SOUTH AUSTRALIA'S RECYCLING ACTIVITY SURVEY 2017-18 REPORT

Government of South Australia

Green Industries SA

Contents

About data used in this report

The resource recovery data presented in this report was collected from a survey sent to 118 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 2017-18 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 (2016-17).

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 2017-18 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 2017-18.

Summary of 2017-18 results

SA's landfill diversion rate is the highest accomplished since the survey commenced. The State has once again achieved the highest diversion rate of any state in Australia. The increase in diversion rate is driven by a substantial increase in masonry materials on the back of State infrastructure projects.

In 2017-18, the industry was greatly affected by China's waste and recycling policy 'National Sword'. China changed its acceptance criteria for recovered materials, particularly plastics and fibre. This change in specification meant that Australian MRFs could not access the China market, causing prices for mixed paper/cardboard and mixed plastics to drop significantly.

The SA recycling industry is transitioning to this new market situation and responding to these changes by:

- Implementing measures to improve the quality of recovered materials (via education, infrastructure investment and process changes), and
- Reducing its future reliance on international markets (e.g. through contracts and investment in infrastructure for local reprocessing of recyclables).

These measures are expected to improve the quality and volume of locally processed plastics and fibre over time.

By the numbers

The total resource recovery for SA in 2017-18 was 4.49 million tonnes (see **Table 1** below). This comprised:

- 3.14 million tonnes of 'Standard Reporting Materials' (including Metals, Organics, Cardboard & Paper, Glass and Plastics);
- 1.35 million tonnes of 'Separately Reported Materials' and Clean Fill (including soil, sand and rubble, which can fluctuate significantly across reporting years).
- Total landfill disposal for SA was 0.88 million tonnes.

SA therefore achieved a total diversion rate of 83.6% (of waste material diverted to resource recovery).

Table 1

Summary of 2017-18 Recycling Activity results for resource recovery, landfill disposal, total waste generated and total diversion (waste to resource recovery) achieved in SA.

2017-18 Recycling Activity Data Account Summary			
	Standard reporting materials*	Separately reported materials & Clean Fill**	**TOTAL (All materials)**
Resource recovery, tonnes	3.143 million	1.346 million	4.489 million
Landfill disposal, tonnes	0.783 million	0.098 million	0.881 million
Waste generated, tonnes	3.926 million	1.444 million	5.370 million
Diversion, % to resource recovery	80.1%	93.2%	83.6%

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

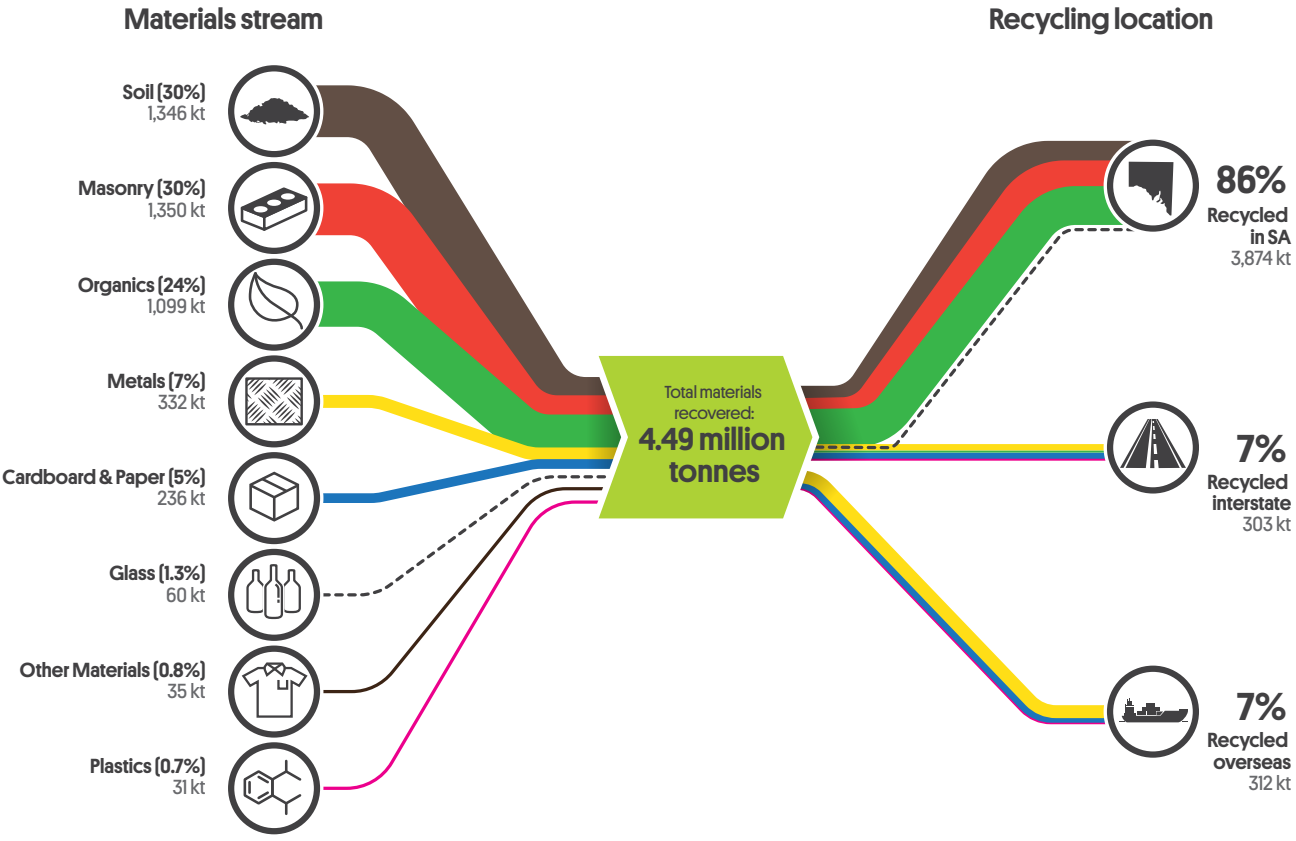
**Total waste generated = Resource recovery + landfill disposal

The diversion rate of Standard Reporting Materials was 80.1%. This was slightly above 2016-17 levels (at 79.6%) due to higher resource recovery volumes.

The diversion rate of Separately Reported Materials & Clean Fill was 93.2%. This was above 2016-17 levels (91.9%) due to lower volumes of materials landfilled.

Figure 1

Contribution of different material categories to SA's resource recovery during 2017-18 and location sent for recycling. Quantities are stated in kilotonnes (kt). The top three material streams contributing to SA's recycling activity are Soil, Masonry and Organics. The majority (86%) of recovered materials was recycled in SA. A further 7% was sent interstate and 7% overseas.



Resource recovery by material category

Most of SA's resource recovered material was Masonry and Soil. These materials each contributed 30% (or 1.35 million tonnes) to SA's recycling activity and were mostly generated by the Construction and Demolition (C&D) sector.

Organics was the third greatest contributor to SA's recycling activity (1.1 million tonnes or 24%). Organics were predominately generated by the Commercial and Industrial (C&I) sector. C&I organics included large volumes of Timber, Meat Rendering and other industry residues.

Metals remained the fourth greatest contributor by weight, remaining at 7% in 2017-18. Most Metals were sourced from the C&I sector.

Following this was Cardboard & Paper (remaining at 5%) and Glass (1.3%), see Figure 1 above. These materials were sourced from the Municipal and C&I sectors.

Destination of recovered materials

Most recovered materials (86%) were recycled in SA. This included large volumes of Masonry materials, Soil and Organics. A further 7% was sent interstate and 7% overseas. Exported materials mainly included Metals and Cardboard & Paper. See **Figure 1** above.

Other key trends

When observing differences in material recovery from 2016-17 to 2017-18 (see Section 3) the biggest increases were seen in:

- Masonry, which increased significantly by 286,000 tonnes. Asphalt, Bricks, Concrete and Plasterboard all increased with more C&D activity.
- Metals, which increased by 22,000 tonnes mainly due to an increase in recycled Steel with higher prices and generation.

Reduced volumes were seen in:

- Organics (down 14,000 tonnes) due to a drop in Garden Organics from lower rainfall levels.
- Cardboard & Paper (down 13,000 tonnes) due to lower volumes of recovered Magazines & Newsprint and improved reporting by industry.
- Glass (down 7,000 tonnes) due to a combination of factors including light-weighting, reductions in recovery of MRF glass fines and increased competition with interstate glass.
- Other Materials (down 13,000 tonnes) due to a reduction in Foundry Waste volumes.

The volume of materials sent for energy recovery in SA increased to 116,600 tonnes (up from 94,900 tonnes in 2016-17) with expanded local processing.

There was a significant increase in the volume of imported materials for resource recovery. This increased to 200,700 tonnes (up from 158,300 tonnes in 2016-17). This was mainly driven by higher volumes of Organics, Metals and Glass imported from interstate.

The total value of recovered materials in SA increased to $356 million (up from $328 million).

Performance against State targets

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

- SA's landfill volumes (at 881,000 tonnes) are 29% lower than the baseline year (2002-03) when including contaminated soil. SA therefore continues to work towards its 2020 target of a 35% reduction in waste to landfill.
- SA has continued to exceed its 2020 target of 80% and 90% diversion for metropolitan C&I and C&D respectively, with C&I diversion at 82.6% and C&D at 91.9% overall (see **Table 2.9**).
- The MSW metropolitan diversion rate is at 58.5%. SA needs to increase this by over 10 percentage points to achieve its 2020 target of 70% (See **Table 2.9**).
- Waste generation per capita remains a significant challenge. The target is at least 5% reduction in waste generation per capita by 2020 from 2015 levels. In 2017-18, per capita generation of Standard Reporting Materials increased by 8.7% from the baseline level (see **Table 2.8**).

Kerbside performance

In 2017-18, the performance of SA's kerbside systems was included in the RAS report for the first time. This 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 is collected for resource recovery by weight (via the comingled and organics bins). Performance is higher in metro councils (at 49%) compared to regional councils (at 38%).

Food waste makes 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 (FOGO) 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 with South Australian recyclers and re-processors on resource recovery of waste materials during the 2017-18 financial year.
- This data enables us to measure South Australia's performance against waste diversion goals and targets in and 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) is a leader in waste management reform and resource recovery. The state has implemented several initiatives to divert and recycle waste materials instead of disposing them to landfill. These actions have improved resource efficiency, created jobs in the circular economy, and avoided damaging greenhouse gas emissions caused by waste disposal to landfill.

SA's performance in waste management is underpinned by SA's State Waste Strategy 2015-2020 (Green Industries SA, 2015). These requirements include targets for reducing waste generation and diverting waste materials from landfill (**Figure 1.1** overleaf). Monitoring the State's performance against these targets requires measurement and collection of data for both resource recovery and landfill disposal of waste materials.

Green Industries SA's annual survey of South Australian recyclers and re-processors collects data about SA's handling of resources which would otherwise go to waste.

This report identifies waste streams by type, including recycling tonnages and potential reductions achieved in greenhouse gas emissions. We continue the separate analysis of resource recovery for material recovery versus energy production in SA, and present data reported on waste materials imported into SA for resource recovery. The current market conditions for resource recovery and recycling are

also discussed, including market size and strength, and the section on employment figures in the resource recovery industry in SA remains in this year's report. We have also included a summary of the revenue generated in the industry based on survey responses and updated the figures that summarise the market value of resource recovery in SA.

The annual survey data collected and presented in this report allows Green Industries SA to measure progress towards meeting the waste reduction targets of SA's Waste Strategy and is an authoritative reference for industry, government and the community.

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), which 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%.

1.2 The 2017-18 Recycling Activity Survey Report

This report presents the results of Green Industries SA's annual Recycling Activity Survey for the 2017-18 financial year. The results in this report are compared to the last reporting period, which was the 2016-17 financial year.

02 Key 2017-18 Recycling Activity Statistics

At a glance:

- This section summarises the key outcomes and statistics obtained from analysis of the 2017-18 SA Recycling Activity Survey data. The outcomes and statistics include:
  - Resource recovery and landfill disposal – Total 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 employment in the SA waste and resource recovery sector.

2.1 Resource recovery and landfill disposal

2.1.1 Overview

In 2017-18 SA's recycling industries reported 4.49 million tonnes of material diverted to resource recovery (**Table 2.1** overleaf). This total resource recovery included:

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

Total resource recovery increased by 2% from the 4.40 million tonnes reported for 2016-17. Standard Reporting Materials increased by 9.1% from 2016-17, from 2.88 to 3.14 million tonnes. Separately Reported Materials & Clean Fill decreased 11.5% from 1.52 to 1.35 million tonnes in 2017-18. When including both Standard and Separately Reported Materials, SA's 2017-18 per capita diversion/recovery rate increased to 2,585 kg/p/yr (up from 2,555 kg/p/yr in 2016-17). Material recovered per $ Gross State Product (GSP) in 2017-18 remained in line with 2016-17 at 50.7 tonnes per $1 million.

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

Based on this total resource recovery, SA achieved a diversion rate of 83.6%, which is slightly up from 83.4% in 2016-17. This outcome is the highest resource recovery rate achieved since the beginning of this survey.

During 2017-18 the amount of waste received at landfills in SA increased slightly, to 0.88 million tonnes (from 0.87 million tonnes in 2016-17). This represents a per capita waste-to-landfill rate of 505 kg/p/yr (in line with 2016-17). Waste to landfill in tonnes per $1 million GSP decreased from 8.4 in 2016-17 to 8.3 in 2017-18.

Table 2.1 **Annual South Australian resource recovery and landfill disposal quantities diversion performance for 2017-18, 2003-04 (first survey year) and since 2013-14.** 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). Of 4.49 million tonnes of recycling reported in 2017-18, 1.35 million tonnes were recycled soil, sand and rock materials, or Separately Reported Materials & Clean Fill. Percentage changes in performance from 2003-04 and from 2016-17 are shown.

	2003-04	2013-14	2014-15	2015-16	2016-17	2017-18	Change	
							16-17 to 17-18	03-04 to 17-18
RESOURCE RECOVERY (TONNES)								
Standard Reporting Materials	1,880,000	2,720,000	2,760,000	2,950,000	2,880,000	3,143,000	9.1%	67%
Seperately Reported Materials & Clean Fill	162,000	870,000	940,000	960,000	1,521,000	1,346,000	-11.5%	731%
TOTAL (for SA)	**2,042,000**	**3,590,000**	**3,700,000**	**3,910,000**	**4,401,000**	**4,489,000**	**2.0%**	**120%**
LANDFILL DISPOSAL (TONNES)								
Standard Reporting Materials	1,258,000	865,000	724,000	772,000	739,000	783,000	6.0%	-38%
Seperately Reported Materials & Clean Fill	20,000	49,000	180,000	118,000	134,000	98,000	-26.9%	390%
TOTAL (for SA)	**1,278,000**	**914,000**	**904,000**	**890,000**	**873,000**	**881,000**	**0.9%**	**-31%**
WASTE GENERATION (TONNES)								
Standard Reporting Materials	3,138,000	3,585,000	3,484,000	3,722,000	3,619,000	3,926,000	8.5%	25%
Seperately Reported Materials & Clean Fill	182,000	919,000	1,120,000	1,078,000	1,655,000	1,444,000	-12.7%	693%
TOTAL (for SA)	**3,320,000**	**4,504,000**	**4,604,000**	**4,800,000**	**5,274,000**	**5,370,000**	**1.8%**	**62%**
DIVERSION/RECOVERY RATE (%)								
Standard Reporting Materials (ONLY)	59.9%	75.9%	79.2%	79.3%	79.6%	80.1%	0.6%	34%
TOTAL (for SA)	**61.5%**	**79.7%**	**80.4%**	**81.5%**	**83.4%**	**83.6%**	**0.2%**	**36%**
SA Population (persons)	1,534,000	1,682,600	1,698,900	1,708,200	1,723,500	1,736,400	0.7%	13.2%
PER CAPITA DIVERSION/RESOURCE RECOVERY (KG/PERSON/YR)								
Standard Reporting Materials (ONLY)	1,230	1,620	1,650	1,730	1,670	1,810	8.4%	47%
TOTAL (for SA)	**1,330**	**2,135**	**2,205**	**2,290**	**2,555**	**2,585**	**1.2%**	**94%**
PER CAPITA LANDFILL DISPOSAL (KG/PERSON/YEAR)								
Standard Reporting Materials (ONLY)	820	510	430	450	430	450	4.7%	-45%
TOTAL (for SA)	**830**	**545**	**535**	**520**	**505**	**505**	**0.0%**	**-39%**
PER CAPITA WASTE GENRATION (KG/PERSON/YEAR)								
Standard Reporting Materials (ONLY)	2,050	2,130	2,080	2,180	2,100	2,260	7.6%	10%
TOTAL (for SA)	**2,160**	**2,680**	**2,740**	**2,810**	**3,060**	**3,090**	**1.0%**	**43%**
SA Gross State Product [a] (GSP) ($millions)	82,231	100,291	101,314	101,528	103,935	106,004	2.0%	28.9%
PERFORMANCE METRICS PER $GSP (TONNES/$MILLION GSP)								
TOTAL SA Diversion/Resource Recovery [b]	24.8	35.8	36.5	38.5	42.3	42.3	0.0%	71%
TOTAL SA Landfill Disposal [b]	15.5	9.6	8.9	8.8	8.4	8.3	-1.1%	-47%
TOTAL SA Waste Generation [b]	40.4	47.3	45.4	47.3	50.7	50.7	-0.2%	25%

Notes:

(a) Reference year for GSP chain volume measures (which removes the inflation effects on GSP values) is reported as 2017-18 (ABS 2016).

(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

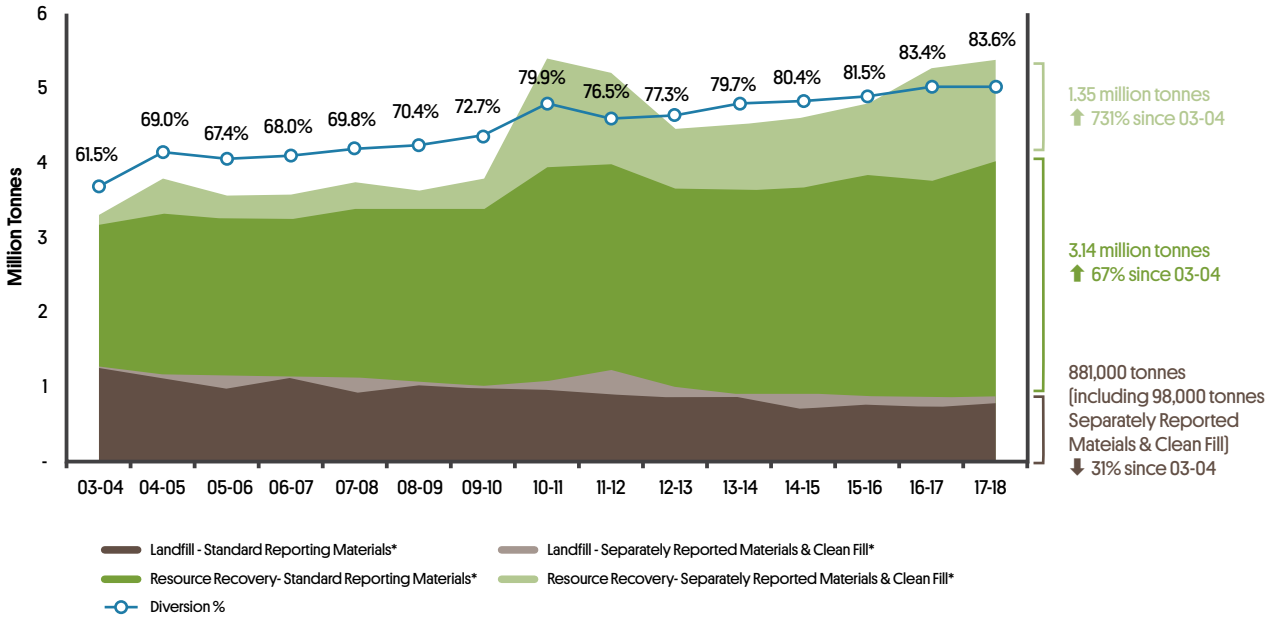
Figure 2.1 displays the increase in diversion rate and materials recovered over time, as well as the change in landfill disposal (for Standard Reported Materials and Separately Reported Materials & Clean Fill). Percentage changes from the 2003-04 financial year are stated.

Changes from 2003-04 to 2017-18 include:

- Reported resource recovery, which has increased from approximately 2 million tonnes to 4.49 million tonnes a year. This includes Standard Reporting Materials (3.14 million tonnes recovered in 2017-18) and Separately Reported Materials & Clean Fill (1.35 million tonnes recovered in 2017-18).
- Diversion rate has increased by 22.1 percentage points over this period.
- The volume of materials sent to landfill has decreased by 31% from 2003-04. Note the this includes Standard Reporting Materials to landfill (which has decreased by 38% from 2003-04) and Separately Reported Materials & Clean Fill to landfill.

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

The recovery of materials from 2003-04 to 2017-18 are summarised in **Table 2.2**. These changes are described in more detail by material category in Section 3 of this report, but some important or interesting changes are highlighted in this section.

The biggest increases were seen in:

- Masonry, which increased significantly by 286,000 tonnes. Asphalt, Bricks, Concrete and Plasterboard all increased with increased C&D activity. This is on the back of State infrastructure projects.
- Metals, which increased by 22,000 tonnes mainly due an increase in recycled Steel with higher prices and recycling of metal framework and equipment used in buildings of a few manufacturing businesses that have closed.

Reduced volumes were seen in:

- Organics (down 14,000 tonnes) due to a drop in Garden Organics from lower rainfall levels. There remains a significant opportunity to recover food waste from landfill.
- Cardboard & Paper (down 13,000 tonnes) due to lower volumes of recovered Magazines & Newsprint and improved reporting by industry.
- Glass (down 7,000 tonnes) due to a combination of factors including light-weighting, reductions in recovery of MRF glass fines and increased competition with interstate glass.
- Other Materials (down 13,000 tonnes) due to a reduction in Foundry Waste volumes.

Overall resource recovery is at 42.3 tonnes per $ of gross domestic product. This is at the highest levels since 2010-11 (**Figure 2.2** below). Source sector and destinations for each material stream are illustrated in **Figure 2.3** overleaf.

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

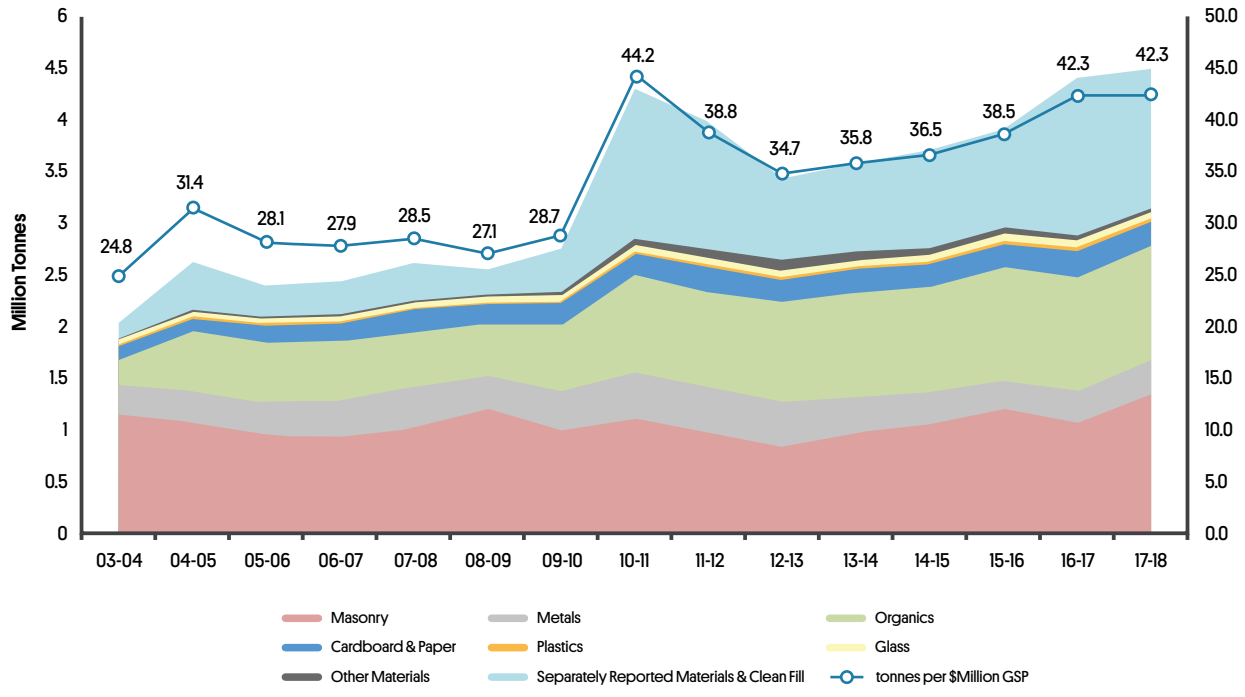


Figure 2.3

2017-18 SA Recycling Activity materials, showing their source sector and destinations for recycling. The most voluminous streams are Soil, Masonry and Organics. Most recovered resources are from the C&D sector (62%) and most volumes are recycled in SA (86%).

