South Australia's Recycling Activity Survey

2015-16 Financial Year Report

June 2017

Government of South Australia

Green Industries SA

Prepared by rawtec

Contents

About Data used in this Report

The resource recovery data presented in this report was collected from a survey sent to 114 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 2015-16 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 (2013-14).

It is important to note that the resource recovery data reported by a survey respondent has not been adjusted or manipulated. 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 (previously Zero Waste SA) to present the results and findings from the 2015-16 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.

11 Paringa Avenue, Somerton Park, SA 5044

PO Box 1159, Glenelg South, SA 5045

T: +61 8 8294 5571

Executive Summary

Introduction

Each year since 2003-04, Green Industries SA (previously Zero Waste SA) has measured recycling activity and waste disposal to landfill in South Australia (SA) to assess the State's performance against State Waste Strategy Targets.

This report presents the results from the SA Recycling Activity Survey for 2015-16, which collected the State's recycling and landfill disposal data for this purpose. These results are presented in accordance with the National Guidelines for compiling waste and recycling data (Dept Environment and Energy, 2015).

This year's report also separately reports resource recovery by 'material recovery' and 'energy recovery', which was introduced in the 2013-14 report. The 2015-16 results are compared to the last reporting period, which was the 2013-14 financial year. No report was produced for 2014-15, although data was captured during the 2015-16 survey and analysis undertaken where possible to allow comparisons.

Summary of 2015-16 results

The total resource recovery for SA was 3.91 million tonnes (see Table 1 below). This total resource recovery comprised:

- 2.95 million tonnes of 'Standard Reporting Materials' – which includes traditionally reported material categories of metals, organics, cardboard & paper, glass, plastics, masonry, etc.;
- 0.96 million tonnes of 'Separately Reported Materials' & Clean Fill – includes data for soil, sand, rock, rubble and fly ash materials, which can fluctuate significantly across reporting years.

Total landfill disposal for SA was 0.89 million tonnes.

- Approximately 13% (118,000 tonnes) of this landfill disposal was contaminated soil from construction activities, which may also be categorised as a 'Separately Reported Material' under the National Guidelines for compiling waste and recycling data (Dept Environment and Energy, 2015).

SA therefore achieved a total diversion rate of 81.5% (of waste material diverted to resource recovery).

Table 1 Summary of 2015-16 Recycling Activity results for resource recovery, landfill disposal, total waste generated and total diversion (waste to resource recovery) achieved in SA.

	2015-16 Recycling Activity Data Account Summary		
	Standard Reporting Materials*	Separately Reported Materials & Clean Fill*	**TOTAL (All materials)**
Resource recovery, tonnes	2.950 million	0.960 million	**3.910 million**
Landfill disposal, tonnes	0.772 million	0.118 million	**0.890 million**
Total Waste generated**, tonnes	3.722 million	1.078 million	**4.800 million**
Diversion, % to resource recovery	79.3%	89.1%	**81.5%**

* *Standard Reporting Materials and Separately Reported Materials & Clean Fill – As specified by the National Guidelines for compiling waste and recycling data (Dept Environment and Energy, 2015)*

** *Total waste generated = Resource recovery + landfill disposal*

Resource recovery by material category

The majority of SA's resource recovered material (2.17 million tonnes or 55%) was made up of Masonry materials, Clean Fill and Separately Reported Materials (Figure 1 below). These materials were mainly generated by Construction and Demolition (C&D) activities.

Organics was also a major contributor to SA's resource recovery in 2015-16, with over 1 million tonnes or 28% of all materials. These materials were predominately from the Commercial and Industrial (C&I) sector, including timber mills and regional processing of primary produce.

Metals remained the third greatest contributor by weight, although it has decreased from 10% in 2013-14 to 7% in 2015-16. Following this was Cardboard and Paper (6% by weight) and Glass (2%). Most Metals were from the C&I sector, whereas Cardboard and Paper and Glass were sourced predominately from the Municipal and C&I sectors.

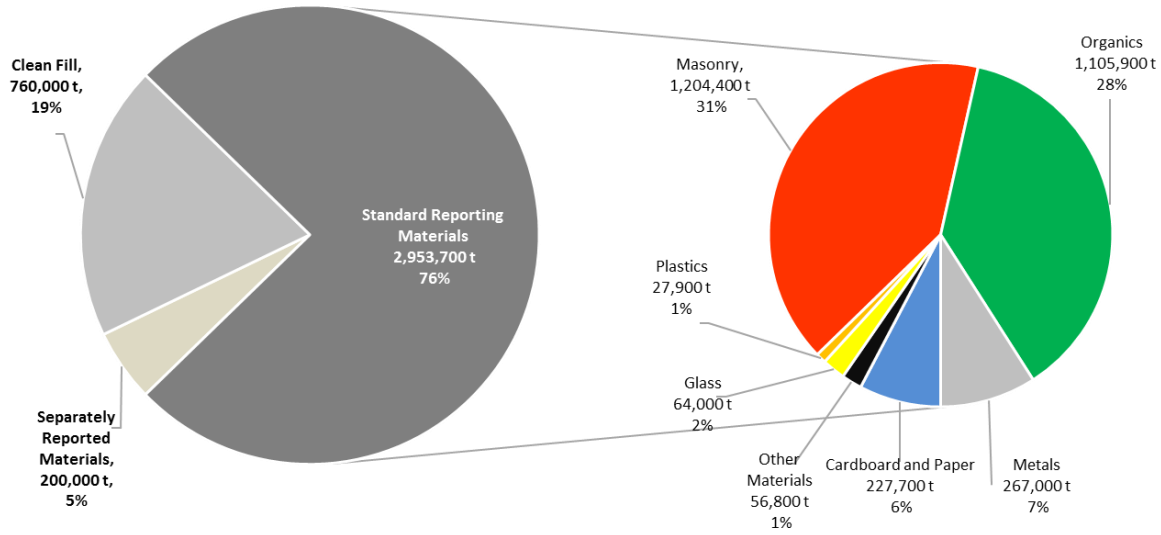

Figure 1 Contribution of different material categories to SA's resource recovery during 2015-16

Energy recovery

Energy recovery may be useful for waste not deemed suitable or cost-effective for material recovery. Some industries produce energy from waste by-products generated on their own sites, which is not reportable under the National Guidelines for compiling waste and recycling data (Dept Environment and Energy, 2015). Energy recovery identified by this report therefore considers where waste materials were separately and purposely recovered for local energy production, instead of being sent for landfill disposal.

During 2015-16, 73,100[1] tonnes of material, mainly timber and mixed plastics, were identified as being recovered for production of energy in SA. This quantity contributed 1.5% to the State's total diversion rate (*refer Table 2.6 in the Key 2015-16 Recycling Activity Statistics section for additional detail*).

Energy recovery is anticipated to grow over the next 5 to 10 years. This could include anaerobic digestion of organic wastes, pyrolysis of agricultural waste, and/or large-scale diversion of the municipal waste/C&I residuals away from landfill to waste-to-energy plants.

Resource recovery of imported waste material

While not counted toward SA's recycling performance, numerous re-processors import waste materials into SA for resource recovery. Based on survey responses, over 177,000 tonnes of waste material were imported into the state in 2015-16. Around 42% of imported material was sourced from Victoria and 29% from overseas *(Table 2.7 in the Key 2015-16 Recycling Activity Statistics section includes a more detailed breakdown of this data)*.

[1] Note that due to rounding, the 2015-16 reported figure is lower than the 2013-14 reported figure of 75,900 despite actuals being only 100 tonnes lower.

Market value of resource recovery

The estimated total direct market value of resource recovered materials for SA in 2015-16 was $203 million (Figure 2), or $52 per tonne of resource recovered on average. As usual, Metals, Cardboard & Paper and Organics materials were the main contributors to this resource market value, although Metals' value decreased substantially from 2013-14 (previously valued at $141 million, now $64 million) due to a decrease in the value of scrap metals.

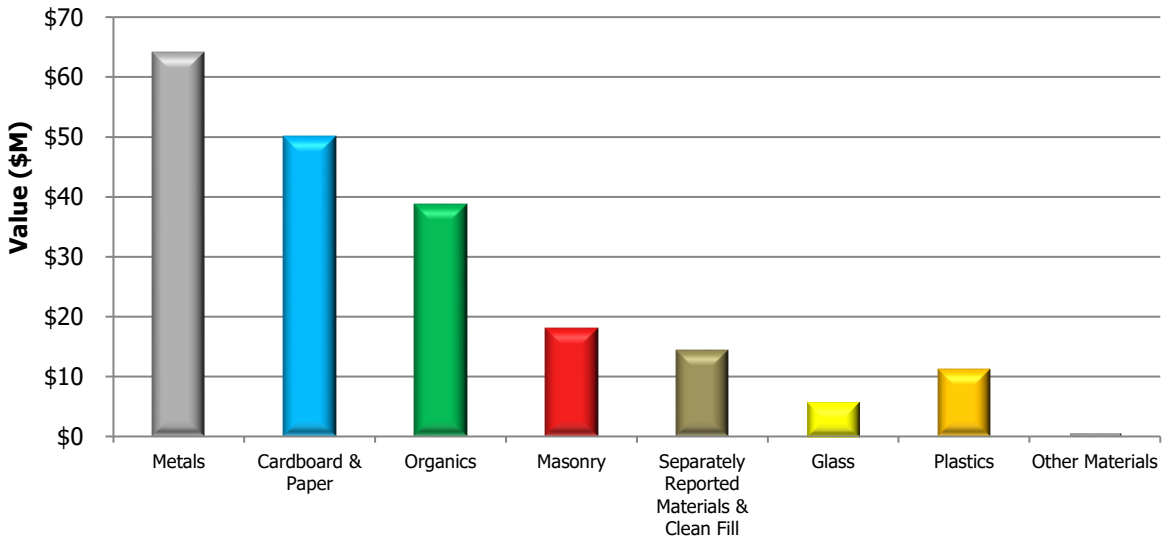

Figure 2 Estimated market value of resource recovered material in SA during 2015-16

Resource recovery trends

Total resource recovery in 2015-16 (at 3.91 million tonnes) rose by 8.9% (approximately 240,000 tonnes) from 2013-14. The increase in resource recovery from 2013-14 in combination with a slight decrease in overall landfill disposal (2.6% or 24,000 tonnes) has led to yet another increase in SA's total diversion rate. This now sits at 81.5%, continuing the long-term upward trend in resource recovery that SA has achieved since 2003-04.

- Standard Reporting Materials increased by 230,000 tonnes (or 8.5%) from 2013-14.
  - Masonry and Organic materials were the main contributors to this increase whereas Metals and Other Materials decreased, while the remaining materials remained steady.
- Separately Reported Materials & Clean Fill quantities were also up from 2013-14 (90,000 tonnes or 10.3%). This was due to an increase in Clean Fill (up 170,000 tonnes from 2013-14), as Contaminated Fill and Fly Ash quantities both decreased (down 70,000 and 14,000 tonnes respectively from 2013-14).

Changes from 2003-04 to 2015-16 include:

- Reported resource recovery has increased from approximately 2 million tonnes to almost 4 million tonnes a year.
- Diversion rate has increased by 20 percentage points over this period.

There have been a number of large infrastructure projects occurring in SA since 2009-10, which contributed substantially to resource recovery of Clean Fill material over this period. While a number of these projects have completed or progressed past their major waste generation stages, new infrastructure projects have commenced (e.g. South Road upgrades in metropolitan Adelaide) or are planned to commence (Northern Connector). We therefore expect to see Clean Fill volumes reported in SA remain at elevated levels (i.e. above those seen before 2009-10) over the next 2 to 3 years.

The ongoing decrease in Metals and Foundry Waste recovered during 2015-16 reflects the decline of manufacturing and industrial activity in SA, as well as reduced metal commodity prices. With the foreshadowed end of car manufacturing and allied industries in Adelaide occurring soon, this downward trend in resource recovery of these materials is expected to continue, and could also potentially flow through, albeit to a lesser extent, as reduced resource recovery in other Material categories.

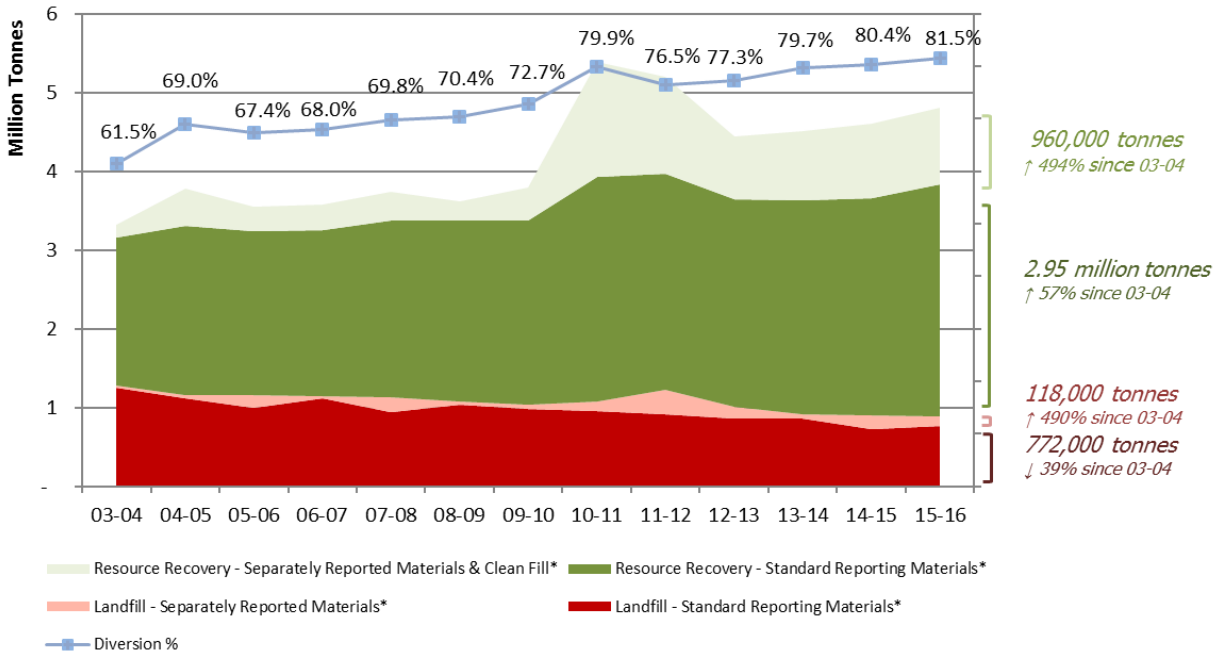

Figure 3 Trend in resource recovery and landfill disposal in SA since 2003-04. * *Reporting of both resource recovery and landfill disposal is divided into Standard Reporting Materials and Separately Reported Materials & Clean Fill categories.*

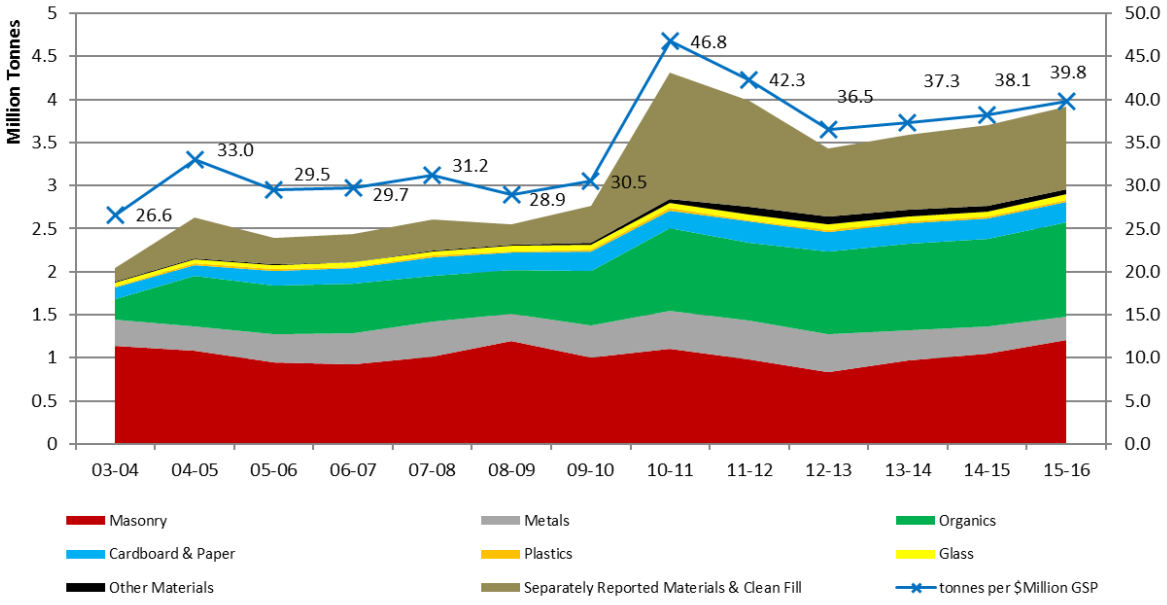

Figure 4 Trend in resource recovery for SA by material category since 2003-04, including tonnes per $m of Gross State Product (GSP).

Resource recovery by source sector

Construction and Demolition (C&D) remains the major source sector for SA's resource recovery (at 2.09 million tonnes or 54% by weight, see Figure 5). Clean Fill comprised 36% of the C&D sector's contribution to SA's resource recovery (749,000 tonnes). Despite an increase in C&D and C&I tonnes and an overall increase in resource recovery in SA from 2013-14, MSW resource recovery decreased from 2013-14. This decrease was 2.4% or 11,000 tonnes.

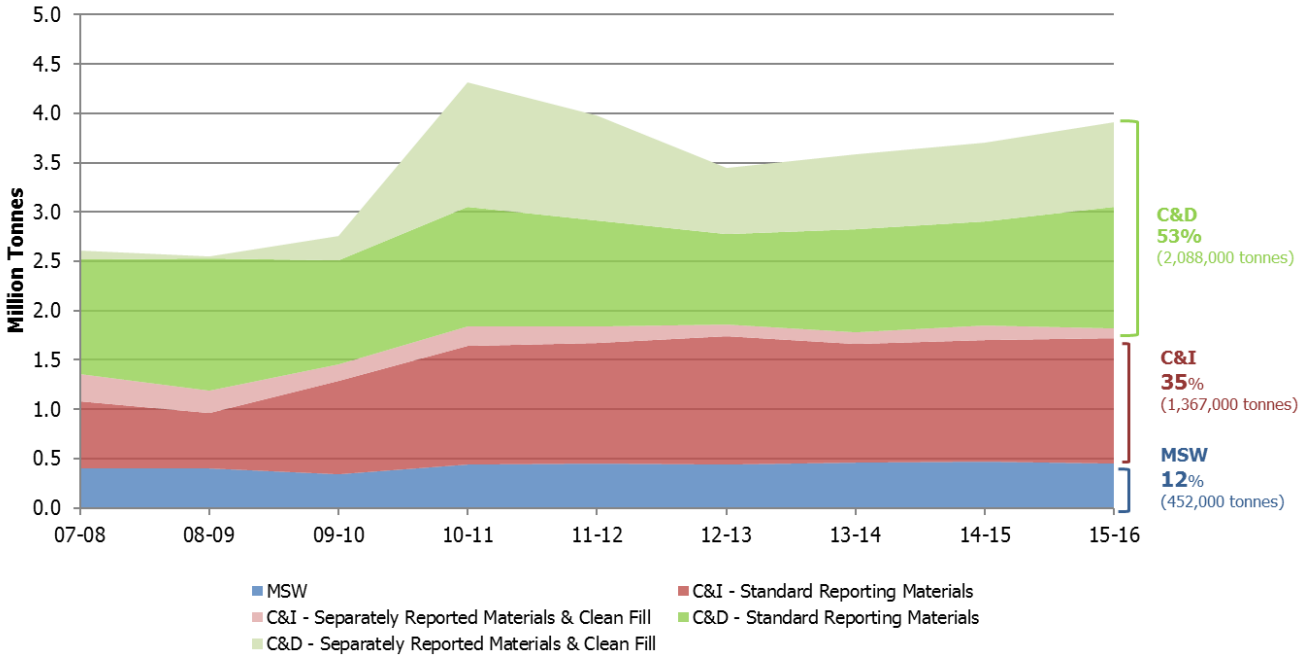

Figure 5 Contribution to resource recovery in SA by source sector for 2015-16 and trend since 2007-08

Landfill Disposal

Landfill disposal continues to decrease, with 2015-16 landfill disposal falling to 890,000 tonnes from 914,000 tonnes in 2013-14 (or a 2.7% decrease, see Figure 6 below). This decrease in landfill disposal from 2013-14 was mostly due to a fall in the volumes of standard reporting materials in the C&D sector (decrease of 45,000 tonnes) and a decrease in C&I volumes (53,000 tonnes), while MSW and C&D separately reported materials both went up slightly from 2013-14 volumes, at 4,200 and 69,000 tonnes respectively.

