronic Waste**	
	31	Printer cartridges
	32	Compact fluorescent lamps
	33	Batteries
	34	Computers
	35	Televisions / Monitors
	36	Mobile phones
	37	Other e-waste (not classified above)
H	**Alternative Fuels**	
	38	Alternative Fuel
I	**Other Materials (exc. e-waste)**	
	39	Fly ash
	40	Foundry sands
	41	Leather & textiles
	42	Tyres & other rubber
J	**Re-use Materials**	
	43	Auto-Parts
	44	Home Furnishings & Goods
	45	Clothes
	46	Food Products

2. Continued Survey Questions for Period 1 July 2018 - 30 June 2019

For the following questions, please enter responses directly into the table below.

6. In addition to the volumes reported in **Table 1**, did you receive any waste from interstate or overseas sources that was reprocessed at your site? If so, please list materials received (see **Table 2**) and state volumes and sources.

If you received any plastics, please provide this information in the **plastics recyclers survey form**.

Material	*Tonnes received*	*Source location*

7. Were any of the reported materials derived from packaging? If yes, (for each material) approximately what proportion (as % of total)? If you received any plastics, please provide this information in the **plastics recyclers survey form**.

Material	*Proportion*

8. If there have been any significant changes in quantities, stockpiles, sources or destinations from the 2017-18 financial year, what was the reason for this?

9. Where do you receive most of your material from, e.g. Councils, manufacturing, retail, hospitality, etc.?

10. Which organisation(s) did you send each of your recovered or re-processed materials (e.g. Company X for organics and Company Y for plastics)?

11. a How many people (FTEs) are directly employed by your company/organisation's site(s) or operations(s) associated with material collection, resource recovery and/or recycling, i.e. permanent or casual staff, individual contractors?

11. b What are the main employment classifications in your company/organisation? Please complete the table below:

Classification		No. FTE
O	Unskilled	
O	Administration	
O	Construction/design	
O	Driver	
O	Machinery operator	
O	Technical support	
O	Sales/marketing	
O	Supervisor	
O	Other (list)	

12. What is your opinion about the market strength/prospects for recycled materials?

13. Does your company or organisation intend to expand or contract its SA facilities or make new investments in recycling activity? If yes, what will this involve?

14. Are there any significant barriers, e.g. market, regulatory, technology, for your SA operations?

15. What is your organisation's approximate Annual Sales Revenue (Turnover) from material collection, resource recovery and/or recycling activities?

16. What are the names of other recyclers in your area of the SA recycling industry? (this helps us ensure that we have captured all recyclers in the industry)

17. Would you like to be invited to an industry seminar by Green Industries SA (GISA) summarising the findings of this 2018-19 **SA Recycling Activity survey? (Please Circle/Highlight)**
[Yes / No]

A5 Appendix 5: 2018-19 Environmental Benefits Conversion & Emission Factors

Table A4.1 **Emission and conversion factors adopted for estimation of environmental benefits of recycling, SA 2018-19** (Trellis Technologies, 2019)

	Material	GHG Emissions Saved	Energy Saved	Water Saved
		Emissions factor (t CO_2-e/t)	Conversion Factor (GJ LHV/t)	Conversion Factor (kL/t)
	Masonry			
1	Asphalt	0.030	2.380	0.880
2	Bricks	0.020	0.280	1.260
3	Concrete	0.020	0.350	1.280
4	Plasterboard	0.030	0.550	-0.030
5	Clay, fines, rubble & soil	0.088	1.420	0.440
	Metals			
6	Steel	0.440	7.940	-2.360
7	Aluminium	16.667	206.667	29.333
8	Non-ferrous metals	0.880	36.090	5.970
	Organics			
9	Food Organics	0.250	0.180	0.440
10	Garden Organics	0.224	-0.309	5.592
11	Timber	1.350	10.730	-0.040
12	Organics - Other	0.481	2.165	0.230
	Cardboard & paper			
13	Cardboard & waxed cardboard	0.169	0.467	11.111
14	Liquid Paperboard	0.169	0.467	11.111
15	Magazines	0.455	0.364	10.909
16	Newsprint	0.455	0.364	10.909
17	Phonebooks	0.455	0.364	10.909
18	Printing & Writing Paper	1.300	-0.680	11.000
	Plastics			
19	Polyethylene terephthalate	1.200	55.000	68.750
20	High density polyethylene	0.825	50.000	22.750
21	Polyvinyl chloride	0.313	30.000	26.250
22	Low density polyethylene	0.825	50.000	22.750
23	Polypropylene	0.313	30.000	26.250
24	Polystyrene	0.313	30.000	26.250
25	Mixed &/or Other plastics	0.313	30.000	26.250
	Glass			
26	Glass	0.528	4.444	0.931
	Other Materials			
27	Fly ash	0.029	0.552	1.260
28	Foundry sands	NS	NS	NS
29	Leather & textiles	NS	NS	NS
30	Tyres & other rubber	1.070	64.080	52.250

NS = Not specified as insufficient reference data identified

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