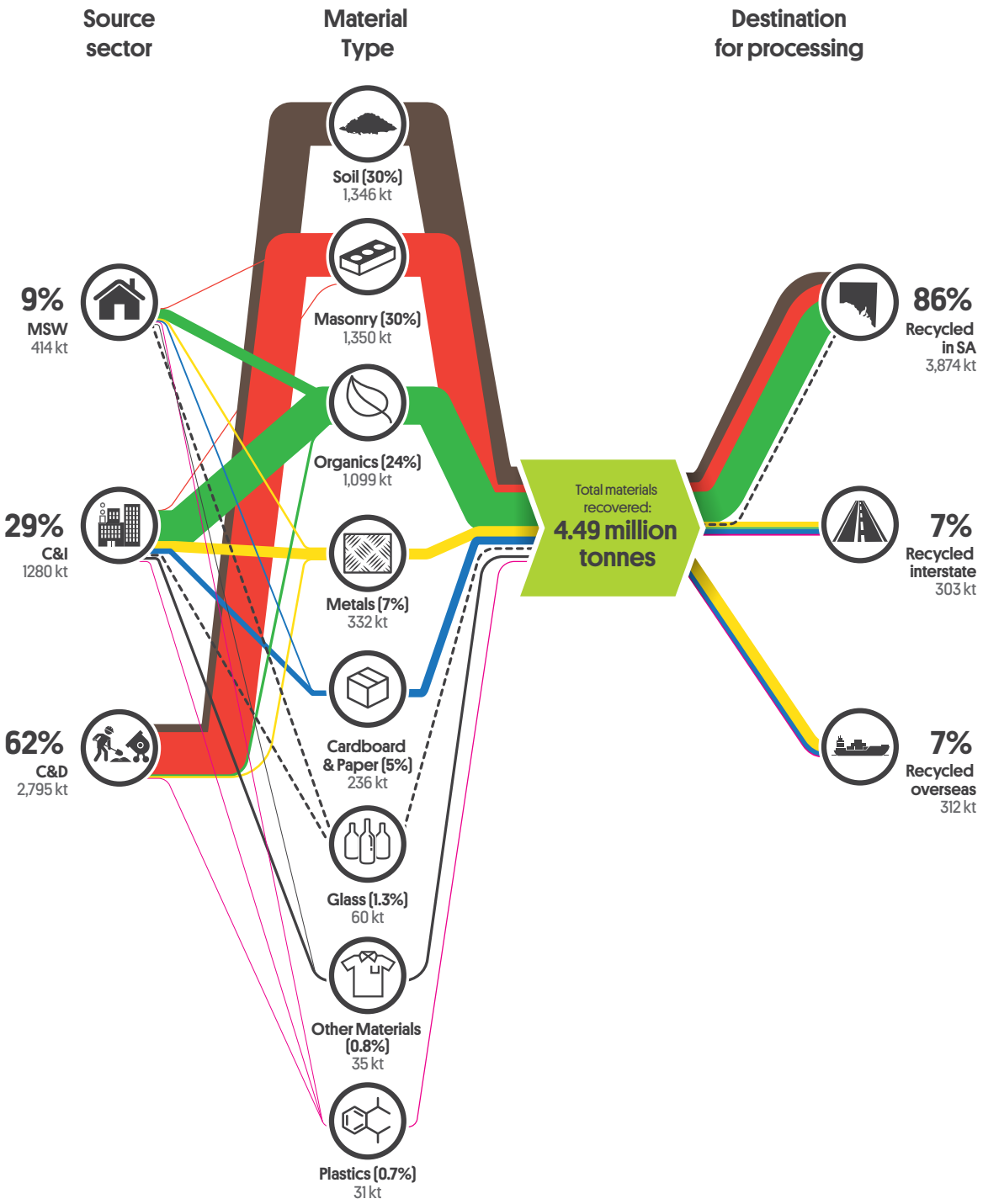


Table 2.2

Reported material quantities (tonnes) being diverted for resource recovery in SA for 2017-18, 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 2016-17 and 2017-18. The data is presented in accordance with national reporting guidelines (Dept Environment and Energy, 2015).

ID	Material	2003-04	2012-13	2013-14	2014-15	2015-16	2016-17	2017-18	Change (%) 16-17 to 17-18
	Masonry								
1	Asphalt	100,000	148,000	148,000	170,000	210,000	270,000	286,000	6%
2	Bricks	165,000	50,000	63,000	55,000	53,000	42,000	102,000	143%
3	Concrete	877,000	640,000	760,000	820,000	940,000	750,000	960,000	28%
4	Plasterboard		600	1,000	1,100	1,400	1,400	1,500	7%
	Subtotal	**1,142,000**	**838,600**	**972,000**	**1,046,100**	**1,204,400**	**1,063,400**	**1,349,500**	**27%**
	Metals								
7	Steel	264,200	387,000	320,000	280,000	230,000	275,000	299,000	9%
8	Aluminium	19,000	18,500	14,000	18,000	18,000	17,000	14,000	-18%
9	Non-ferrous metals	13,000	24,400	18,000	20,000	19,000	18,000	19,000	6%
	Subtotal	**296,200**	**429,900**	**352,000**	**318,000**	**267,000**	**310,000**	**332,000**	**7%**
	Organics								
10	Food Organics	0	7,900	7,000	7,600	7,900	8,100	9,100	12%
11	Garden Organics	130,100	209,000	260,000	259,000	255,000	293,000	257,000	-12%
12	Timber	116,700	237,000	180,000	220,000	273,000	250,000	270,000	8%
13,14,15,16	Other Organics	0	510,000	550,000	530,000	570,000	562,000	563,000	0%
	Subtotal	**246,800**	**963,900**	**997,000**	**1,016,600**	**1,105,900**	**1,113,100**	**1,099,100**	**-1%**
	Cardboard & Paper								
17	Cardboard & Waxed Cardboard	91,000	190,000	180,000	149,000	151,000	170,000	162,000	-5%
18	Liquid Paperboard	0	3,600	3,100	1,800	1,700	1,200	1,200	0%
19, 20, 21	Magazines & Newsprint	32,701	38,800	33,000	62,000	61,000	69,000	62,000	-10%
22	Printing & Writing Paper	12,300	20,700	24,000	19,000	14,000	9,000	11,000	22%
	Subtotal	**136,001**	**253,100**	**240,100**	**231,800**	**227,700**	**249,200**	**236,200**	**-5%**
	Plastics								
23	Polyethylene Terephthalate	0	4,300	4,200	4,400	4,200	4,200	4,800	14%
24	High Density Polyethylene	0	3,600	3,200	4,500	4,800	4,500	6,100	36%
25	Polyvinyl Chloride	0	260	300	300	300	10	60	500%
26	Low Density Polyethylene	0	4,600	3,400	3,600	3,700	4,100	3,200	-22%
27	Polypropylene	0	2,200	2,000	1,700	1,600	1,400	800	-43%
28	Polystyrene	0	410	410	250	300	300	330	10%
29	Mixed &/or Other Plastics	8,607	6,000	9,000	12,000	13,000	14,000	15,800	13%
	Subtotal	**8,607**	**21,400**	**22,500**	**26,800**	**27,900**	**28,500**	**31,100**	**9%**
	Glass								
30	Glass	45,600	61,000	56,000	61,000	64,000	67,000	60,000	-10%
	Other Materials								
40	Foundry Waste	0	70,200	51,600	40,800	34,400	24,500	9,600	-61%
41	Leather & Textiles	4,080	3,900	4,000	4,000	4,000	4,000	5,500	38%
42	Tyres & Other Rubber	88	19,700	21,300	18,500	18,400	19,900	20,000	1%
	Subtotal	**4,168**	**93,800**	**76,900**	**63,300**	**56,800**	**48,400**	**35,100**	**-27%**
	Total of above materials	**1,879,376**	**2,661,700**	**2,716,500**	**2,763,600**	**2,953,700**	**2,880,000**	**3,143,000**	**9%**
39	Fly Ash	0	120,000	114,000	146,000	100,000	0	0	NA
5	Clay, Fines, Rubble & Soil – Clean Fill	162,400	480,000	590,000	660,000	760,000	1,307,000	1,052,000	-20%
6	Clay, Fines, Rubble & Soil – Intermediate Waste Soil[1]	NRS[2]	190,000	170,000	130,000	100,000	214,000	294,000	37%
	Total Clay, Fines, Rubble & Soil	162,400	670,000	760,000	790,000	860,000	1,521,000	1,346,000	-12%
	Total Reported	**2,041,776**	**3,450,000**	**3,590,000**	**3,700,000**	**3,910,000**	**4,401,000**	**4,489,000**	**2%**

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

During 2017-18, Municipal (MSW) sources contributed 414,000 tonnes to resource recovery (see **Table 2.3** below and **Figure 2.4** overleaf). This is 47,000 tonnes less than volumes reported from 2016-17 (at 461,000 tonnes). This is due to a reported decrease in Garden Organics (which may be driven by a low amount of rainfall in 2017-18), and lower quantities of Masonry, specifically Asphalt, Concrete and Soil. Source sector classifications of Tyres and Biosolids, were also adjusted to 100 percent C&I to align with national reporting. Meanwhile, the estimated quantity of MSW volumes to landfill also decreased to 381,000 tonnes (down 9,000 tonnes from 2016-17). Overall the MSW diversion rate for SA reduced to 52.1% (from 54.0% in 2016-17).

The reported quantity of C&I resource recovery in 2017-18 (of 1.28 million tonnes) decreased slightly from 2016-17 levels (at 1.32 million tonnes). The volume of C&I waste to landfill (at 219,000 tonnes) increased by 30,000 tonnes from 2016-17 levels. This led to a slight decrease in the C&I diversion rate for SA to 85.4% (from 87.4% in 2016-17).

C&D recovery was reported at 2.80 million tonnes), which rose from 2016-17 (up from 2.63 million tonnes). At the same time, C&D landfill disposal decreased to 281,000 tonnes. This has led to an increase in C&D diversion to 90.9% (up from 90.0% in 2016-17).

C&I and C&D sources (at 28% and 62%, respectively) continued to constitute the main sources of resource-recovered material reported by SA recycling industries in 2017-18 (see **Table 2.3** and **Figures 2.4** and **2.5**). Due to the increase in reported C&D recovered volumes, the proportion of this waste stream relative to C&I and MSW sources has increased again in 2017-18 from previous years.

MSW sources still make up the majority (at 43%) of waste disposed of to landfill. C&I and C&D sources for landfill disposal made up 25% and 32% respectively (see **Figure 2.6**).

Table 2.3 **Source sector origins (by weight, tonnes and %) of SA recovered materials and waste to landfill, 2017-18, and diversion rates (%).**
Source data for resource recovery by source sector was obtained from the 2017-18 Recycling Activity Survey data. Source data for landfill disposal by source sector during 2017-18 was obtained from Green Industries SA.

Sector Origin	Resource Recovery		Landfill		Diversion (%)
	tonnes	(%)	tonnes	(%)	
Municipal	414,000	9.2%	381,000	43%	52.1%
C&I	1,280,000	28.5%	219,000	25%	85.4%
C&D	2,795,000	62.3%	281,000	32%	90.9%
Total [1]	**4,489,000**	**100%**	**881,000**	**100%**	**83.6%**

1 Some totals may not equate precisely due to rounding

Figure 2.4 **Contribution to resource recovery in SA by source sector for 2017-18 and trend since 2007-08**
(note percentages may not equate due to rounding)

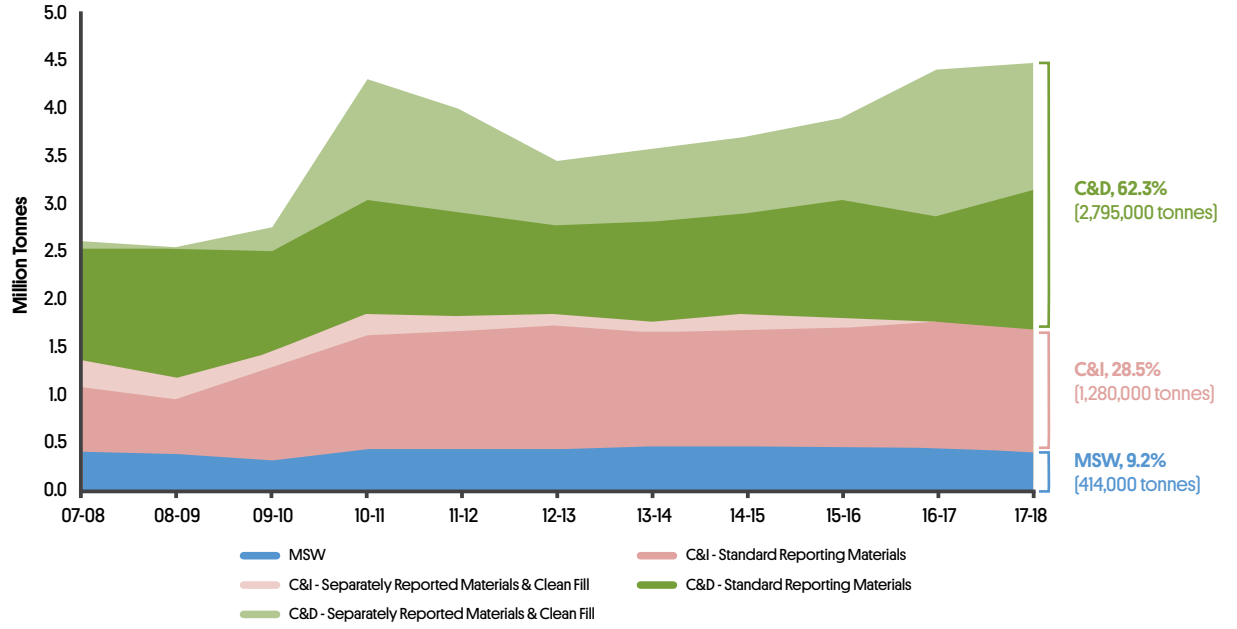
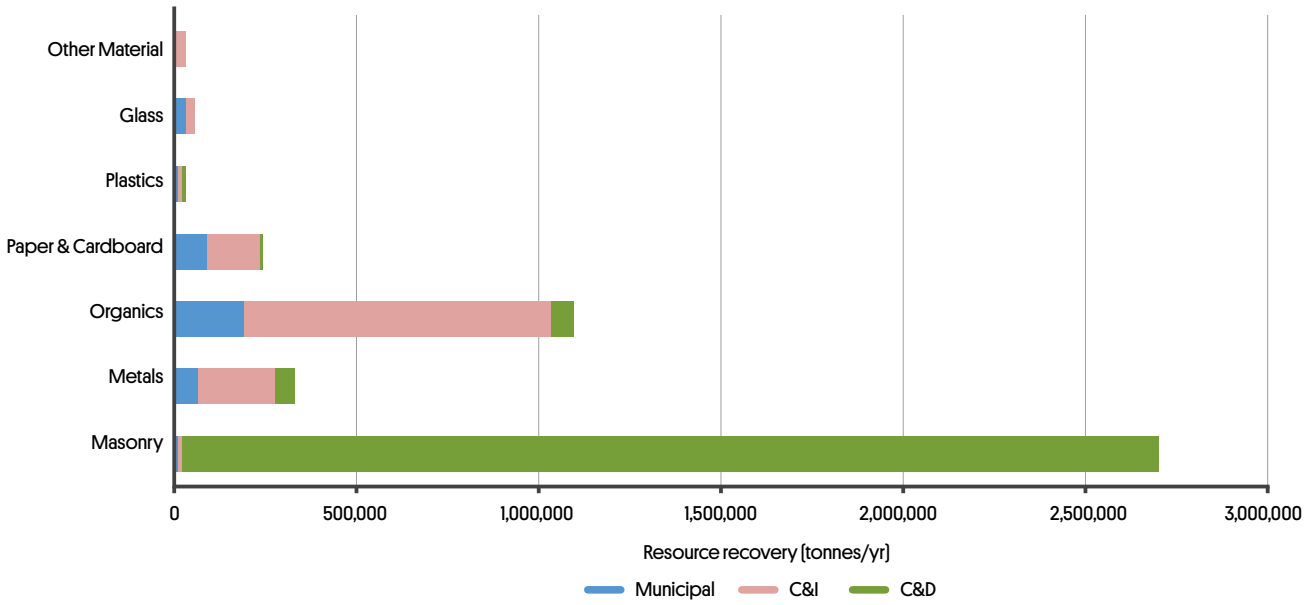


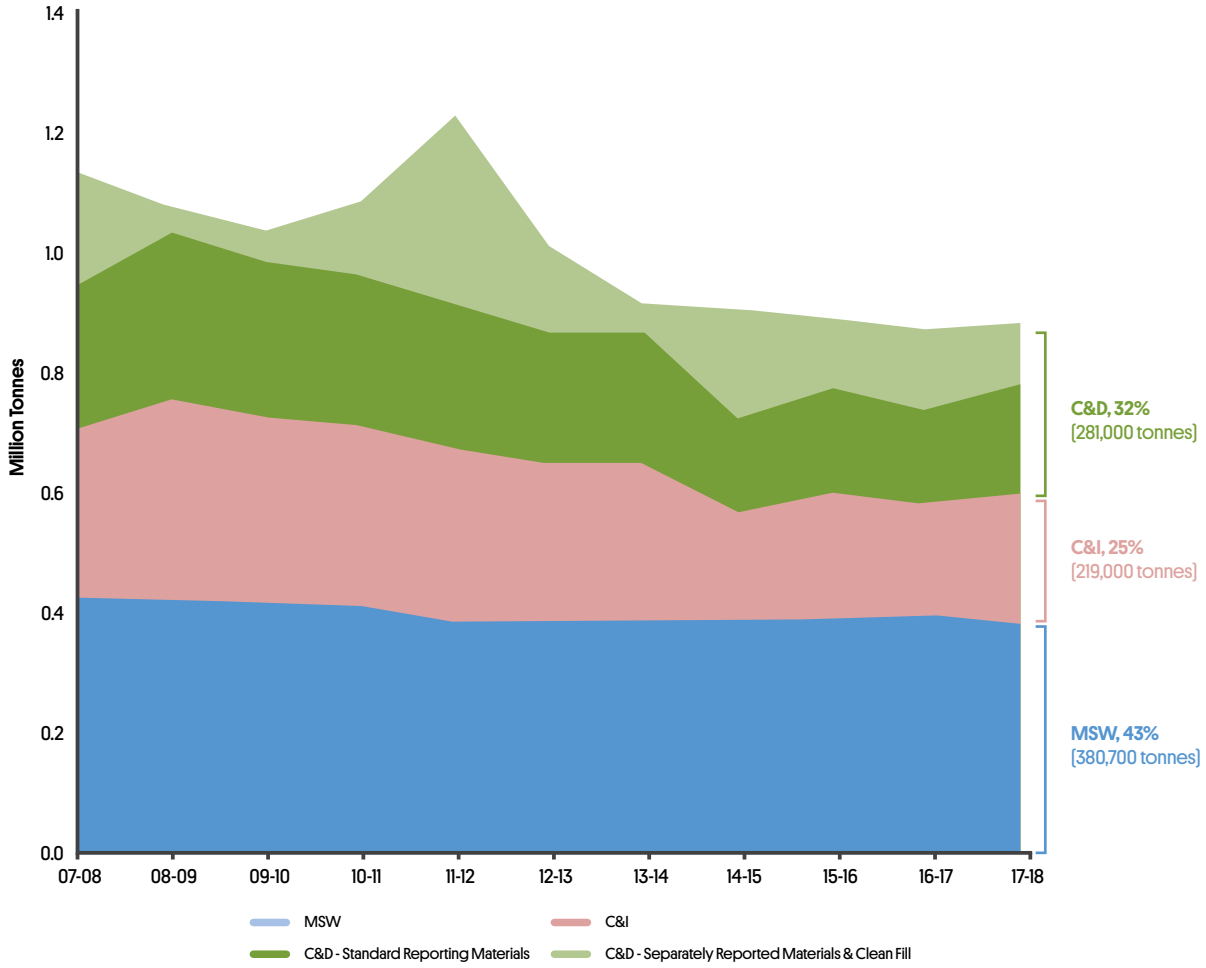
Figure 2.5 **Sector origin of SA recovered materials according to material category (by weight, tonnes), SA 2017-18.**
This figure shows the source sector splits for resource recovered materials by source sector (MSW, C&I and C&D)



2.1.5 Landfill Disposal

Landfill disposal in South Australia was 881,000 tonnes in 2017-18. This is a slight increase of 1% from 2016-17 (see **Figure 2.6** below). It is supposed this increase is due to higher volumes of C&I landfilled materials (up 30,000 tonnes) and Standard Reporting Materials in the C&D sector (up 27,000 tonnes). MSW disposal to landfill decreased (down 16,000 tonnes[2]) and C&D Separately Reported Materials fell (down 36,000 tonnes).

Figure 2.6 **Contribution to landfill disposal in SA by source sector for 2017-18 and trend since 2007-2008.**
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 Due to improved reporting in 2017-18 on the proportion of regional hard waste to landfill, MSW landfill waste in 2016-17 increased to 396,300 tonnes

2.1.6 Geographical origin

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

During 2017-18, metropolitan areas contributed to:

- 86% (or 3.86 million tonnes) of resource recovery in SA, and
- 75% (or 0.66 million tonnes) of waste sent to landfill (**Table 2.4** below).

Regional areas once more contributed strongly to SA's recycling activity in 2017-18, providing the balance (at 0.63 million tonnes or 14%) of material being resource recovered. This is a slight decrease from its 2016-17 contribution of 15%. In line with previous years, a significant proportion of this regional resource recovery arises from processing of primary products (e.g. wine, timber, meat). Regional areas were also responsible for 0.22 million tonnes (or 25%) of waste disposed to landfill in SA.

Table 2.4 **Geographical origins (by weight, tonnes and %) of SA recovered materials and waste to landfill, 2017-18, 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	3,863,000	86%	665,000	75%	85.3%
Regional	626,000	14%	216,000	25%	74.3%
Total	**4,489,000**	**100%**	**881,000**	**100%**	**83.6%**

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

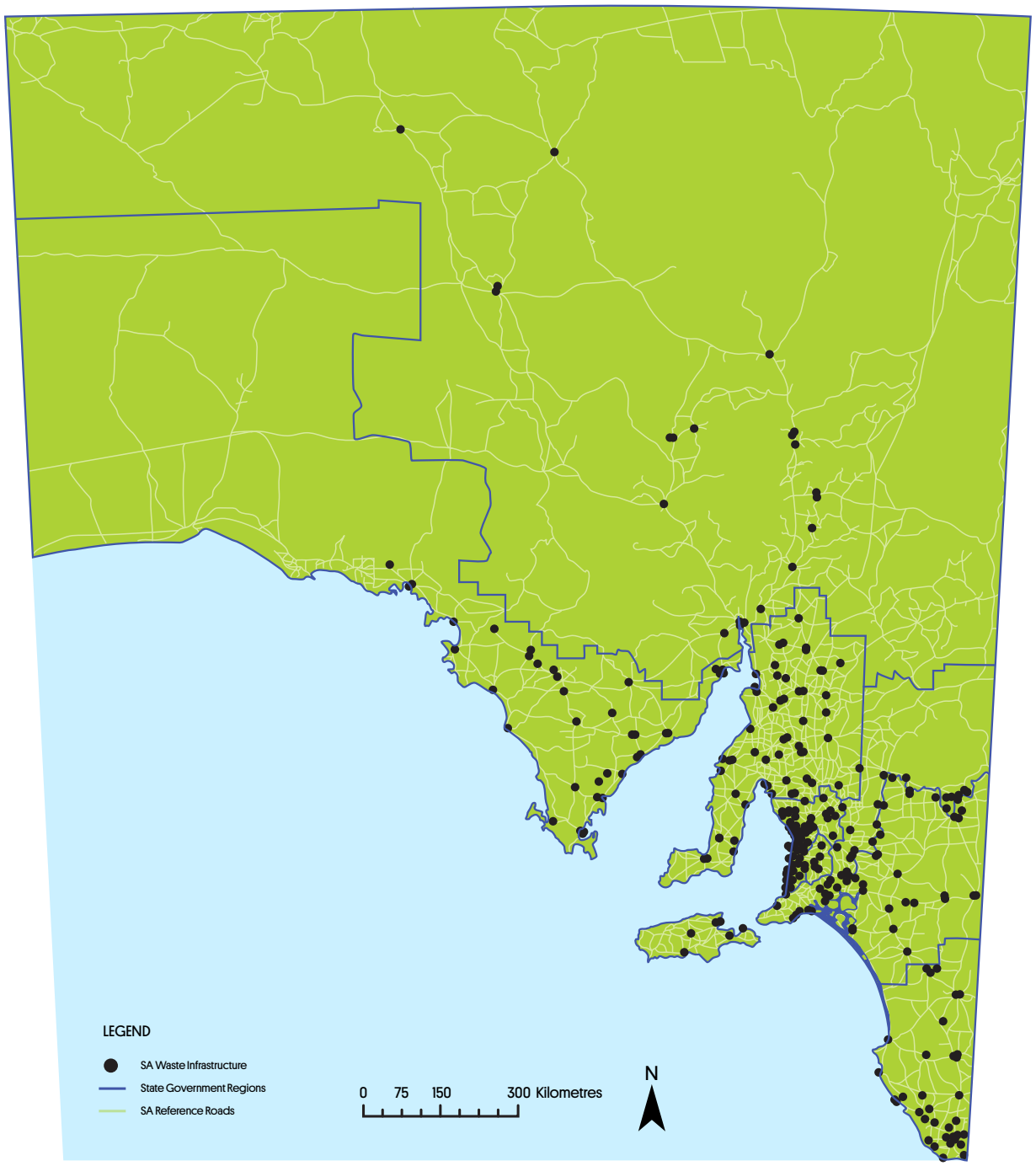
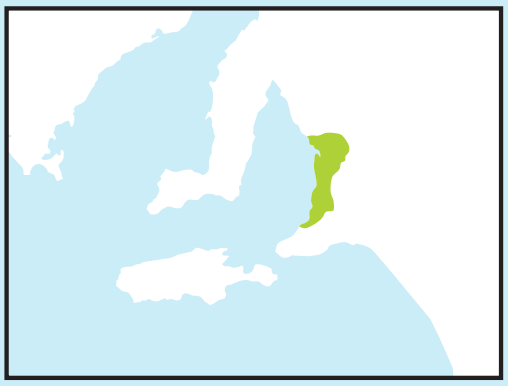


Figure 2.8

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.



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

In 2017-18, an estimated 3.87 million tonnes or 86% of all recovered material reported was re-processed in SA (**Table 2.5** below).

The tonnes and proportion of materials sent interstate increased from 286,000 in 2016-17 to 303,000 tonnes in 2017-18 (up from 6% to 7%). Quantities sent overseas also increased, from 274,000 in 2016-17 to 312,000 in 2017-18 (up from 6% to 7%).

All Masonry and most Organics and Glass remained in SA. Whereas, almost all Cardboard & Paper (97%) and most Metals (96%) were sent interstate or overseas for re-processing.

The volume of Organics reprocessed in the state decreased slightly (from 1,087,000 tonnes in 2016-17, to 1,069,000 in 2017-18). There was an increase in Other Material re-processed within the state, from 24,000 in 2016-17 to 28,000 tonnes in 2017-18.