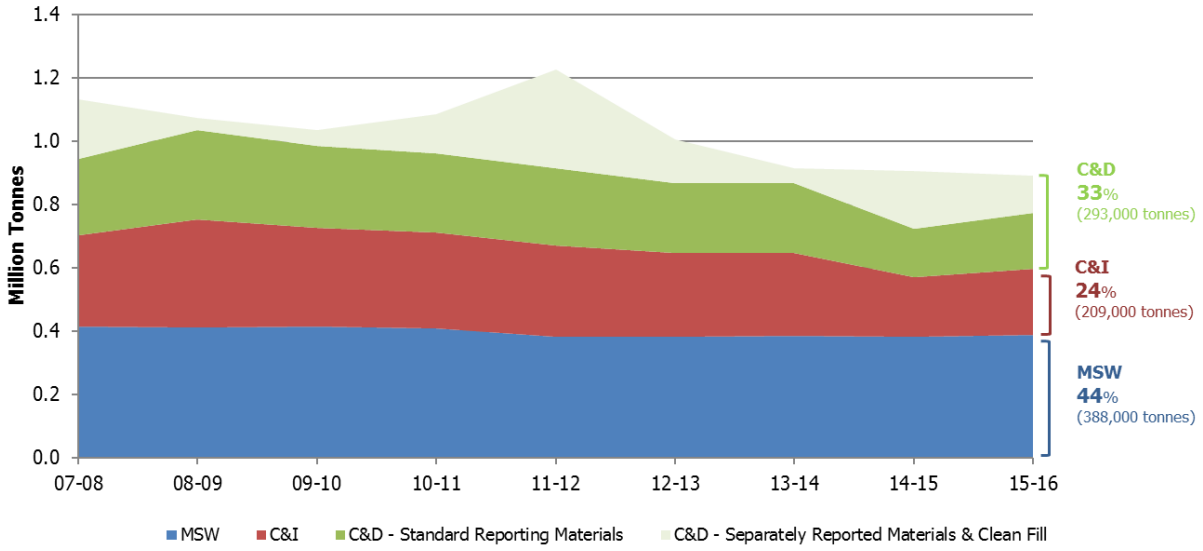

Figure 6 Contribution to landfill disposal in SA by source sector for 2015-16 and trend since 2007-2008

South Australia's Strategic Plan – Landfill Reduction Target

South Australia's Strategic Plan sets out a number of targets for the state (SA Government, 2011). Target 67 sets the following landfill reduction goal for SA:

- ***Reduce waste to landfill by 35% by 2020 (baseline: 2002-03), milestone of 30% by 2017-18.***

SA's disposal to landfill for 2015-16 is 889,500 which is 29% lower than the 2002-03 level. Based on this trend (see yellow dotted line in Figure 7), SA is progressing towards achieving its Target of 35% reduction by 2020. It is also on track to achieve its milestone of 30% by 2017-18 (current volume is 29% less than the 2002-03 tonnes).

However, to reach these milestones it will require ongoing commitment to achieving further gains in diverting waste materials from landfill disposal to resource recovery. Waste audits indicate that a large proportion of material ending up in landfill is food waste, particularly from MSW and C&I sources. To achieve further reductions in landfill volumes it would be beneficial to increase or expand food waste recycling programs across homes and businesses.

It is worth noting that the previous milestone of a 25% reduction from 2002-03 levels by 2014 was surpassed in the 2013-14 financial year.

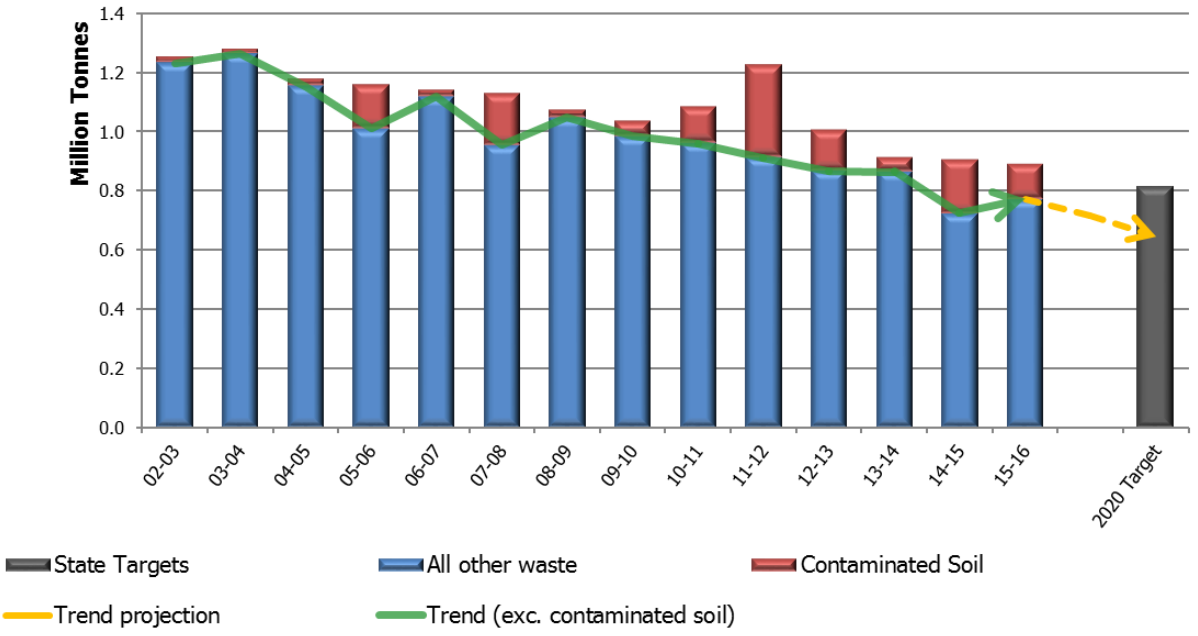

Figure 7 Landfill disposal trend in SA versus State Waste Strategy Target for landfill reduction

South Australia's Waste Strategy – 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).***

Table 2 below includes the per capita waste generation from 2010-11 to 2015-16. As the baseline is 2015, 2014-15 analysis was undertaken to make a comparison to the baseline year.

As can be seen in the table, SA has not reached its new target. In fact, 2015-16 has shown an increase in waste generation per capita of 4.8% from 2014-15. Although it has only been a year since the baseline was set, there will need to be a reduction in waste generation per capita in order to reach the target. With this in mind, SA reached its previous target of >5% reduction from the 2010 waste generation levels per capita by 2015 in 2013-14.

Table 2 2015-16 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*	***% Change***	
Standard Reporting Materials	2,300	2,210	2,120	2,130	2,080	2,180	**4.8%** Increase from 2014-15	5% Reduction from 2014-15
Separately Reported Materials & Clean Fill	950	930	550	550	660	630		
TOTAL	3,250	3,140*	2,670	2,680	2,740	2,810	**2.6%** Increase from 2014-15	

South Australia's Waste Strategy – Metropolitan Diversion Targets

South Australia's Waste Strategy (Green Industries SA, 2015) includes targets for metropolitan diversion (to resource recovery) by source sector (Table 3 below).

The C&I and C&D sectors' diversion rates increased from 2013-14, while MSW decreased:

- MSW – Diversion rate decreased to 58.2% (down from 59.4% in 2013-14). This is below the 2015 and 2020 Target of 70%.
- C&I – Diversion rate increased to 82.0% (from 76.6% in 2013-14). This is already above the 2020 Target of 80%.
- C&D – The diversion rate increased:
  - *Excluding Separately Reported Materials & Clean Fill:* A diversion rate of 89.9% was achieved (up from 84.8% in 2013-14), which is just below the 2020 Target of 90%.
  - *Total C&D sector result:* The diversion rate was 88.9% (slightly up from 88.4% in 2013-14). This is slightly below the 2015 and 2020 Target of 90%.

Table 3 2015-16 Recycling Activity results for metropolitan diversion by source sector vs. State Waste Strategy targets

Source Sector	2015-16 Diversion Achieved	Metro Diversion Target	
		By 2015	*By 2020*
■ **MSW**	**58.2%**	70%	70%
■ **C&I**	**82.0%**	75%	80%
■ **C&D – *Excluding Separately Reported Materials & Clean Fill***	**89.9%**	90%	90%
■ **C&D – *Total***	**88.9%**		

South Australia's performance relative to other states and territories

South Australia continues to be a national leader in resource recovery and waste diversion. Performance comparisons with other states and territories are difficult however, because of irregular reporting and different reporting bases between jurisdictions. According to most recently reported and publicly available waste management data from across Australia (including Separately Reported Materials & Clean Fill), South Australia:

- Achieves the highest diversion rate (at 81.5%) and per capita resource recovery (at 2,290 kg/person/yr) in Australia;
- Has the lowest per capita landfill disposal rates (at 520 kg/person/yr);
- But has the second highest per capita waste generation rate (at 2,810 kg/person/yr).

(Figure 2.6 in section 2.3 presents further detail for the above comparison).

Environmental benefits of resource recovery

Resource recovery of waste materials delivers significant environmental benefits for SA, by avoiding resource consumption of virgin materials that would have otherwise occurred.

In 2015-16, SA's resource recovery activities led to estimated savings in[2]:

- Greenhouse Gas emissions of 1.18 million tonnes of CO2-e;
- Energy savings of about 15,130 Terajoules (TJ); and
- Water savings of about 12,716 Megalitres (ML).

[2] Terajoule or TJ = 10^{12} Joules = 1,000 Gigajoules (GJ)

1 Introduction

At a glance:

- *This report presents and analyses data collected from South Australian recyclers and re-processors on resource recovery of waste materials during the 2015-16 financial year.*
- *This data enables us to measure the performance of South Australia against waste diversion goals and targets in the State Strategic Plan (2011) 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 Environment and Energy, 2015).*

1.1 Background

Over the past decade South Australia (SA) has established itself as a leader in waste management reform and resource recovery in the nation. Significant initiatives have been implemented to divert and recycle waste materials instead of simply disposing them to landfill. These actions are helping SA to become more resource efficient, recover and recycle more waste materials, and avoid damaging greenhouse gas emissions caused by waste disposal to landfill.

SA's improvement in waste management is underpinned by requirements set out in the State Strategic Plan (SA Government, 2011) and 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 (previously Zero Waste SA) annual survey of South Australian recyclers and re-processors collects data about SA's handling of resources which would otherwise go to waste.

The report includes an analysis and evaluation of waste streams by waste type, including recycling tonnages as well as potential reductions achieved in greenhouse gas emissions. We continue the separate analysis of resource recovery for material recovery versus energy production in SA, as well as presenting data reported on waste materials imported into SA for resource recovery, which was introduced in the 2013-14 report. The current market conditions for resource recovery and recycling are also discussed including market size and strength, and introduced a section on employment figures in the resource recovery industry 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 compiled according to the National Guidelines for compiling waste and recycling data (Dept Environment and Energy, 2015), which ensures that SA's recycling data can successfully contribute to national recycling surveys and assessments undertaken by the Australian Government.

***South Australia's Strategic Plan 2011* (Department of the Premier and Cabinet)**

> 35% reduction in landfill disposal from 2002-03 level by 2020[19]
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%.

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)

1.2 The 2015-16 Recycling Activity Survey Report

This report presents the results of Green Industries SA's annual Recycling Activity Survey for the 2015-16 financial year (1 July 2015 – 30 June 2016). A detailed analysis and report for the 2014-15 financial year was not undertaken. Instead, results for 2014-15 were collected during the 2015-16 survey and assessment of the 2014-15 data undertaken where possible.

Given a detailed analysis was not completed in 2014-15, results in this report are compared to the last reporting period, which was the 2013-14 financial year (1 July 2013 – 30 June 2014). The following provides a guide to how this data and information is organised and presented in this report.

- **Section 2** – Provides an overview of key Recycling Activity statistics obtained for 2015-16.
- **Section 3** – Presents the 2015-16 Recycling Activity Survey data by material category, including reporting of resource recovery for material recovery and energy production.
- **Section 4** – Gives a separate analysis obtained for resource recovery of electrical and electronic (E-waste) materials.
- **Section 5** – Presents a separate analysis of packaging materials derived from the 2015-16 Recycling Activity Survey data.
- **Section 6** – Assesses the environmental benefits, including greenhouse gas emission savings, of recycling for SA achieved by its 2015-16 recycling performance.
- **Section 7** – Provides an estimated market value for SA resources recovered during 2015-16.
- **Section 8** – Lists a number of the participating organisations (which consented to their survey contributions being acknowledged in this report).
- **Section 9** – Provides a glossary of common terms used in this report which may aid the reader.
- **Section 10** – Indicates common sources and end uses for different types of waste materials.
- **Section 11** – Outlines key abbreviations used throughout the report.
- **Section 12** – Lists references and other sources of information used in compiling this report.
- **Appendices** –
  - *Appendix 1* – Describes the methodology that was used to undertake the 2015-16 Recycling Activity Survey.
  - *Appendix 2* – Summarises selected 2015-16 Recycling Activity Survey statistics relating to industry participation.
  - *Appendix 3* – Provides a copy of the questions used in the 2015-16 Recycling Activity Survey.
  - *Appendix 4* – Lists the emission and conversion factors that were adopted for the environmental benefits analysis of the 2015-16 Recycling Activity data.

2 Key 2015-16 Recycling Activity Statistics

At a glance:

- *This section summarises the key outcomes and statistics obtained from analysis of the 2015-16 SA Recycling Activity Survey data. The outcomes and statistics include:*
  - *Resource recovery and landfill disposal (Section 2.1) – Total and by type of material, source sector, geographical origin, destination for re-processing, and whether re-processed for material recovery or energy production in SA;*
  - *SA's performance against State goals and targets for waste management (Section 2.2); and*
  - *SA's resource recovery and performance relative to other states and territories in Australia (Section 2.3)*

2.1 Resource recovery and landfill disposal

2.1.1 Overview

In 2015-16 SA's recycling industries reported 3.91 million tonnes of material diverted to resource recovery (Table 2.1 overleaf). In accordance with new National Guidelines for compiling waste and recycling data (Dept Environment and Energy, 2015), this total resource recovery comprised:

- 2.95 million tonnes of 'Standard Reporting Materials' – which includes traditionally reported material categories of Metals, Organics, Cardboard & Paper, Glass, Plastics, Masonry, etc.;
- 0.96 million tonnes of 'Separately Reported Materials' & Clean Fill – reported data for soil, sand, rock, rubble and fly ash materials[3].

Total resource recovery volumes were up by 8.9% from the 3.59 million tonnes reported for 2013-14.

As a consequence, SA's 2015-16 per capita diversion/recovery rate increased to 2,290 kg/p/yr (up from 2,135 kg/p/yr in 2013-14). Material recovered per $ Gross State Product (GSP) in 2015-16 also increased to 39.7 tonnes per $1 million in 2015-16 from 37.1 tonnes in 2013-14.

Based on this total resource recovery, SA achieved a diversion rate of 81.5%, which is up from 79.7% in 2013-14. This outcome is the highest resource recovery rate achieved since the beginning of this survey.

During 2015-16 the amount of waste accepted by landfills in SA decreased to 0.89 million tonnes (from 0.91 million tonnes in 2013-14). This represents a per capita waste-to-landfill rate of 520 kg/p/yr (down from 545 kg/p/yr in 2013-14). Waste to landfill in tonnes per $1 million GSP also decreased from 9.6 in 2013-14 to 9.0 in 2015-16.

[3] These materials are considered separately under the new National Guidelines for compiling waste and recycling data (Dept Environment and Energy, 2015) because they can fluctuate significantly across reporting years and between different States and Territories.

Table 2.1 **Annual South Australian resource recovery and landfill disposal quantities diversion performance for 2015-16, 2003-04 (first survey year) and since 2010-11.** *This table presents a breakdown of Standard Reporting Materials and Separately Reported Materials & Clean Fill in accordance with the National Guidelines for compiling waste and recycling data (Dept Environment and Energy, 2015). Of 3.91 million tonnes of recycling reported in 2015-16, 0.96 million tonnes were recycled soil, sand, rock and fly ash materials, or Separately Reported Materials & Clean Fill. Changes in performance since 2003-04 and from 2013-14 are shown.*

	2003-04	2010-11	2011-12	2012-13	2013-14	2014-15	2015-16	Change	
								13-14 to 15-16	*03-04 to 15-16*
RESOURCE RECOVERY (TONNES)									
Standard Reporting Materials	1,880,000	2,850,000	2,750,000	2,660,000	2,720,000	2,760,000	2,950,000	8.5%	57%
Separately Reported Materials & Clean Fill	162,000	1,460,000	1,230,000	790,000	870,000	940,000	960,000	10.3%	493%
TOTAL (for SA)	**2,042,000**	**4,310,000**	**3,980,000**	**3,450,000**	**3,590,000**	**3,700,000**	**3,910,000**	**8.9%**	**91%**
LANDFILL DISPOSAL (TONNES)									
Standard Reporting Materials	1,258,000	961,000	913,000	867,000	865,000	724,000	772,000	-10.8%	-39%
Separately Reported Materials & Clean Fill	20,000	123,000	311,000	140,000	49,000	180,000	118,000	140.8%	490%
TOTAL (for SA)	**1,278,000**	**1,084,000**	**1,224,000**	**1,007,000**	**914,000**	**904,000**	**890,000**	**-2.6%**	**-30%**
WASTE GENERATION (TONNES)									
Standard Reporting Materials	3,138,000	3,811,000	3,663,000	3,527,000	3,585,000	3,484,000	3,722,000	3.8%	19%
Separately Reported Materials & Clean Fill	182,000	1,583,000	1,541,000	930,000	919,000	1,120,000	1,078,000	17.3%	492%
TOTAL (for SA)	**3,320,000**	**5,394,000**	**5,204,000**	**4,457,000**	**4,504,000**	**4,604,000**	**4,800,000**	**6.6%**	**45%**
DIVERSION/RECOVERY RATE (%)									
Standard Reporting Materials (ONLY)	59.9%	74.8%	75.1%	75.4%	75.9%	79.2%	79.3%	3.4%	19%
TOTAL (for SA)	**61.5%**	**79.9%**	**76.5%**	**77.4%**	**79.7%**	**80.4%**	**81.5%**	**1.8%**	20%
SA population (persons)	**1,534,000**	**1,657,000**	**1,654,800**	**1,667,500**	**1,682,600**	**1,698,900**	**1,708,200**	**1.5%**	**11.4%**
PER CAPITA DIVERSION/RESOURCE RECOVERY (KG/PERSON/YR)									
Standard Reporting Materials (ONLY)	1,230	1,720	1,660	1,600	1,620	1,650	1,730	6.8%	41%
TOTAL (for SA)	**1,330**	**2,600**	**2,410**	**2,070**	**2,135**	**2,205**	**2,290**	**7.3%**	**72%**
PER CAPITA LANDFILL DISPOSAL (KG/PERSON/YR)									
Standard Reporting Materials (ONLY)	820	580	550	520	510	430	450	-11.8%	-45%
TOTAL (for SA)	**830**	**650**	**740**	**600**	**545**	**535**	**520**	**-4.6%**	**-37%**
PER CAPITA WASTE GENERATION (KG/PERSON/YR)									
Standard Reporting Materials (ONLY)	2,050	2,300	2,210	2,120	2,130	2,080	2,180	2.3%	6.3%
TOTAL (for SA)	**2,160**	**3,250**	**3,150**	**2,670**	**2,680**	**2,740**	**2,810**	4.9%	**30%**
SA Gross State Product[(a)] (GSP) ($millions)	**76,685**	**91,879**	**94,050**	**94,600**	**96,218**	**96,994**	**98,539**	**2.4%**	**28%**
PERFORMANCE METRICS PER $GSP (TONNES/$MILLION GSP)									
TOTAL SA Diversion/Resource Recovery (b)	26.6	46.9	42.3	36.5	37.7	38.1	39.7	5.2%	49%
TOTAL SA Landfill Disposal (b)	16.7	11.8	13.0	10.6	9.6	9.3	9.0	-5.9%	-46%
TOTAL SA Waste Generation (b)	43.3	58.7	55.3	47.1	47.3	47.5	48.7	**3.0%**	**13%**

Notes:

(a) Reference year for GSP chain volume measures (which removes the inflation effects on GSP values) is reported as 2015-16 (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 Recovery by material type

Resource recovery reported for various waste materials changed during 2015-16 (see Table 2.2 overleaf). These changes are described in more detail by material category in Section 3 of this report, but some important or interesting changes are highlighted below.

There was a significant increase in resource recovery reported for Masonry materials (up 24% overall from 2013-14). Since a decline in 2012-13, this has continued to increase reflecting a consistent, ongoing resurgence in Construction and Demolition (C&D) activity across the SA economy for 3 years. Asphalt and Concrete contributed (at an increase of 62,000 tonnes and 180,000 tonnes from 2013-14 respectively) to most of this gain.

At the same time, Clean Fill also rose (by 170,000 tonnes from 2013-14), which is due to large infrastructure projects (e.g. South Road upgrades).

Metals recovery has continued its decline since 2011-12, with 2015-16 down 24% or 85,000 tonnes from 2013-14, as well as Foundry Waste (down 33% or 17,000 tonnes). This reflects the on-going weakening of manufacturing and industrial activity in SA.

Plastics saw an overall increase of 24%, or 5,400 tonnes, since 2013-14, predominately from an increase in Mixed Plastics (up by 4,000 tonnes or 44%), and Polyvinyl Chloride (up by 1,600 tonnes or 50%). There were declines in resource recovery of single polymer materials Polystyrene and Polypropylene (down 27% and 20% respectively from 2013-14).

Magazines and Newsprint in the Cardboard & Paper category increased substantially from 2013-14 to tonnes reported in 2015-16. This is due to a change in the split of Cardboard & Paper from MSW sources, based on the availability of new and more accurate MSW recycling audit data. Cardboard & Paper overall decreased (down by 12,400 tonnes or 5%) and we expect this figure to decrease in line with growing popularity of on-line access using digital devices, displacing Newsprint.

Fly ash also maintained its downward trend, which is attributed to greater use of renewable energy for electricity supply in SA and less reliance on coal-fired power stations.