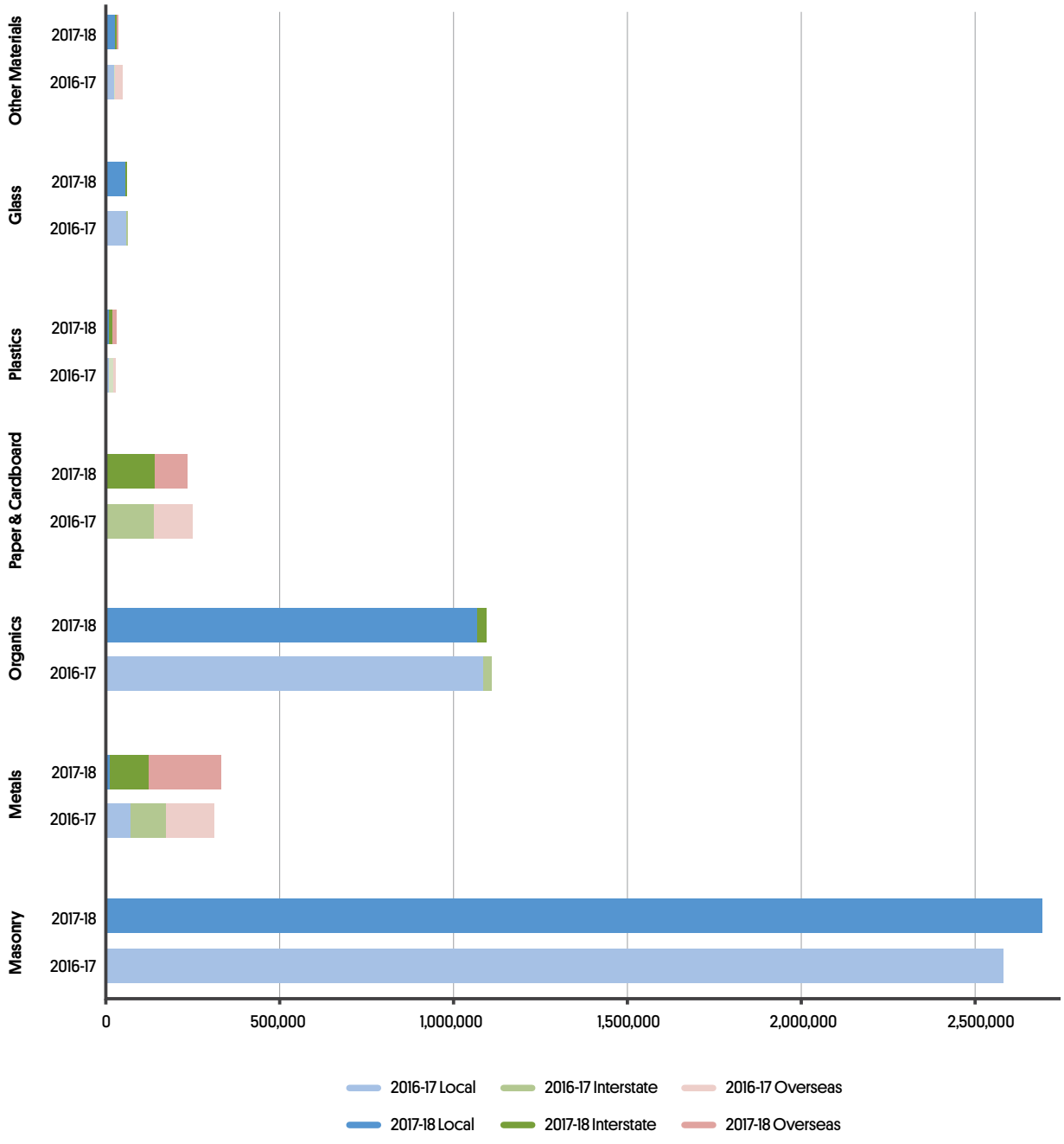
The tonnes of Metals sent interstate increased from 2016-17 to 2017-18 (from 99,900 tonnes to 111,000 tonnes). Tonnes of Metals sent overseas also increased (from 135,000 tonnes to 207,000).

Table 2.5 **Final reported destination (by weight, tonnes and %) of SA sourced materials, 2017-18.**
The destination is where material is sent for re-processing. The majority of resource recovered material in SA is locally re-processed to use in the manufacture of new products.[1]

Destination	Quantity	
	tonnes	%
SA	3,874,000	86%
Interstate	303,000	7%
Overseas	312,000	7%
Total	**4,489,000**	**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), SA 2017-18 compared with 2016-17.**
Most materials are were re-processed within SA, but significant quantities of some materials are exported interstate or overseas.



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*[3].

In 2017-18, the tonnes of recovered materials identified as used to produce energy in SA increased to 111,600 tonnes of material (from 94,900 tonnes in 2016-17). This includes Timber, Mixed Plastics and Other Organics. This quantity contributed 2.1% to the State's total diversion rate.

Table 2.6 (overleaf) includes 2017-18 recovered materials, broken down by recovery method (material versus energy recovery). This data is displayed under Standard Reporting Materials, Separately Reported Materials & Clean Fill and total (all materials).

The overall diversion rate for all materials is 83.6%, which includes 81.5 percentage points from materials recovery and 2.1 percentage points from energy recovery.

The overall diversion rate for Standard Reporting Materials is 80.1%, which includes 77.2 percentage points from material recovery and 2.8 percentage points from energy recovery.

Lastly, the overall recovery of Separately Reported Materials & Clean Fill is 93.2%, which is all from material recovery.

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.

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

Table 2.6 **Resource recovery (tonnes) for material recovery and energy production, from SA sourced materials reported during 2017-18.** 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. The respective contributions of resource recovery for material recovery and energy production to SA's diversion rate is also shown.

		Standard Reporting Materials	Separately Reported Materials & Clean Fill	TOTAL (All materials)
Material recovery	Quantity, tonnes	3.03 million	1.35 million	4.38 million
	Diversion rate, %	77.2%	93.2%	81.5%
Energy recovery	Quantity, tonnes	111,600	Nil	111,600
	Diversion rate, %	2.8%	0.0%	2.1%
Total (resource) recovery	**Quantity, tonnes**	3.14 million	1.35 million	4.49 million
	Diversion rate, %	80.1%	93.2%	83.6%

2.1.9 Imported materials

Imported waste materials brought into SA for resource recovery and/or re-processing are separately identified during the SA's Recycling Activity survey, to ensure that they are not counted towards SA's recycling performance. This does not include already re-processed materials imported for manufacturing.

Table 2.7 overleaf summarises these imported waste materials identified in reported data for 2017-18. Approximately 200,700 tonnes of imported waste materials for resource recovery were recorded. This represents a 42,400 tonne increase from 2016-17.

There were significant increases in Metals (increase of 15,300 tonnes), Organics (increase of 40,000 tonnes) and Glass (increase of 7,600 tonnes) in 2017-18 compared to 2016-17.

The origin of waste changed slightly with waste materials from Victoria, Northern Territory and NSW increasing. Waste materials imported from Overseas decreased significantly (by 13,800 tonnes), mainly due to decreases in the importing of Other Materials (down 11,700 tonnes from 2016-17), but also a reduction in Glass from overseas from 2,000 tonnes to 0 tonnes as sufficient Glass from interstate was available for processing in 2017-18.

Table 2.7 **Waste materials reported as imported to SA for resource recovery in 2017-18, including estimated accuracy of data.** Significant quantities of Organics, Glass and Other Materials were imported for resource recovery. The highest quantities came from Victoria, NSW and Overseas.

Material Sector	Interstate								Overseas	TOTAL	Est Accuracy (%)
	VIC	NT	QLD	WA	NSW	ACT	TAS	State not identified			
Masonry	-	-	-	-	-	-	-	-	-	-	N/A
Metals	6,500	10,700	-	-	4,300	-	-	-	-	21,500	3%
Organics	103,400	-	-	-	-	-	-	-	-	103,400	4%
Cardboard and Paper	-	-	-	-	-	-	-	-	-	-	N/A
Plastics	100	-	-	-	500	-	-	-	-	600	6%
Glass	15,400	4,000	-	2,600	35,000	-	-	-	-	57,000	3%
Other materials	11,200	-	-	-	100	-	-	-	6,900	18,200	1%
Total	**136,600**	**14,700**	**-**	**2,600**	**39,900**	**-**	**-**	**-**	**6,900**	**200,700**	**3%**

2.1.10 Market value of resource recovery

Survey participants were asked to provide the value per tonne for each material stream that was re-processed within their respective organisations. This was used to estimate the market value of resource recovery in SA (see **Figure 2.10**).

Metals remains the greatest contributor to the market value of resource recovery in SA at $177 million, with Organics the second greatest contributor, estimated at $101 million and then Cardboard & Paper at $40 million. Meat Rendering contributes most of the overall Organics market value (87% of the value of Organics or $88 million), with Garden Organics, Food Organics and Timber contributing the remaining $13 million.

Overall, the resource recovery sector in SA has an estimated worth of $356 million. Further details on the value of each of these streams is included overleaf in **Table 2.8**. A comparison with previous years can be found in Section 6.

Figure 2.10

Estimated market value of resource recovered material in SA during 2017-18.
Organics continues to contribute the second greatest proportion of all materials behind Metals.

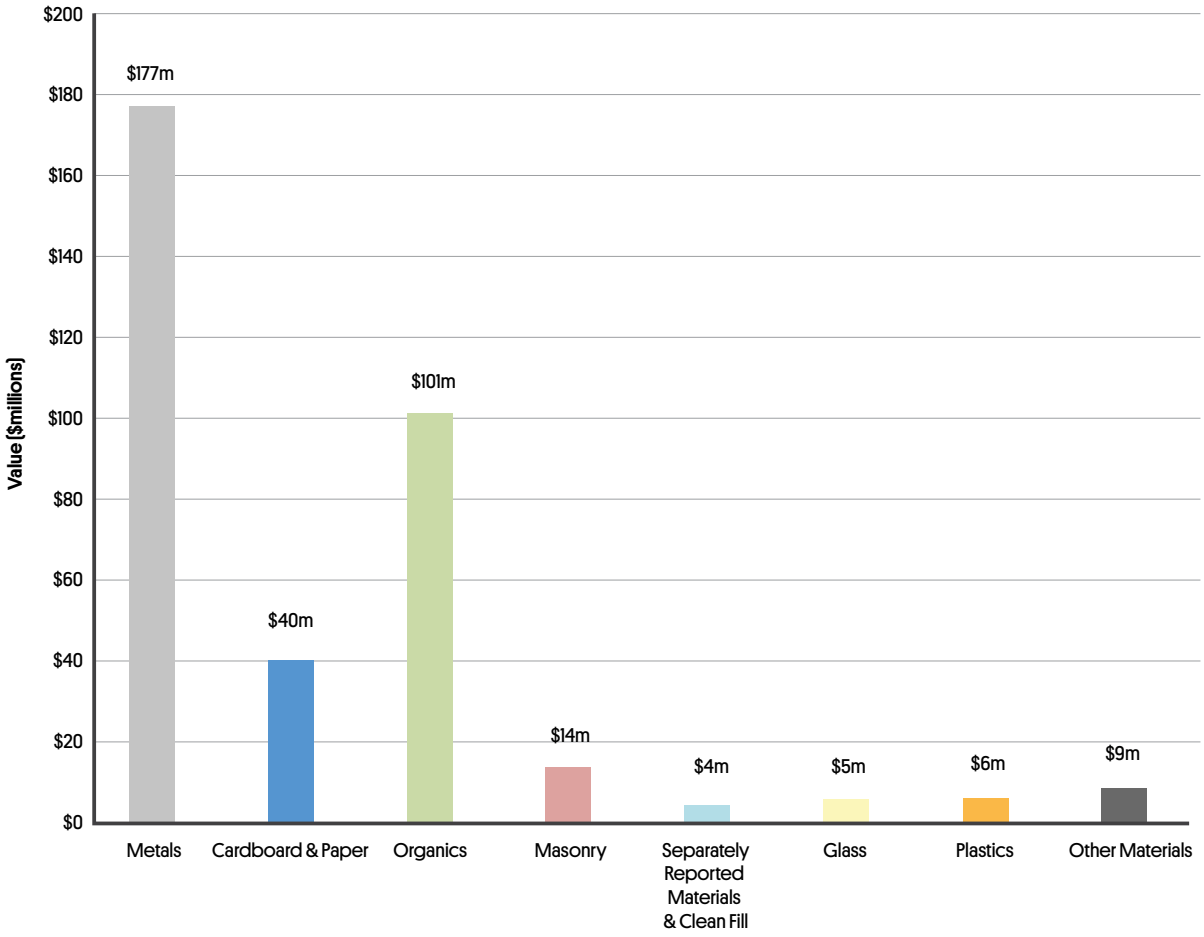


Table 2.8 Assumed values for recovered materials in SA during 2017-18 used to estimate resource market value.

Material category	Estimated on-sale price ($/tonne)	Price data source
Masonry	$10	Based on RAS survey results
Metals – Steel	$333	Based on RAS survey results and commodity data
Metals – Non-ferrous including Aluminium	$2,357	Based on RAS survey results and commodity data
Organics – Meat Rendering	$765	Based on RAS survey results
Organics – Garden, Food and Timber	$35	Based on RAS survey results
Paper & cardboard	$171	Based on RAS survey results
Plastics	$181	Based on RAS survey results
Glass	$85	Based on RAS survey results
Other materials (including Tyres & Other Rubber, Leather & Textiles and Foundry Sands)	$249	Based on RAS survey results
Separately Reported Materials & Clean Fill	$3	Based on RAS survey results

Please note these values are based on:

- Consultations with industry in October and November 2018.
- 2017-18 survey responses (this question was new to the 2016-17 survey, which asked participants to provide a price per tonne for each material recovered, reflecting the commodity price or market value for that material).
- 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 $181 per tonne for all plastics.
- It is also noted that the price per tonne for Other Materials increased in 2017-18 compared to 2016-17 due to inclusion of the on-sale price of Tyres and Leather & Textiles, which were reported by industry in 2017-18 but not in previous years.

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), with the milestone of 30% by 2017-18. SA's performance against its target of reducing waste depends on whether contaminated soil is included in landfill volumes.

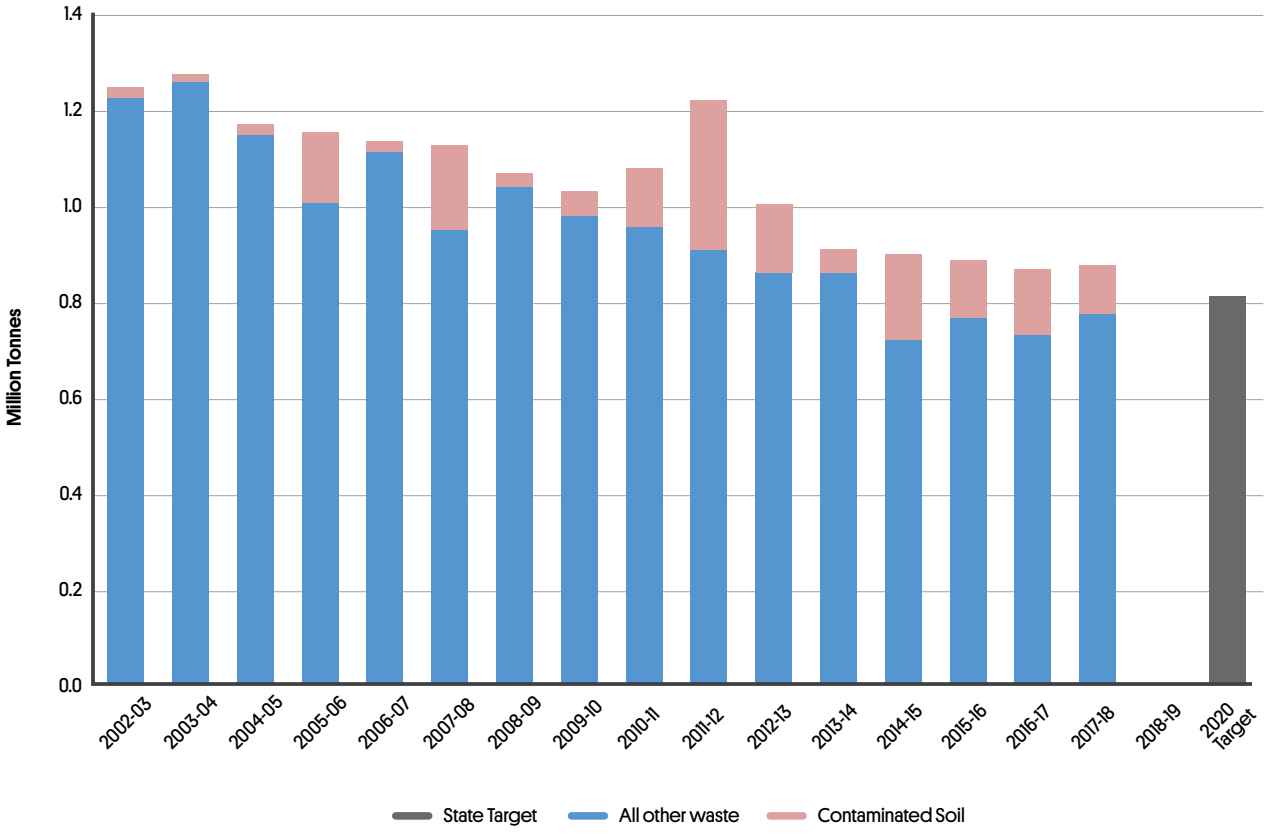
When including contaminated soil:

- SA's landfill volumes (at 881,000 tonnes) are 29% lower than the baseline year (2002-03). This means the state has just fallen short of the financial year milestone of a 30% reduction from 2002-03 landfill volumes by 2017-18. This is 6 percentage points under the 2020 target (of a 35% reduction).

When excluding contaminated soil:

- SA's landfill volumes (at 783,000 tonnes) are 37% 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 (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)**

Data collected for the 2017-18 SA Recycling Activity Survey indicates that there has been an 8.7% increase in waste generation per capita from 2014-15 to 2017-18. This can be found in **Table 2.9**, which includes the per capita waste generation from 2010-11 to 2017-18.

The percentage change refers to the difference between 2014-15 (baseline year for Target) and 2017-18 (current year). There will need to be a reduction in waste generation per person to reach the target. Waste generation needs to reduce to 1,976 kg/person/yr in 2020 to reach the target.

Table 2.9 **2017-18 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	% Change	
Standard Reporting Materials	2,300	2,210	2,120	2,130	2,080	2,180	2,100	2,260	**8.7%** Increase from 2014-15	5% Reduction from 2014-15
Separately Reported Materials & Clean Fill	950	930	550	550	660	630	960	830		
TOTAL	3,250	3,140	2,670	2,680	2,740	2,810	3,060	3,090	**12.8%** Increase from 2014 -15	

2.2.3 Metropolitan Diversion Targets

SA's Waste Strategy 2015-20 (Green Industries SA, 2015) includes targets for metropolitan diversion (to resource recovery) by source sector (**Table 2.10** below).

In 2017-18, only C&D diversion rates increased:

- MSW – Diversion rate decreased to 58.5% (down from 59.2% in 2016-17). This remains below the 2015 and 2020 Target of 70%.
- C&I – Diversion rate decreased to 82.6% (from 85.2% in 2016-17). This remains above the 2020 Target of 80%.
- C&D – The diversion rate increased:
  - » *Excluding Separately Reported Materials & Clean Fill:* A diversion rate of 90.9% was achieved (up from 90.1% in 2016-17), which remains in line with the 2020 Target of 90%.
  - » *Total C&D sector result:* The diversion rate was 91.9% (up from 91.0% in 2016-17). This is above the 2015 and 2020 Target of 90%.

Table 2.10 **Metropolitan diversion by source sector: 2017-18 Recycling Activity results and State -Waste Strategy targets.**
This table compares the metropolitan diversion outcomes achieved for MSW, C&I and C&D sectors with diversion targets in SA's Waste Strategy 2015-2020 (Green Industries SA, 2015).

Source Sector	2017-18 Diversion Achieved	Metro Diversion Target	
		By 2015	By 2020
MSW	58.5%	70%	70%
C&I	82.6%	75%	80%
C&D – Excluding Separately Reported Materials & Clean Fill	90.9%	90%	90%
C&D – Total	91.9%		

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.

Local Government data reported here is different to MSW data included elsewhere in this report, as 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, street sweepings and textiles. This section may be expanded in future Recycling Activity Surveys.

2.3.1 Overall volumes collected through kerbside

Table 2.11 includes waste collected from kerbside across South Australia overall and metro versus regional. As can be seen, the overall tonnes collected at kerbside in South Australia in 2017-18 was 682,000. This includes 495,500 tonnes from metro and 186,600 tonnes from regional households.

The overall kerbside recovery rate in South Australia in 2017-18 is approximately 46%. Hence 54% of waste disposed at kerbside is going to landfill. Performance is higher in metro councils (at 49%) compared to regional councils (at 38%).

The recovery rate is affected by the weather. The drier the year the lower weight of organics. 2017-18 was a dry year for South Australia.

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 food and garden (FOGO) bins would lead to a large increase in kerbside performance.

Table 2.11 **Tonnes collected at kerbside in South Australia, 2017-18***

Collection	SA Overall		Metro		Regional	
	2017-18 overall (tonnes)	Proportion of total	2017-18 Metro (tonnes)	Proportion of total	2017-18 Regional (tonnes)	Proportion of total
Residual Waste	371,300	54.4%	254,700	51.4%	116,600	62.5%
Organic	171,500	25.1%	137,200	27.7%	34,300	18.4%
Recyclables	139,200	20.4%	103,600	20.9%	35,700	19.1%
Total Materials	**682,000**	**100%**	**495,500**	**100%**	**186,600**	**100%**
Recovery Rate	45.6%		48.6%		37.5%	

* 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 2.12 includes population and household information at a sub-region level for metropolitan Adelaide, and overall for regional South Australia. This is used to calculate the kilograms of waste generated per capita based on each region, as well as a recovery rate for each region.

In 2017-18 South Australians generated 396 kilograms of waste per person on average across kerbside bins.

Councils in Adelaide's Central Eastern region together achieved the highest recovery rate, at almost 54% (compared to an average of 46% across the state). This region has full roll out of FOGO and is leafy and therefore generates more organic waste, which may increase this recovery rate. The Northern region had the lowest recovery rate at around 44%. Some Councils within this region only offer opt-in organics services, which may lower the recovery rate at kerbside.

Table 2.12 **Population, waste generation and kg per capita per year and recovery rate data, by region**

Sub-region	Population	Total kerbside waste generated 17-18, tonnes	Kg/capita waste (all three streams) 17-18	Recovery rate
Central Eastern[1]	265,162	97,900	369	53.7%
Northern[2]	356,657	132,800	372	44.1%
Southern[3]	328,629	128,300	390	47.3%
Western[4]	337,048	136,500	405	50.5%
Total, Metro	**1,287,496**	**495,500**	**385**	**48.6%**
Total, Regional[5]	436,175	186,600	428	37.5%
Total, South Australia	**1,723,671**	**682,100**	**396**	**45.6%**

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

2.3.3 Coverage

The coverage of kerbside collections is summarised in **Table 2.13** below:[4]

- 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 (FOGO), whereas others have a garden waste only service. Some areas have opt-in services and take up rates vary.

Table 2.13 **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%**

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**).

In 2017-18, SA had:

- The highest reported diversion (at 83.6%)
- The highest per capita resource recovery (2,585 kg/p/yr) [5]
- The highest per capita resource recovery for standard reporting material only, at 1,810 kg/p/yr, and
- The lowest per capita landfill disposal rate at 507 kg/p/yr.

However, SA continues to report high overall per capita waste generation rates. In 2017-18 SA had the highest waste generation in Australia at 3,092 kg/p/yr). 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 Not all recycling data could be obtained for 2017-18. Furthermore, not all Australian states and territories collect and report this data in conformance with the reporting guidelines (Dept Environment and Energy, 2015).

Estimated waste generation, recycling and landfill disposal were based on most current and best available data for each State/Territory. 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 2.14 below summarises SA employment figures based on data captured in the 2017-18 survey[6]. There was a total of 1,657 FTE employees reported, and 174 other employees that were not classed as an FTE but were employed in 2017-18 (e.g. casual, part-time or contractor). 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 2017-18 financial year. In total, the annual revenue is estimated at $662 million, an increase from $413 million in 2016-17. This is likely to be an underestimation of the value of the industry due to the limited number of responses[7].

Table 2.14 **2017-18 Recycling Activity results of FTEs in SA associated with material collection, resource recovery and/or recycling (including comparison with 2016-17).** Note that is a sub-set of employment in the SA industry, with data from 70 organisations used in the 2017-18 results (69 organisations' data were used in 2016-17). It also does not include indirect employment.

Year	2017-18	2016-17
Employment type	Number	Number
Full time Equivalent (FTE)	1,657	1,440
Additional employment, unable to be converted to FTE	174	278
Total	**1,831**	**1,718**

6 Not all participating organisations provided a response to this question. In total, 53 responses were received, and an additional 17 responses were used from 2016-17. This figure is therefore 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 36 organisations was used. Of these, 26 organisations provided data in 2017-18 and data from 10 organisations that provided data in 2016-17 was used.

03 Material Resource Recovery (Activity) Reports

At a glance:

- This section presents the key findings from analysis of 2017-18 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 (SA) against waste diversion goals and targets in South Australia's State Waste Strategy 2015-20.

3.1 Masonry

Highlights:

- An estimated 2.7 million tonnes of Masonry materials were recovered in 2017-18 (up by 4% from 2016-17 levels).
- Large volumes were generated from state government infrastructure projects, including the Torrens to Torrens, Northern Connector and Darlington Upgrade.
- All this material was re-processed in SA.
- The commercial viability of Masonry materials reprocessing is strengthened by increases in the SA Solid Waste Levy.
- Demand for fill material is expected to remain strong in SA. However, supply of materials is expected to decline once infrastructure projects are completed.

The total quantity of recovered Masonry materials reported for SA during 2017-18 was 2.7 million tonnes (**Table 3.1** overleaf), which is up by 4% from 2016-17 (by 112,100 tonnes).

Large volumes of Masonry materials were generated from state government infrastructure projects, including the Torrens to Torrens, Northern Connector and Darlington Upgrade.

Most of SA's recovered Masonry materials was Total Clay, Fines, Rubble & Soil (Clean Fill and Intermediate Waste Soil[8], at 50%), followed by Concrete (at 36%, see **Figure 3.1** overleaf).

Volumes of recovered materials increased across most streams:

- Concrete and Intermediate Waste Soil increased by 210,000 tonnes and 80,000 tonnes respectively from 2016-17 (see **Figure 3.2**).
- Bricks, Asphalt and Plasterboard increased by 60,000 tonnes, 16,000 tonnes and 100 tonnes respectively from 2016-17 (see **Figure 3.3**).

Clean Fill decreased by 255,000 tonnes from 2016-17 values.

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 2017-18, 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	286,000	33,000	12%
Bricks	102,000	9,000	9%
Concrete	960,000	110,000	11%
Plasterboard	1,500	210	14%
Total Clay, Fines, Rubble & Soil[2]	1,346,000	278,000	21%
Clay, Fines, Rubble & Soil – Clean Fill[2]	1,052,000	237,000	23%
Clay, Fines, Rubble & Soil – Intermediate Waste Soil[3]	294,000	41,000	14%
Total	**2,695,500**	**430,000**	**16%**

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 2016-17 and 2017-18.**

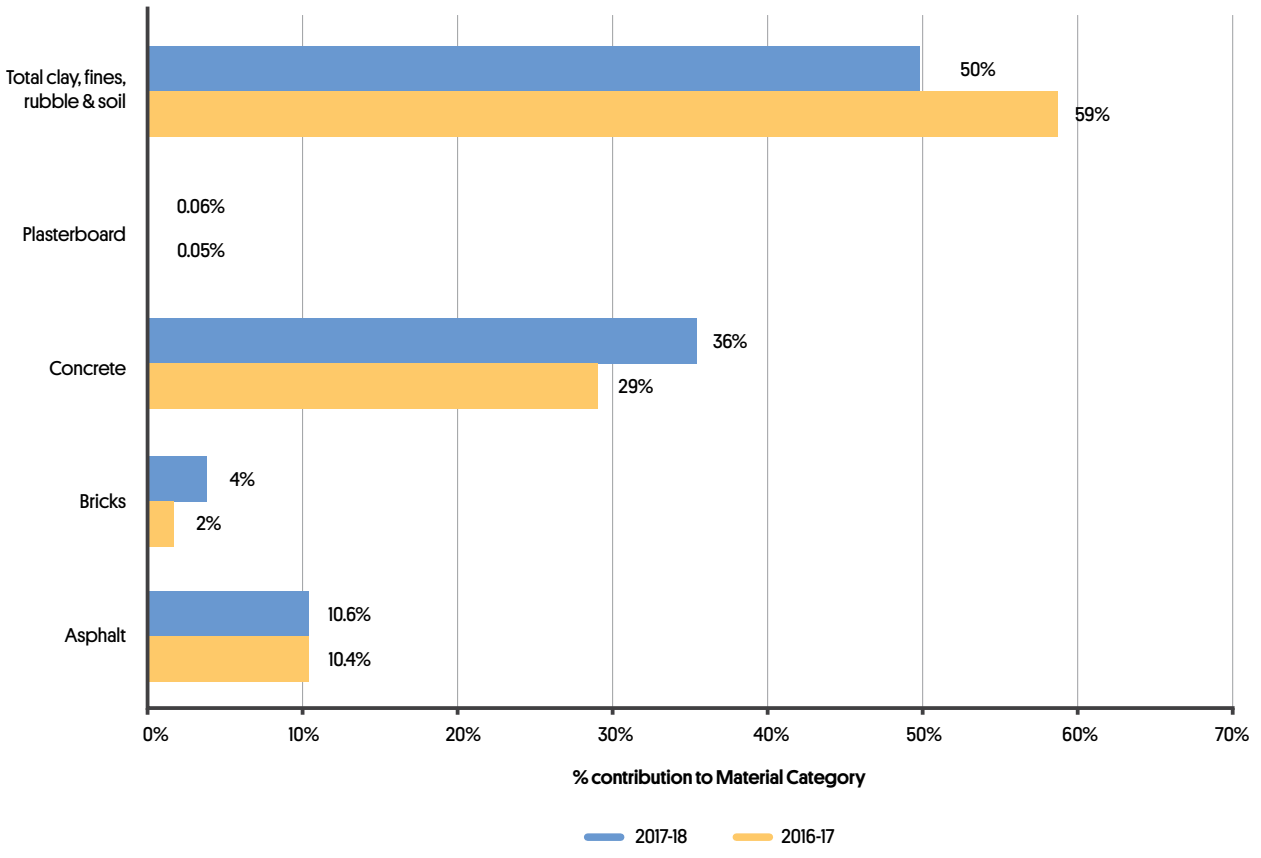


Figure 3.2 **Changes in reported recovered Masonry quantities since 2003-04 – Concrete and Total Clay, Fines, Rubble & Soil.**
Concrete increased from 2016-17, whilst Total Clay, Fines, Rubble and Soil decreased.

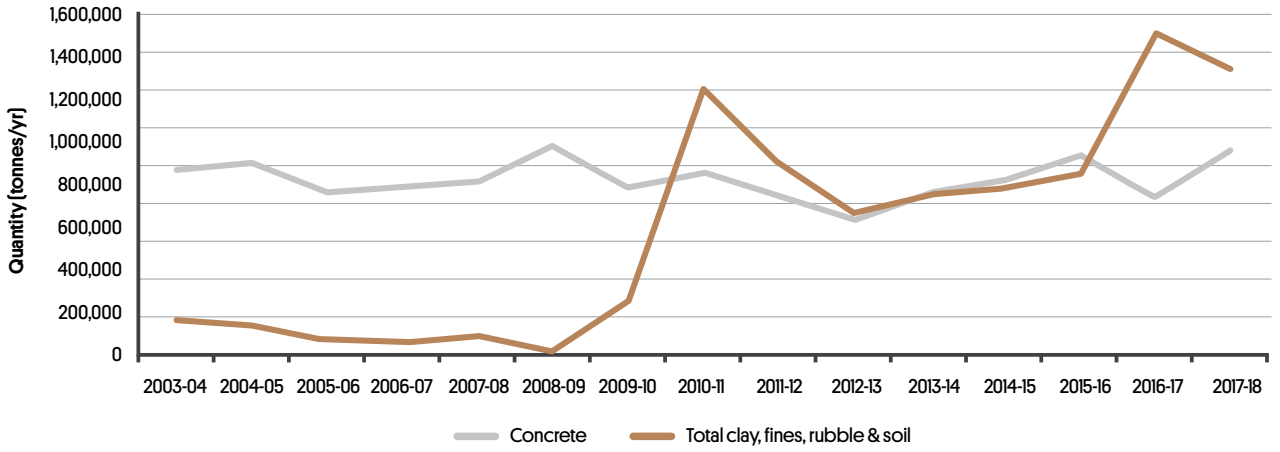
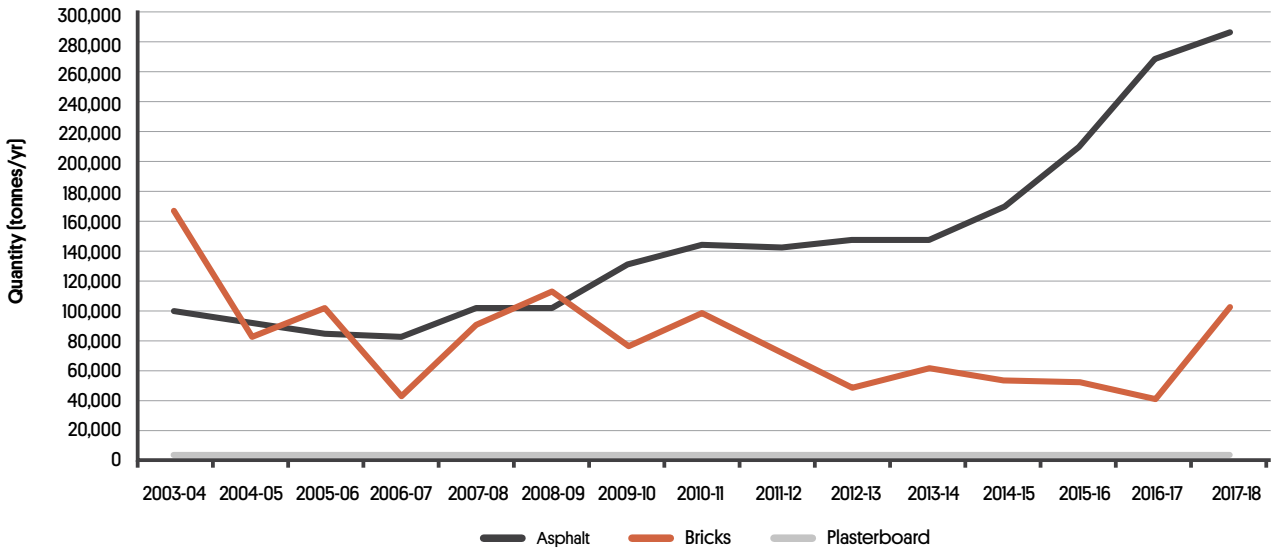


Figure 3.3 **Changes in reported recovered Masonry quantities since 2003-04 – Asphalt, Bricks and Plasterboard.**
Bricks and Asphalt increased from 2016-17. Plasterboard increased slightly.



As expected, and in line with previous years, most (99%) of recovered Masonry materials were from C&D sources (**Table 3.2** overleaf) with only small quantities reported from municipal sources. **Table 3.2** also shows that most of these Masonry materials (98%) were sourced from Metropolitan SA, and all the materials were re-processed locally in SA.

Table 3.2 **Sector and geographical origins and re-processing locations for recovered Masonry in SA in 2017-18.**
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%	0.1%	99.9%	95%	5%	100%	0%	0%
Bricks	1%	0%	99%	94%	6%	100%	0%	0%
Concrete	1%	0%	99%	97%	3%	100%	0%	0%
Plasterboard	6%	1%	93%	92%	8%	100%	0%	0%
Total Clay, Fines Rubble & Soil	0.2%	0.7%	99%	99%	1%	100%	0%	0%
Clay, fines, rubble & soil - IWS (separately reported)	0%	0%	100%	100%	0%	100%	0%	0%
Total clay, fines, rubble & soil	0.2%	0.5%	99%	99%	1%	100%	0%	0%
Total	**0.4%**	**0.4%**	**99.2%**	**98%**	**2%**	**100%**	**0%**	**0%**

The outlook for recovery of Masonry materials is mixed:

- 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 was increased to $100/tonne in June 2018. This levy makes recovery of C&D materials more cost-effective than sending the material to landfill.
- The demand for clean fill material is expected to remain strong in SA.
- However, the volume of Masonry materials is expected to decline once civil projects are completed. Masonry materials available for recovery are also expected to reduce over time due to:
  - » Changing material composition of buildings, with demolished houses getting lighter per unit
  - » Less waste generated in asphalt profiling.

Markets for recovered Masonry materials can be strengthened through creating and developing domestic markets to consume recycled products.

3.2 Metals

Highlights:

- An estimated 332,000 tonnes of Metals were recovered in 2017-18.
- This is up by 22,000 tonnes from 2016-17 levels, mainly driven by higher Steel volumes.
- The quantity of Steel increased due to higher scrap prices and volumes from some manufacturing business closures.
- The markets for recovered Metals are reasonably stable. However, there is still some uncertainty long term as declines in scrap metal from the manufacturing sector are expected to continue, placing greater competition to secure the remaining local sources of scrap steel.

An estimated 332,000 tonnes of Metals were recovered in 2017-18 (**Table 3.3**). This is up by 22,000 tonnes from 2016-17 levels, mainly due to higher Steel volumes.

The quantity of Steel increased by 9% (or 24,000 tonnes) from 2016-17. This was driven by higher prices for scrap Steel, which have continued to recover from 2015-16 levels. In addition, volumes of scrap steel continue to be recovered from manufacturing businesses that have closed and been demolished (e.g. businesses from the automotive industry).

Non-ferrous Metals increased by 5.6% (or 1,000 tonnes) and aluminium volumes decreased by 17.6% (or 3,000 tonnes) from 2016-17. These changes in volumes are due to improved reporting by industry, rather than changes in volumes recovered.

Table 3.3 **Quantity of Metals (tonnes) recovered in SA during 2017-18, including estimated reporting error (tonnes & %).** Steel remained the dominant contributor to recovered Metals in SA.

Item	Net Recovery[1]	Reporting Error	
	tonnes	tonnes	%
Steel	299,000	21,000	7%
Aluminium	14,000	1,100	8%
Non-ferrous Metals	19,000	2,000	11%
Total	**332,000**	**24,000**	**7%**

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, there has again been an increase in the 2016-17 and 2017-18 financial years.

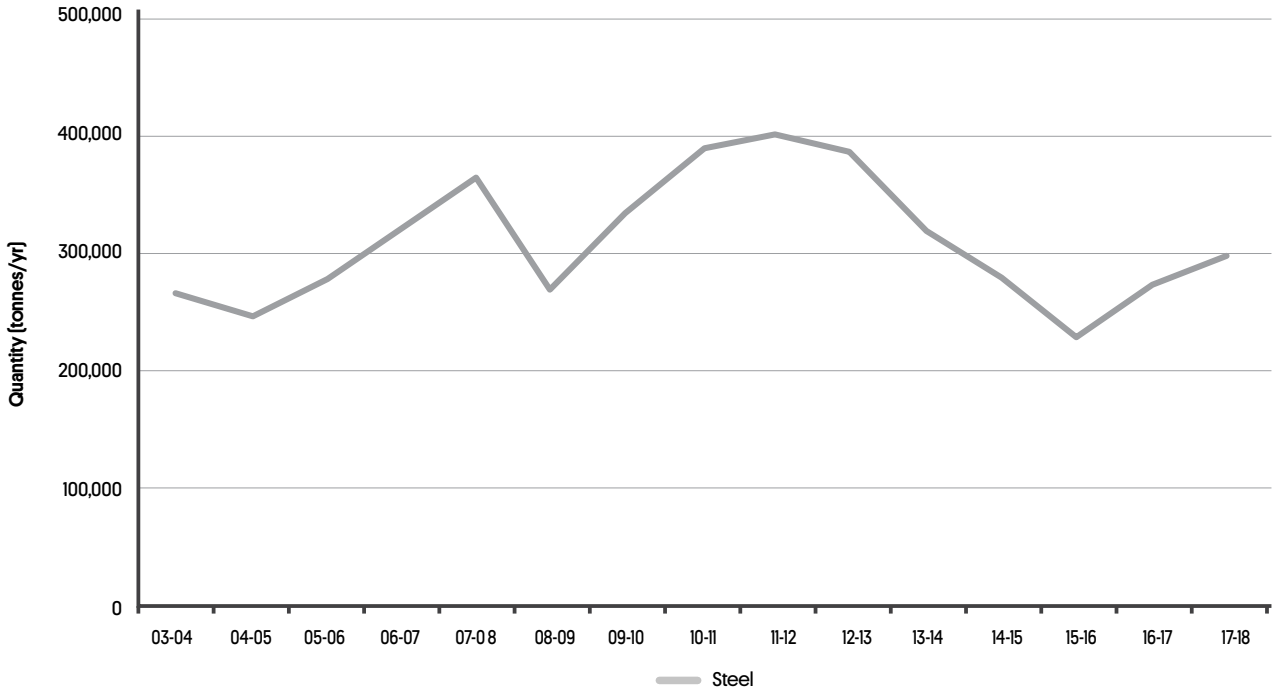
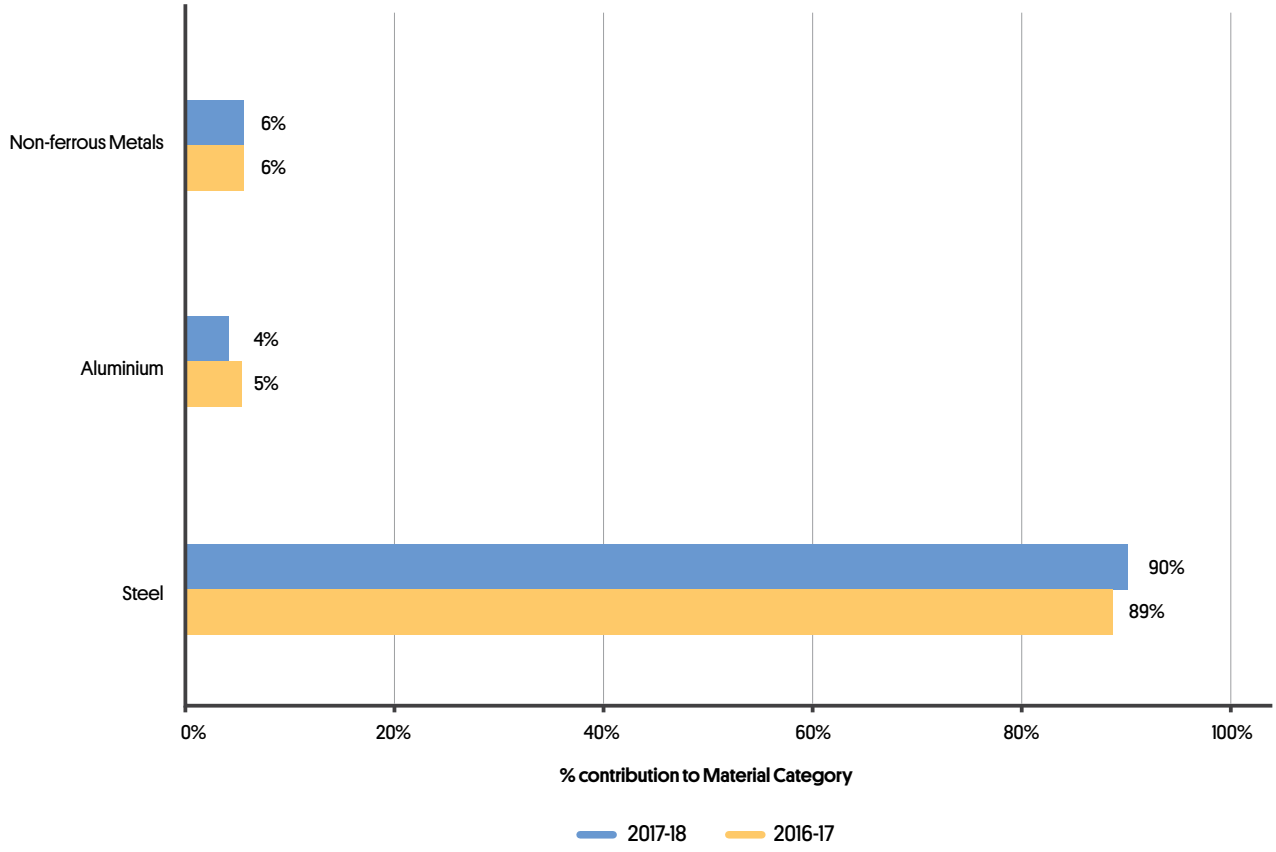


Figure 3.5 **Changes in reported recovered metal quantities since 2003-04 – Aluminium and Non-ferrous Metals.**
Recovery of Non-ferrous has risen slightly and Aluminium decreased slightly from 2016-17.

Figure 3.6 **Changes in percent composition of recovered Metals (by weight), SA, between 2016-17 and 2017-18.**
From 2016-17 to 2017-18, Steel's composition has increased slightly while Aluminium has decreased and Non-Ferrous remained the same.



All Metals recovered in SA 2017-18 were sent for material recovery, as no Metals were sent for energy recovery. Scrap metals imported into SA during 2017-18 for resource recovery or re-processing (which is additional to the tonnes reported for SA in **Table 3.3**) totalled 21,500 tonnes (10,700 from Northern Territory, 6,500 from Victoria, 4,300 from NSW).

Steel continued to constitute the majority (90%) of Metal recovery (**Figure 3.6** above). Non-ferrous Metals and Aluminium made up 6% and 4% of reported Metal recovery respectively.

During 2017-18, 63% of Metal volumes were sourced from the C&I sector, with remaining volumes sourced from the MSW sector (21%) and C&D sector (16%).

Only 4% of Metals was re-processed locally in SA. Overseas exports increased by 18 percentage points to 62% in 2017-18 (from 44% in 2016-17), with the balance sent interstate (33%) for recycling.

The amount of Aluminium and Non-ferrous Metals re-processed in SA decreased (down two and 28 percentage points respectively from 2016-17 - see **Table 3.4**).

Table 3.4 **Sector and geographical origins and re-processing locations for recovered Metals in SA during 2017-18.** 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	19%	64%	17%	80%	20%	3%	35%	61%
Aluminium	41%	55%	4%	83%	17%	9%	8%	83%
Non-ferrous Metals	27%	60%	14%	85%	15%	12%	22%	66%
Total	**21%**	**63%**	**16%**	**81%**	**19%**	**4%**	**33%**	**62%**

During 2017-18, the SA metals recycling industry consolidated from three to two large processors.

Declines in scrap metal from the manufacturing sector are expected to continue as businesses that traditionally produce scrap metal as part of their processes close. As a consequence, there will be even more intense competition for volumes left in the market.

The Solid Waste Levy increases operating costs involved with disposing the 'flock' residual from re-processing to landfill. To limit further increases in the levy from adding more pressure on local scrap metal recovery operations, the State Government fixed the Solid Waste Levy applicable to shredder floc disposal at $62 per tonne for disposal in metropolitan Adelaide (rather than the standard rate of $87 per tonne) for the period between September 2017 and 30 June 2018.

In addition, business ventures planned in the state (for example manufacturing of electric cars) may help the Metals recycling industry.

3.3 Organics

Highlights:

- An estimated 1.1 million tonnes of Organics were recovered in 2017-18.
- Volumes of recovered Organics fell slightly from 2016-17 (down by 14,000 tonnes). This decrease was due to a fall in Garden Organics, which may be attributed to lower rainfall volumes in 2017-18 than 2016-17.
- Most Organics recovered in SA (97%) 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.
- There are several planned investments in infrastructure within SA, which are expected to increase the volumes and value of recovered Organics.
- An ongoing challenge for some re-processors is contamination of incoming tonnes of Organics.

The total quantity of recovered Organics reported for SA during 2017-18 was approximately 1.1 million tonnes (**Table 3.5** overleaf), which is down by 1.3% (or 14,000 tonnes) from 2016-17.

Figures 3.7 and **3.8** (overleaf) demonstrate that the decrease came from Garden Organics (down 36,000 tonnes or 12.3%), which may be due to lower rainfall volumes.

When observing the categories within Other Organics (**Figure 3.9** two pages overleaf), Waste Grease & Fat and Meat Rendering decreased slightly while Waste Sludge & Biosolids and Miscellaneous Organics increased slightly. The net change from 2016-17 for Other Organics was therefore very small.

Food Organics (**Figure 3.8** overleaf) volumes increased (up 1,000 tonnes or 12.3%), with larger amounts of food recovered from C&I sources. Additional volumes of food waste are being recovered from municipal sources. These are not separately reported but are included within the Garden Organics volumes. Most volumes of Food Organics in SA (estimated at more than 200,000 tonnes) are still disposed to landfill.

Timber volumes increased (up 20,000 tonnes or 8%) and Organics Other by 1,000 tonnes (or 0.2%).

During 2017-18, 103,400 tonnes of Organics were imported to SA for resource recovery (which is additional to tonnes reported for SA in **Table 3.5**). All of this material originated from Victoria.

Most recovered Organics were sent for material recovery. Some timber (84,000 tonnes or 31%) and Other Organics (18,000 tonnes) were used for energy recovery in SA. **Table 3.5** includes quantities of material recovery quantities versus energy recovery (in SA).

Table 3.5 **Quantity of Net Organics (tonnes) recovered in SA during 2017-18, 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	9,100	-	9,100	4,100	45%
Garden Organics	257,000	-	257,000	78,000	30%
Timber	186,000	84,000	270,000	56,000	21%
Other Organics	545,000	18,000	563,000	99,000	18%
Meat Rendering	230,000	-	230,000	9,000	4%
Waste Grease & Fat	110,000	-	110,000	29,000	25%
Waste Sludge & Bio-solids	43,000	-	43,000	11,000	26%
Miscellaneous Organics	163,000	18,000	181,000	50,000	28%
Total	**997,100**	**102,000**	**1,099,100**	**237,100**	**22%**

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.** Timber increased whilst Garden Organics decreased since 2016-17.

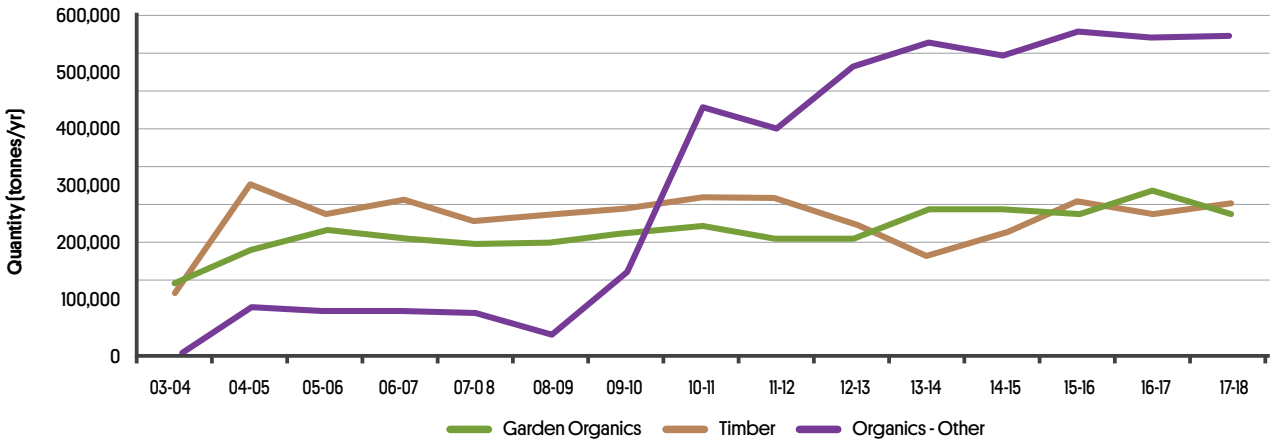


Figure 3.8 **Changes in reported recovered organics quantities since 2003-04 – Food Organics.** Food Organics during 2017-18 from the last reported financial year (2016-17).

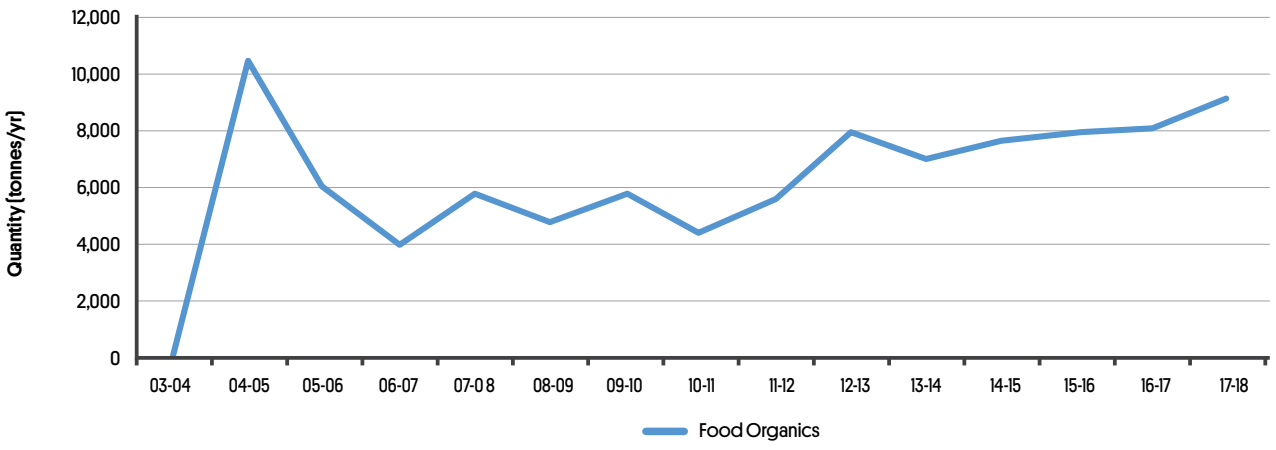


Figure 3.9

Changes in reported recovered Other Organics quantities since this data became available (2009-10).
Waste Grease & Fat and Meat Rendering decreased slightly while Waste Sludge & Biosolids and Miscellaneous Organics increased slightly from 2016-17.