Table 2.2 **Reported material quantities (tonnes) being diverted for resource recovery in SA for 2015-16, 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 2013-14 and 2015-16. The data is presented in accordance with the National Guidelines for compiling waste and recycling data (Dept Environment and Energy, 2015).*

ID	Material	2003-04	2010-11	2011-12	2012-13	2013-14	2014-15	2015-16	Change (%) 13-14 to 15-16
	Masonry								
1	Asphalt	100,000	145,000	143,000	148,000	148,000	170,000	210,000	42%
2	Bricks	165,000	100,000	73,000	50,000	63,000	55,000	53,000	-16%
3	Concrete	877,000	860,000	760,000	640,000	760,000	820,000	940,000	24%
4	Plasterboard		300	600	600	1,000	1,100	1,400	40%
	Subtotal	*1,142,000*	*1,105,300*	*976,600*	*838,600*	*972,000*	*1,046,100*	*1,204,400*	24%
	Metals								
7	Steel	264,200	391,000	404,000	387,000	320,000	280,000	230,000	-28%
8	Aluminium	19,000	19,400	20,500	18,500	14,000	18,000	18,000	29%
9	Non-ferrous metals	13,000	31,100	27,800	24,400	18,000	20,000	19,000	6%
	Subtotal	*296,200*	*441,500*	*452,300*	*429,900*	*352,000*	*318,000*	*267,000*	-24%
	Organics								
10	Food Organics	0	4,400	5,600	7,900	7,000	7,600	7,900	13%
11	Garden Organics	130,100	230,000	212,000	209,000	260,000	259,000	255,000	-2%
12	Timber	116,700	280,000	281,000	237,000	180,000	220,000	273,000	52%
13,14,15,16	Other Organics	0	440,000	403,000	510,000	550,000	530,000	570,000	4%
	Subtotal	*246,800*	*954,400*	*901,600*	*963,900*	*997,000*	*1,016,600*	*1,105,900*	11%
	Cardboard & Paper								
17	Cardboard & Waxed Cardboard	91,000	154,000	183,000	190,000	180,000	149,000	151,000	-16%
18	Liquid Paperboard	0	3,500	3,600	3,600	3,100	1,800	1,700	-45%
19, 20, 21	Magazines & Newsprint	32,701	40,200	39,500	38,800	33,000	62,000	61,000	85%
22	Printing & Writing Paper	12,300	13,600	23,300	20,700	24,000	19,000	14,000	-42%
	Subtotal	*136,001*	*211,300*	*249,400*	*253,100*	*240,100*	*231,800*	*227,700*	-5%
	Plastics								
23	Polyethylene Terephthalate	0	4,100	4,500	4,300	4,200	4,400	4,200	0%

ID	Material	2003-04	2010-11	2011-12	2012-13	2013-14	2014-15	2015-16	Change (%) 13-14 to 15-16
24	High Density Polyethylene	0	4,600	3,200	3,600	3,200	4,500	4,800	50%
25	Polyvinyl Chloride	0	170	50	260	300	300	300	0%
26	Low Density Polyethylene	0	4,600	4,400	4,600	3,400	3,600	3,700	9%
27	Polypropylene	0	4,000	2,100	2,200	2,000	1,700	1,600	-20%
28	Polystyrene	0	430	270	410	410	250	300	-27%
29	Mixed &/or Other Plastics	8,607	5,800	5,100	6,000	9,000	12,000	13,000	44%
	Subtotal	*8,607*	*23,700*	*19,620*	*21,400*	*22,500*	*26,800*	*27,900*	24%
	Glass								
30	Glass	45,600	58,000	68,000	61,000	56,000	61,000	64,000	14%
	Other Materials								
40	Foundry Waste	0	31,800	60,900	70,200	51,600	40,800	34,400	-33%
41	Leather & Textiles	4,080	3,900	4,500	3,900	4,000	4,000	4,000	0%
42	Tyres & Other Rubber	88	17,000	17,400	19,700	21,300	18,500	18,400	-14%
	Subtotal	*4,168*	*52,700*	*82,800*	*93,800*	*76,900*	*63,300*	*56,800*	-26%
	Total of above materials	***1,879,376***	***2,846,900***	***2,750,320***	***2,661,700***	***2,716,500***	***2,763,600***	***2,953,700***	***9%***
39	Fly Ash	0	200,000	160,000	120,000	114,000	146,000	100,000	-12%
5	Clay, Fines, Rubble & Soil – Clean Fill	162,400	1,260,000	910,000	480,000	590,000	660,000	760,000	29%
6	Clay, Fines, Rubble & Soil – Intermediate Waste Soil[1]	NRS[2]	NRS[2]	160,000	190,000	170,000	130,000	100,000	-41%
	Total Clay, Fines, Rubble & Soil	162,400	1,260,000	1,070,000	*670,000*	760,000	790,000	860,000	13%
	Total Reported	***2,041,776***	***4,310,000***	***3,980,000***	***3,450,000***	***3,590,000***	***3,700,000***	***3,910,000***	***9%***

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.*

2.1.3 Source sector outcomes

During 2015-16, Municipal (MSW) sources contributed 452,000 tonnes to resource recovery (Table 2.3 below). This is 11,000 tonnes less than volumes reported from 2013-14 (at 463,000 tonnes). This reduction is mainly due to a reported decline in scrap metal and organics from MSW sources. At the same time, the estimated quantity of MSW volumes to landfill increased to 388,000 tonnes (up from 383,000 tonnes in 2013-14). This led to a small decrease in the MSW diversion rate for SA to 53.8% (from 54.7% in 2013-14).

The reported quantity of C&I resource recovery in 2015-16 (of 1.37 million tonnes) increased from 2013-14 levels (at 1.32 million tonnes). The volume of C&I waste to landfill (at 209,000 tonnes) has fallen significantly from 2013-14 levels (at 263,000 tonnes). This led to a significant increase in the C&I diversion rate for SA to 86.7% (up from 83.3% in 2013-14).

Volumes of C&D recovery (at 2.09 million tonnes) rose substantially from 2013-14 (up from 1.81 million tonnes). At the same time, C&D landfill disposal increased to 293,000 tonnes (up from 268,000 tonnes in 2013-14). The overall impact of these changes in C&D volumes led to an increase in C&D diversion to 87.7% (up from 87.1% in 2013-14).

C&I and C&D sources (at 35% and 53%, respectively) continued to constitute the main sources of resource-recovered material reported by SA recycling industries in 2015-16 (Table 2.3 and Figure 2.1). Due to the increase in reported C&D recovered volumes, the proportion of this waste stream relative to C&I and MSW sources has expanded.

MSW sources made up the majority (at 44%) of waste disposed of to landfill. C&I and C&D sources (23% and 33% respectively) comprised the balance of the landfill disposal volumes. The contribution of C&I to landfill disposal has decreased relative to the previous reporting period due to decreased volume of materials (to 23%), while C&D has increased to 33% (up from 29% in 13-14).

Table 2.3 **Source sector origins (by weight, tonnes and %) of SA recovered materials and waste to landfill, 2015-16, and diversion rates (%).** *Source data for resource recovery by source sector was obtained from the 2015-16 Recycling Activity Survey data. Source data for landfill disposal by source sector during 2015-16 was obtained from Green Industries SA.*

Sector Origin	Resource Recovery		Landfill		Diversion (%)
	tonnes	(%)	tonnes	(%)	
Municipal	452,000	12%	388,000	44%	53.8%
C&I	1,368,000	35%	209,000	23%	86.7%
C&D	2,094,000	54%	293,000	33%	87.7%
Total[1]	**3,910,000**	**100%**	**890,000**	**100%**	**81.5%**

1. Some totals may not equate precisely due to rounding

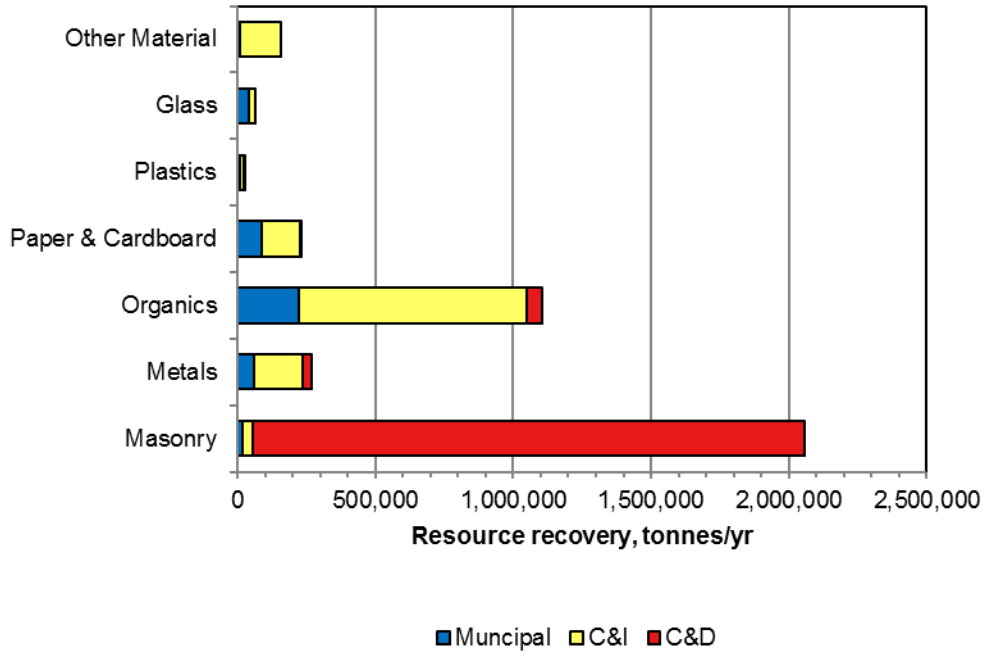

Figure 2.1 **Sector origin of SA recovered materials according to material category (by weight, tonnes), SA 2015-16.** *This figure shows the source sector splits for resource recovered materials by source sector (MSW, C&I and C&D).*

2.1.4 Geographical origin

Figures 2.2 and 2.3 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 2015-16, metropolitan areas contributed to over three quarters (80% or 3.11 million tonnes) of resource recovery in SA and 76% (0.68 million tonnes) of waste sent to landfill (Table 2.4 below).

Regional areas once more contributed strongly to SA's recycling activity in 2015-16, providing the balance (at 0.80 million tonnes or 20%) of material being resource recovered. A significant proportion of this regional resource recovery arises from processing of primary products (e.g. wine, timber, meat) or energy production (i.e. fly ash). Regional areas were also responsible for 0.21 million tonnes (or 24%) of waste disposed of to landfill in SA.

Table 2.4 **Geographical origins (by weight, tonnes and %) of SA recovered materials and waste to landfill, 2015-16, 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	3,110,000	80%	679,000	76%	82.1%
Regional	800,000	20%	211,000	24%	79.1%
Total	**3,910,000**	**100%**	**890,000**	**100%**	**81.5%**

1. Landfill data was provided by Green Industries SA
2. Sums may not equate due to rounding. Rounding also influences diversion rates

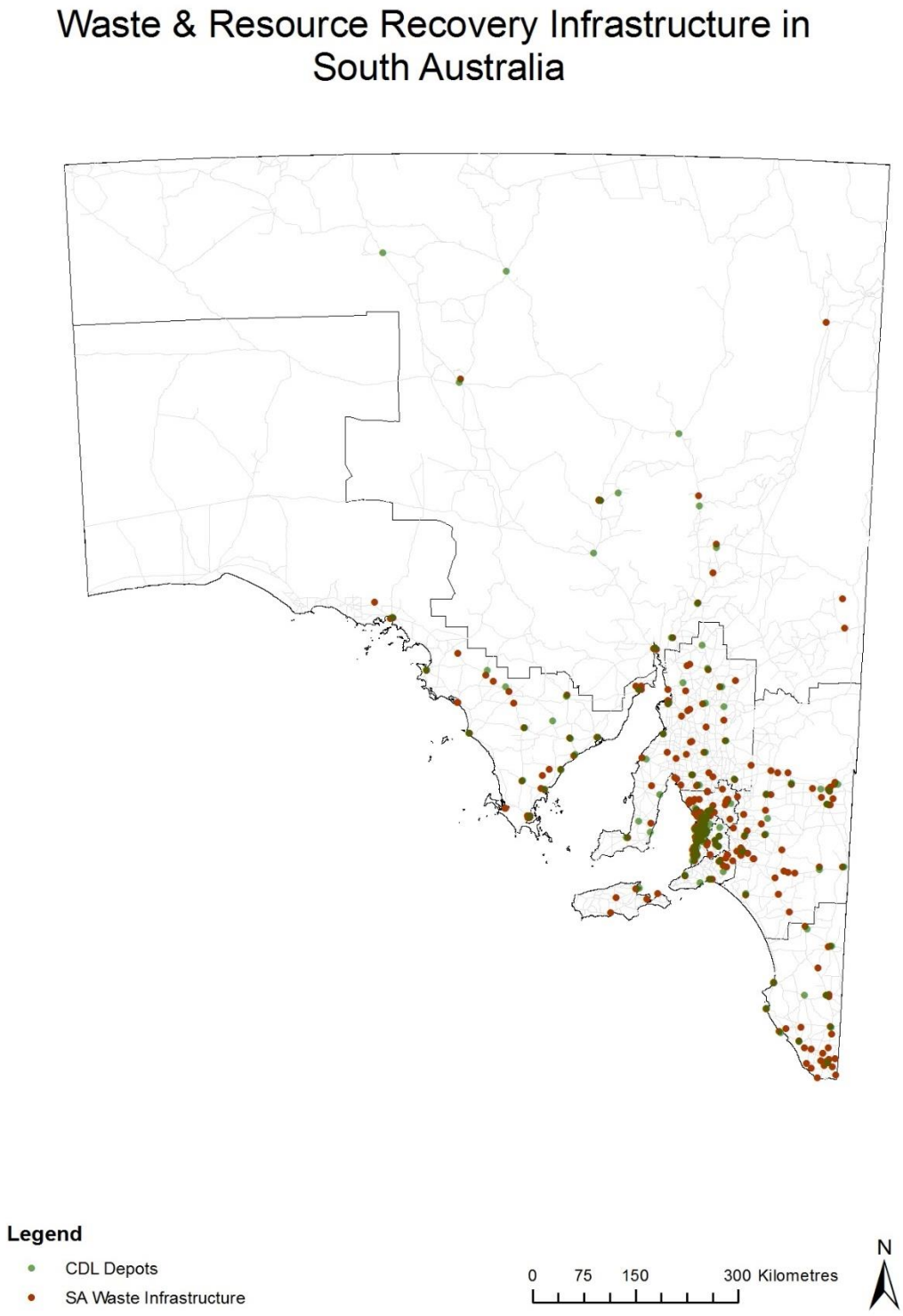

Figure 2.2 **Approximate geographical location of main sites for recyclers/re-processors in SA.** *This map was produced by Green Industries SA during the 2015-16 Recycling Activity Survey Year. The map is based on data from the SA Waste and Resource Recovery Infrastructure Plan Consultation Draft (Green Industries SA, 2016). Refer Figure 2.3 for enlargement showing metropolitan Adelaide area*

2015-16 Recycling Activity Survey – Metropolitan Adelaide

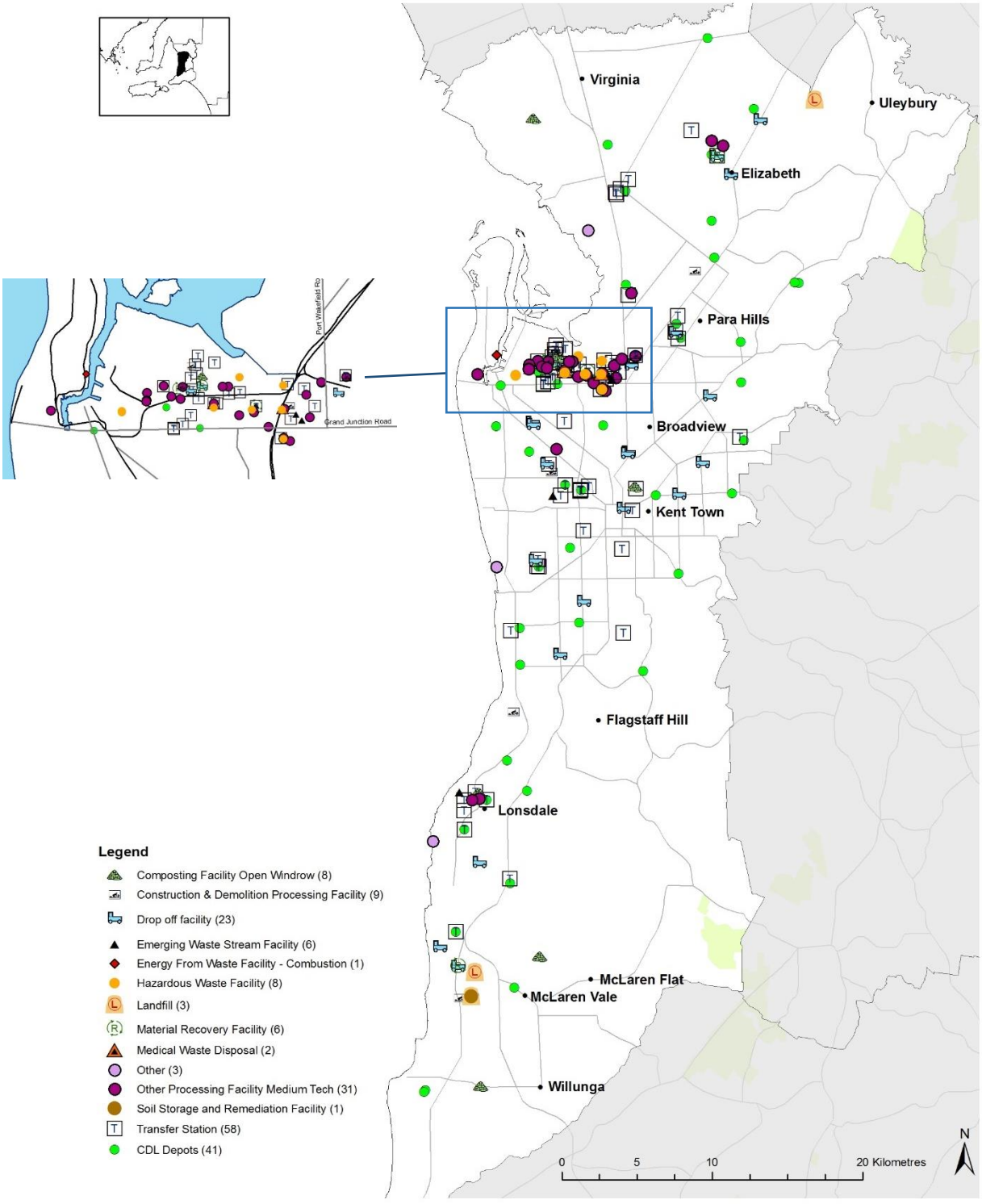

Figure 2.3 **Approximate geographical location of main sites for recyclers/ re-processors in Adelaide.**

This map was produced by Green Industries SA during the 2015-16 Recycling Activity Survey Year. The map is based on data from the SA Waste and Resource Recovery Infrastructure Plan Consultation Draft (Green Industries SA, 2016).

2.1.5 Destination for Recovered Materials

In 2015-16, an estimated 3.39 million tonnes or 87% of all recovered material reported was re-processed in SA (Table 2.5 below). SA has well developed recycling industry capabilities in most material streams, and the quantities being re-processed locally rose by 410,000 tonnes (or 14%) from 2013-14.

The increase in re-processing in SA and interstate has led to a decrease in the quantity of materials reported as being exported overseas. 2015-16 saw a 180,000 tonne increase in materials re-processed interstate compared to 2013-14, and a drop of 270,000 tonnes re-processed overseas.

Cardboard & Paper constituted the majority of this material sent overseas for re-processing (48% of all overseas materials), followed by Metal (41%, see Figure 2.5 overleaf). With this in mind, the tonnes of Cardboard & Paper as well as Metals exported overseas decreased from 2013-14 by 61,000 (38%) and 209,000 tonnes (or 71%) respectively. Metal re-processing interstate increased from 2013-14 (113,000 tonnes or 1440%), as did Cardboard & Paper (56,000 tonnes or 77%).

Tonnes of other materials exported interstate or overseas remained stable from 2013-14 to 2015-16. These materials included Plastics (about 12,000 and 6,000 tonnes re-processed interstate and overseas respectively) and Other Materials (about 4,000 and 18,000 tonnes re-processed interstate and overseas respectively). Tyres remained a large component of the Other Materials sent interstate or overseas (total of 17,000 tonnes sent interstate and overseas).

Table 2.5 **Final reported destination (by weight, tonnes and %) of SA sourced materials, 2015-16.**

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.

Destination	Quantity	
	tonnes	%
SA	3,390,000	87%
Interstate	310,000	8%
Overseas	210,000	5%
Total	**3,910,000**	**100%**

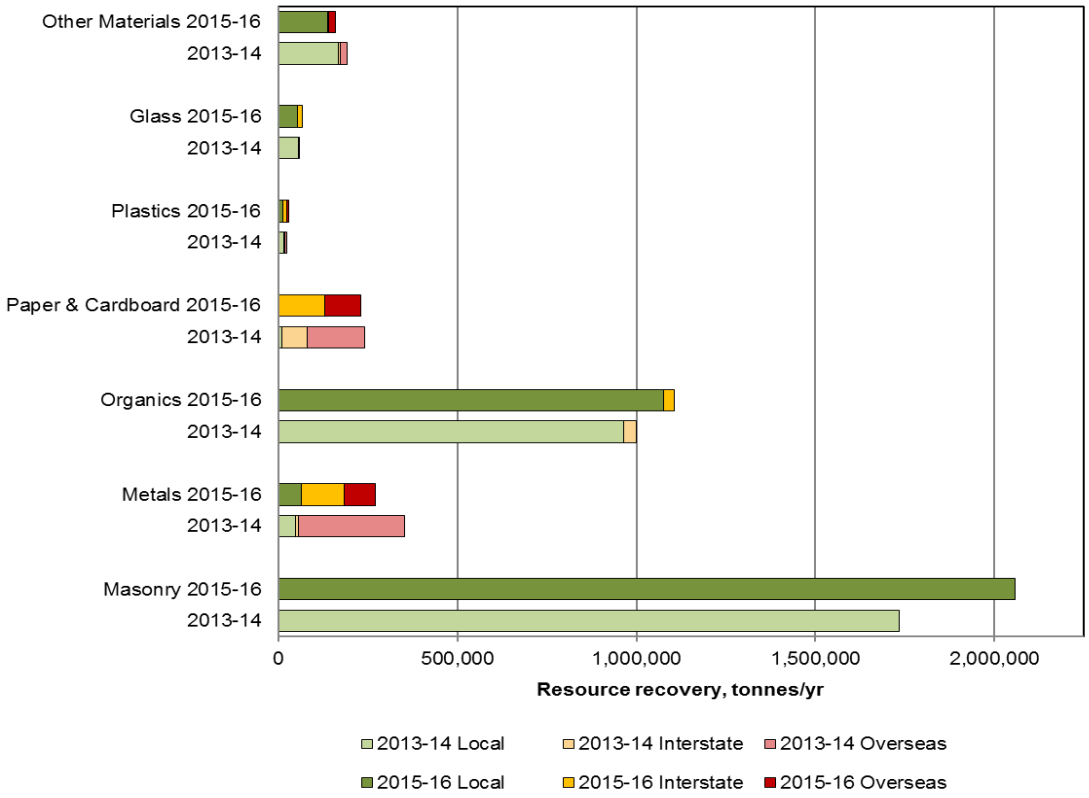

Figure 2.4 **Destination of SA recovered materials according to material category (by weight, tonnes), SA 2015-16 compared with 2013-14.** *The majority of materials are being re-processed within SA, but also significant quantities of some material being exported interstate or overseas.*

2.1.6 Energy recovery

Energy recovery is beginning to attract attention in SA as a potential alternative for waste not deemed suitable or cost-effective for material recovery. Some industries already produce energy from waste by-products they generate on their own sites, but this is not reportable under the National Guidelines for compiling waste and recycling data (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 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*[4].