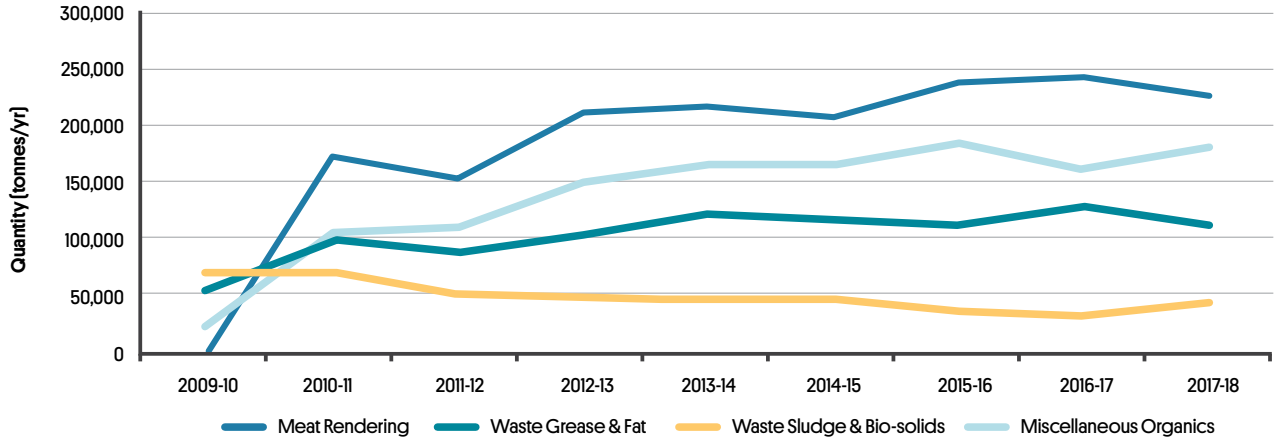
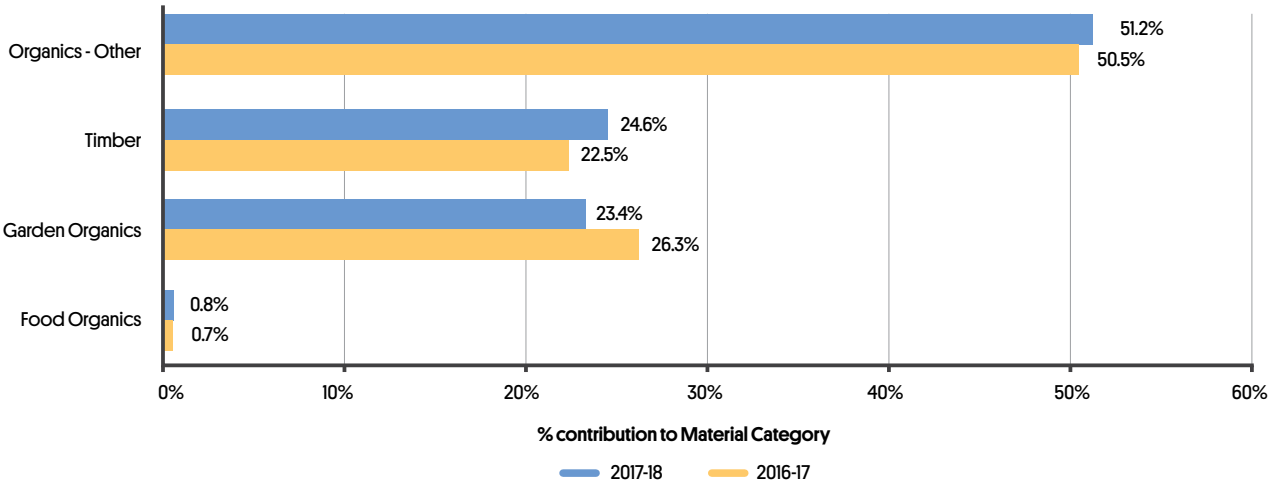


Figure 3.10

Changes in percent composition of recovered Organics (by weight), SA, between 2016-17 and 2017-18.
Timber, Organics Other and Food Organics increased their contribution to this material sector whilst garden organics decreased.



Other Organics (Meat Rendering, Grease Trap, Bio-solids, etc.) continued to constitute the majority (51%) of Organics recovery (**Figure 3.10** above). Timber and Garden Organics were also significant contributors, making up 25% and 23% respectively of reported Organics recovery.

The majority (77%) of recovered Organics originated from C&I sources including material from the timber, meat rendering, bio-solids and wine production industries (**Table 3.6**). C&I volumes increased slightly in 2017-18 due to reporting Bio-solids as 100% C&I to align with national reporting standards.

Approximately 17% of recovered Organic materials originated from municipal sources, which was dominated by a large amount of Garden Organics. Small quantities (6%) were sourced from the C&D sector, which were the Timber and Garden Organics streams.

Nearly half (43%) of recovered Organics was sourced from SA's regional areas due to the significant contribution by regional industries to Other Organics and Timber (see **Table 3.6**). The majority (97%) of Organics was re-processed in SA.

Table 3.6 **Sector and geographical origins and re-processing locations for recovered organics in SA during 2017-18.**
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%	90%	10%	100%	0%	0%
Timber	0.2%	82%	18%	62%	38%	97%	3%	0%
Other Organics	0%	100%	0%	40%	60%	96%	4%	0%
Total	**17%**	**77%**	**6%**	**57%**	**43%**	**97%**	**3%**	**0%**

The outlook for Organics recovery for the next period is positive:

- Some reprocessors reported 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.
- There are still significant volumes of Food Organics ending up in SA's landfills that can be recovered.
- Further volumes of Food & Garden Organics (FOGO) may become available to SA reprocessors from Victoria where processing costs are higher.
- There are several planned investments in infrastructure within SA, which are expected to increase the volumes and value of recovered Organics. Examples include investment in infrastructure to de-package organics, make granulated fertiliser and biochar.

The competition for incoming tonnes remains high. An ongoing challenge for some re-processors is contamination of incoming tonnes of organics. Planning and regulatory approval processes were reported as a barrier for some reprocessors.

3.4 Cardboard & Paper

Highlights:

- In 2017-18 overall quantities of recovered Cardboard & Paper decreased slightly (by 5% from 2016-17). This difference was largely due to improved reporting by industry, rather than a reduction in volumes recovered.
- Nearly all (99.5%) Cardboard & Paper was reported to be sent interstate or overseas for re-processing.
- China Sword greatly impacted markets for mixed fibre streams. The market is now demanding lower contamination levels and has a larger focus on quality of recovered materials.
- SA reprocessors are responding to China Sword by improving the quality of recovered Cardboard & Paper via infrastructure upgrades, as well as, developing onshore markets for recovered materials.

The total quantity of recovered Cardboard & Paper materials reported for SA during 2017-18 was approximately 236,200 tonnes (**Table 3.7** below).

Overall Cardboard & Paper volumes decreased by 5% (or 13,000 tonnes) from 2016-17 figures. There was a decrease in Cardboard & Waxed Cardboard (down 5% from 2016-17) and Magazines & Newsprint (10% decrease). Liquid Paperboard remained consistent with 2016-17. Liquid Paperboard saw a large increase in 2009-10 (see **Figure 3.12** overleaf) due to the change in the material split assumptions for paper and cardboard. In 2014-15 updated data was provided and a more accurate method adopted. Printing & Writing Paper increased (up 22%, **Figures 3.11** overleaf). These differences in volumes were largely due to improved reporting by industry, rather than actual changes in volumes recovered.

During 2017-18 no Cardboard & Paper was reported as being collected for energy production in SA, nor were any of these waste materials imported into SA for resource recovery. This is consistent with the findings in the 2015-16 and 2016-17 surveys.

Table 3.7 **Quantity of Cardboard & Paper (tonnes) recovered in SA during 2017-18, 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	162,000	8,000	5%
Liquid Paperboard	1,200	210	18%
Magazines & Newsprint[2]	62,000	3,137	5%
Printing & Writing Paper	11,000	2,100	19%
Total	**236,200**	**13,400**	**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. There was a decrease in reported volumes of Cardboard & Waxed Cardboard and Magazines & Newsprint and slight increase in Printing & Writing Paper.

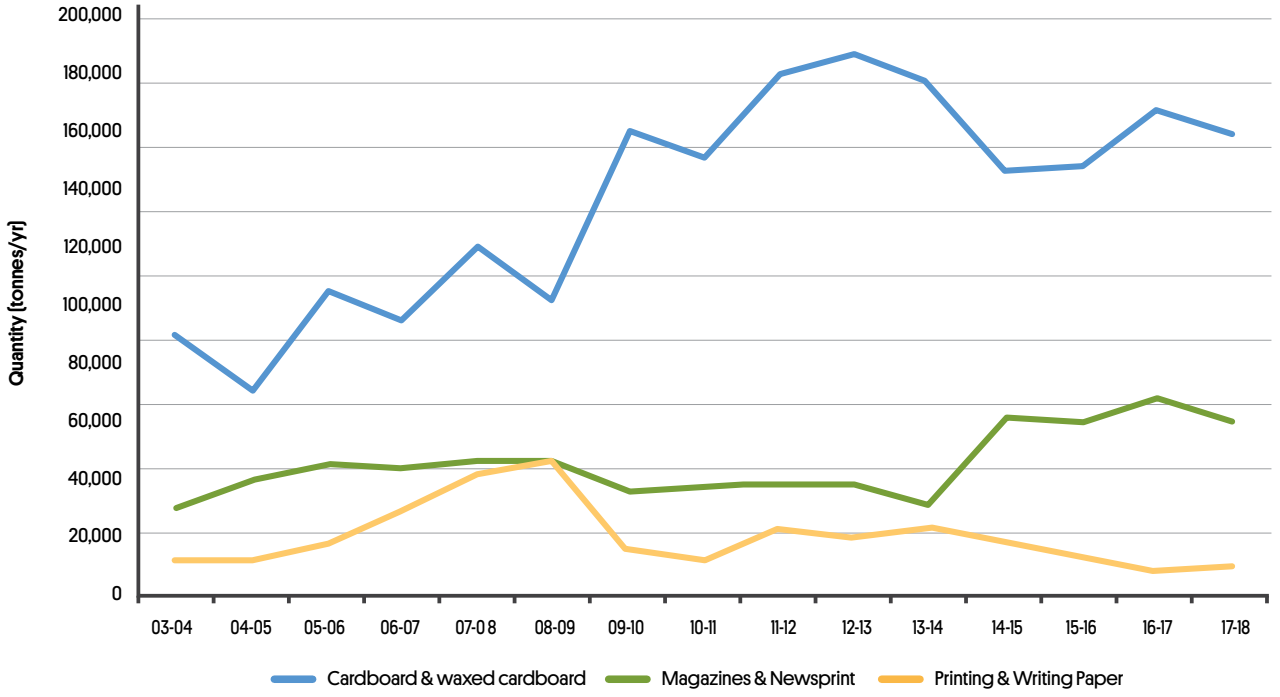


Figure 3.12

Changes in reported recovered Cardboard & Paper quantities since 2003-04 – Liquid Paperboard. Liquid Paperboard remained consistent with 2016-17 levels.

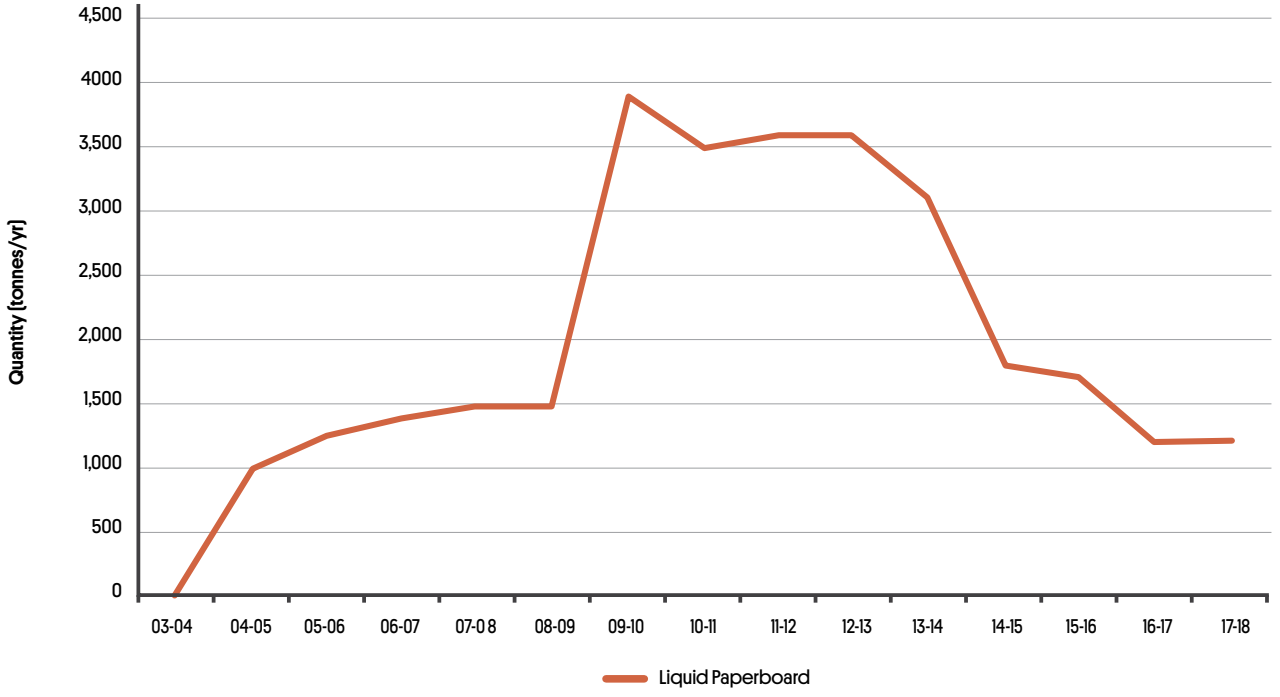
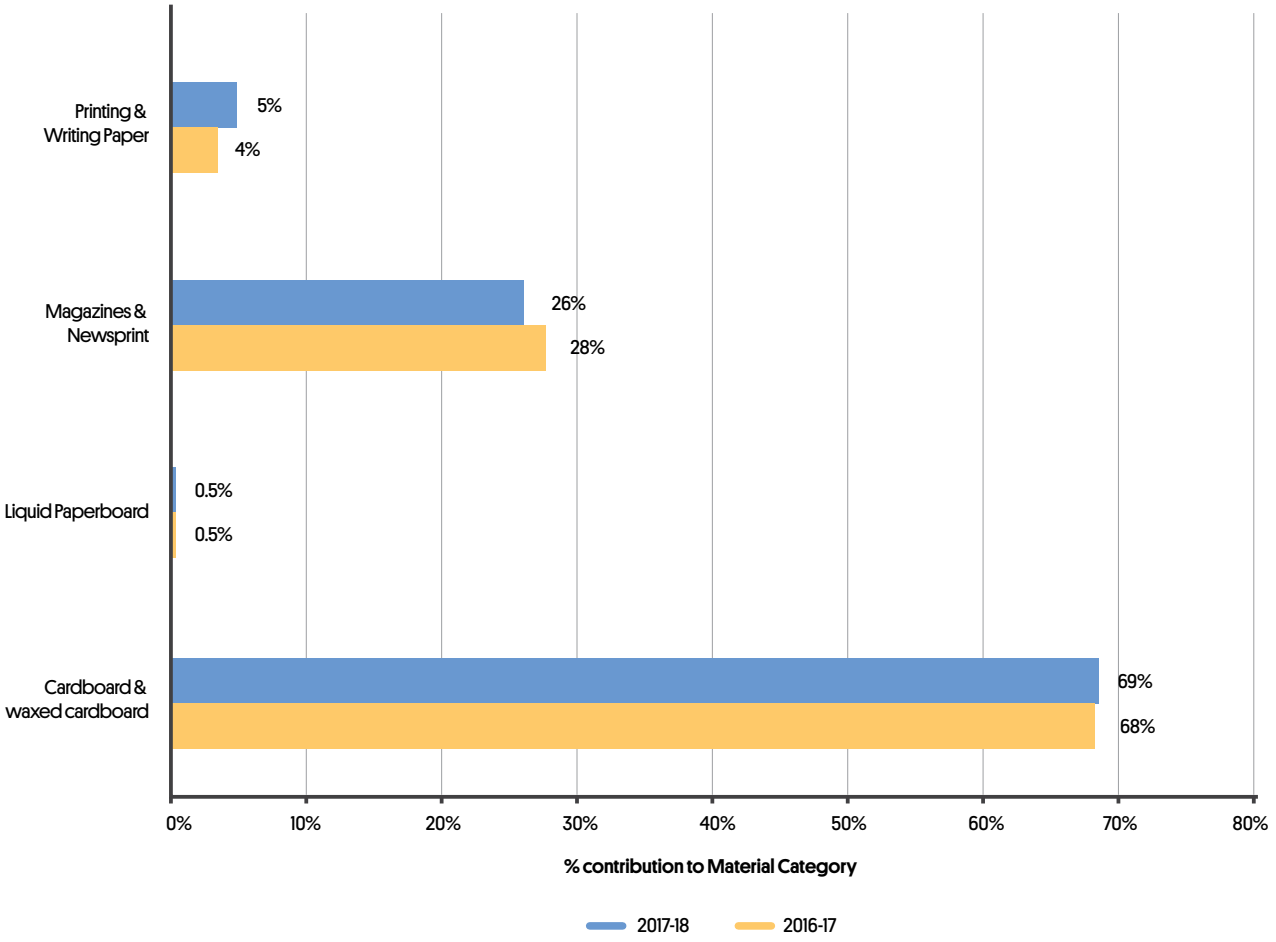


Figure 3.13

Changes in percent composition of recovered Cardboard & Paper (by weight), SA, between 2016-17 and 2017-18.
Relative contributions by the different material types has remained consistent with the previous financial year.



The relative contributions of each material to the Cardboard & Paper sector have remained consistent with 2016-17 (**Figure 3.13** above). In 2017-18, Cardboard & Waxed Cardboard contributed 69% of the resource recovery, Magazines & Newsprint provided 26%, Printing & Writing Paper at 5% and Liquid Paperboard at only 0.5%.

Sources and destinations of recovered materials in 2017-18 are consistent with findings from 2016-17:

- C&I and Municipal sources made up 62% and 38% of reported recovered Cardboard & Paper materials respectively (**Table 3.8** overleaf).
- Most Cardboard & Paper (91%) was sourced from Metropolitan SA (**Table 3.8** overleaf).
- However, the proportion of Cardboard & Paper sent overseas for re-processing decreased to 39% (from 45%), with the remaining 60% sent interstate (**Table 3.8** overleaf). The move toward increased onshore processing may have been driven by China Sword.

Table 3.8 **Sector and geographical origins and re-processing locations for recovered Cardboard & Paper in SA during 2017-18.** C&I and MSW were the main source sectors, most recovery occurred from metropolitan Adelaide, and all recovered 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	19%	81%	0%	91%	9%	0%	48%	52%
Liquid Paperboard	86%	14%	0%	90%	10%	0%	53%	47%
Magazines & Newsprint	87%	13%	0%	93%	7%	2%	87%	12%
Printing & Writing Paper	40%	60%	0%	85%	15%	0%	92%	8%
Total	**38%**	**62%**	**0%**	**91%**	**9%**	**0.5%**	**60.4%**	**39.1%**

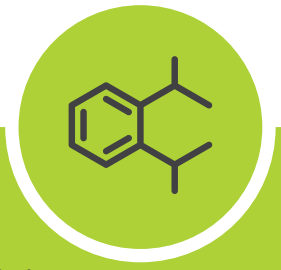
Recovery of Cardboard & Paper is going through a period of transition. China Sword impacted markets for mixed fibre streams. The market is now demanding lower contamination levels and has a larger focus on quality of recovered materials.

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

Overall volumes of Cardboard & Paper are expected to remain stable. However, types and sources of material are expected to change over time. This may include:

- 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.

3.5 Plastics



Highlights:

- An estimated 31,100 tonnes of Plastics were recovered in 2017-18. This is a slight increase in reported quantities from 2016-17. This increase is largely due to higher volumes of recovered Mixed and/or Other Plastics that is being sent for energy recovery in SA.
- SA's capacity to recycle plastics locally reduced, with the closure of a local plastics granulator.
- China Sword greatly impacted markets for Plastics. The market is now demanding lower contamination levels and has a larger focus on quality of recovered materials. This caused the price of mixed and low-grade recovered Plastics to plummet.
- About a third of total plastic generated in SA was re-processed in the state. Local reprocessing of plastics is expected to increase over time given planned investments in plastics granulation infrastructure.

During 2017-18, SA had:

- Reduced capacity to recycle plastics locally, with the closure of an Adelaide-based plastics granulation company.
- Expanded capacity for local energy recovery of plastics.

The total quantity of recovered Plastics reported for SA during 2017-18 was 31,100 tonnes (**Table 3.9** below).

Total volumes of plastic increased by 2,600 tonnes (or 9%) from 2016-17. This was mainly driven by an increase in Mixed &/or Other Plastics sent for energy recovery.

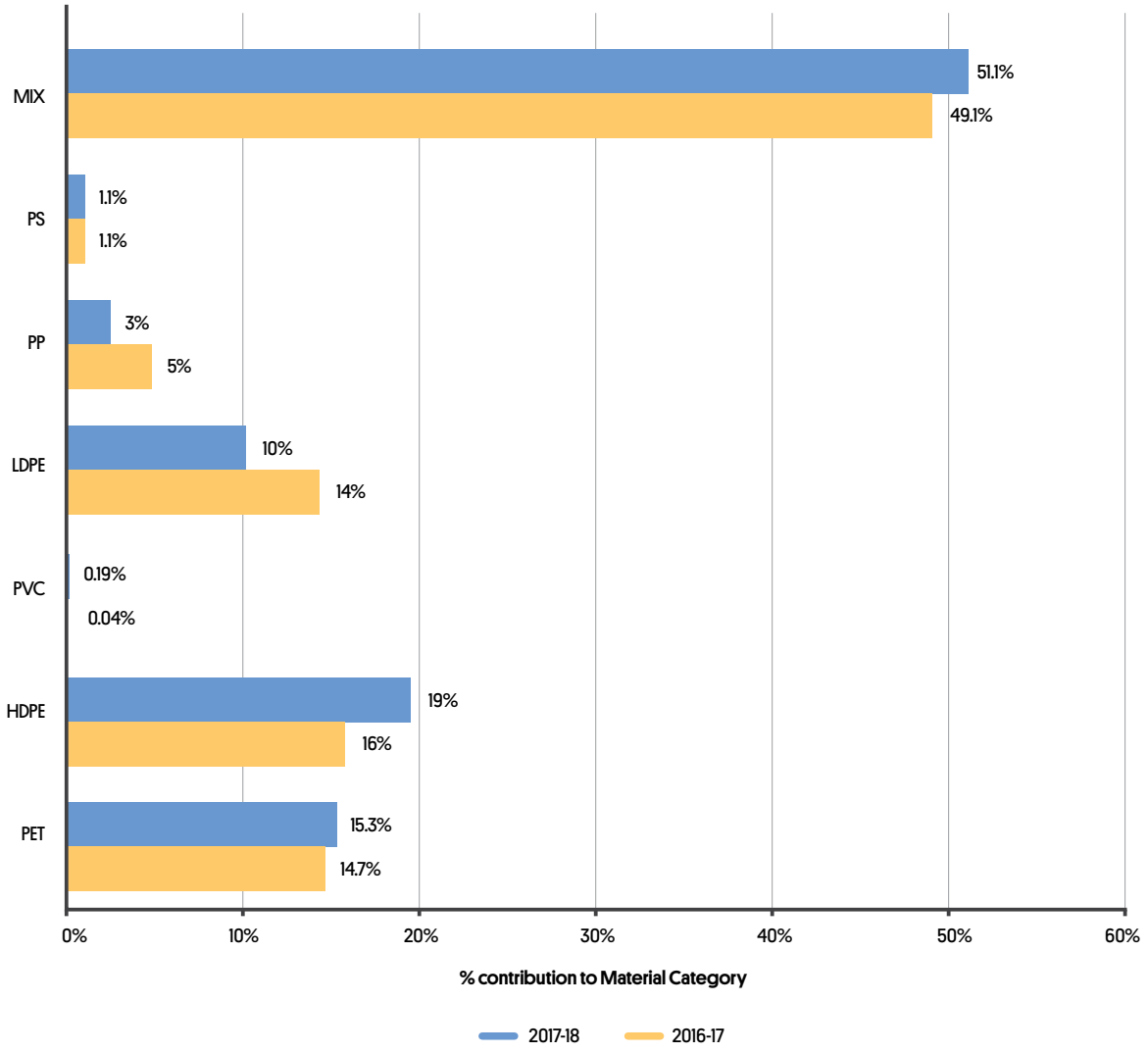
Local re-processors also imported 600 tonnes of Plastics into SA for resource recovery, mostly from NSW. This is additional to tonnes reported for SA in **Table 3.9**. Import volumes were significantly lower from the previous year (6,950 tonnes), due to the closure of a plastics recycler in SA.

Table 3.9 **Quantity of Plastics recovered (tonnes) in SA during 2017-18, including estimated reporting error (tonnes & %).**
Net resource recovery slightly increased from 2016-17.

Item	Material Recovery	Energy Recovery	Net Recovery[1,2]	Reporting Error	
	tonnes	tonnes	tonnes	tonnes	%
Polyethylene Terephthalate (PET)	4,800	-	4,800	680	14%
High density Polyethylene (HDPE)	6,100	-	6,100	820	13%
Polyvinyl Chloride (PVC)	60	-	60	12	20%
Low density Polyethylene (LDPE)	3,200	-	3,200	740	23%
Polypropylene (PP)	800	-	800	140	18%
Polystyrene (PS)	330	-	330	29	9%
Mixed &/or Other Plastics (MIX)	6,500	9,300	15,800	2,580	16%
Total	**21,800**	**9,300**	**31,100**	**5,000**	**16%**

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 2016-17 and 2017-18.**
Mixed Plastics remained a significant contributor to resource recovery at 51% of all Plastics.



Mixed &/or Other Plastics constituted the majority (51%) of reported Plastics recovery followed by HDPE (19%), PET (15%), and LDPE (10%) (**Figure 3.14** above).

During 2017-18:

- Mixed &/or Other Plastics increased by 2,000 tonnes (or 36%), with higher volumes being sent for energy recovery in SA.
- PET increased by 600 tonnes (or 14%) due to improved reporting by industry.
- HDPE increased by 1,600 tonnes (or 36%).
- PVC increased by 50 tonnes (or 500%).
- PS increased by 30 tonnes (or 10%)
- LDPE and PP reduced by 900 tonnes (22%) and 600 tonnes (43%) respectively. It is possible these polymers were instead collected in the Mixed &/or Other Plastics stream as a result of not meeting higher quality standards imposed by the market due to China Sword.

See **Figures 3.15** and **3.16** overleaf.

Total Plastics recovery has continued to increase over time, from 8,600 tonnes in 2003-04 to 31,100 in 2017-18 (**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.

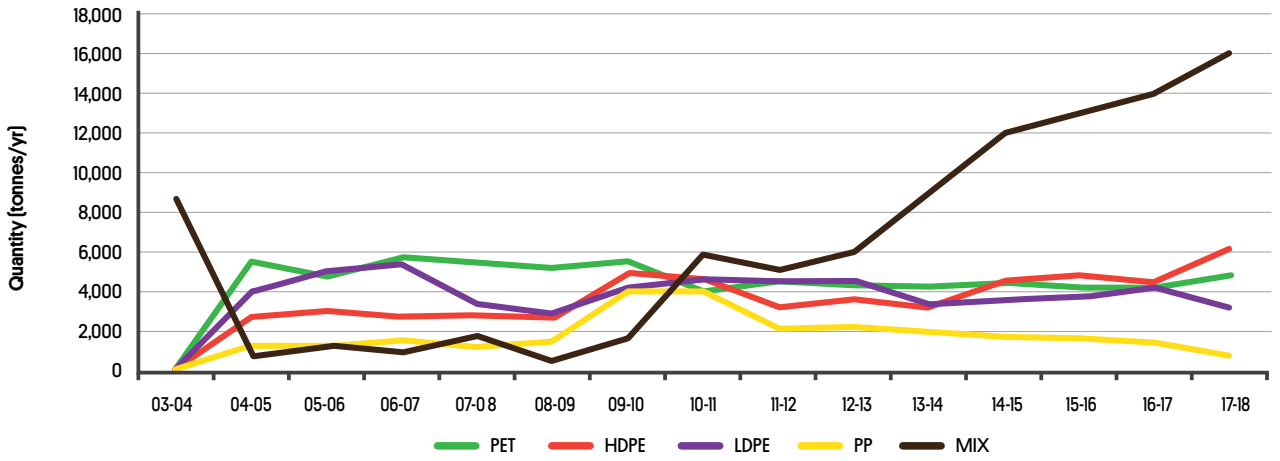
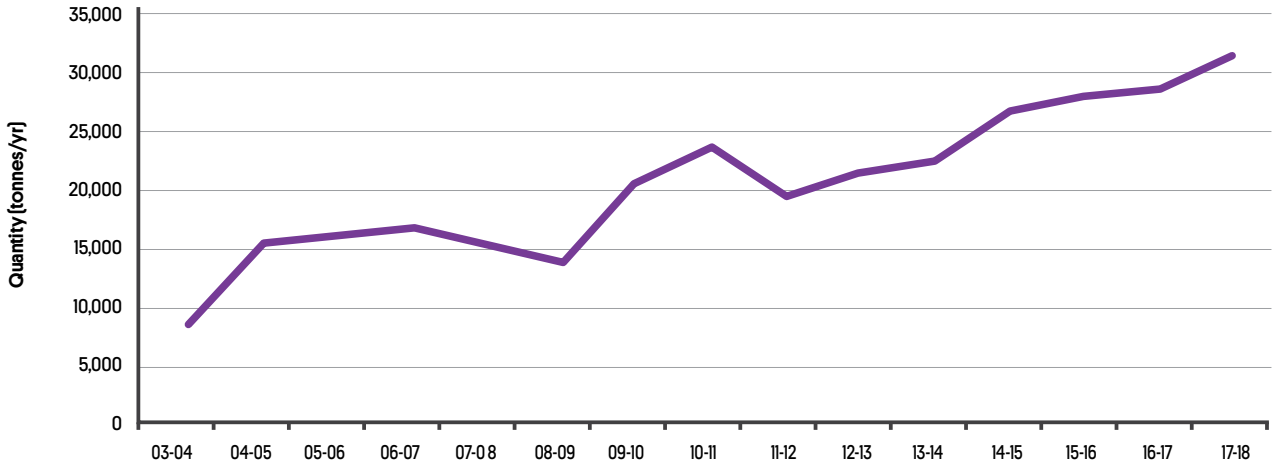


Figure 3.16

Changes in reported recovered Plastics quantities since 2003-04 – PVC and PS.
PVC and PS recovery increased slightly.

Figure 3.17

Changes in reported recovered Plastics quantities since 2003-04 – all Plastics.
Overall quantity of recovered plastics rose since 2016-17, maintaining a steady upward trend over time



In 2017-18, sources of recovered Plastics from remained relatively steady with the previous reporting period. 43% came from MSW sources, 42% from C&I sources and the balance from C&D sources. Most recovered Plastics continued to come from Metropolitan Adelaide (91%). See **Table 3.10** for 2017-18 data.

About a third (34%) of Plastics re-processing occurred in SA in 2017-18. This is a slight decrease from 2016-17 (down from 37%), with the reduced recycling capacity mostly being offset by increased capacity for energy recovery. A further 36% was sent interstate and 30% was sent overseas for reprocessing.

China Sword greatly impacted markets for recovered plastics. The market is now demanding lower contamination levels. As a result, the price of mixed and low-grade recovered plastics plummeted. SA has benefitted from having the energy recovery option available for lower grade plastics (mixed) during this transition period.

The SA recycling industry is responding to this market shift by reducing its reliance on international markets. There are several planned investments in local plastics granulation infrastructure. SA reprocessing of Plastics is expected to increase once these facilities are operating.

There are a few challenges for recovery and reprocessing of plastics in SA, including:

- Reducing contamination of recovered plastics (e.g. via improved source separation and/or infrastructure upgrades)
- High costs of electricity that impact the costs of recycling
- Plastics granulators needing to resecure both the supply of recovered plastics and the demand for granulated products
- Managing perceptions regarding the quality of recycled products (compared to virgin alternatives). According to companies that use plastics to make products in South Australia, the imported recycled plastics can be of poorer quality than virgin products which can tarnish the view of recycled plastics.

Table 3.10 **Sector and geographical origins and re-processing locations for recovered plastics in SA in 2017-18.**
The majority of plastic is recovered from the C&I and MSW sectors. Metropolitan Adelaide is the source of most plastics. There has been a slight decrease in re-processing of plastics in SA and an increase in plastics sent overseas.

Item	Sector Origin (%)			Geographical Origin (%)		Re-processing Location (%)		
	MSW	C&I	C&D	Metro	Regional	SA	Interstate	Overseas
Polyethylene Terephthalate (PET)	62%	38%	0%	82%	18%	0.2%	85.5%	14.3%
High density Polyethylene (HDPE)	64%	36%	0%	89%	11%	8.8%	14.6%	76.6%
Polyvinyl Chloride (PVC)	0%	100%	0%	100%	0%	0%	0%	100%
Low density Polyethylene (LDPE)	0%	100%	0%	88%	12%	1%	28%	71%
Polypropylene (PP)	28%	72%	0%	76%	24%	36%	0%	64%
Polystyrene (PS)	4%	68%	27%	97%	3%	6.3%	4.5%	89.2%
Mixed &/or Other Plastics (MIX)	39%	31%	30%	96%	4%	61.7%	32.7%	5.7%
Total	**43%**	**42%**	**15%**	**91%**	**9%**	**34%**	**36%**	**30%**

3.6 Glass

Highlights:

- In 2017-18 the total quantity of recovered Glass was 60,000 tonnes.
- A further 57,000 tonnes was imported from interstate into South Australia.
- The volumes of Glass recovered from SA decreased by 10% from 2016-17 due to a combination of factors. This includes light weighting of glass packaging, reduced recovery of MRF glass fines, and increased supply of recovered Glass from interstate.
- Most Glass was sourced from the MSW sector and was re-processed locally.
- The outlook for Glass is expected to remain steady.

The total quantity of recovered Glass reported for SA during 2017-18 was 60,000 tonnes. All recovered Glass was packaging, including glass bottles and jars (see Section 5 for additional information on packaging).

A further 57,000 tonnes of Glass was imported to SA in 2017-18 for re-processing. NSW was the major source (at 61%), with Vic (27%), NT (7%) and WA (5%).

Glass recovered in SA fell by of 10% (or 7,000 tonnes) from 2016-17 (see **Table 3.11** and **Figure 3.18** overleaf). This was due to a combination of factors, including:

- Light weighting of glass packaging
- Reduced recovery of MRF glass fines, and
- Increased competition for supplying Glass to reproccessors (with greater volumes available from interstate)

Most Glass (63%) was recovered from MSW sources and the remainder was from C&I sources (37%, see **Table 3.12** overleaf). The source of Glass was different to 2016-17, due to improved reporting from industry.

The majority (89%) of Glass was from metropolitan sources and re-processed in SA (95%), with the balance (5%) sent interstate (**Table 3.12**).

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

- A significant part of the Glass recovery arises from glass bottles returned as part of SA's container deposit (or CDL) scheme.
  - » This source of Glass is of high quality and highly prized by re-processors and glass bottle manufacturers as a source for recycled glass content.
- Industry have indicated that prospects of Glass is positive.
- Industry and councils are exploring opportunities for glass fines into glass manufacture, glass sand for roads or other civil applications which will increase markets for glass products.

Table 3.11 **Quantity of Glass recovered (tonnes) in SA during 2017-18, including estimated reporting error (tonnes & %).**

Item	Net Recovery [1]	Reporting Error	
	tonnes	tonnes	%
Glass	**60,000**	**9,000**	**15%**

1 Net recovery excludes re-processing losses

Figure 3.18 **Changes in reported recovered Glass quantities since 2003-04 – Glass.**
Glass quantities decreased slightly in 2018-18 but have increased since 2013-14.

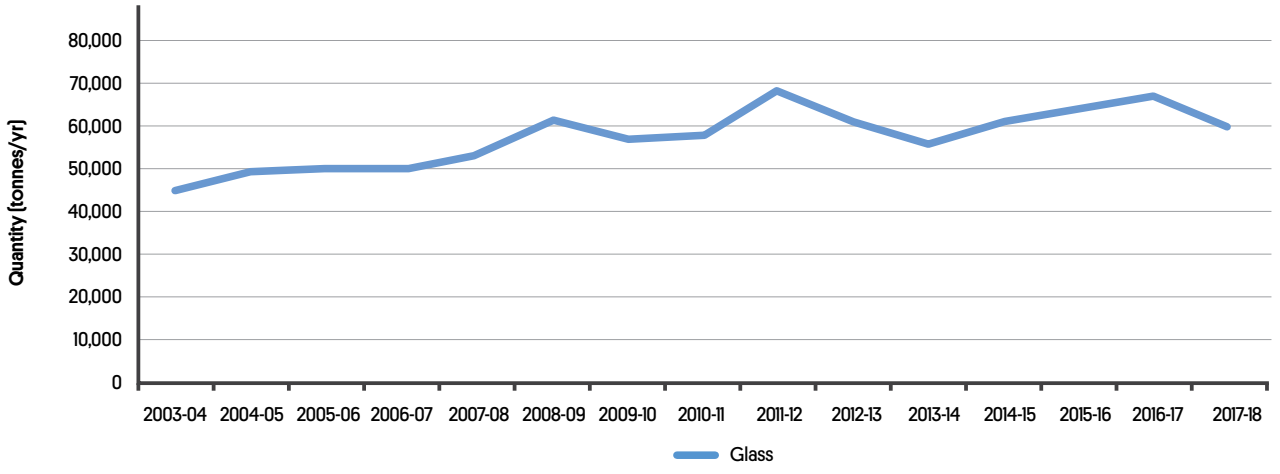


Table 3.12 **Sector and geographical origins and re-processing locations for recovered Glass in SA in 2017-18.**
All resource recovery occurs from Municipal and C&I sources, most of which is re-processed locally.

Item	Sector Origin (%)			Geographical Origin (%)		Re-processing Location (%)		
	MSW	C&I	C&D	Metro	Regional	SA	Interstate	Overseas
Glass	63%	37%	0%	89%	11%	95%	5%	0%

3.7 Other Materials

Highlights:

- In 2017-18 an estimated 35,600 tonnes of Other Materials were recovered.
- Volumes fell by 13,600 tonnes (or 27%) from 2016-17 levels. This was driven by a large drop in Foundry Waste following the decline in SA's manufacturing and industrial activity.
- Volumes of Leather and Textiles increased with expanded reporting.
- The outlook for future resource recovery of Other Materials is expected to continue to decline. This is due to on-going reductions the recovery of Foundry Waste. Other streams are expected to remain steady.

The total quantity of recovered Other Materials reported for SA during 2017-18 was approximately 35,600 tonnes (**Table 3.13** below). This is down by 27% (13,300 tonnes) from 2016-17. This decrease was driven by a large decrease in Foundry Waste (down 61% or 14,900 tonnes from 2016-17, see **Figure 3.19** overleaf).

Leather & Textiles increased by 38% or 1,500 tonnes from 2016-17, with expanded reporting. Tyres & Other Rubber increased slightly by 100 tonnes or 1%.

An additional 18,200 tonnes of Other Materials were imported into SA for resource recovery, including 38% from overseas. Most of the remaining imports were from Victoria.

Table 3.13 **Quantity of Other Materials (tonnes) Net recovered in SA during 2017-18, including estimated reporting error (tonnes & %).**
Leather and textiles has increased and Tyres & Other Rubber has increased slightly, whilst Foundry Waste decreased.

Item	Net Recovery [1]	Reporting Error	
	tonnes	tonnes	%
Fly ash	0	0	0%
Foundry Waste	9,600	300	3%
Leather & textiles	5,500	900	16%
Tyres & other rubber	20,000	2,000	10%
Total	**35,600**	**3,200**	**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.**
Foundry Waste continues to drop, while Leather & Textiles and Tyres & Rubber remain stable.

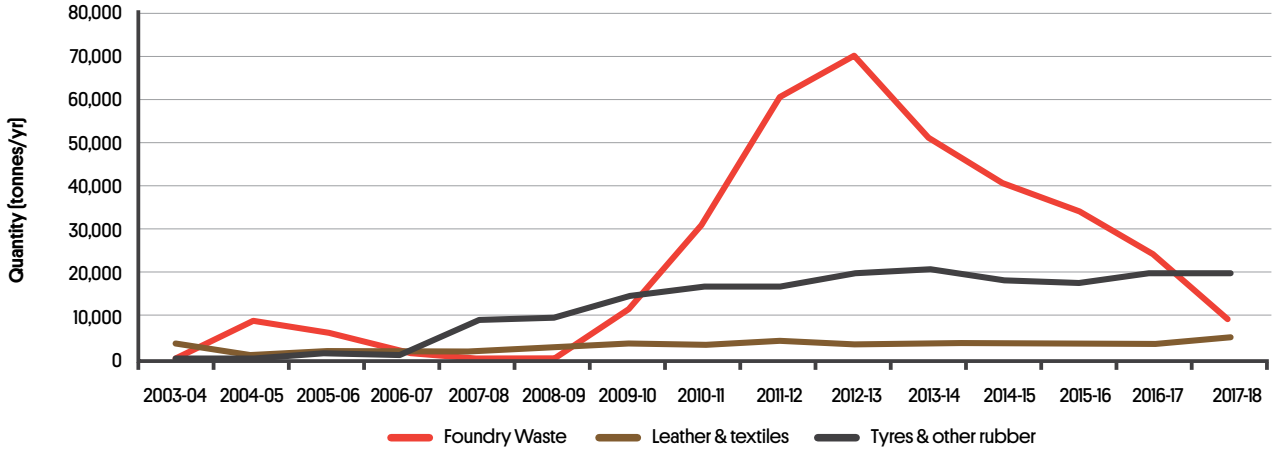


Figure 3.20 **Changes in reported recovered Other Materials quantities since 2003-04 – Fly Ash.**
Fly Ash is zero since the closure of the Port Augusta Power Station.

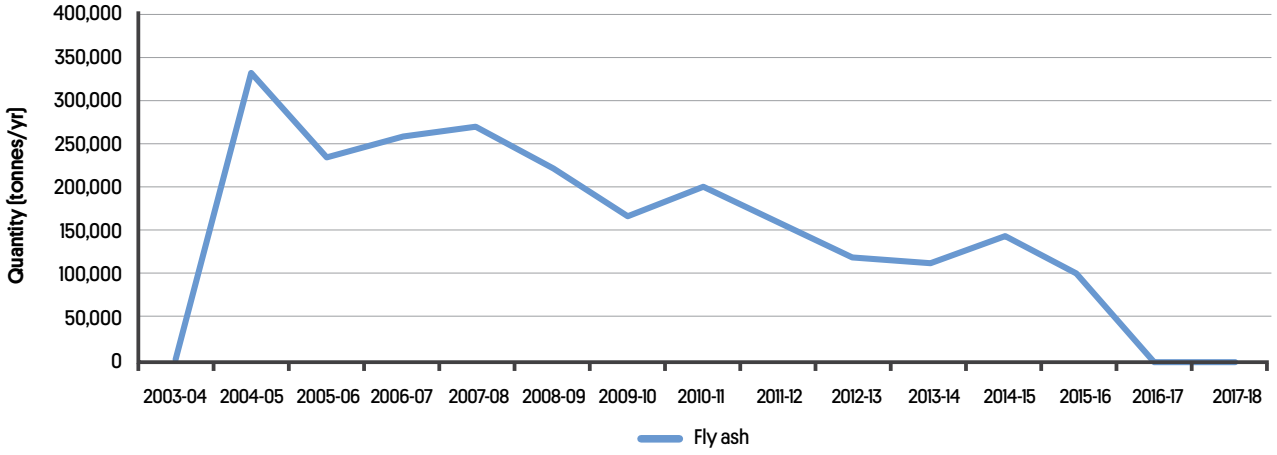
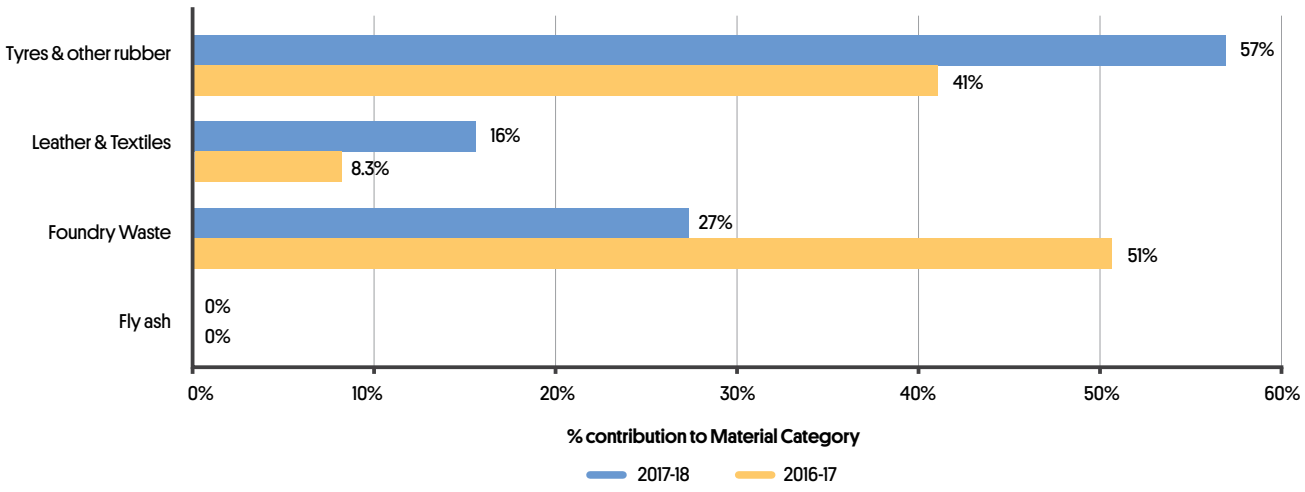


Figure 3.21 **Changes in percent composition of recovered Other Materials (by weight), SA, between 2016-17 and 2017-18.**
Proportions of Tyres and other rubber and Leather & Textiles increased significantly as Foundry Waste decreased.



Tyres & Other Rubber are now the biggest contributor to other materials (57%). Foundry Waste now contributes 27% of all the Other Materials (see **Figure 3.21** above). The proportion of material sourced from metropolitan Adelaide has increased again relative to regional SA. C&I volumes make up the majority (93%) of overall volumes (**Table 3.14** below).

All reported Foundry Waste was re-processed in SA for cement production (**Table 3.14**). 56% of the Leather & Textiles were sent interstate and the balance was exported overseas (44%).

Table 3.14 **Sector and geographical origins and re-processing locations for recovered Other Materials in SA in 2017-18.**
Most Other Materials are produced by the C&I Sector with the origin shifting from 2016-17 to predominantly metro based

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%	99%	1%	100%	0%	0%
Leather & Textiles	43%	57%	0%	94%	6%	0%	56%	44%
Tyres & Other Rubber	0%	100%	0%	84%	16%	91%	9%	0%
Total	**7%**	**93%**	**0%**	**90%**	**10%**	**79%**	**14%**	**7%**

All tonnes of recovered Tyres & Other Rubber were sent overseas for energy recovery or interstate to be made into road base. Given Tyres & Other Rubber is processed in SA before it is sent overseas, this is reported as re-processed in SA (91% of all Tyres & Other Rubber), with the remaining 9% sent to Victoria to be granulated into a material appropriate for civil application.

The outlook for future resource recovery of Other Materials is expected to continue to decline. This is due to on-going reductions the recovery of Foundry Waste in line with reduced manufacturing and industrial activity in SA. Fly Ash is expected to remain at zero tonnes per annum. Tyre quantities are expected to remain steady.

04 Electronic and Electrical Waste

At a glance:

- The total volumes of recovered E-waste decreased slightly from 2016-17.
- This is predominately due to a reduction in Computers and Televisions/ Monitors. These continue to decrease in weight per item and as such, although industry is recycling a higher number of these items, the weight is continuing to decrease.
- Most material (71%) continues to be reprocessed in SA, mostly through manual disassembly into constituent parts.

SA has a landfill ban on E-waste. An estimated 4,490 tonnes of E-waste were recovered in 2017-18 (**Table 4.1** below). This is lower than the reported tonnes in 2016-17 (5,130 tonnes). This decrease was driven by reduced volumes of recovered Televisions/ Monitors and Computers. According to the industry, many of the older, heavier televisions and computers 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.

There were slight increases in:

- Printer Cartridges (10 tonnes or 7%)
- Mobile Phones (2 tonnes or 40%) and
- Other E-waste (50 tonnes or 16%).

These increases are in part due to the increased availability of e-waste drop off points across the state.

Compact Fluorescent Lamps and Batteries recovered in 2017-18 remained in line with 2016-17.

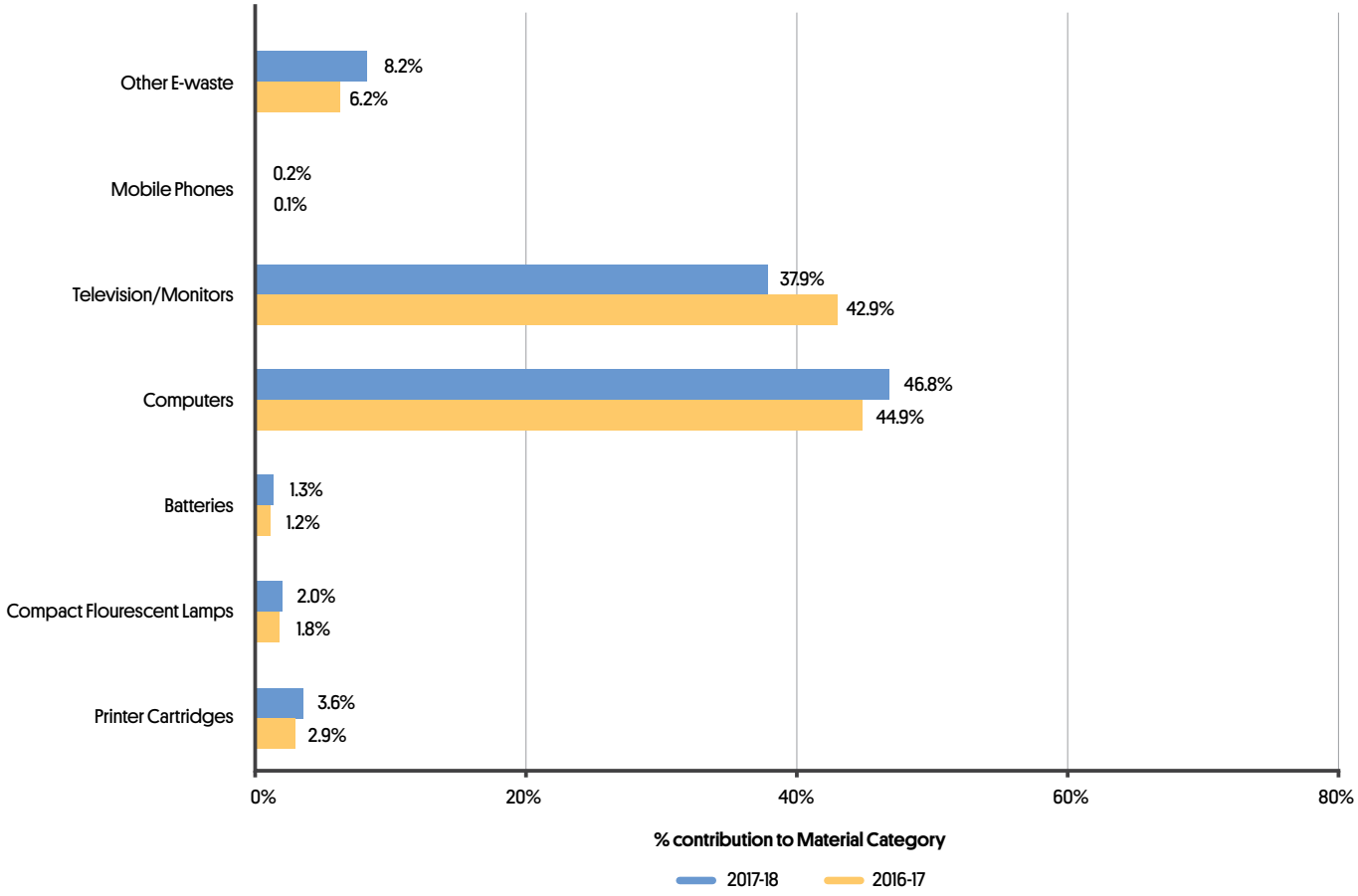
Table 4.1 **Changes in reported quantities of E-waste between 2016-17 and 2017-18[1].** TVs/Monitors and Computers were major contributors to E-waste recovery in SA.

Item	2016-17	2017-18	% change 16-17 to 17-18
Printer Cartridges	150	160	7%
Compact Fluorescent Lamps	90	90	0%
Batteries	60	60	0%
Computers	2,300	2,100	-9%
Televisions / Monitors	2,200	1,700	-23%
Mobile Phones	5	7	40%
Other E-waste	320	370	16%
Total	**5,130**	**4,490[2]**	**-12.4%**

1 Net recovery excludes re-processing losses

2 This value has a reporting error of 970 tonnes (+/-22%).

Figure 4.1 Changes in percent composition of recovered E-waste (by weight), SA, between 2016-17 and 2017-18.



Most E-waste (68%) during 2017-18 was sourced from MSW sources. C&I made up the balance in SA (32% in 2017-18), which is mostly from Printer Cartridges, Compact Fluorescent Lamps, and a proportion of Computers.

Table 4.2 also shows that 9% of E-waste volumes was recovered from regional sources, with the balance (91%) from metropolitan SA. The destination for 71% of E-waste materials was reported as SA, with the rest sent interstate.