Table 2.6 (overleaf) includes 2015-16 recovered materials, broken down by recovery method (material versus energy recovery).

[4] This necessarily excludes energy recovery from landfill gas arising from waste already disposed to landfills.

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 81.5%, which includes 79.9 percentage points from materials recovery and 1.5 percentage points from energy recovery. The overall diversion rate for Standard Reporting Materials is 79.3%, which includes 77.3 percentage points from material recovery and 2.0 percentage points from energy recovery. Lastly, the overall recovery of Separately Reported Materials & Clean Fill is 89.1%, which is all from material recovery.

Table 2.6 **Resource recovery (tonnes) for material recovery and energy production, from SA sourced materials reported during 2015-16.** *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	2.88 million	0.96 million	3.84 million
	Diversion rate, %	77.3%	89.1%	79.9%
Energy recovery	Quantity, tonnes	73,100	Nil	73,100
	Diversion rate, %	2.0%	0.0%	1.5%
Total (resource) recovery	**Quantity, tonnes**	2.95 million	0.96 million	3.91 million
	Diversion rate, %	79.3%	89.1%	81.5%

2.1.7 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 2015-16. Approximately 177,000 tonnes of imported waste materials for resource recovery were recorded. This represents a 45,500 tonne increase from 2013-14. This rise was in part due to higher volumes of materials imported by SA recyclers, including reported increases in Metal (up 12,500 tonnes from 2013-14) and Other Materials (up 10,300 tonnes from 2013-14), as well as 24,000 tonnes of Other Organics volumes that was missing from the 2013-14 data set. Glass and Plastics remained consistent at 51,000 and 7,700 tonnes respectively.

Table 2.7 **Waste materials reported as imported to SA for resource recovery in 2015-16, including estimated accuracy of data.** *Significant quantities of Glass, Other Materials and Organics, as well as Metals and Plastics, were imported for resource recovery. The highest quantities came from Victoria and overseas, while the origin of some imported waste materials from interstate could not be identified.*

	Interstate								***Overseas***	***TOTAL***	**Est. Accuracy (%)**
Material sector	*VIC*	*NT*	*QLD*	*WA*	*NSW*	*ACT*	*TAS*	*State not identified*			
Masonry	-	-	-	-	-	-	-	-	-	**-**	N/A
Metals	-	6,500	-	-	-	11,100	-	100	-	**17,700**	4%
Organics	38,900	-	-	-	2,500	-	-	-	-	**41,400**	2%
Cardboard and Paper	-	-	-	-	-	-	-	-	-	**-**	N/A
Plastics	2,100	-	100	2,100	3,400	-	-	-	-	**7,700**	19%
Glass	20,100	-	-	-	16,300	-	-	7,800	6,800	**51,000**	5%
Other materials	13,500	-	-	-	1,900	-	-	-	43,900	**59,300**	1%
Total	**74,600**	**6,500**	**100**	**2,100**	**24,100**	**11,100**	**-**	**7,900**	**50,700**	**177,100**	4%

2.2 Performance against State Waste Strategy Targets

2.2.1 Landfill Reduction Target

South Australia's Strategic Plan sets out a number of targets for the state (SA Government, 2011). Target 67 sets the following landfill reduction goal for SA:

- ***Reduce waste to landfill by 35% by 2020 (baseline: 2002-03), Milestone of 30% by 2017-18.***

According to data collected for the 2015-16 SA Recycling Activity Survey, the state is on track to reach its waste to landfill target of 35% reduction (from 2002-03) by 2020. SA's disposal to landfill for 2015-16 is 889,500, which is a reduction from previous years and is 29% lower than the 2002-03 level. It is also worth noting that the previous milestone of 25% reduction from 2002-03 levels in 2014 was surpassed in the 2013-14 financial year. As can be seen in Figure 7, SA is progressing towards achieving its Target of 35% reduction (see yellow dotted trend line in Figure 2.5). It is also on track to achieve its milestone of 30% by 2017-18. However, to reach these milestones will require ongoing commitment to achieving further gains in diverting waste materials from landfill disposal to resource recovery, including contaminated soil.

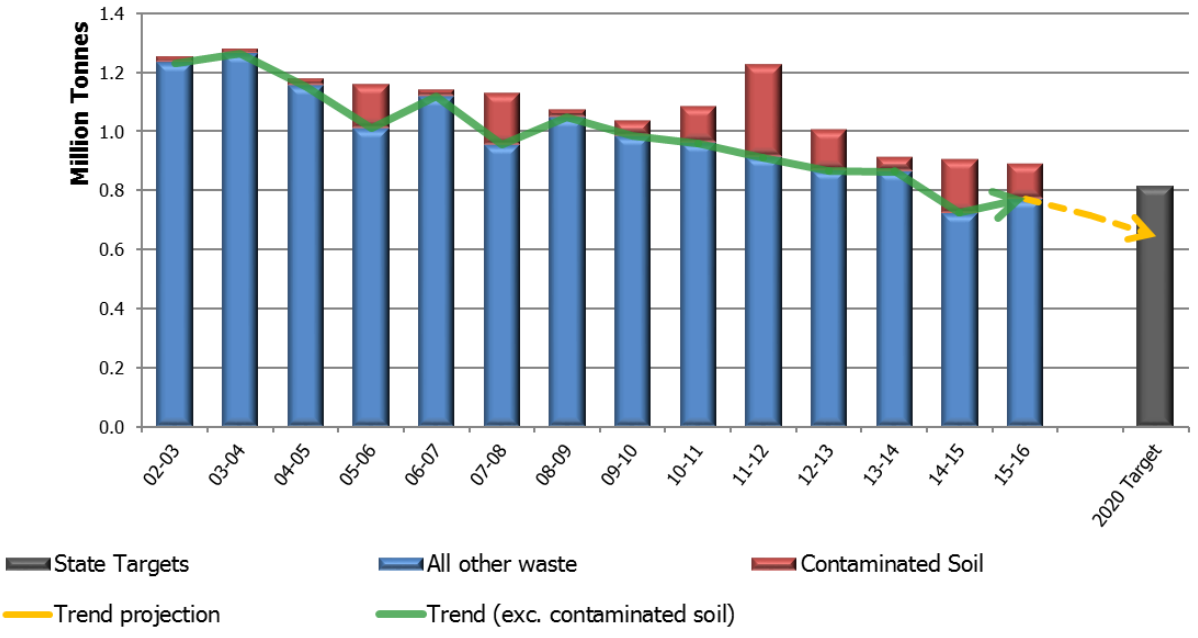

Figure 2.5 **Landfill disposal: Trend in SA since 2002-03 and the State Waste Strategy Target.** *This figure shows how landfill disposal in SA has changed since 2002-03 relative to SA's Strategic Plan (SA Government, 2011) landfill reduction targets. The separate contribution to landfill disposal of 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 2015-16 SA Recycling Activity Survey indicates that there has been an increase in waste generation per capita from 2014-15 to 2015-16. This can be found in Table 2.8, which includes the per capita waste generation from 2010-11 to 2015-16.

The % change refers to the difference between 2014-15 (baseline year for Target) and 2015-16 (current year), which demonstrates that 2015-16 has shown an increase in waste generation per capita of 4.8% from 2014-15. There will need to be a reduction in waste generation per person to reach the target.

Table 2.8 2015-16 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*	***% Change***	
Standard Reporting Materials	2,300	2,210	2,120	2,130	2,080	2,180	**4.8%** Increase from 2014-15	5% Reduction from 2014-15
Separately Reported Materials & Clean Fill	950	930	550	550	660	630		
TOTAL	3,250	3,140*	2,670	2,680	2,740	2,810	**2.6%** 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 2.9 below).

The C&I and C&D sectors' diversion rates increased from 2013-14 while MSW decreased:

- MSW – Diversion rate decreased to 58.2% (down from 59.4% in 2013-14). This is below the 2015 and 2020 Target of 70%.
- C&I – Diversion rate increased to 82.0% (from 76.6% in 2013-14). This is now above the 2020 Target of 80%.
- C&D – The diversion rate increased:
  - *Excluding Separately Reported Materials & Clean Fill:* A diversion rate of 89.9% was achieved (up from 84.8% in 2013-14), which is just below the 2020 Target of 90%.
  - *Total C&D sector result:* The diversion rate was 88.9% (slightly up from 88.4% in 2013-14). This is slightly below the 2015 and 2020 Target of 90%.

Table 2.9 Metropolitan diversion by source sector: 2015-16 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	2015-16 Diversion Achieved	Metro Diversion Target	
		By 2015	*By 2020*
■ **MSW**	**58.2%**	70%	70%
■ **C&I**	**82.0%**	75%	80%
■ **C&D – *Excluding Separately Reported Materials & Clean Fill***	**89.9%**	90%	90%
■ **C&D – *Total***	**88.9%**		

2.3 Comparative performance (with other jurisdictions)

Based on resource recovery and landfill data for 2015-16, SA currently achieves both the highest publicly reported diversion (at 81.5%) and per capita resource recovery (2,290 kg/p/yr) of any state or territory in Australia[5] (Figure 2.6). SA also achieves the highest per capita resource recovery for standard reporting material only, at 1,727 kg/p/yr and the second highest per capita recycling of separately reported materials (of those states that reported this figure), at 563 kg/p/yr. in addition, SA has the lowest per capita landfill disposal rate at 520 kg per person per year. However, SA reported the second highest overall per capita waste generation rate (2,810 kg/p/yr).

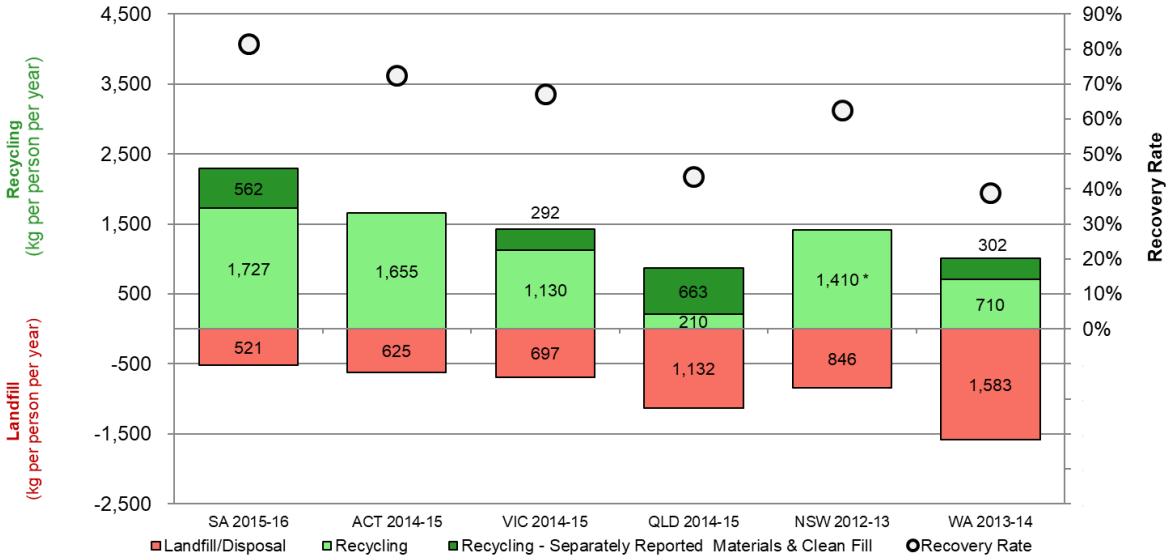

Figure 2.6 **Comparison of reported per capita (kg/person/yr) resource recovery and landfill disposal and recovery (%) by state or territory.** *This figure illustrates the per capita resource recovery and landfill disposal for different states and territories in Australia based on latest and currently available data (not all of which are for 2015-16). 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 Guidelines for compiling waste and recycling data (Dept Environment and Energy, 2015). Note: Reported recovery for some states and territories (e.g. NSW, ACT) do 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] Note: Not all recycling data needed for this comparison could be obtained for 2015-16. Furthermore, not all Australian states and territories collect and report this data in conformance with the National Guidelines for compiling waste and recycling data (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.

2.4 Employment in the SA Resource Recovery Sector

Participants in the 2015-16 SA Recycling Activity survey were asked to provide the number of FTE's directly employed by the 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). Not all respondents provided a response to this question, and with a total of 61 responses received it is also important to note that this figure is an underestimate of the entire industry in South Australia, as not all waste, recycling and resource recovery organisations were surveyed and of those that were, not all provided a response. In addition, the data was obtained through survey responses only, and more comprehensive figures could be found through further investigations by Green Industries SA.

Table 2.10 below summarises the employment figures captured in the 2015-16 survey. As can be seen in this table, of the 61 organisations that reported, there were a total of 1,410 full time employees, some part time and casual employees, and over 200 contractors. 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).

Table 2.10 *2015-16 Recycling Activity results of FTEs in SA associated with material collection, resource recovery and/or recycling. Note that is a sub-set of employment in the SA industry, with only 61 organisations providing data for this question. It also does not include indirect employment.*

Employment type	Number
Full time	1,410
Part time	5
Casual	20
Contractor	229
Total	**1,664**

3 Material Resource Recovery (Activity) Reports

At a glance:

- *This section presents the key findings from analysis of 2015-16 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 Guidelines for compiling waste and recycling data (Dept Environment and Energy, 2015). Where relevant, the reports differentiate between resource recovery for material recovery and energy recovery.*

1. ***Masonry [refer pg. 38 of this report]***
   - *Asphalt*
   - *Bricks*
   - *Concrete*
   - *Plasterboard*
   - *Clay, Fines, Rubble & Soil*
   - *Clay, Fines, Rubble & Soil- Intermediate Waste Soil*
2. ***Metals [refer pg. 42]***
   - *Steel or Ferrous Metals*
   - *Aluminium*
   - *Non-ferrous Metals (exc. Aluminium)*
3. ***Organics [refer pg. 46]***
   - *Food Organics*
   - *Garden Organics*
   - *Timber*
   - *Other Organics*
4. ***Cardboard & Paper [refer pg. 50]***
   - *Cardboard and Waxed Cardboard*
   - *Liquid Paperboard*
   - *Magazines & Newsprint*
   - *Printing & Writing Paper*
5. ***Plastics [refer pg. 54]***
   - *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. 58]***
7. ***Other Materials [refer pg. 60]***
   - *Fly Ash*
   - *Foundry Sands*
   - *Leather & Textiles*

3.1 Masonry

Highlights:

- *In 2015-16 the quantity of recovered Masonry materials, including Clean Fill and Intermediate Waste Soil, increased from 2013-14.*
- *Concrete, Asphalt and Clean Fill rose significantly (180,000, 62,000 and 170,000 tonnes respectively), while Bricks decreased (10,000 tonnes).*
- *All of this material is re-processed in SA.*
- *The outlook for recovery of Masonry materials is strong, with supply of materials expected to remain high due to generation of materials from infrastructure projects, and the commercial viability of Masonry materials reprocessing is strengthened by increases in the SA Solid Waste Levy.*

The total quantity of recovered Masonry materials reported for SA during 2015-16 was 2.06 million tonnes (Table 3.1 below), which is up by 19% from 2013-14 (from 1.73 million tonnes). Concrete (at 46% of total Masonry quantities) and Total Clay, Fines, Rubble & Soil (Clean Fill and Intermediate Waste Soil[6], at 42%) again provided the majority of this resource recovery (Figure 3.1 overleaf). Concrete rose 180,000 tonnes from 2013-14 (or 24%), and Clean Fill increased by 170,000 tonnes or 29% from 2013-14 (Figure 3.2 overleaf). Asphalt also increased, up 62,000 from 2013-14 (42%), while bricks decreased, down by 10,000 tonnes or 16% from 2013-14.

Table 3.1 **Quantity (tonnes) of Masonry material recovered in SA during 2015-16, 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	210,000	18,000	9%
Bricks	53,000	8,000	15%
Concrete	940,000	104,000	11%
Plasterboard	1,400	200	14%
Total Clay, Fines, Rubble & Soil [2]	860,000	140,000	16%
Clay, Fines, Rubble & Soil – Clean Fill[2]	760,000	116,000	15%
Clay, Fines, Rubble & Soil – Intermediate Waste Soil[3]	100,000	24,000	24%
Total	**2,064,400**	**270,000**	13%

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
3. Intermediate Waste Soil[6] was reported for the first time in 2011-12.

[6] 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').

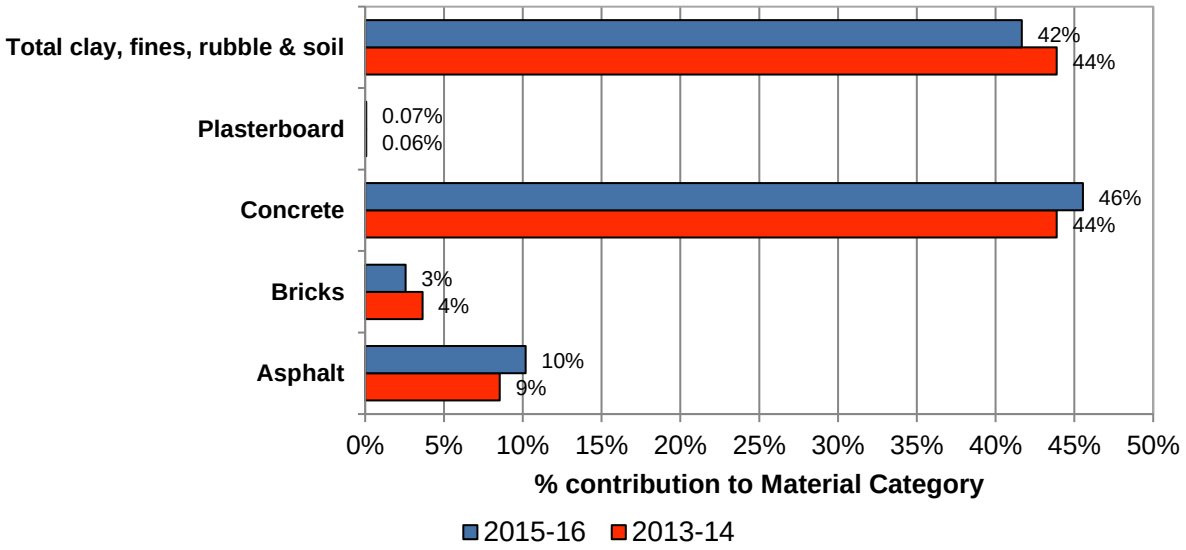

Figure 3.1 **Changes in percent composition of recovered Masonry (by weight), SA, between 2013-14 and 2015-16.**

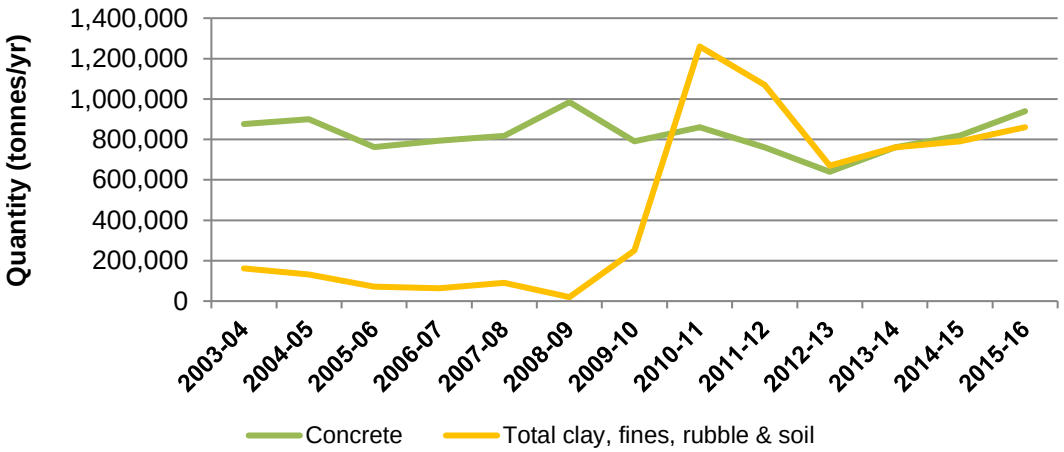

Figure 3.2 **Changes in reported Masonry quantities since 2003-04 – Concrete and Total Clay, Fines, Rubble & Soil.** *Concrete and total clay, fines, rubble and soil continue to increase at similar rates and quantities.*

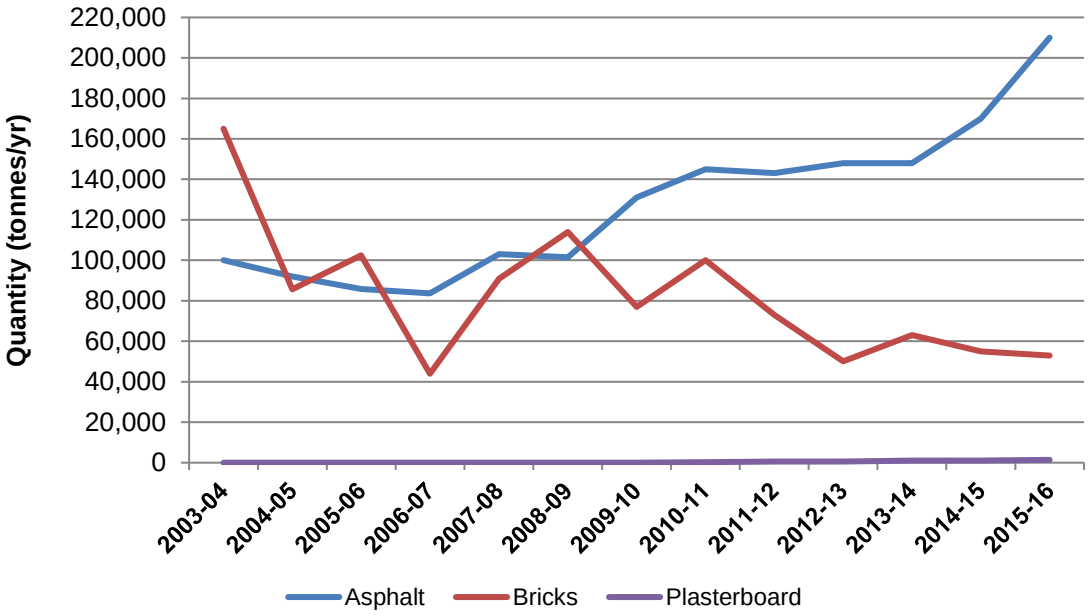

Figure 3.3 **Changes in reported Masonry quantities since 2003-04 – Asphalt, Bricks and Plasterboard.** *Bricks declined slightly which asphalt continued to increase. Plasterboard continued to experience a slight rise from its low base.*

As expected, the majority (97%) of recovered Masonry materials arose from C&D sources (Table 3.2 below) with only small quantities reported from C&I (2%) and Municipal (1%) sources. Most of these Masonry materials (97%) were sourced from Metropolitan SA (Table 3.2), and all the materials were re-processed locally in SA (Table 3.2).

Table 3.2 **Sector and geographical origins and re-processing locations for recovered Masonry in SA in 2015-16.** *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	1%	9%	89%	98%	2%	100%	0%	0%
Bricks	1%	0%	99%	93%	7%	100%	0%	0%
Concrete	2%	1%	97%	97%	3%	100%	0%	0%
Plasterboard	6%	1%	93%	92%	8%	100%	0%	0%
Total Clay, Fines Rubble & Soil	0%	1%	99%	98%	2%	100%	0%	0%
Total	**1%**	**2%**	**97%**	**97%**	**3%**	**100%**	**0%**	**0%**

The volumes of Masonry materials recovered in SA are affected by fluctuations in building C&D activity that occur from year to year (Figures 3.2 and 3.3).

- Clay, Fines, Rubble & Soil rose to historically high levels on the back of several major infrastructure projects in 2010-11 and it remains relatively high compared to the period prior to 2010-11.
  - These high levels reduced over the 2011-12 and 2012-13 financial years as projects progressed past their major waste generating phases, but have since increased as new Government funded infrastructure projects (e.g. South Road upgrades) in SA commence.
- Asphalt and Concrete have also risen steadily since 2013-14, which may also relate to the above major infrastructure projects in SA.
- Plasterboard, which was introduced as its own category to the SA Recycling Activity Report in 2010-11, remains a minor quantity, but appears to be growing gradually as more people start separately identifying and reporting its resource recovery.

The outlook for recovery of Masonry materials is strong:

- The commercial viability of Masonry materials reprocessing is strengthened by the SA Solid Waste Levy, which is set to increase from $57 /tonne in 2015-16 up to $103/tonne in 2019-20 for Metropolitan waste. This levy makes recovery of C&D materials more cost-effective than sending the material to landfill.
- The supply of Masonry materials is expected to remain high due to generation of materials from infrastructure projects including Calvary Hospital, Torrens to Torrens, Gateway, Darlington and the Northern Connector projects.
- It is expected that demand for recovered clean fill materials will outstrip supply, with many infrastructure projects (Northern Connector) needing significant volumes of fill material to their needs.

3.2 Metals

Highlights:

- *In 2015-16 the quantity of recovered Metals decreased significantly for Steel but increased slightly for Non-ferrous Metals and Aluminium when compared to 2013-14.*
- *The decline and closures in manufacturing industries across SA in combination with low metal prices, continue to substantially affect waste Metal volumes available for resource recovery. Scrap steel prices are at their lowest in 20 years.*
- *The immediate and longer-term outlook for Metals recovery is poor, 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. Competition will be further exacerbated with a new entrant in the SA metals recovery market.*
- *The above could affect the on-going viability of some local metals re-processors.*

The total quantity of recovered Metals reported for SA during 2015-16 was approximately 267,000 tonnes (Table 3.3 overleaf), which is down by 24% (or 85,000 tonnes) from 2013-14. This decrease was due to a reduction in recovered Steel, which declined significantly while volumes of Non-ferrous metals increased:

- Steel decreased by 28% (or 90,000 tonnes); while
- Non-ferrous Metals were up by 6% (or 1,000 tonnes) and
- Aluminium volumes increased by 29% (or 4,000 tonnes) from 2013-14.

This reduction in Steel quantities is in line with the trend for Steel recovery seen over the past four years (Figures 3.4 and 3.5 overleaf). The deterioration in scrap steel resource recovery occurred across all three sectors and has placed significant pressure on SA's metal re-processors. There is greater competition to secure the remaining local sources of scrap steel that is reducing in volume with manufacturing activity reductions. Lower volumes mean higher re-processing costs due to reduced economies of scale from their fixed capital investments in equipment and plant. At the same time, the price for scrap steel is at its lowest in 20 years, placing further pressure on local reprocessing of scrap steel. This has led to some stockpiling of scrap metal (metro and regional sites) which will remain until more favourable commodity pricing is available.

Table 3.3 Quantity of Metals (tonnes) recovered in SA during 2015-16, including estimated reporting error (tonnes & %). *Steel remained the dominant contributor to recovered Metals in SA.*

Item	Net Recovery[1]	Reporting Error	
	tonnes	tonnes	%
Steel	230,000	14,000	6%
Aluminium	18,000	2,000	11%
Non-ferrous Metals	19,000	3,000	16%
Total	**267,000**	**19,000**	7%

1. Net recovery excludes re-processing losses

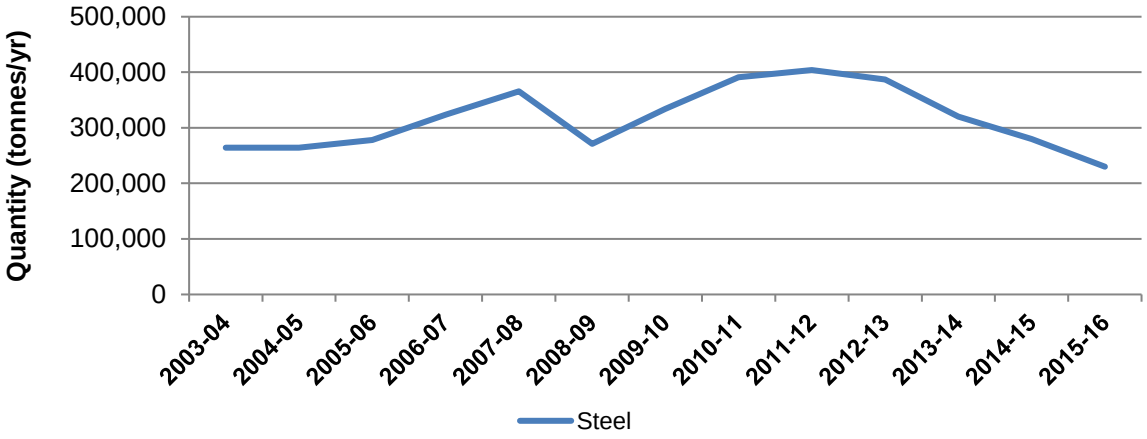

Figure 3.4 Changes in reported metal quantities since 2003-04 – Steel. *The decline since 2011-12 has continued into the 2015-16 financial year.*

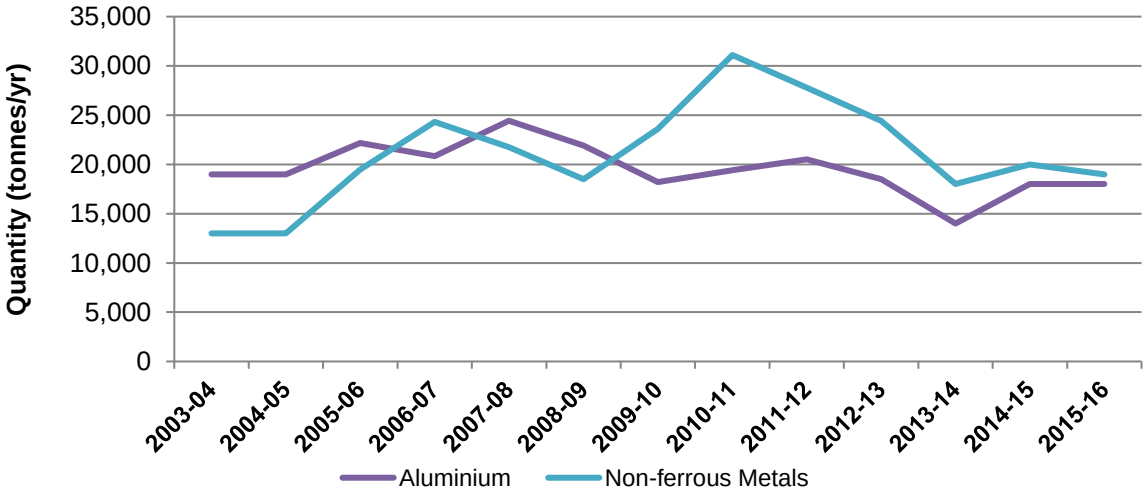

Figure 3.5 Changes in reported metal quantities since 2003-04 – Aluminium and Non-ferrous Metals. *Recovery of Non-ferrous has increased slightly from 2013-14.*

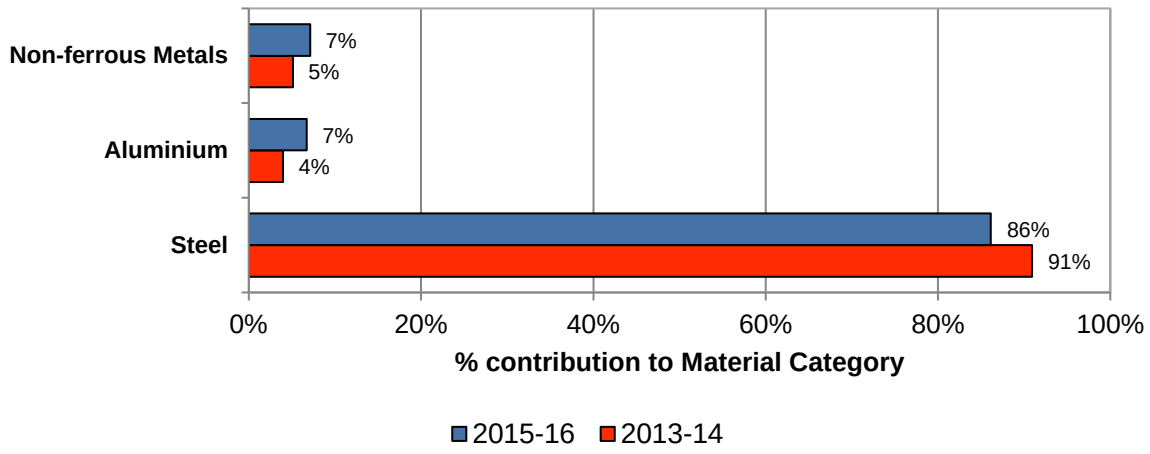

Figure 3.6 **Changes in percent composition of recovered Metals (by weight), SA, between 2013-14 and 2015-16.** *From 2013-14 to 2015-16 steel's composition has decreased slightly while aluminium and non-ferrous metals have increased their composition.*

All scrap metal recovered in SA 2015-16 was sent for material recovery. There were 17,700 tonnes (6,500 tonnes from NT, 11,100 tonnes from ACT, 100 tonnes from unknown sources) of scrap metals imported into SA during 2015-16 for resource recovery or re-processing (which is additional to tonnes reported for SA in Table 3.3).

Steel continued to constitute the majority (86%) of Metal recovery (Figure 3.4 above). Non-ferrous Metals and Aluminium each made up 7% of reported Metal recovery.

During 2015-16, 67% of scrap metal volumes were sourced from the C&I sector, with remaining volumes sourced from the MSW sector (22%) and C&D sector (11%).

23% of scrap metal is re-processed locally at a local steelworks and metals foundries. Metal overseas exports have decreased to 32% in 2015-16 (from 85% in 2013-14), with the balance sent interstate for recycling driven by demand for scrap steel from steel manufacturing in NSW.

Almost all recovered Aluminium (99%) and most (94%) of the Non-ferrous Metals was sent interstate or overseas for recycling. This is consistent with findings from previous financial years.

Table 3.4 **Sector and geographical origins and re-processing locations for recovered Metals in SA during 2015-16.** *C&I was the major sector origin for recovered Metals. There is some re-processing of recovered Steel in SA but most recovered Metals are sent interstate or overseas.*

Item	Sector Origin (%)			Geographical Origin (%)		Re-processing Location (%)		
	Municipal	C&I	C&D	Metro	Regional	SA	Interstate	Overseas
Steel	21%	67%	12%	81%	19%	26%	45%	29%
Aluminium	29%	68%	3%	80%	20%	1%	26%	73%
Non-ferrous Metals	20%	75%	5%	83%	17%	6%	68%	26%
Total	**22%**	**67%**	**11%**	**81%**	**19%**	**23%**	**45%**	**32%**

The outlook for Metals recovery for the next period is (again) expected to be poor, with further falls anticipated for quantities recovered in SA.

- Declines in scrap metal from the manufacturing sector are expected to continue, particularly with the closure in 2017 of car manufacturing in SA.
- As a consequence, there will be even more intense competition for the scrap metal left in the market. This competition will be further exacerbated with the recent entrant of a new organisation in the SA metals recovery market.

Another factor reported to be impacting on the Metals recovery sector is the Solid Waste Levy. This levy increases operating costs involved with disposing the 'flock' residual from re-processing to landfill. The State Government has 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 $76 per tonne) for the period between September 2016 and 30 June 2017, to limit further increases in the levy from adding more pressure on local scrap metal recovery operations.

3.3 Organics

Highlights:

- *In 2015-16 overall quantities of Organic material recovery increased.*
- *This increase was largely driven by a rise in Timber, due to the recovery of SA's forestry industry. Higher volumes of Other Organics were also reported from meat rendering activities and regional processing of primary produce.*
- *A further 41,000 tonnes of organic waste material was imported to SA for resource recovery.*
- *Most organics recovered in SA (97%) is locally reprocessed.*
- *The outlook for recovered organics remains positive.*

The total quantity of recovered Organics reported for SA during 2015-16 was approximately 1.1 million tonnes (Table 3.5 below), which is up by 11% (or 109,000 tonnes) from 2013-14.

Figures 3.7 and 3.8 overleaf demonstrate that the major increases came from Timber (up 93,000 tonnes or 52%), Food Organics (up 900 tonnes or 13%) and Organics Other (up 20,000 tonnes or 4%). Garden Organics decreased slightly, down 5,000 tonnes or 2%.

The increase in timber volumes was driven by a recovery of SA's forestry industry. Volumes of Other Organics increased through additional meat rendering activities and regional processing of primary produce. Food waste increased in line with expansion of commercial food recycling collections.

All recovered Organics materials except Timber were sent for material recovery. For Timber, 67,000 tonnes (or 25%) of this material was used for energy recovery in SA. Table 3.5 includes which quantities for resource recovery were destined for material recovery or energy recovery (in SA).

Table 3.5 **Quantity of Organics (tonnes) recovered in SA during 2015-16, including estimated reporting error (tonnes & %).** *Use of Timber for energy production in SA is presented in this table by two new columns to show separate resource recovery for material and energy recovery.*

Item	Material Recovery[1] tonnes	Energy Recovery[1] tonnes	Net Recovery[1,2] tonnes	Reporting Error tonnes	Reporting Error %
Food Organics	7,900		7,900	1,000	13%
Garden Organics	255,000		255,000	39,000	15%
Timber	206,000	67,000	273,000	32,000	12%
Other Organics	570,000		570,000	74,000	13%
- Meat Rendering	240,000		240,000	14,000	0%
- Waste Grease & Fat	110,000		110,000	21,000	0%
- Waste Sludge & Bio-solids	36,000		36,000	9,000	0%
- Miscellaneous Organics	180,000		180,000	30,000	0%
Total	**1,038,900**	**67,000**	**1,105,900**	**146,000**	13%

1. Net recovery excludes re-processing losses
2. Net recovery = Material Recovery + Energy Recovery

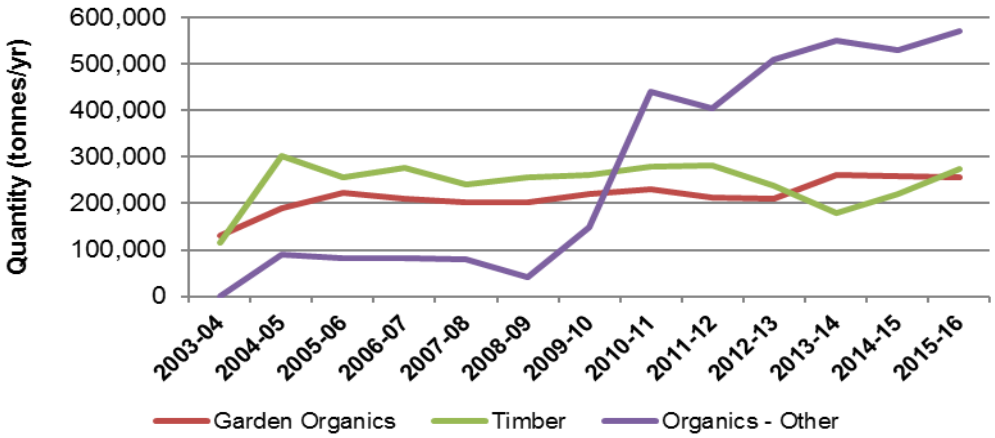

Figure 3.7 **Changes in reported organics quantities since 2003-04 – Garden Organics, Timber and Other Organics.** *Organics – Other has continued its rise seen over the past several years and Timber has also risen since 2013-14.*

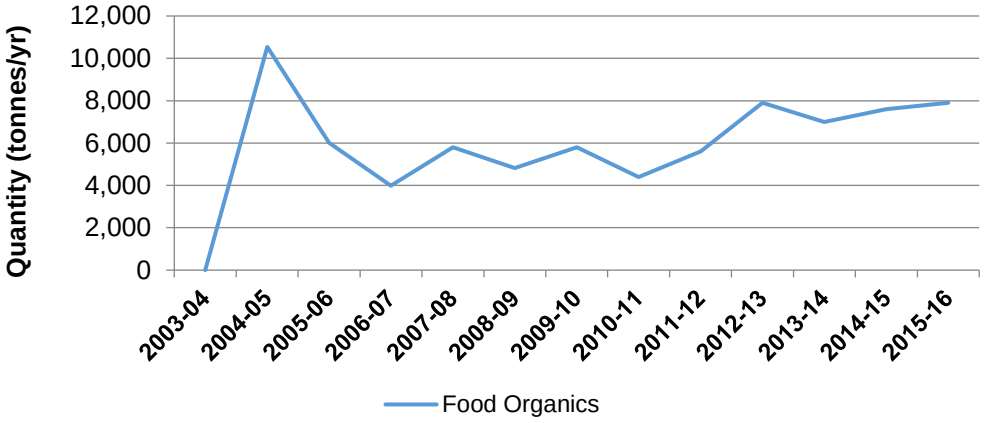

Figure 3.8 **Changes in reported organics quantities since 2003-04 – Food Organics**. *There was an increase in Food Organics during 2015-16 from the last reported financial year (2013-14).*

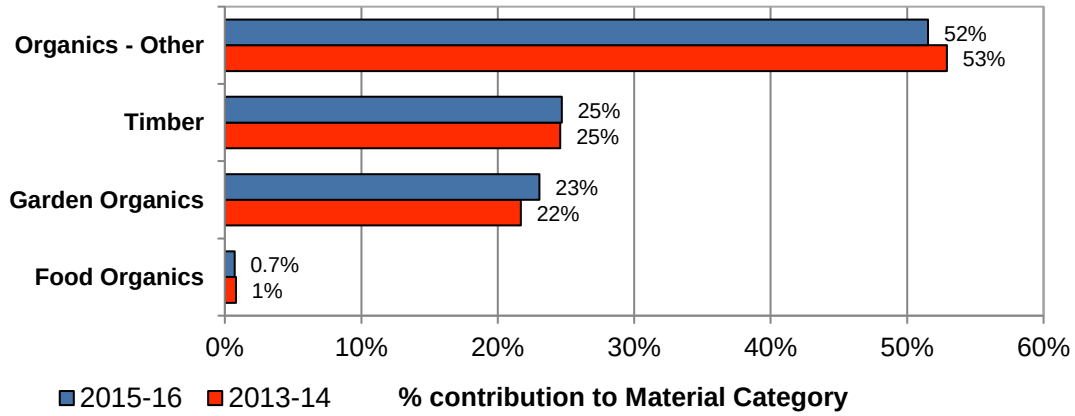

Figure 3.9 **Changes in percent composition of recovered Organics (by weight), SA, between 2013-14 and 2015-16.** *Organics – Other and Garden Organics increased their contribution to this material sector.*

During 2015-16, 41,000 tonnes of organic waste material was imported to SA for resource recovery (which is additional to tonnes reported for SA in Table 3.5). About 94% of this material (Timber and Green Waste and Meat Rendering) originated from Victoria with the balance (mainly grape marc) arriving from NSW.