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 local aggregators/merchants. These local 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 re-processing destination for E-waste materials.

Table 4.2 **Sector and geographical origins and re-processing locations for recovered E-waste in SA in 2017-18.** MSW has increased slightly and is the dominant sector, most the E-Waste was recovered from metropolitan areas, and was initially re-processed in SA.

Item	Sector Origin (%)			Geographical Origin (%)		Re-processing Location (%)		
	MSW	C&I	C&D	Metro	Regional	SA	Interstate	Overseas
Total E-waste	68%	32%	0%	91%	9%	71%	29%	0%

The recovery of E-waste items is anticipated to increase as:

- The End-Of-Life (EOL) National TV/ Computer Recycling Scheme increases its recovery targets[9], and
- With the expansion and promotion of drop off points across the state (e.g. Unplug and Drop)

However, while the number of items may increase, the overall weight may not change (or may even decrease) due to electronic waste weighing less per unit.

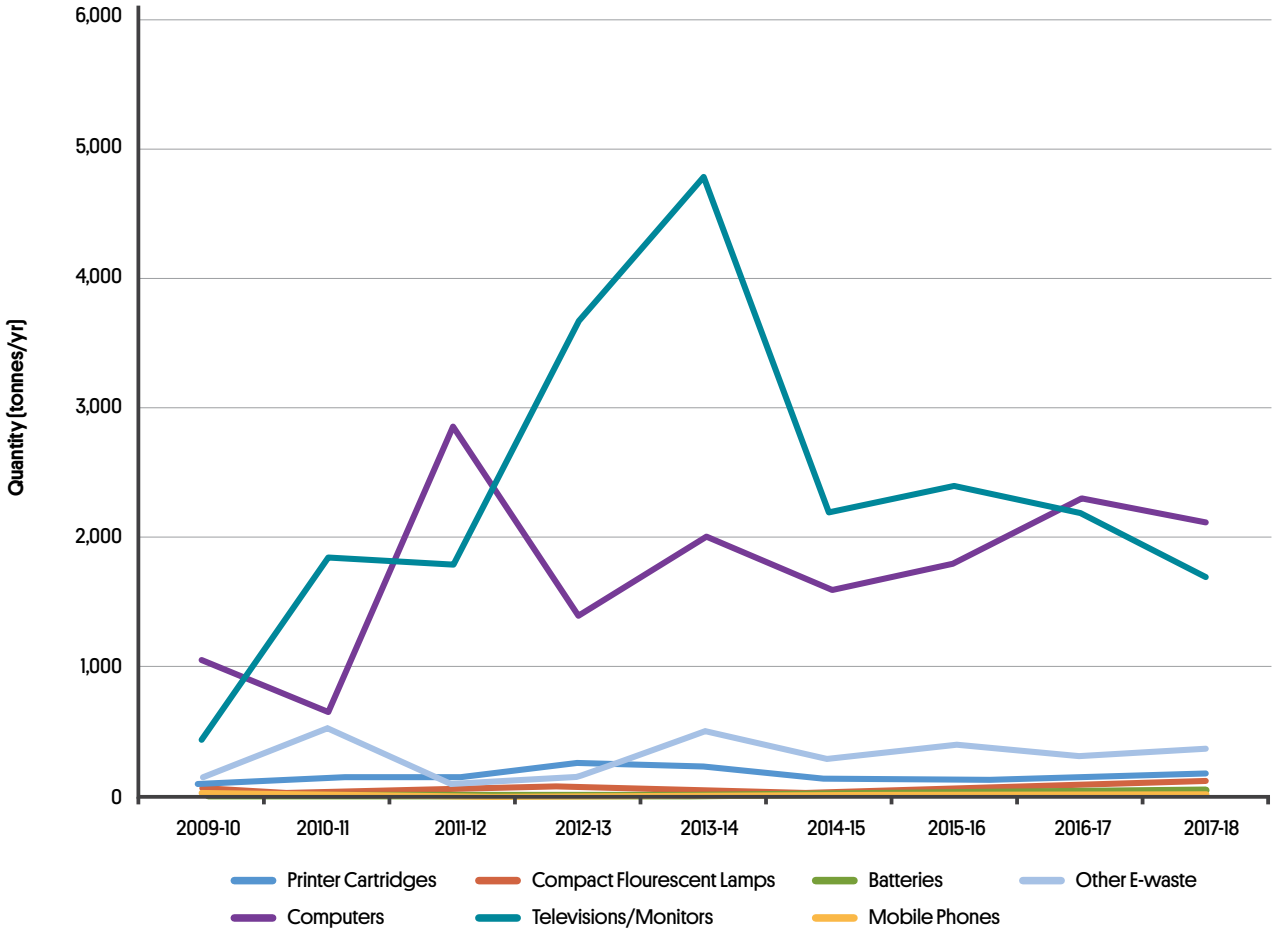
In 2017-18, the recycling target for industry was 62% (which will rise to 80% by 2026-27, see ANZRP, 2017). State, territory and/or local governments are responsible for the remainder of the waste (e.g. 38% in 2017-18).

Figure 4.2 overleaf 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).

Figure 4.2

Changes in quantities of recovered E-waste (by weight), SA, between 2009-10 and 2017-18.
TVs/Monitors and Computers remain the major contributors to E-waste in SA.



05 Packaging Materials

At a glance:

- An estimated 236,600 tonnes of packaging was recovered in 2017-18. These volumes were down by 6% from 2016-17.
- SA's Container Deposit scheme continues to make a substantial contribution to the recovery of packaging materials in SA.

5.1 Total Packaging

Total packaging recovery was estimated at 236,600 tonnes. This included:

- 42,900 tonnes (18.1%) recovered through SA's container deposit scheme, and
- 193,800 tonnes (81.9%) recovered from other sources (**Table 5.1** overleaf).

These packaging quantities are a subset of the individual material data presented in Section 3. Packaging materials therefore constitute an important proportion of the total amount of recycling activity reported in SA for some of these individual materials. For example, in 2017-18:

- 100% of recovered Glass, PVC, Polypropylene, LDPE and LPB packaging was packaging; and
- At least 90% of recovered PET and Cardboard was packaging.

The total volume of packaging in 2017-18 was lower than reported in 2016-17 by 14,000 tonnes (or 6%). The main differences were driven by reductions in Glass and Cardboard:

- Although Glass CDL increased slightly, Glass packaging overall decreased by 7,000 tonnes (or 10%). This was due to a range of factors such as light weighting of glass packaging, reduced volumes of recovered glass fines at MRFs, and increased supply of recovered Glass from interstate.
- Cardboard packaging decreased by 7,000 tonnes (or 5%) due to improved reporting.

Table 5.1

Estimated packaging recovery, SA 2017-18. Cardboard and glass remain dominant contributors to packaging 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		2,340	2,340	0.8%
Aluminium Cans	3,800	30	3,830	27%
Cardboard Packaging		146,000	146,000	90%
Liquid Paperboard Cartons	579	668	1,200	100%
PET Packaging	3,800	880	4,680	97.5%
HDPE Packaging	250	3,500	3,750	61%
PVC Packaging		60	60	100%
LDPE Packaging		3,200	3,200	100%
Polypropylene Packaging		800	800	100%
Polystyrene Packaging		242	242	73%
Other Plastics Packaging		10,535	10,535	66%
Glass bottles & Jars	34,500	25,500	60,000	100%
Total	**42,929**	**193,754**	**236,637**	

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).

In 2017-18, glass containers represented 80% (by weight) of returned deposit containers in SA, followed by Aluminium and PET (both 9% by weight, see **Figure 5.1**). The average return rate for container deposits was 83% (by weight) from approximately 698 million containers (estimated as sold in SA during 2017-18). The number of returned CDL in 2017-18 increased slightly to 83% (from 82% in 2016-17).

Figure 5.1 **Relative proportions of returned recycled deposit containers (by weight), SA 2017-18**
Glass is the major contributor by weight.

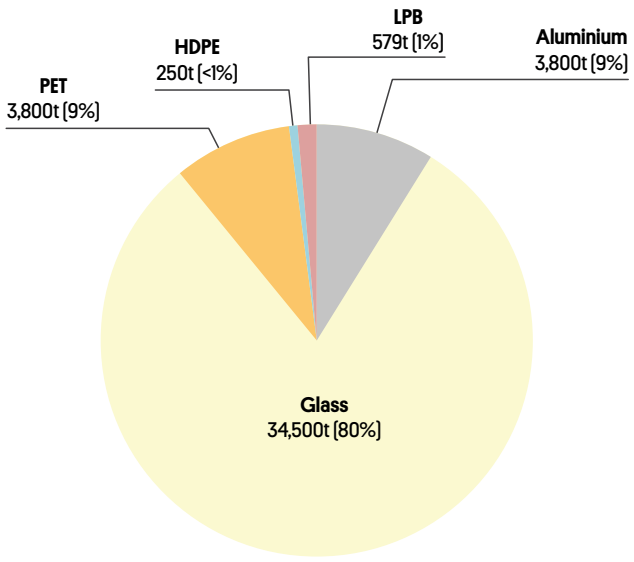


Table 5.2 **Return rates for recycled deposit containers, SA 2017-18.** SA continues to achieve high return rates of recycled deposit containers, with a slightly higher return rate than 2016-17.

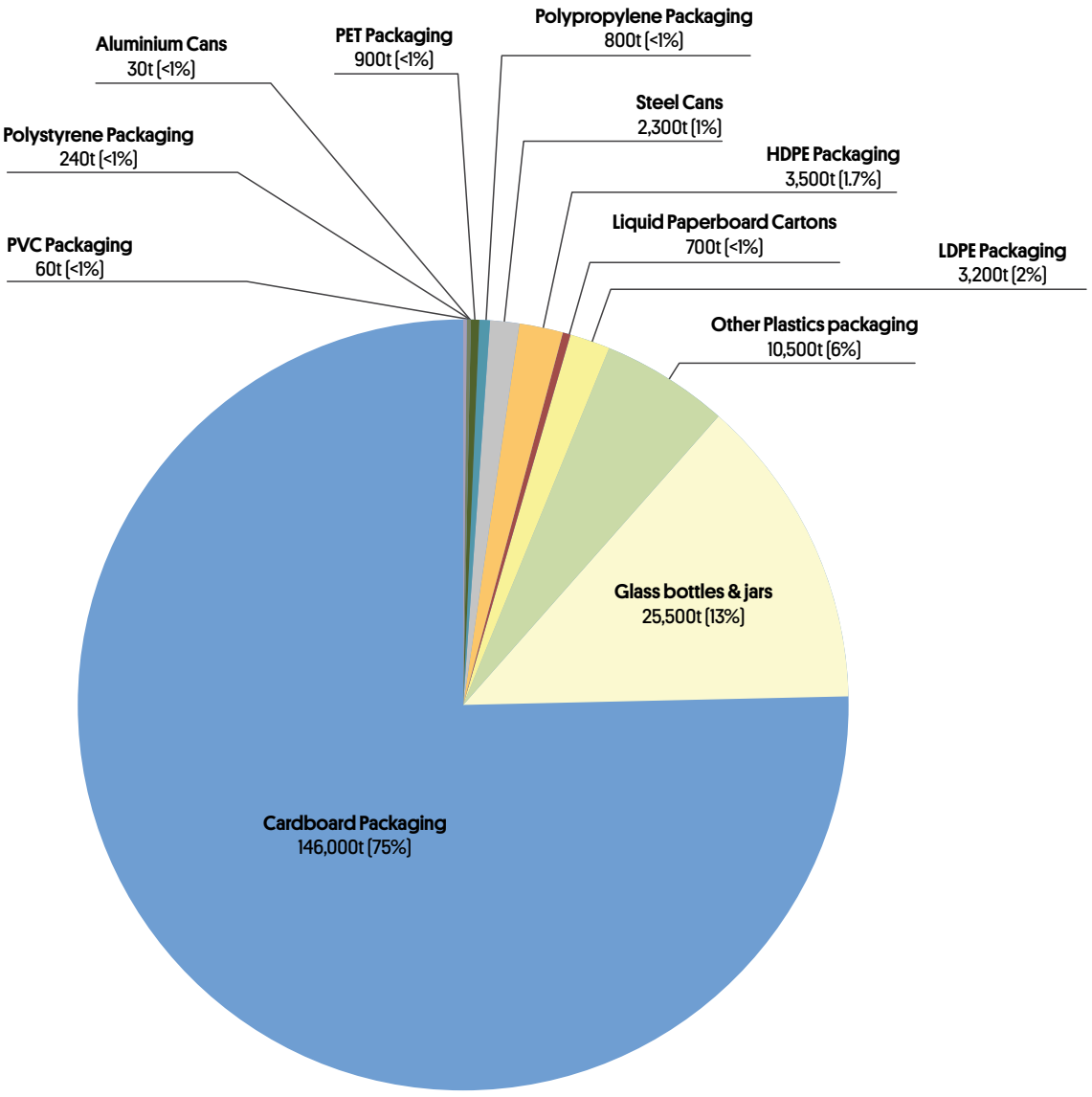
Material	Recovered (tonnes)	Return rate (%)
Aluminium	3,800	84%
Glass	34,500	86%
PET	3,800	69%
HDPE	250	64%
LPB	579	44%
Total	**42,929**	**83%**

5.3 Other Packaging Materials

Other packaging material is collected through routes such as kerbside recycling and commercial collections. The non-CDL packaging is captured in **Figure 5.2** below.

As can be seen in this figure, Cardboard (75%) and Glass (13%) materials were the main contributors to resource recovery of Other Packaging Materials, followed by other Plastics packaging (6%), and all others contributing 2% or less to overall packaging materials by weight.

Figure 5.2 **Relative proportions of recovered other packaging materials by weight, SA 2017-18.** Cardboard and Glass materials are the major contributors to recovery for other packaging materials. Plastics materials overall were a significant contributor to recovery for other packaging materials at 6% of all packaging materials.



06 Resource Recovery Value

At a glance:

- The resource value of recovered materials in 2017-18 was estimated at $356 million.
- This increase is due to an increase in the value of Metals and Organics (particularly Steel and Meat Rendering) as well as the recovery of more valuable streams within Masonry.
- There was a decrease in the resource recovery value of Plastics, Cardboard and Paper, due to the China Sword reducing the price of mixed Plastics and Mixed Paper and Cardboard.
- Metals remains the largest contributor to the overall value, at 50% of the total resource recovery value in SA. Organics remains the second, at 28% of the total.
- The average resource value for recovered materials was $92 per tonne.

Based on the quantities reported during this year's Recycling Activity survey, the estimated value of resource recovery for SA during 2017-18 was $356 million, or $92 for each tonne of resource recovered on average (**Table 6.1** overleaf).

Figure 6.1 (two pages overleaf) provide a breakdown of the value of the materials by their sub-categories. The major contributor to the 2017-18 resource recovery valuation (at 50%) was Metals (**Figure 6.1** and **6.2**), of which the commodity value has increased slightly since the updated last reported period. The next most significant contributors to resource recovery value were Organics (at 28%) and Cardboard and Paper (at 11%).

It is important to recognise that the value of waste 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 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;
- 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, 2017-18[a].**

Material category	Resource recovery (tonnes)	Estimated on-sale price[a] ($/tonne)	Estimated Resource Value ($ millions)[c]	Price data source[a]
Masonry	1,349,500	$10	$13.5	Based on RAS survey results
Metals – Steel	299,000	$333	$99.7	Based on RAS survey results and commodity data
Metals – Other (non-ferrous including Aluminium)	33,000	$2,357	$77.8	Based on RAS survey results and commodity data
Organics – Meat Rendering[b]	115,000	$765	$88.0	Based on RAS survey results
Organics – Garden, Food and Timber[b]	376,100	$35	$13.2	Based on RAS survey results
Cardboard & Paper	236,200	$171	$40.3	Based on RAS survey results
Plastics	31,300	$181	$5.6	Based on RAS survey results
Glass	60,000	$85	$5.1	Based on RAS survey results
Other Materials[d]	35,100	$249	$8.7	Based on RAS survey results
Separately Reported Materials & Clean Fill	1,346,000	$3	$4.0	Based on RAS survey results
TOTAL ALL Materials	**3,881,000**	**$92**	**$356**	

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 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 2017-18 Recycling Activity Survey

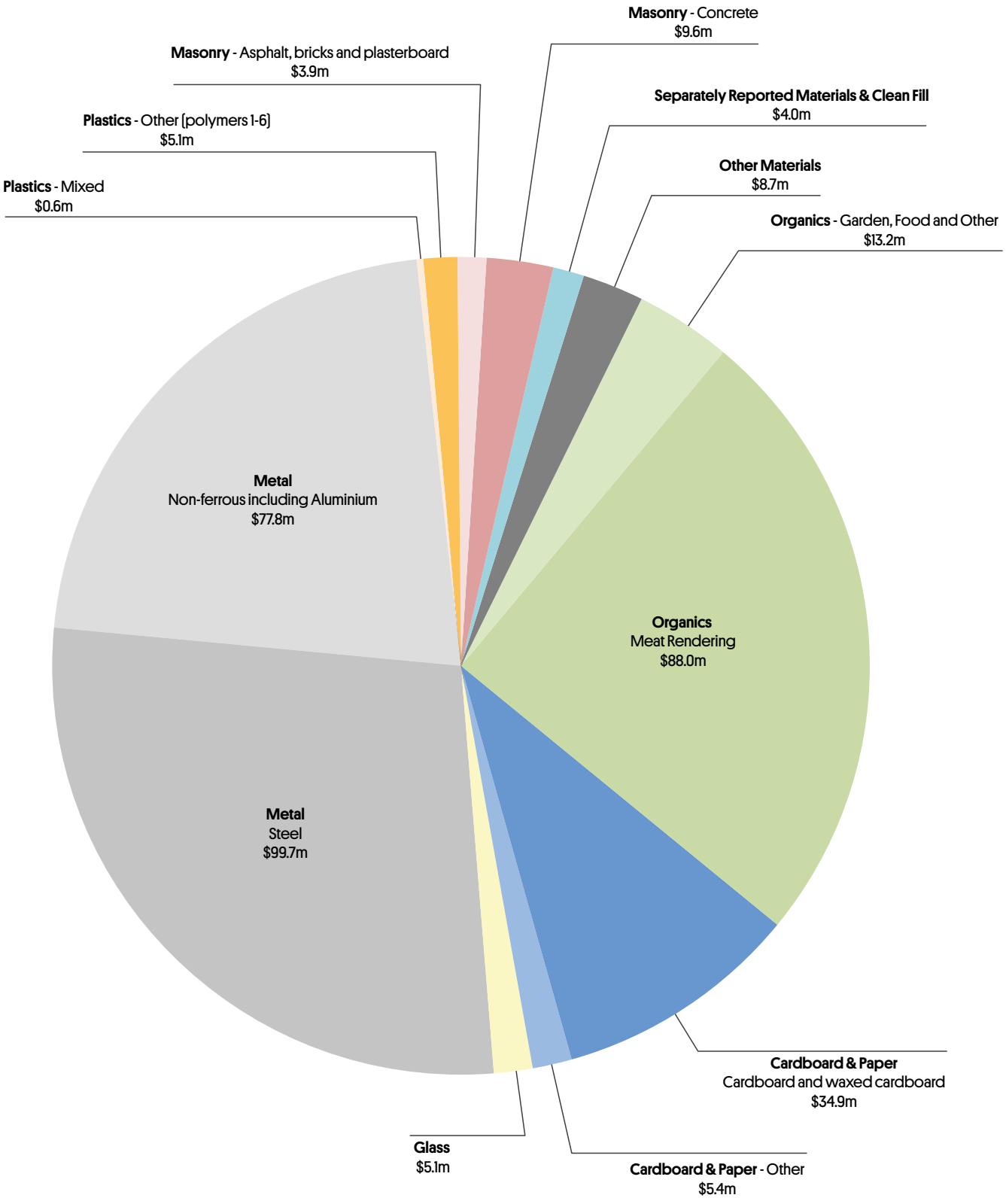
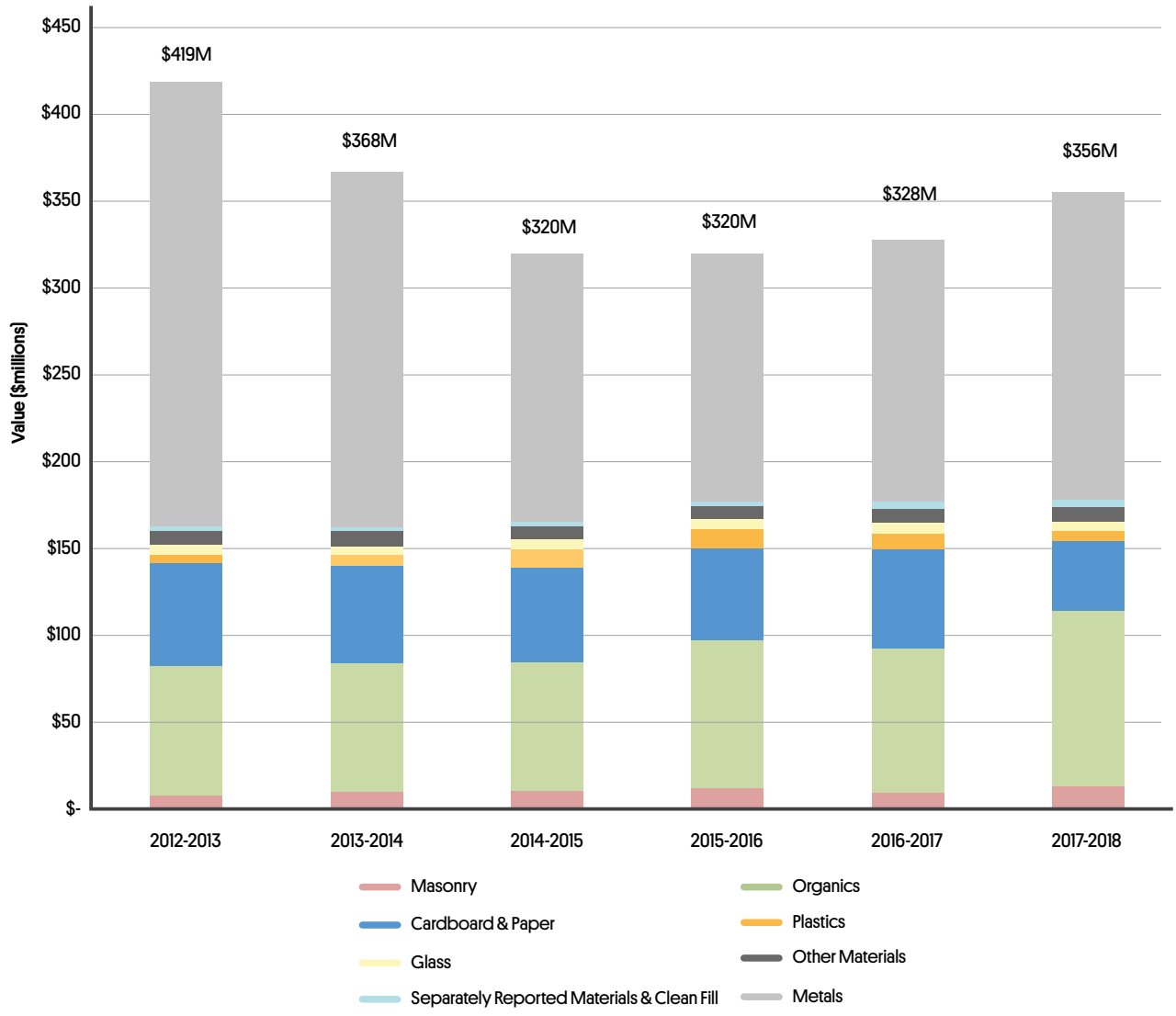


Figure 6.2 below compares the estimated market value of resource recovered materials in SA from 2012-13 to 2017-18[10]. The value of Resource Recovery to South Australia is much higher than 2016-17, with $356 million value reported in 2017-18 (compared with $328 million reported in 2016-17). Fluctuations over the past five years 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.

From 2016-17 to 2017-18 there has been an increase in the recovery value of Metals, Organics and Masonry. For Metals and Organics this is due to an increase in the dollar value of this material (in particular, Steel and Meat Rendering). Masonry has increased due to an increase in higher value Masonry materials (e.g. Bricks and Concrete) recovered in 2017-18 compared to lower value materials (e.g. Clean Fill).

From 2016-17 to 2017-18 there has been a noticeable decrease in the value of the Cardboard and Paper and Plastics materials, due to the drop in price of mixed materials in these streams as a result of the China Sword.

Figure 6.2 Estimated market value of resource recovered materials in SA, 2012-13 to 2017-18



10 To enable the comparison with previous years' results, the commodity price or market value data updated in 2017-18 has been applied to previous years where relevant. As a result, the numbers outlined in Figure 6.2 do not match that of those found in previous reports.

07 Environmental Benefits of Recycling[11]

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** – 1.37 million tonnes of CO_2-e
  - » **Cumulative Energy Demand saved** – 15,800 TeraJoules (TJ)
  - » **Water Savings** – 8,300 Megalitres (ML)

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 2017-18 is about 1.37 million tonnes of CO_2-e (**Tables 7.1** and **7.2** and **Figure 7.1** on following pages).
- Organics (at 51%) generates the substantive part of the estimated greenhouse gas savings. This was followed by Metals (at 28%) and Masonry (11%).
- These GHG savings are considered approximately equivalent to:
  - » About 2 million trees that would have to be planted to absorb the same amount of CO_2.
  - » The greenhouse gas emissions that 316,000 cars would produce in a year[12].
- The greenhouse gas savings from SA recycling, 2017-18 equate to:
  - » Approximately 20% of SA's total Community sector GHG emissions in 2011[13].

11 Note that figures in Section 7 are based on environmental benefits conversion and emission factors updated in the 17-18 report. For this reason, comparisons with the 2016-17 results are not made. See Appendix 5 for the updated factors.