Other Organics (meat rendering, grease trap, bio-solids, etc.) continued to constitute the majority (52%) of Organics recovery (Figure 3.9 above).

Timber and Garden Organics made up 25% and 23%, respectively, of reported Organics recovery respectively.

In 2015-16, the majority (75%) of recovered Organics originated from C&I sources including material from the timber, meat rendering and wine production industries (Table 3.6). Approximately 20% of recovered Organic materials originated from municipal sources, which was dominated by a large amount of Garden Organics. Small quantities (5%) were sourced from the C&D sector, which were Timber and Garden Organics.

Table 3.6 **Sector and geographical origins and re-processing locations for recovered organics in SA during 2015-16.** *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.*

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	75%	20%	5%	87%	13%	100%	0%	0%
Timber	0.2%	85%	15%	58%	42%	100%	0%	0%
Other Organics	6%	94%	0%	34%	66%	95%	5%	0%
Total	**20%**	**75%**	**5%**	**53%**	**47%**	**97%**	**3%**	**0%**

Due to the significant contribution by regional industries to Other Organics and Timber, nearly half (47%) of recovered Organics was sourced from SA's regional areas (Table 3.6 above).

Most Organic materials (97%) were re-processed locally but a small quantity of Other Organics is being sent interstate for recovery (Table 3.6).

The outlook for Organics recovery for the next period generally remains positive:

- Feedback from the industry during the survey indicated a positive outlook for organics recycling;
- There were comments that more incentives to recycle organic waste could be beneficial to continue to lower organic waste to landfill and increase recycling;
- The industry is continuing to develop innovative products to suit new and existing markets such as for broad acre agriculture and horticulture;
- There is strengthening demand from these markets as more of the agriculture and horticulture sector participants recognise the value of organic derived compost products for improving soil quality and conditioning;
- Waste to energy is being investigated by some market participants for residuals from organics processing, not only to provide new organics-derived products but as a cheaper energy source for their re-processing equipment;
- The market demand for compost and mulch is more broadly growing, and also increasing for other organics end-products such as those from Meat Rendering;
- The uncertainty around timber industry related recovery in the South East of SA has resolved and the composting industry in this area is experiencing an up-swing in availability and supply of these materials;
- Feedback from the industry indicated that there was interest in certification of employees working at organics processing facilities.

Reported barriers for re-processors in the organics sector remained the: on-going high cost of electricity; and significant cost to upgrade their processing equipment to improve quality and diversify their products to meet new market demands.

3.4 Cardboard and Paper

Highlights:

- *In 2015-16 overall quantities of recovered Cardboard & Paper declined (by 5% from 2013-14).*
- *All Cardboard & Paper was reported to be sent interstate or overseas for re-processing.*
- *The sector and regional origin of recovered Cardboard & Paper has remained consistent with 2013-14.*
- *The commodity price of cardboard is at historically high levels, which is expected to return to previous levels within the next year.*
- *Overall volumes of Cardboard and Paper are expected to decline over the coming years in response to the declining local manufacturing industry and reduced print media.*

The total quantity of recovered Cardboard & Paper materials reported for SA during 2015-16 was approximately 228,000 tonnes (Table 3.7 below), which was a decrease of 5% (or about 12,000 tonnes) from 2013-14 figures.

There was a significant decrease in Cardboard & Waxed Cardboard (down 16% from 2013-14), and reductions in Liquid Paperboard (down 45%) and Printing & Writing Paper (down 42%, see Figures 3.10 and 3.11 overleaf). However, Magazines and Newsprint is up 85% from 2013-14 (that is almost double the 33,000 tonnes reported in 2013-14). These changes are predominately due to changing the split of cardboard and paper material, based on new and more accurate audit data in 2014-15. As such, the percentage of Magazines and Newsprint from MSW has increased while Cardboard & Waxed Cardboard has decreased. Nonetheless, overall volumes of Cardboard and Paper decreased from 2013-14, and these volumes are expected to continue to decline as digital continues to replace printed media.

During 2015-16 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.

Table 3.8 **Quantity of Cardboard & Paper (tonnes) recovered in SA during 2015-16, including estimated reporting error (tonnes & %).** *Cardboard & Waxed Paper and Magazines & Newsprint, were the dominant contributors in this sector.*

Item	Net Recovery [1]	Reporting Error	
	tonnes	tonnes	%
Cardboard & Waxed Cardboard	151,000	13,000	9%
Liquid Paperboard	1,700	230	14%
Magazines & Newsprint[2]	61,000	5,331	9%
Printing & Writing Paper	14,000	2,300	16%
Total	**227,700**	**20,900**	9%

1. Net recovery excludes re-processing losses
2. Magazines & Newsprint includes Phone Books. All three material streams were reported together for the first time in 2012-13.

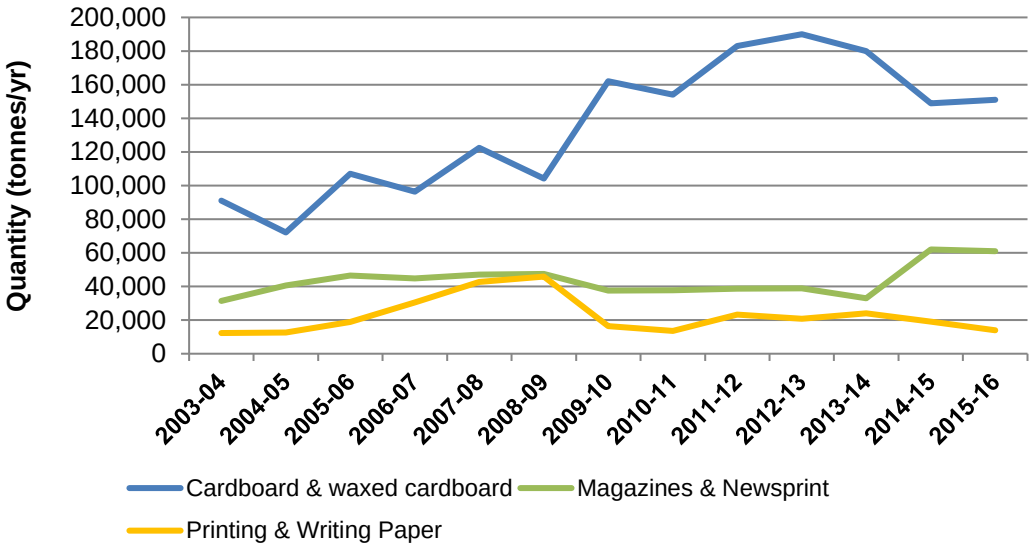

Figure 3.10 **Changes in reported Cardboard & Paper quantities since 2003-04 – Cardboard & Waxed Cardboard, Magazines & Newsprint and Printing & Writing Paper.** *There was a decline in Cardboard and Waxed Cardboard and an increase in Magazines and Newsprint due to a change in the splits of MSW Cardboard and Paper.*

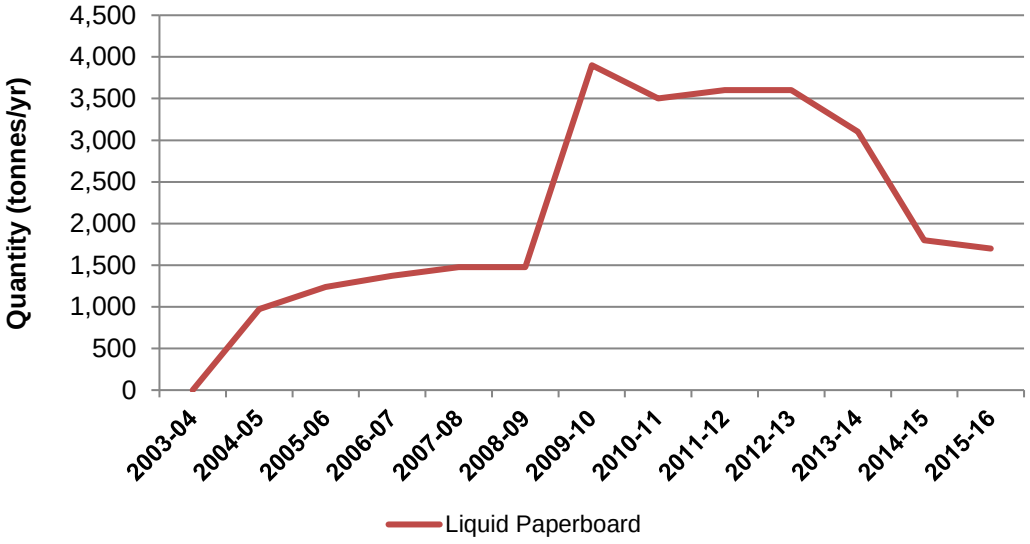

Figure 3.11 **Changes in reported Cardboard & Paper quantities since 2003-04 – Liquid Paperboard.** *Liquid Paperboard decreased slightly, predominately due to a change in splits of MSW Cardboard and Paper based on new audit data.*

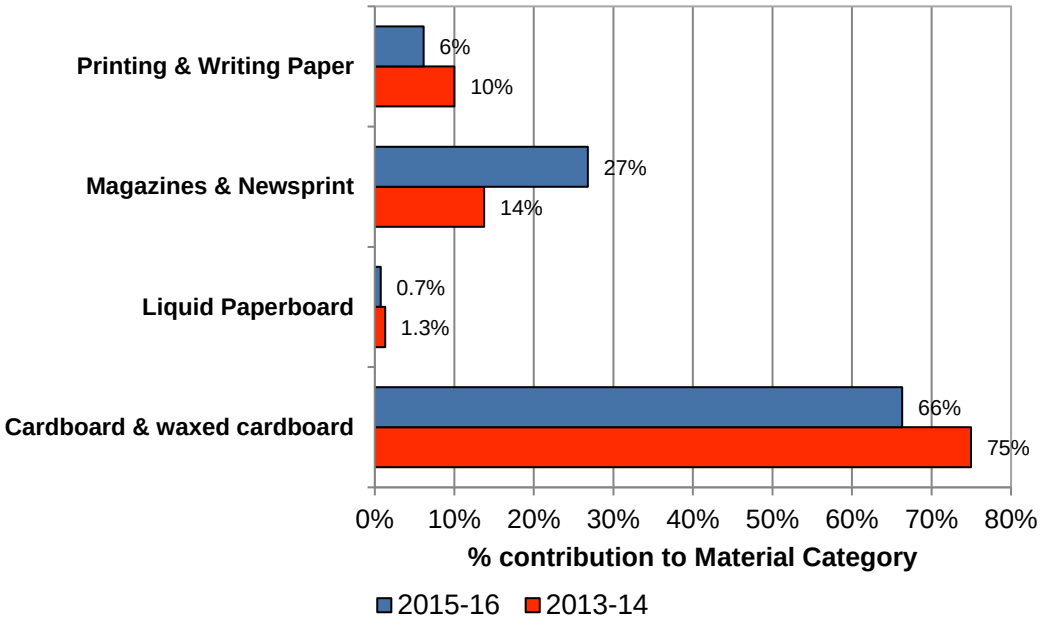

Figure 3.12 **Changes in percent composition of recovered Cardboard & Paper (by weight), SA, between 2013-14 and 2015-16.** *Relative contributions by the different material types have changed based on the updated MSW recycling audit data used for 2015-16 reporting.*

The relative contributions of each material to the Cardboard & Paper sector have changed significantly when compared to 2013-14 (Figure 3.12 above). As mentioned above, this is due to improved MSW recycling audit data which provides a more accurate estimation of the splits of each material stream. In 2015-16, Cardboard & Waxed Cardboard contributed 66% of the resource recovery, Magazines & Newsprint provided 27%, Printing & Writing Paper delivered 6%, with Liquid Paperboard at only 1%.

In 2015-16:

- C&I and Municipal sources made up 62% and 38% of reported recovered Cardboard & Paper materials respectively (Table 3.8 overleaf).
- The proportion of Cardboard & Paper sent overseas for re-processing was 44%, with the remaining 56% sent interstate (Table 3.8)
- Most Cardboard & Paper (88%) was sourced from Metropolitan SA (Table 3.8).

Table 3.8 **Sector and geographical origins and re-processing locations for recovered Cardboard & Paper in SA during 2015-16.** *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.*

Item	Sector Origin (%)			Geographical Origin (%)		Re-processing Location (%)		
	MSW	C&I	C&D	Metro	Regional	SA	Interstate	Overseas
Cardboard & Waxed Cardboard	18%	82%	0%	88%	12%	0%	45%	56%
Liquid Paperboard	98%	2%	0%	63%	37%	0%	47%	53%
Magazines & Newsprint	85%	15%	0%	90%	10%	0%	79%	21%
Printing & Writing Paper	48%	52%	0%	90%	10%	0%	86%	14%
Total	**38%**	**62%**	**0%**	**88%**	**12%**	**0%**	**56%**	**44%**

The outlook for recovery of Cardboard & Paper is expected to remain relatively stable, with a mix of favourable and unfavourable market conditions:

- The price for recovered Cardboard is at historically high levels ($220 per tonne), which is expected to be a short-term spike and reduce to previous levels within a year;
- Tightening of China's Green Fence policy is favourable to Australian processing of Paper & Cardboard;
- Electricity prices in SA are having a major impact on business costs associated with recovery of mixed Cardboard & Paper, with one organisation reporting a 120% rise in prices in the last year;
- Overall volumes of Cardboard & Paper are expected to reduce over time due to:
  - Continued reduction of Cardboard generation due to the decline in SA's manufacturing industry.
  - Expected declines in print media (e.g. Magazines and Newspapers) as digital consumption of news media rises.

3.5 Plastics

Highlights:

- *2015-16 saw a slight increase in reported quantities of recovered Plastics from 2013-14.*
- *This was due to an increase in HDPE, LDPE and Mixed Plastics. About a third of total plastic generated in SA was re-processed locally.*
- *In addition, 7,700 tonnes of plastic were imported into SA for recycling.*
- *Challenges to plastics recovery in SA include securing consistent volumes of plastics from the C&I market, high costs of complying with government regulations and the rising costs of energy.*

The total quantity of recovered Plastics reported for SA during 2015-16 was 27,900 tonnes (Table 3.9 below), which is up by 24% (or 5,400 tonnes) from 2013-14.

Mixed &/or Other Plastics constituted the majority (47%) of reported Plastics recovery followed by HDPE (17%), PET (15%), and LDPE (13%) (Figure 3.13 overleaf). All plastics recovered as individual polymers were sent for material recovery.

However, 45% (5,900 tonnes) of the Mixed Plastics recovered during 2015-16 was re-processed for energy recovery in SA (Table 3.9). In 2015-16, local re-processors imported 7,700 tonnes of Plastics into SA for resource recovery (which is additional to tonnes reported for SA in Table 3.9). All of this imported waste plastic material was in the form of already source separated polymers. The majority (44%) of this imported waste plastic was sourced from NSW. Waste plastic material was also obtained from WA (27%), Vic (27%), and Queensland (1%).

Table 3.9 **Quantity of Plastics recovered (tonnes) in SA during 2015-16, including estimated reporting error (tonnes & %).** *There was an increase in resource recovery from 2014-15, particularly for HDPE and Mixed and/or Other Plastics.*

Item	Material Recovery[1] tonnes	Energy Recovery[1] tonnes	Net Recovery[1,2] tonnes	Reporting Error tonnes	Reporting Error %
Polyethylene Terephthalate (PET)	4,200	-	4,200	840	20%
High density Polyethylene (HDPE)	4,800	-	4,800	840	18%
Polyvinyl Chloride (PVC)	300	-	300	87	29%
Low density Polyethylene (LDPE)	3,700	-	3,700	1,100	30%
Polypropylene (PP)	1,600	-	1,600	180	11%
Polystyrene (PS)	300	-	300	26	9%
Mixed &/or Other Plastics (MIX)	7,100	5,900	13,000	1,420	11%
Total	**22,000**	**5,900**	**27,900**	**4,000**	**14%**

1. Net recovery excludes re-processing losses
2. Net recovery = Material Recovery + Energy Recovery

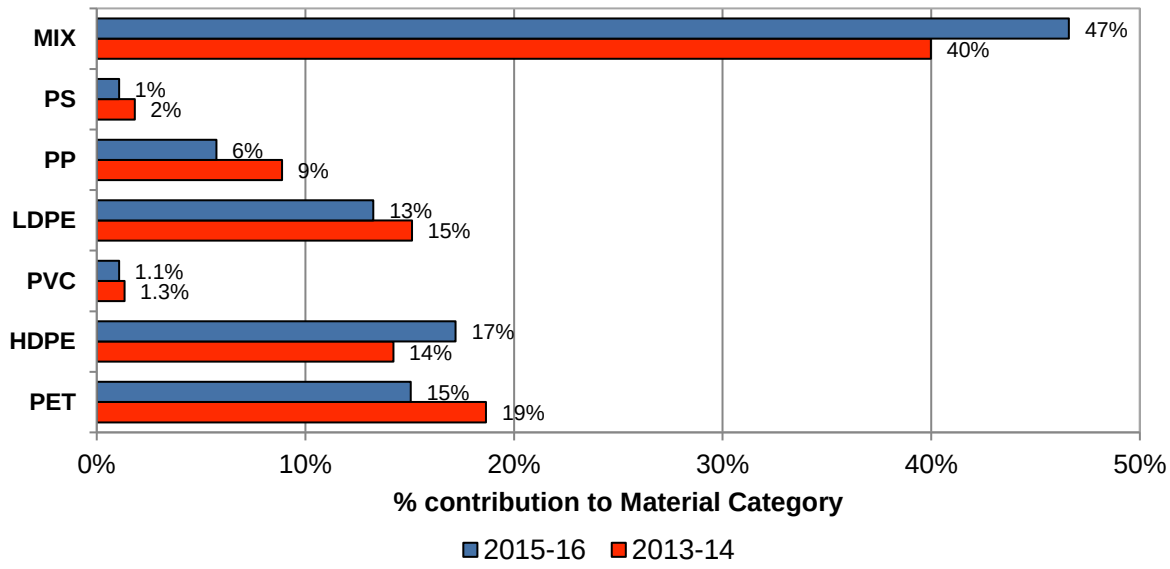

Figure 3.13 **Changes in percent composition of recovered Plastics (by weight), SA, between 2013-14 and 2015-16.** *Mixed Plastics remained a significant contributor to resource recovery at 47% of all plastics.*

The increase in Plastics recovery during 2015-16 from 2013-14 was due to increases in Mixed Plastics, HDPE and LDPE (Figures 3.14 and 3.15 overleaf):

- Mixed &/or Other Plastics was up by 44% (or 4,000 tonnes);
- HDPE increased by 50% (or 1,600 tonnes);
- LDPE also increased slightly, up 9% (or 300 tonnes);
- PET and PVC remained stable at 4,200 and 300 tonnes respectively; while
- PP decreased by 400 tonnes (or 20%) and PS decreased by 110 tonnes (or 27%).

The continued rise in Mixed Plastics appears to be due to several factors:

- There has been an increase of mixed plastics being recovered by MRF operators.
- There has been a steady increase in mixed plastics recovery from commercial and industrial businesses.

The recovery of total plastics has risen since 2003-04 (Figure 3.16), from 8,600 tonnes in 2003-04 up to 27,900 in 2015-16.

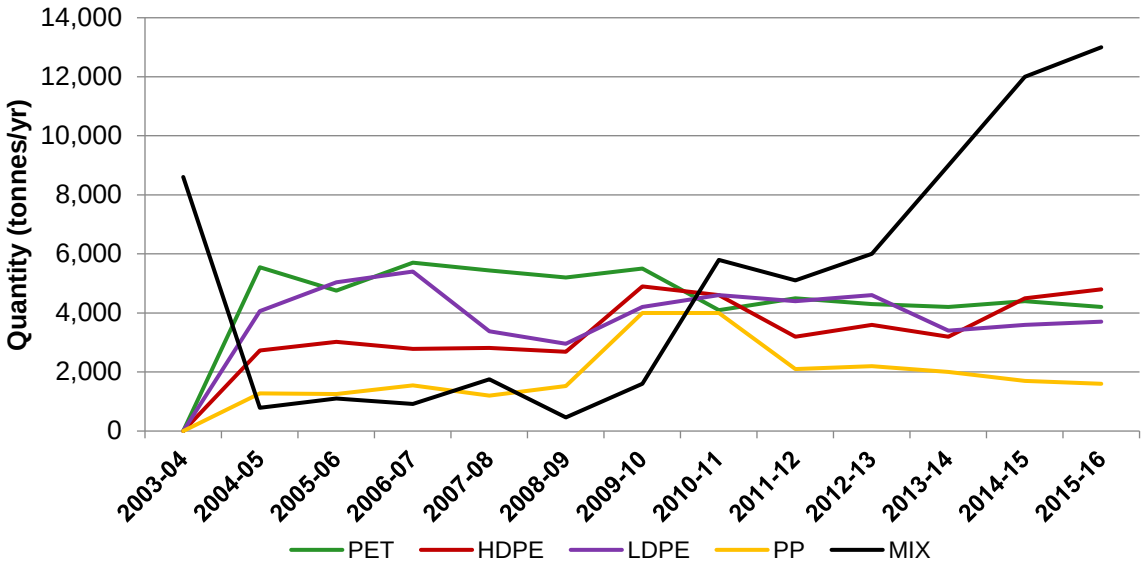

Figure 3.14 **Changes in reported Plastics quantities since 2003-04 – PET, HDPE, LDPE, PP and MIX.** *Mixed plastics remains a significant contributor to plastics recovery by weight.*

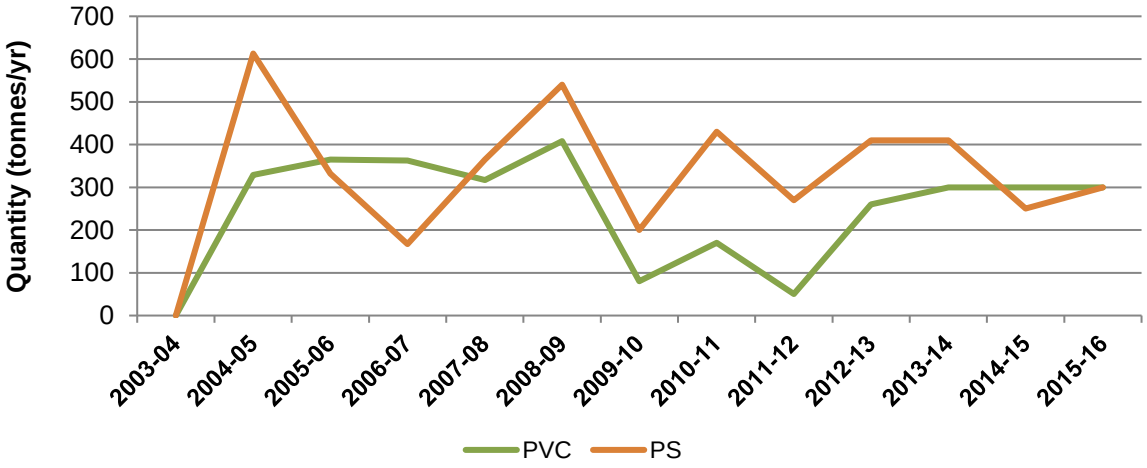

Figure 3.15 **Changes in reported Plastics quantities since 2003-04 – PVC and PS.** *PVC recovery remained stable, while PS quantities rose.*

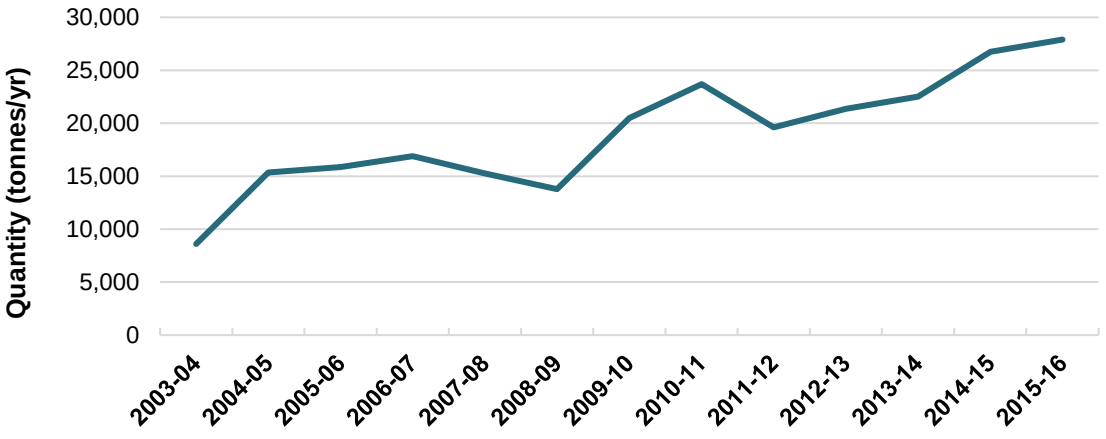

Figure 3.16 **Changes in reported Plastics quantities since 2003-04 – all Plastics.** *Overall quantity of recovered plastics rose since 2014-15, maintaining a steady upward trend over time.*

In 2015-16, C&I and C&D sources of reported recovered Plastics decreased, with C&I down to 49% compared with 60% in 2013-14, and C&D sources decreasing to 12% in 2015-16 compared to 18% in 2013-14; see Table 3.10 below). MSW increased from 22% in 2013-14 to 39% in 2015-16. Only 34% of Plastics re-processing occurred in SA in 2015-16 and this is a decrease from 2013-14 where 54% was re-processed in SA (see Table 3.10). SA re-processors continue to take all types of recovered plastic materials, with PET to a lesser extent. While this included re-processing for material recovery, a significant quantity (6,000 tonnes) was sent for re-processing into a form suitable for energy recovery in SA.

The outlook for recovery of Plastics materials in SA is expected to remain relatively stable:

- The value of PET fell significantly (down by $250 per tonne over the past 3 years), whereas LDPE packaging has increased (up by $200 per tonne);
- Local re-processors reported that high electricity and utility costs in SA continued to be a large cost to their operations;
- One major SA re-processor reported higher demand for their recovered plastic products;
- A couple of local re-processors indicated that they plan to make investments in re-processing and re-manufacturing equipment;
- The expansion of a local facility to re-process mixed plastics into fuel for energy recovery may see greater volumes of waste plastics re-processed in SA for this purpose;
- Overseas markets for recovered plastics are shifting from China to Vietnam, where labour costs are lower.

Table 3.10 **Sector and geographical origins and re-processing locations for recovered plastics in SA in 2015-16.** *The majority of plastic is recovered from the C&I and MSW sectors. Metropolitan Adelaide is the source of most plastics. There is still substantial re-processing of plastics in SA. However, this is a shift from 2013-14, where 54% was re-processed in SA and 18% interstate.*

Item	Sector Origin (%)			Geographical Origin (%)		Re-processing Location (%)		
	MSW	C&I	C&D	Metro	Regional	SA	Interstate	Overseas
Polyethylene Terephthalate (PET)	64%	36%	0%	79%	21%	1%	91%	8%
High density Polyethylene (HDPE)	54%	42%	3%	87%	13%	23%	48%	29%
Polyvinyl Chloride (PVC)	0%	100%	0%	100%	0%	97%	0%	3%
Low density Polyethylene (LDPE)	1%	99%	0%	72%	28%	34%	33%	33%
Polypropylene (PP)	4%	93%	2%	85%	15%	42%	2%	56%
Polystyrene (PS)	1%	64%	35%	93%	7%	42%	1%	57%
Mixed &/or Other Plastics (MIX)	43%	34%	23%	92%	8%	47%	38%	16%
Total	**39%**	**49%**	**12%**	**86%**	**14%**	**34%**	**44%**	**22%**

3.6 Glass

Highlights:

- *In 2015-16 the total quantity of recovered Glass increased by 14% from 2013-14.*
- *The majority of Glass was sourced from the Municipal sector and was re-processed locally.*
- *In addition, 51,000 tonnes of glass were imported to SA for re-processing.*
- *The outlook for glass is expected to remain steady and potentially strong.*

The total quantity of recovered Glass reported for SA during 2015-16 was 64,000 tonnes, which is an increase of 14% (or 8,000 tonnes) from 2013-14 (see Table 3.11 and Figure 3.17 overleaf). All of this recovered glass was packaging, including glass bottles and jars (see Section 5 for additional information on packaging).

In addition to the abovementioned tonnes, 51,000 tonnes of Glass was imported to SA in 2015-16 for re-processing. Victoria was the major source (at 39%), with NSW (32%) and overseas (13%) also providing some of this waste glass material, while 15% was from unidentified states.

During 2015-16, most Glass (66%) was recovered from Municipal sources and the remainder was from C&I (34%, see Table 3.12 overleaf). The majority (83%) of Glass was from metropolitan sources and re-processed in SA (80%), with the balance (20%) sent interstate (Table 3.12).

Between 2003-04 and 2008-09, there had been a strong upward trend for recovered Glass in SA (Figure 3.17). As identified in 2013-14, this trend, while still slightly upwards, appears to have reached a steady band (or range of variability) within which it appears to fluctuate up and down from year to year.

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

- 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.

Table 3.11 Quantity of Glass recovered (tonnes) in SA during 2015-16, including estimated reporting error (tonnes & %).

Item	Net Recovery [1]	Reporting Error	
	tonnes	tonnes	%
Glass	**64,000**	**14,000**	22%

1. Net recovery excludes re-processing losses

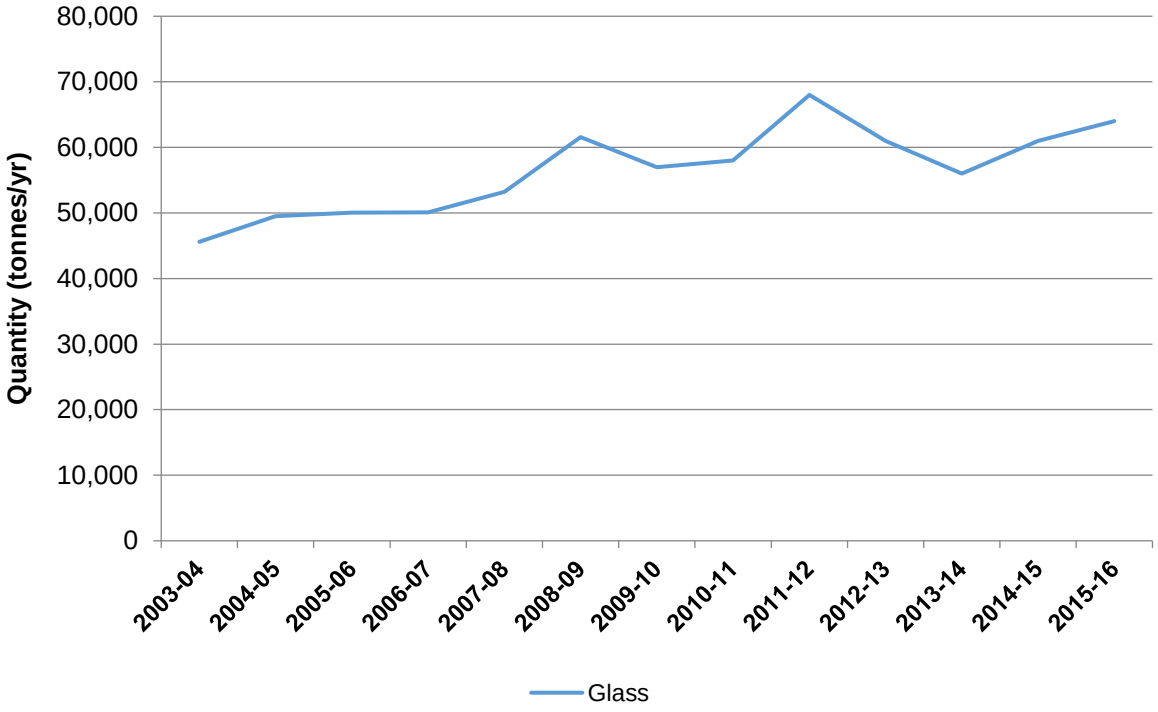

Figure 3.17 **Changes in reported Glass quantities since 2003-04 – Glass.** *Glass quantities have increased since 2013-14.*

Table 3.12 **Sector and geographical origins and re-processing locations for recovered Glass in SA in 2015-16.** *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	66%	34%	0%	83%	17%	80%	20%	0%

3.7 Other Materials

Highlights:

- *In 2015-16 the overall quantity of recovered Other Materials declined, which was largely driven by a drop in Fly Ash and Foundry Waste.*
- *Recovery of Fly Ash is continuing its downward trend, reflecting less reliance in SA on coal-fired power generation.*
- *The reduction in Foundry Waste is following the decline in SA's manufacturing and industrial activity.*

The total quantity of recovered Other Materials reported for SA during 2015-16 was approximately 157,000 tonnes (Table 3.13 below), which is down by 18% (34,000 tonnes) from 2013-14. This decrease was principally driven by:

- Fly Ash, which decreased by 12% (14,000 tonnes, see Figure 3.19 overleaf);
- Foundry Waste (down 33% or 17,000 tonnes from 2013-14, see Figure 3.18 overleaf); and
- Tyres & Other Rubber also decreased, by 2,900 tonnes or 14%.

Leather & textiles remained consistent with 2013-14. None of the waste material from this sector was used for energy production in SA, but all Tyres & Other Rubber (predominantly tyres) is believed to be exported overseas for energy recovery.

During 2015-16, up to 65,000 tonnes of Other Materials were imported into SA for resource recovery, 74% of which was from overseas. The majority of interstate imports were from Victoria (23%).

Table 3.13 **Quantity of Other Materials (tonnes) recovered in SA during 2015-16, including estimated reporting error (tonnes & %).** *All materials except Leather & Textiles have decreased since 2013-14.*

Item	Net recovery [1]	Reporting Error	
	tonnes	tonnes	%
Fly ash	100,000	1,000	1%
Foundry Waste	34,400	700	2%
Leather & textiles	4,000	1,200	30%
Tyres & other rubber	18,400	1,800	10%
Total	**156,800**	4,700	3%

1. Net recovery excludes re-processing losses

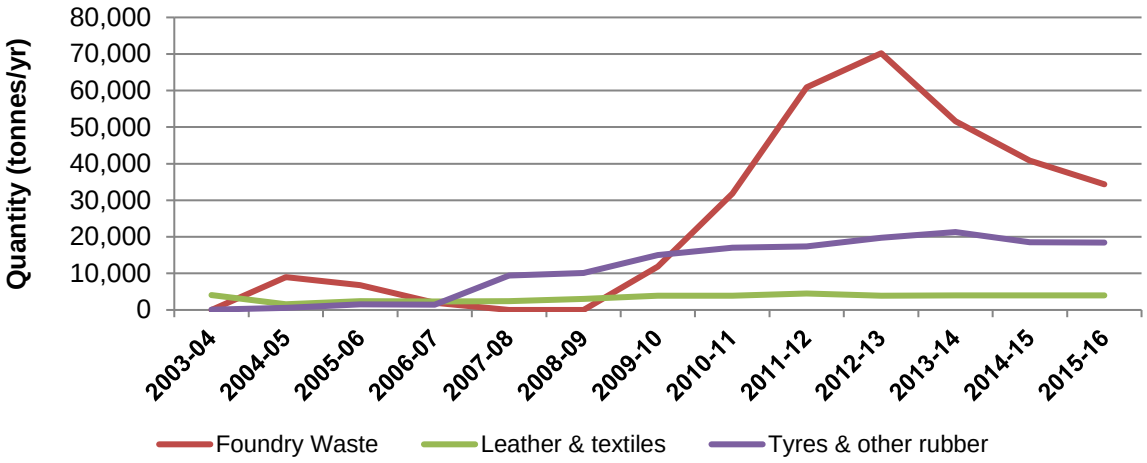

Figure 3.18 **Changes in reported Other Materials quantities since 2003-04 – Foundry Waste, Leather & Textiles, and Tyres & Other Rubber.** *Foundry Waste continues to drop, while Leather & Textiles and Tyres & Rubber remain stable.*

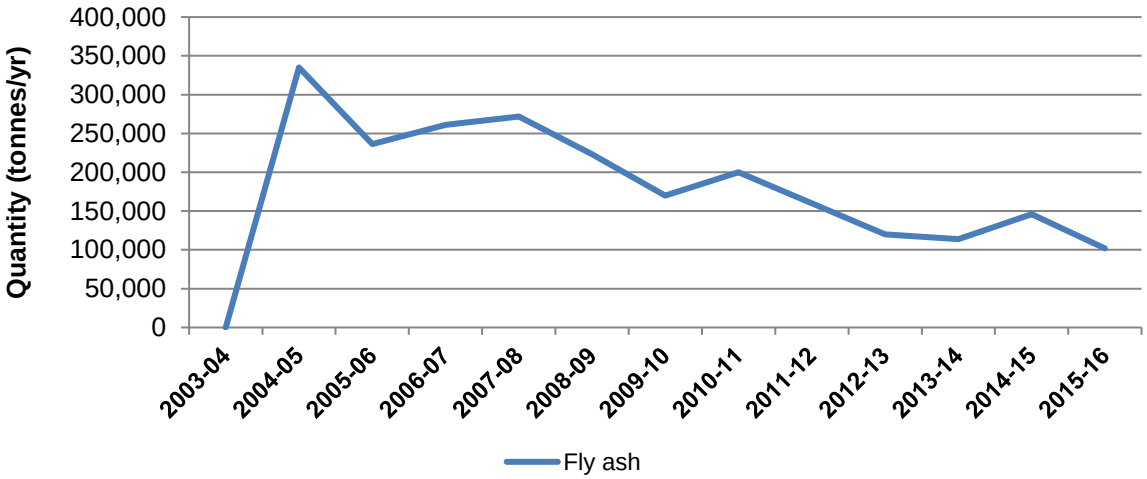

Figure 3.19 **Changes in reported Other Materials quantities since 2003-04 – Fly Ash.** *Fly Ash increased in 2014-15 but has again decreased in 2015-16 to the lowest volumes since 2003-04.*

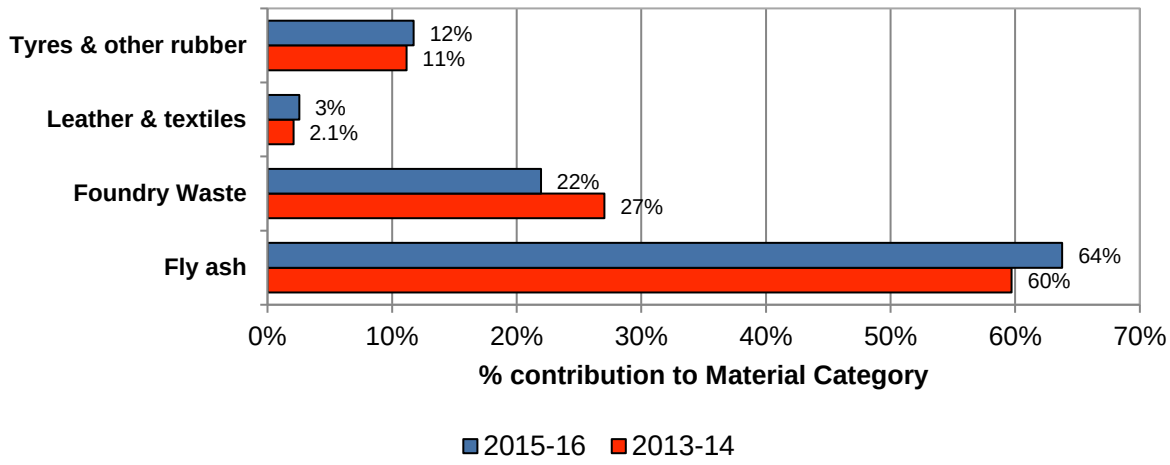

Figure 3.20 **Changes in percent composition of recovered Other Materials (by weight), SA, between 2013-14 and 2015-16.** *The relative contribution of Fly ash increased during 2015-16 and remains the largest contributor to Other Materials.*

Fly Ash continued to constitute the majority (64%) of reported Other Materials recovery followed by Foundry Waste (22%, Figure 3.20 above). Nearly all (94%) of the Other Materials in 2015-16 were collected from C&I sources (Table 3.14 below). The majority (80%) of the Other Materials were sourced from regional SA (Table 3.14), which was mostly Fly Ash from coal-fired power stations in Port Augusta, and significant quantities of Foundry Waste materials recovered from smelters in Port Pirie.

All reported Fly Ash and Foundry Waste was re-processed in SA for cement production (Table 3.14 on previous page). Most of the Leather & Textiles were sent interstate (80%) for processing into cleaning cloths.

Table 3.14 **Sector and geographical origins and re-processing locations for recovered Other Materials in SA in 2015-16.** *Most Other Materials are produced by the C&I Sector and originate in regional SA. Nearly all materials were re-processed in SA, except for Tyres & Rubber and Leather & Textiles.*

Item	Sector Origin (%)			Geographical Origin (%)		Re-processing Location (%)		
	MSW	C&I	C&D	Metro	Regional	SA	Interstate	Overseas
Fly Ash	0%	100%	0%	0%	100%	100%	0%	0%
Foundry Waste	0%	100%	0%	31%	69%	100%	0%	0%
Leather & Textiles	18%	82%	0%	91%	9%	0%	80%	20%
Tyres & Other Rubber	53%	47%	0%	92%	8%	0%	6%	94%
Total	**7%**	**93%**	**0%**	**20%**	**80%**	**86%**	**3%**	**11%**

Nearly two thirds of Tyres & Rubber were pre-shredded or crumbed in SA, with the remainder of this material sent interstate or overseas as whole tyres. None of this pre-shredded or crumbed waste material, however, was further re-processed locally, with final destinations reported as interstate for material recovery (9%) as rubber mats or export overseas for energy recovery (91%).

The outlook for future resource recovery in the Other Materials sector is expected to be one of decline, which will be affected by on-going reductions in two key material categories:

- The recovery of Foundry Waste is expected to decrease in line with reduced manufacturing and industrial activity in SA.
- Fly Ash is expected to reduce to close to zero in the next period due to the closure of the coal-fired Port Augusta Power Station in May 2016. As a consequence, local cement manufacturers that have traditionally recycled these waste materials as part of their products are now importing substitute waste materials from interstate and/or overseas for this purpose.
- Tyre recyclers indicated that there is no growth in the market for tyre consumption and therefore the recovered tyre quantities are likely to remain steady.

4 Electronic and Electrical Waste

At a glance:

- *This section of the report assesses the newly emerging area of resource recovery for Electronic and Electrical waste (E-waste) in SA and compares to the 2013-14 financial year.*
- *The total volumes of recovered E-waste reduced by 36%, because of lower volumes of TVs / monitors. This may be due to reduced weight of these items, as well as fewer CRT televisions presented for recycling with most CRTs recovered in previous years during the digital switchover. The reduction in E-waste volumes may also be due to reduced promotion of the product stewardship scheme for computer and TVs.*
- *Most material (76%) continues to be reprocessed in SA through manual disassembly into constitute parts.*

The total quantity of recovered E-waste reported for SA during 2015-16 was approximately 4,850 tonnes (Table 4.1 below), which is down by 36% from 2013-14 (which was 7,600 tonnes).

A large proportion of the decrease from 2013-14 was from Televisions and Monitors (decrease of 2,400 tonnes or 50%). There were also slight decreases in Printer Cartridges (39% or 90 tonnes), Other E-Waste (20% or 100 tonnes) and Computers (10% or 200 tonnes), while Batteries and Compact Fluorescent Lamps increased by 20 tonnes and 10 tonnes respectively.