12 Ave car GHG emissions value ≈ 4.25 tonnes CO_2-e/yr, one tonne of recycled material ≈ 1.49 trees; Source: SA 2008-09 Recycling Activity report (Zero Waste SA, 2010)

13 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, 2017-18[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	286,000	8,600	680	250
2	Bricks	102,000	2,000	30	130
3	Concrete	960,000	19,200	340	1,230
4	Plasterboard	1,500	45	1	
5, 6	Clay, fines, rubble & soil	1,346,000	118,500	1,910	590
	Metals				
7	Steel	299,000	131,600	2,370	-710
8	Aluminium	14,000	233,300	2,890	410
9	Non-ferrous metals	19,000	16,700	690	110
	Organics				
10	Food Organics	9,100	2,300		4
11	Garden Organics	257,000	57,500	-80	1,440
12	Timber	270,000	364,500	2,900	-10
13, 14, 15, 16	Organics - Other	563,000	270,800	1,220	130
	Cardboard & paper				
17	Cardboard & waxed cardboard	162,000	27,400	80	1,800
18	Liquid Paperboard	1,200	200		10
19, 20, 21	Magazines & Newspaper	62,000	28,200	20	680
22	Printing & Writing Paper	11,000	14,300	-10	120
	Plastics				
23	Polyethylene terephthalate	4,800	5,800	260	330
24	High density polyethylene	6,100	5,000	310	140
25	Polyvinyl chloride	60			
26	Low density polyethylene	3,200	2,600	160	70
27	Polypropylene	800	300	20	20
28	Polystyrene	330	100	10	10
29	Mixed &/or Other plastics	16,000	4,900	470	410
	Glass				
30	Glass	60,000	31,700	270	60
	Other Materials				
39	Fly Ash	0			
40	Foundry Waste	9,600			
41	Leather & Textiles	5,500			
42	Tyres & Other Rubber	20,000	21,400	1,280	1,050
	Total[b]	**4,489,000**	**1,367,000**	**15,800**	**8,300**

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, 2017-18[a]

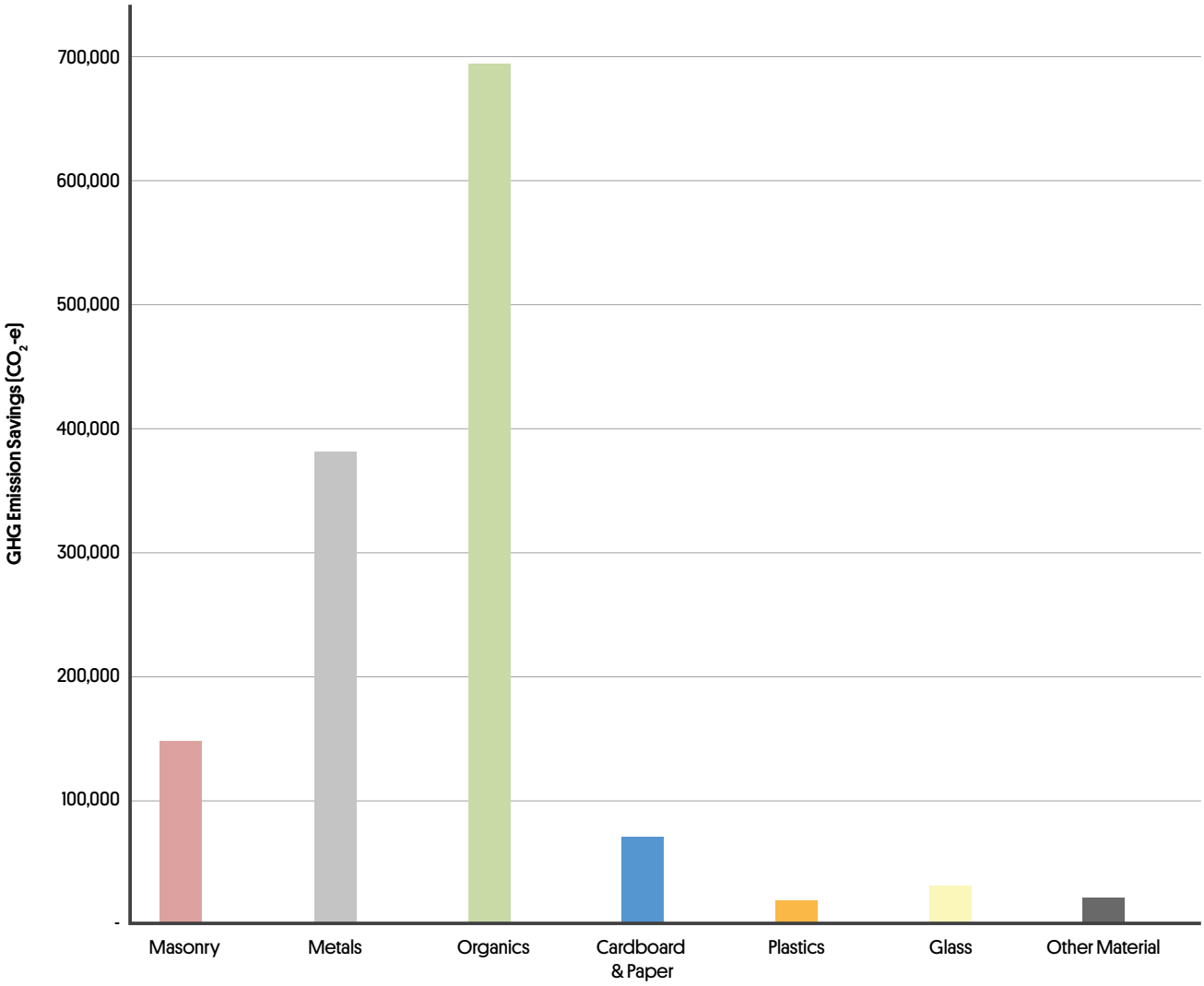
Sector Origin	GHG Emissions Saved[a]	Equivalent trees planted required for carbon absorption[a]	Equivalent cars off the road (1 year)[a]
	tonnes CO_2-e		
Masonry	148,300	222,000	34,200
Metals	381,600	570,000	88,100
Organics	695,100	1,039,000	160,500
Cardboard & paper	70,100	105,000	16,200
Plastics	18,700	28,000	4,300
Glass	31,700	47,000	7,300
Other Material	21,400	32,000	4,900
Total[b]	**1,367,000**	**2,043,000**	**316,000**

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 2017-18



7.2 Energy Savings

The total projected energy savings (in Terajoules or TJ[14]) from recycling in SA during 2017-18 was about 16,000 TJ (**Table 7.1** above and **Table 7.3** overleaf and **Figure 7.2** overleaf).

- Metals contribute 38% of projected energy savings, even though it represents only 7% of material being recovered in SA. This is because less energy is required to recover metals than to manufacture it from raw materials.
- Organics contribute to 26% of energy savings due to the energy required to create timber from virgin products.
- Masonry (at 19%) is the next most significant contributor to energy savings.
- Despite contributing a low proportion to the overall tonnes recovered in SA (1%), Plastics represented 8% of the overall energy savings, as making plastics from virgin products also consumes substantial amounts of energy.
- These energy savings are considered approximately equivalent to:
  - » Energy use by 291,500 average households in one year[15].
  - » The energy supplied by 2.6 million barrels of oil.
- The energy savings from SA's recycling activity during 2017-18 equate to:
  - » Approximately 5% of SA's total energy consumption reported for 2017-18[16].

14 1 Terajoule or TJ = 10^{12} Joules (J) = 1,000 Gigajoules (GJ)
15 Average household energy use value ≈ 54.29 GJ/yr; Source: 2018 Australian Energy Update (Australian Government Department of the Environment and Energy, 2018)
16 Source: 2018 Australian Energy Update (Australian Government Department of Environment and Energy, 2018).

Table 7.3 Estimated energy savings as a result of recycling in SA, 2017-18[a]

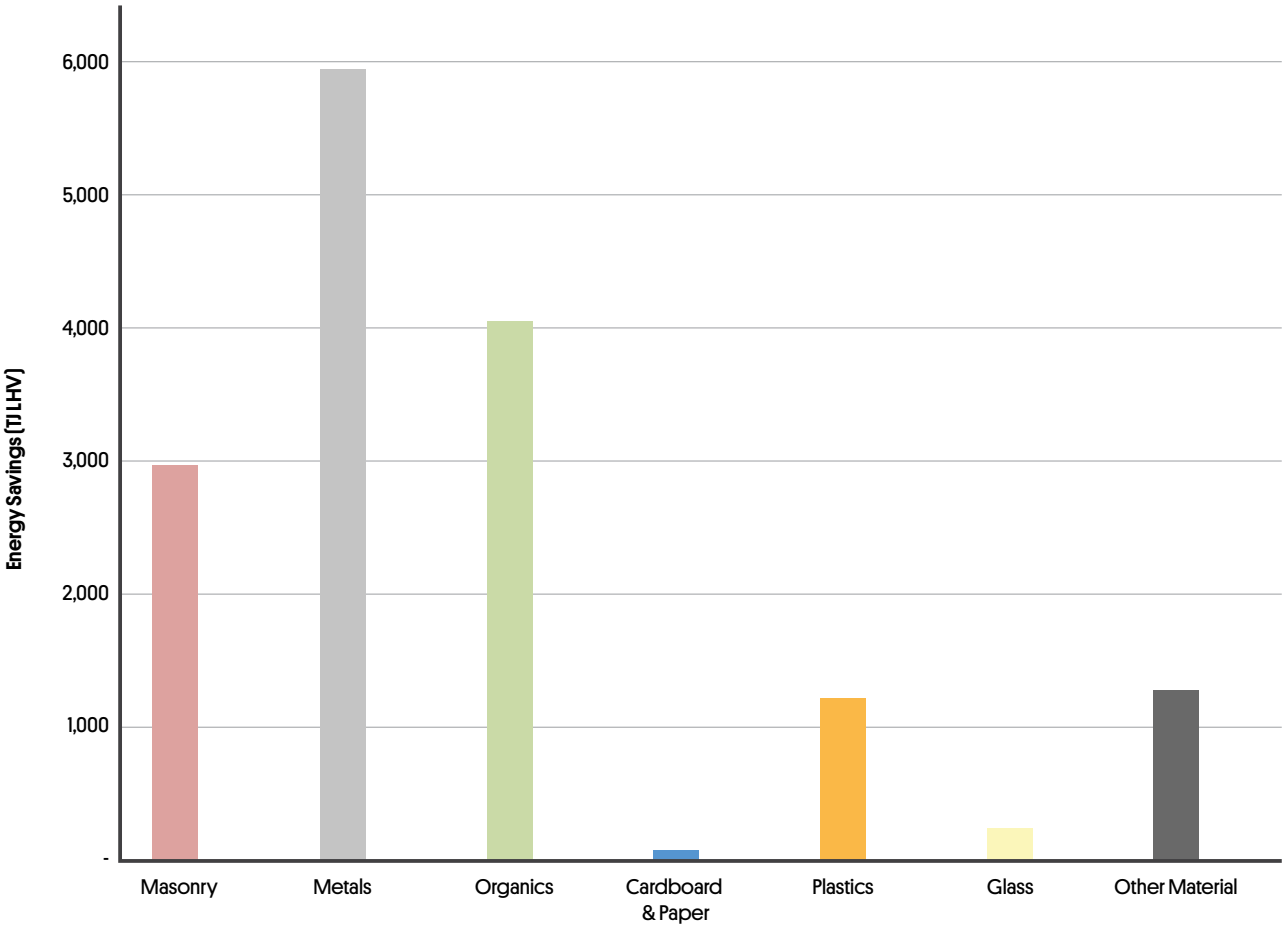
Sector Origin	Energy Saved	Equivalent households (1 year) [a]	Barrel of Oil Equivalents (BOE) [a]
	TJ LHV		
Masonry	2,961	54,500	484,000
Metals	5,950	109,600	972,000
Organics	4,040	74,400	660,000
Cardboard & paper	90	1,700	15,000
Plastics	1,230	22,700	201,000
Glass	270	5,000	44,000
Other Material	1,280	23,600	209,000
Total [b]	**15,800**	**291,500**	**2,585,000**

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 7.2 Avoided energy consumption (by material category) as a result of recycling in SA, 2017-18



7.3 Water savings

The total projected water savings (in Megalitres or ML[17]) from recycling in SA during 2017-18 was approximately 8,300 ML (**Table 7.1** above, and **Table 7.4** overleaf and **Figure 7.3** overleaf).

- Cardboard & Paper contributes most significantly (at 32%) to water savings achieved from recycling (see **Figure 7.3** overleaf) as manufacture of virgin cardboard and paper materials consumes large volumes of water.
- Masonry and Organics are also significant contributors at 27% and 19% respectively.
- Plastic and Other Material were found to contribute 12% and 13% respectively to the water saved from recovered materials in SA.
- 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 2017-18 are considered approximately equivalent to:
  - » Water use by about 44,000 average Adelaide households in one year[18].
  - » The water contained in about 3,300 Olympic-sized swimming pools .
- The water savings from SA's recycling activity in 2017-18 equate to:
  - » 4% of Metropolitan Adelaide's total water consumption reported for 2017-18[19]

17 1 Megalitre or ML = 10^6 Litres (J) = 1,000 kilolitres (kL)
18 Average household water consumption value ≈ 190 kL/yr; Source: South Australian Water Corporation Annual Report 2017-18 SA Water (2018)
19 Olympic-sized pool value ≈ 2,500 kL/yr

Table 7.4 Estimated water savings as a result of recycling in SA, 2017-18 [a]

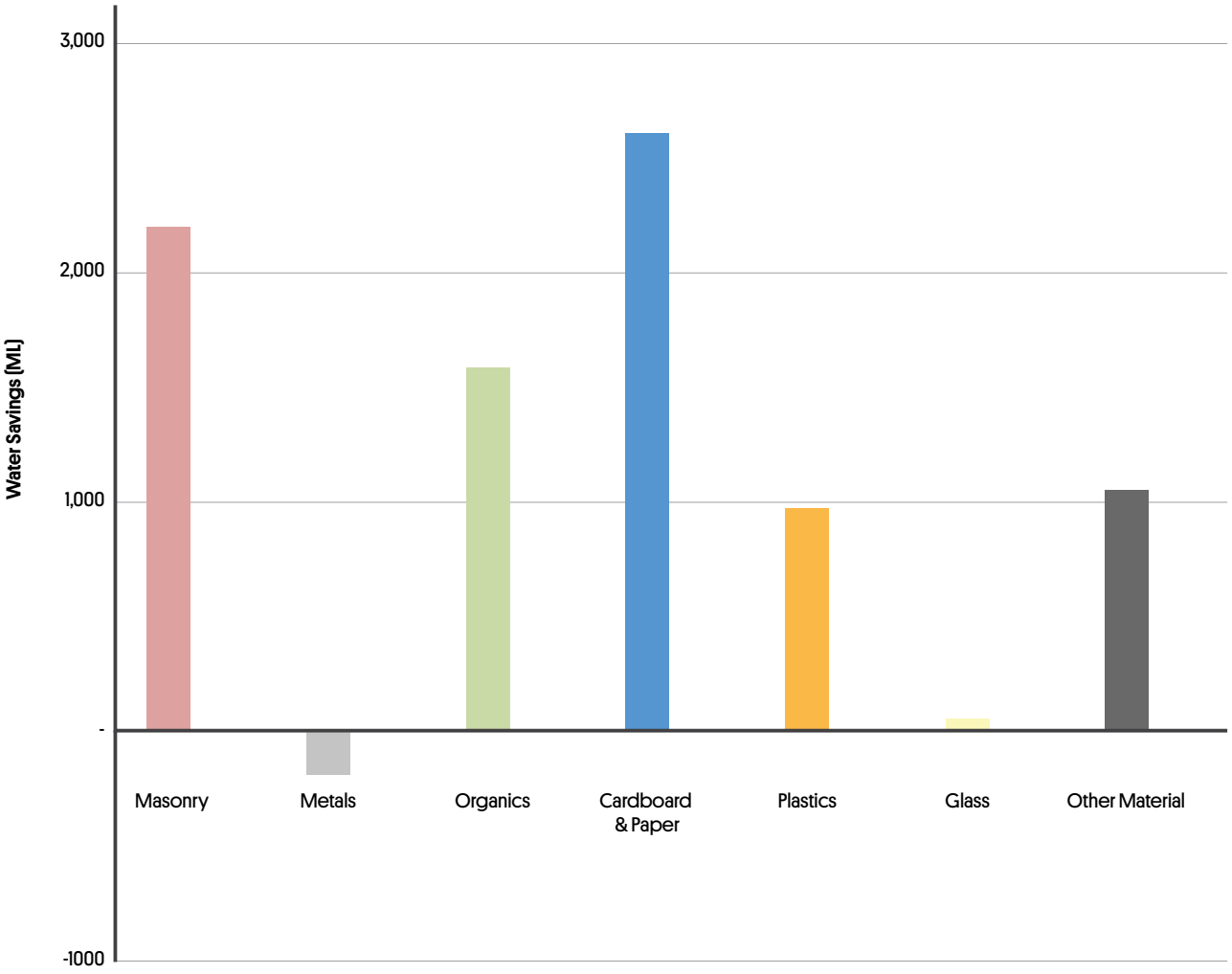
Sector Origin	Water saved	Equivalent households (1 year) [a]	Olympic Swimming Pools [a]
	ML		
Masonry	2,200	11,590	880
Metals	-190	-1,000	-80
Organics	1,564	8,240	630
Cardboard & paper	2,610	13,750	1,040
Plastics	980	5,160	390
Glass	60	320	20
Other Material	1,050	5,530	420
Total [b]	**8,300**	**43,600**	**3,300**

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, 2017-18



08 Acknowledgements

Green Industries SA and Rawtec would like to recognise and thank the following participants in the 2017-18 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 Brighton Cement
- Advanced Plastic Recycling
- Australian Mobile Telecommunications Association (AMTA) | Mobile Muster
- Cave Civil & Environmental Services
- Ceduna Recycling
- Chevron Glass
- Cleanaway
- Coolfoam Pty Ltd
- Downer Group
- DPTI
- Eco Waste Solutions Pty Ltd
- Electronic Recycling Australia
- Fleurieu Regional Waste Authority
- Foamex South Australia
- Fulton Hogan Industries
- Green Triangle Recyclers
- Intercast & Forge Pty Ltd
- Jeffries
- Master Butchers
- Naracoorte Recyclables
- Normetals Pty Ltd
- Norske Skog
- Northern Adelaide Waste Management Authority (NAWMA)
- Nyrstar
- O-I Adelaide
- OneFortyOne Wood Products
- Onesteel Recycling
- Orora
- Peats Soil
- Renewal SA
- ResourceCo Group
- SA Composters
- SA Drum Recyclers
- SA Water Corporation
- Sims Metal Management
- SKM Recycling
- Southern Region Waste Resource Authority
- Statewide Recycling
- SUEZ Recycling and Recovery
- Tarac Technologies Pty Ltd
- The Salvation Army
- Thomas Foods International
- Trident Plastics
- Van Schaiks Bio Gro Pty Ltd
- Visy Recycling
- Visy Recycling – Glass Division
- Whyalla Waste Resources and Recovery Centre
- YCA Recycling

09 Glossary[20]

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.

20 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 (CH4), nitrous oxide (NO), hydrofluorocarbons (HFCs), perfluorocarbons (PFCs), and sulphur hexafluoride (SF6).

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
MSW	Municipal Solid Waste
PET	Polyethylene Terephthalate
PP	Polypropylene
PS	Polystyrene
PVC	Polyvinyl Chloride
t	Tonnes
TJ	Terajoule

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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 2017-18 financial year. This section summarises the approach and methodology used to conducting the survey.

- Rawtec was engaged to conduct the survey for 2017-18.
- This approach and methodology was similar to that used for the 2009-10, 2010-11, 2011-12, 2012-13, 2013-14, 2015-16 and 2016-17 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 118 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)[21]

   » 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 2016-17 questionnaire, except for:

- A question was included in the report this year requesting respondents to indicate whether the tonnes reported were ascertained by weighbridge or other measuring device.

A1.2.4 Survey Deployment

The survey was deployed to survey respondents in September 2018.

- 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 2017-18.

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 2018.

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 2017-18 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.

21 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

A1.3.1Materials 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[22].

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).

22 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[23].

- 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) (2017, 2016 and 2015).
- The relevant reporting periods and sources of recycling activity data were:
  - SA: 2017-18, as reported in this survey;
  - ACT: 2016-17, as provided by Transport Canberra and City Services staff;
  - VIC: 2016-17, as reported by: Victorian Recycling Industry Annual Report 2016-17 (Sustainability Victoria, 2018);
  - WA: 2015-16, as reported by: Recycling Activity in Western Australia, 2015-16 (WA Waste Authority, amended 2018);
  - NSW: 2014-15, as reported by: NSW Waste Avoidance and Resource Recovery Strategy: Progress Report 2014-15 (NSW EPA, 2015);
  - QLD: 2016-17, as reported by: Recycling and Waste in Queensland 2017 (QLD Department of Environment and Science, 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 2017-18 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. Note that updated conversion and emission factors (see below and overleaf for a description) were used in the 2017-18 survey (see **Appendix 5**). The scope of environmental benefits analysis included the following metrics.

23 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.

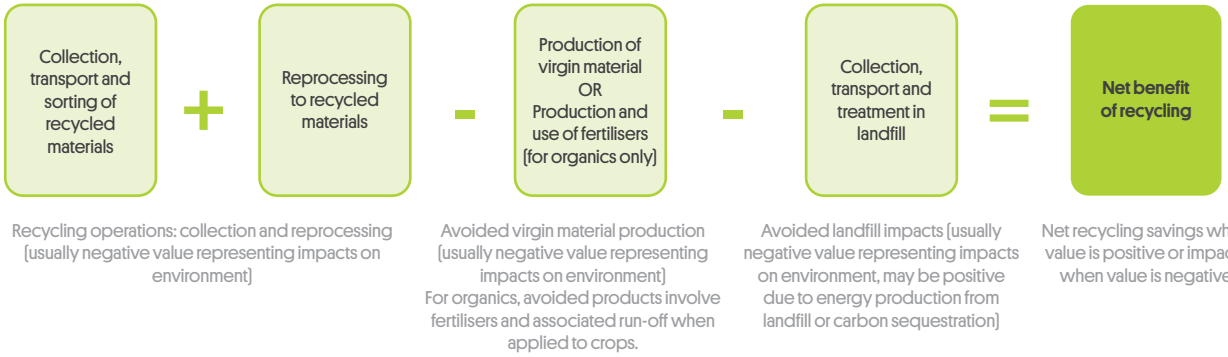
Cumulative Energy Demand Savings (as Terajoules (TJ) – The amount of energy saved, including all fossil, renewable, electrical and embodied energy, by using recycled materials.

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** 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.

The 2017-18 environmental benefits conversion and emission factors were updated in 2017-18 and therefore differ from factors used previously. See **Appendix 5** for the updated figures.

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 2017-18 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; particularly metals and plastics. 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 2017-18 are given in **Table 2.8**. These assumed values are based on:

- Consultations with industry in October and November 2018;

- 2017-18 survey responses (this question was new to the 2016-17 survey, which asked participants to provide a price per tonne for each material recovered, reflecting the commodity price or market value for that material.

- 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 2017-18.

A2.1 Survey Participation & Reported data

Table A2.1 below summarises the survey participation and reported data points for 2017-18.

- The survey questionnaire was successfully deployed to 118 or 100% 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 97 of these companies or organisations.
- Of these 97 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.
  - » 23 data sets came from companies or organisations that generated the material that was being recovered for recycling.
  - » 72 data sets were companies or organisations involved in collection or aggregation of recovered material.
  - » 54 data sets were for companies or organisations undertaking re-processing activities.
  - » 35 of these companies or organisations were also involved in manufacturing products from the recovered or re-processed material.

Table A2.1 **Overall Survey Statistics**

Statistic		No.	(%)	% Basis
Sample Size		118		
Surveys Deployed*		118	100%	of Sample Size
Survey Data Points		97	82%	of Surveys Deployed
Activity Type	Industry Reference Data	3	3%	of Survey Data Points
	Source	23	18%	of Survey Data Points
	Aggregator/Collector	72	70%	of Survey Data Points
	Recycler	54	54%	of Survey Data Points
	Manufacturer	35	36%	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[24] – 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		97	100%
Material Activity	Masonry	19	20%
	Metals	36	37%
	Organics	28	29%
	Cardboard & paper	31	32%
	Plastics	30	31%
	Glass	15	15%
	Other Materials	11	11%
	E-waste	18	19%
	Reuse Materials	3	3%
Material Destination	SA	80	82%
	Interstate	36	37%
	Export	25	26%
Waste Hierarchy	Reuse	7	7%
	Recycle	54	56%
	Material Recovery	72	74%
	Energy Recovery	2	2%

24 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 > Material or Energy Recovery.

A3 Appendix 3: Weighbridge data

In 2017-18, respondents were asked to indicate whether tonnes reported were measured by weighbridge[25] or another method. In addition, when previous survey responses were used in the 2017-18 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[26]. As can be seen in the table, the overall percentage of waste measured via weighbridge is 77%. The streams with the highest proportion of weighbridge data were Glass at 99%, Cardboard and Paper at 99% (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) and Metals, at 93%. Other materials, which included Foundry Sands, Leather & Textiles and Tyres & Other Rubber, had the lowest proportion measured by weighbridge, at 27%. This low proportion is due to Leather & Textiles and Tyres & Other Rubber, as 100% of Foundry Sands was measured via weighbridge in 2017-18.

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 in 2017-18.

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

Stream	% weighbridge out of reported tonnes, by weight
Masonry overall	71%
Metals overall	93%
Organics overall	87%
Cardboard and Paper overall	99%
Plastics overall	52%
Glass overall	99%
Other materials overall	27%
Total proportion of recycled materials measured via weighbridge	**77%**

25 Note weighbridge includes floor scales
26 Weighted averages are provided

A4

Appendix 4: 2017-18 Recycling Activity Survey Questionnaire

Survey Form – Recycling Activity in SA, 2017-18

Issued: 20 September 2018

1. Survey Company & Contact Details

Rawtec Pty Ltd (www.rawtec.com.au)
• Matthew Allan, Senior Consultant, p: (08) 8294 5571, e: matthew.allan@rawtec.com.au
• Kristian Le Gallou, Consultant, p: (08) 8294 5571, e: kristian.legallou@rawtec.com.au

2. Survey Questions for Period 1 July 2017 - 30 June 2018

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
2.	Are you happy for your company to be recognised in the report as participating in the 2017-18 SA Recycling Activity survey? **(Please Circle/Highlight)** **[Yes / No]**
3.	How many people (FTE's) 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?
4.	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.**
5.	What is method for measuring of the data provided in Table 1 **O** Weighbridge **O** Other please specify
6.	What is the estimated accuracy of the data provided in Table 1, **e.g. ±5%**

Table A3.1 **Material and tonnage data requested from industry**

ID	Material	Data for 2017/18 Financial Year (July 2017 – June 2018)											Approx. material value (2017-18)
		MATERIAL SOURCE/INPUT						MATERIAL DESTINATION/OUTPUT				RESIDUAL	
		Total materials received for recycling in 2017/18 (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 2017-18
			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%*	*$35 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 2017 - 30 June 2018

	For the following questions, please enter responses directly into the table below.
7.	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***
8.	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*** ***Tonnes received*** ***Source location***
9.	If there have been any significant changes in quantities, stockpiles, sources or destinations from the 2016-17 financial year, what was the reason for this?
10.	Where do you receive most of your material from, e.g. Councils, manufacturing, retail, hospitality, etc.?
11.	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)?
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 2017-18 SA Recycling Activity survey? **(Please Circle/Highlight)** **Y/N**

A5 Appendix 5: 2017-18 Environmental Benefits Conversion & Emission Factors

Table A4.1 **Emission and conversion factors adopted for estimation of environmental benefits of recycling, SA 2017-18** [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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