The substantial decrease in Televisions/ Monitors could be due to:

- Reduced weight of the items presented for recycling, particularly televisions and monitors;
- Reduced number of Cathode Ray Tube (CRT) televisions presented for recycling, with most of these units already replaced with digital televisions in previous years during the digital switchover, and
- Reduced promotion of the product stewardship scheme for Computers and TVs.

Table 4.1 **Changes in reported quantities of E-waste between 2013-14 and 2015-16.** *TVs/Monitors and Computers were major contributors to E-waste recovery in SA.*

Item	2015-16	2013-14	% change 13-14 to 15-16
Printer Cartridges	140	230	-39%
Compact Fluorescent Lamps	60	50	20%
Batteries	40	20	100%
Computers	1,800	2,000	-10%
Televisions / Monitors	2,400	4,800	-50%
Mobile Phones	6	6	0%
Other E-waste	400	500	-20%
Total	**4,850**[2]	**7,606**	**-36%**

1. Net recovery excludes re-processing losses
2. This value has a reporting error of 320 tonnes (+/-7%).

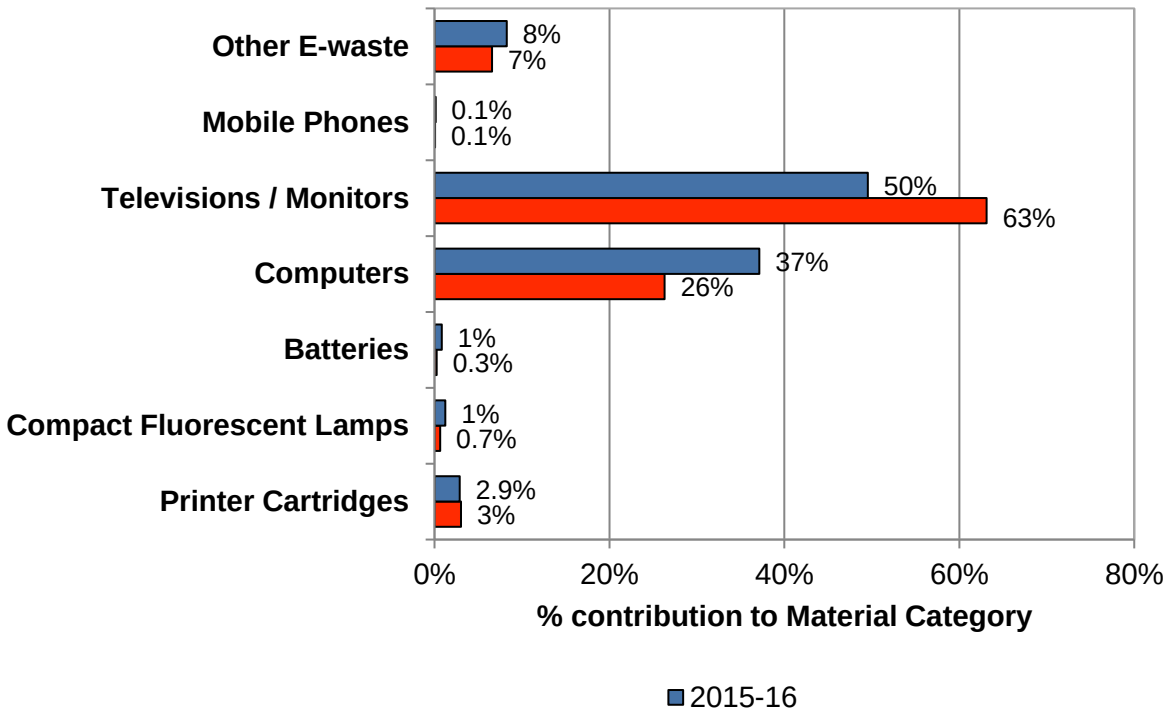

Figure 4.1 **Changes in percent composition of recovered E-waste (by weight), SA, between 2013-14 and 2015-16.** *Although there has been a significant decrease in TVs/Monitors, they remain the major contributors to E-waste in SA, along with Computers.*

Changes in the composition of received E-Waste with 2013-14 were seen in Televisions/ Monitors (down to 50% contribution), Computers (up to 37%) and Batteries (up to 1%). Despite these changes, in 2015-16, the major E-waste constituents by weight remained as Televisions/ Monitors and Computers (Figure 4.1 above). Most E-waste (61%) during 2015-16 was sourced from MSW sources, which is lower than 2013-14 (83%). C&I made up the balance in SA (39% in 2015-16).

Table 2.4 also shows that 25% of E-waste volumes was recovered from regional sources, with the balance (75%) from metropolitan SA. The destination for 76% of E-waste materials was reported as SA, with the rest sent interstate (Table 4.2). This does not necessarily involve re-processing of the materials as it 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 was not possible to accurately discern the ultimate re-processing destination for these materials.

Table 4.2 **Sector and geographical origins and re-processing locations for recovered E-waste in SA in 2015-16.** *MSW remains the dominant source sector while C&I has increased to 39%, 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	61%	39%	0%	75%	25%	76%	24%	0%

The recovery of E-waste is anticipated to further increase as additional computers and televisions are recovered through the End-Of-Life (EOL) National TV/Computer Recycling Scheme. 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). However, while the volume may increase, the overall weight may not change significantly, due to electronic waste weighing less per unit.

In 2015-16, the recycling target for industry was 50% (which will rise to 80% by 2026-27). State, territory and/or local governments are responsible for the remainder of the waste (e.g. 50% in 2015-16).

Presently, there is no requirement for how governments should deal with the remainder of the EOL TV/Computer E-waste (not handled by industry under the scheme) and it may be dealt with as deemed appropriate in each jurisdiction. For SA, a landfill ban has been implemented on E-Waste. Consequently, there needs to be alternative disposal options made available to the community for EOL TV/Computer E-waste disposal falling outside the industry recycling target, otherwise there could be risks of incorrect or inappropriate disposal. An ongoing challenge for future E-waste recovery is therefore to ensure that these alternative options exist and that the public is educated about these options and is encouraged to use them.

Figure 4.2 overleaf shows the trends for each E-Waste stream from 2009-10. This displays the televisions/ monitors trend highlighted earlier, which has decreased significantly since 2013-14. Computers and Other E-waste have increased since 2009-10 despite decreasing since 2013-14.

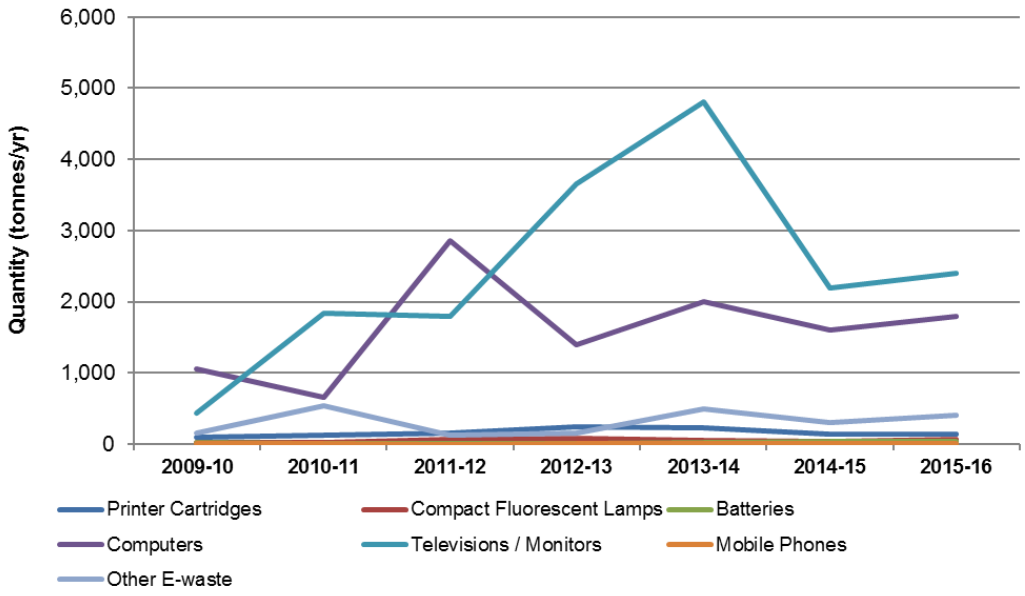

Figure 4.2 **Changes in quantities of recovered E-waste (by weight), SA, between 2009-10 and 2015-16.** Although there has been a significant decrease in TVs/Monitors, they remain the major contributors to E-waste in SA, along with Computers.

5 Packaging Materials

At a glance:

- *This report section specifically assesses resource recovery of packaging waste materials in SA, including for SA's Container Deposit scheme.*
- *2015-16 saw a slight decrease in the recovery of packaging materials in SA, down by 4.9% from 2013-14.*
- *The main contributor to this decline was reductions in cardboard packaging, which is due to improved reporting rather than an actual decline in cardboard packaging volumes.*
- *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 228,300 tonnes, of which 43,100 tonnes (19%) was recovered through SA's container deposit scheme, and 185,200 tonnes (81%) was recovered from other sources (Table 5.1 overleaf). Data is compared to 2013-14 (as a packaging analysis was not conducted in 2014-15). The 2015-16 outcome is a decrease of 4.9% or 11,100 tonnes from 2013-14's reported packaging recovery. A number of packaging material streams recorded reductions from 2013-14 to 2015-16:

- Cardboard packaging decreased by 19% (or 26,000 tonnes), which is due to improved reporting of this material, based on updated MSW audit data. This has influenced the packaging results from 2013-14 and without this change, overall packaging would have increased;
- LDPE was down by 17% (or 500 tonnes);
- Liquid paperboard decreased by 87% (or 1,300 tonnes, although note that this was due to a change in reporting of the material, based on updated MSW audit data);
- Polystyrene also decreased slightly and PVC reduced from 15 tonnes to 0 tonnes.

Some packaging materials did experience increases, including: Steel cans (up 36% or 770 tonnes), HDPE (up 77% or 2,907 tonnes), Polypropylene (from 0 tonnes in 2013-14 to 760 tonnes in 2015-16, which is mainly due to a company reporting this as packaging in the 2015-16 survey), Glass (13% or 8,000 tonnes), and Other Plastics Packaging (up 40% or 3,700 tonnes). The quantities of Aluminium cans and PET generally remained steady.

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 2015-16:

- Glass packaging was 100% of total glass recycling activity reported;
- PET packaging was 100% of total PET recycling activity;
- Cardboard packaging was 90% of the total amount of cardboard recycling activity;
- Liquid Paperboard packaging was 88% of total Liquid Paperboard recycling activity; and
- LDPE packaging was 79% of all recovered LDPE.

Table 5.1 **Estimated packaging recovery, SA 2015-16**. *Cardboard and glass remain dominant contributors to packaging recovery. Packaging constitutes significant proportions of resource recovery for some materials, such as PET, LDPE, glass, cardboard and LPB.*

Packaging Material	Origin (tonnes)		Total packaging (tonnes)	Packaging as a proportion of total material recovered
	CDL [1]	Other		
Steel Cans		2,150	2,150	0.9%
Aluminium Cans	3,700	40	3,740	21%
Cardboard Packaging		136,000	136,000	90%
Liquid Paperboard Cartons	700	1000	1,700	100%
PET Packaging	3,900	295	4,195	100%
HDPE Packaging	230	3,527	3,757	78%
LDPE Packaging		2,906	2,906	79%
Polypropylene Packaging		760	760	48%
Polystyrene Packaging		132	132	44%
Other Plastics Packaging		9,181	9,181	71%
Glass bottles & Jars	34,600	29,400	64,000	100%
Total	**43,130**	**185,192**	**228,892**	

1. Data provided by the South Australian Environmental Protection Authority.

5.2 Container Deposits

SA is one of two Australian states or territories (although this will be increasing in the coming years) to have a container deposit system for return of recyclable beverage bottles and cans.

In 2015-16, 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 78% (by weight) from approximately 728 million containers (estimated as sold in SA during 2015-16). This return rate remains high. However, it is lower than the return rate of 84% 2013-14.

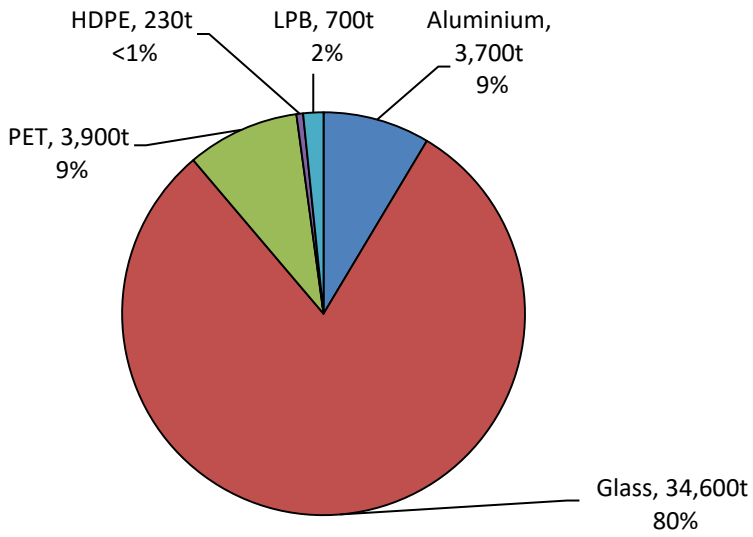

Figure 5.1 **Relative proportions of returned recycled deposit containers (by weight), SA 2015-16.** *Glass is the major contributor by weight.*

Table 5.2 **Return rates for recycled deposit containers, SA 2015-16.** *Although slightly lower than 2013-14, SA continues to achieve high return rates of recycled deposit containers.*

Material	Recovered (tonnes)	Return rate (%)
Aluminium	3,700	84%
Glass	34,600	79%
PET	3,900	65%
HDPE	230	61%
LPB	700	66%
Total	**43,130**	**78%**

5.3 Other Packaging Materials

Other packaging material is collected through routes such as kerbside recycling and commercial collections.

Cardboard (74%) and Glass (16%) materials were the dominant contributors to resource recovery of other packaging materials, followed by Other Plastics packaging (5%), and all others contributing 3% or less to overall packaging materials by weight.

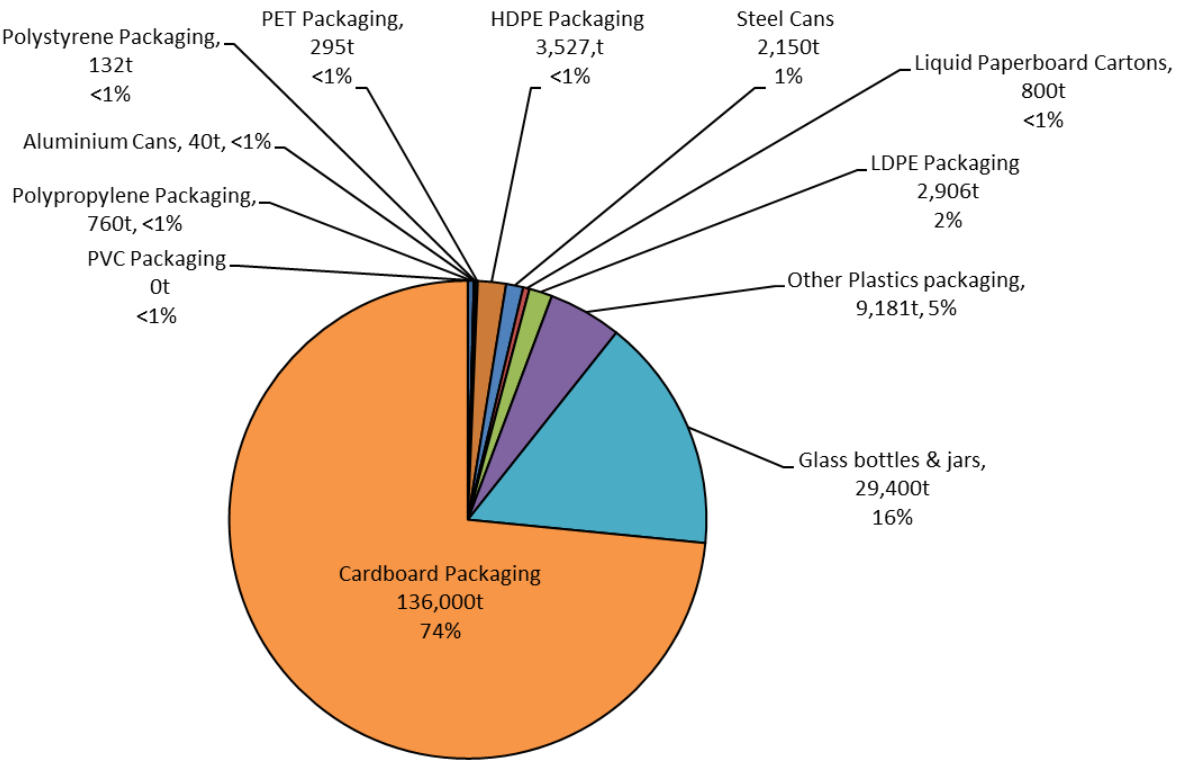

Figure 5.2 **Relative proportions of recovered other packaging materials by weight, SA 2015-16.**
Cardboard and Glass materials are the major contributors to recovery for other packaging materials. Plastics materials overall were a significant contributor to recovery for other packaging materials at 9% of all packaging materials. Other Plastics packaging increased from 3% in 2013-14 to 5% in 2015-16.

6 Resource Recovery Value

At a glance:

- *This section quantifies the resource value of recovered materials reported in 2015-16.*
- *The resource value of recovered materials in 2015-16 was estimated at $203 million.*
- *Metals remained the major contributor to this value comprising 32% or $64 million, although this is significantly lower than the 2013-14 Metals value of $141 million.*
- *The average resource value for recovered materials was $52 per tonne.*

Based on the quantities reported during this year's Recycling Activity survey, the estimated value of resource recovery for SA during 2015-16 was $203 million, or $52 for each tonne of resource recovered on average (Table 6.1 overleaf).

The major contributor to this resource recovery valuation (at 32%) was Metals (Figure 6.2 overleaf), of which the commodity value has reduced significantly since the last reported period. The next most significant contributors to resource recovery value were Cardboard & Paper (at 25%) and Organics (at 19%).

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;
- Regulatory environment; and
- Local waste management and resource recovery practices.

Price and/or value assumptions are therefore usually based on highly aggregated average prices to consider all of these factors. The resource value estimate presented in this report is therefore an approximation only.

Table 6.1 **Assumed market values, quantities and estimated resource value for resource recovered material, 2015-16 [(a)].**

Material category	Resource recovery (tonnes)	Estimated on-sale price[(a)] ($/tonne)	Estimated Resource Value ($ millions)	Price data source[(a)]:
Masonry	1,204,400	$15	$18.1	Based on publicly available price lists
Metals	267,000	$240	$64.1	Based on industry consultations Oct 2016
Organics	1,105,900	$35	$38.7	Based on publicly available price lists
Cardboard & Paper	227,700	$220	$50.1	Based on industry consultations Oct 2016
Plastics	27,900	$400	$11.2	Based on industry consultations Oct 2016
Glass	64,000	$90	$5.8	Authors' estimate
Other Materials	56,800	$10	$0.6	Authors' estimate
Separately Reported Materials & Clean Fill	960,000	$15	$14.4	Authors' estimate
TOTAL ALL Materials	3,910,000	$52	$202.8	

Notes:

(a) Refer to Survey Methodology in Appendix 1 for additional information on resource recovery value assumptions and methodology.

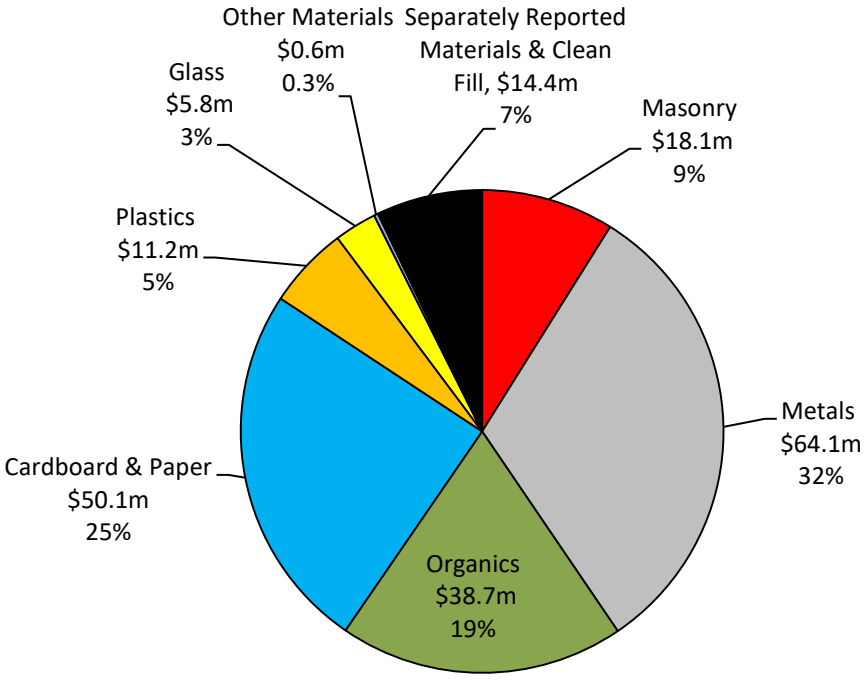

Figure 6.1 **Estimated market value of resource recovered materials in SA from the 2015-16 Recycling Activity Survey**

Figure 6.2 includes the estimated market value of resource recovered materials in SA from 2012-13 to 2015-16. As can be seen in this Figure, the overall value of materials has declined from almost $300M in 2012-13 to just over $200M in 2015-16. This is predominately due to a decline in the market value of metal, from a decrease in metal prices in combination with a reduction in recovered metal volumes. The overall market value of the remaining materials has remained steady or increased slightly since 2012-13.

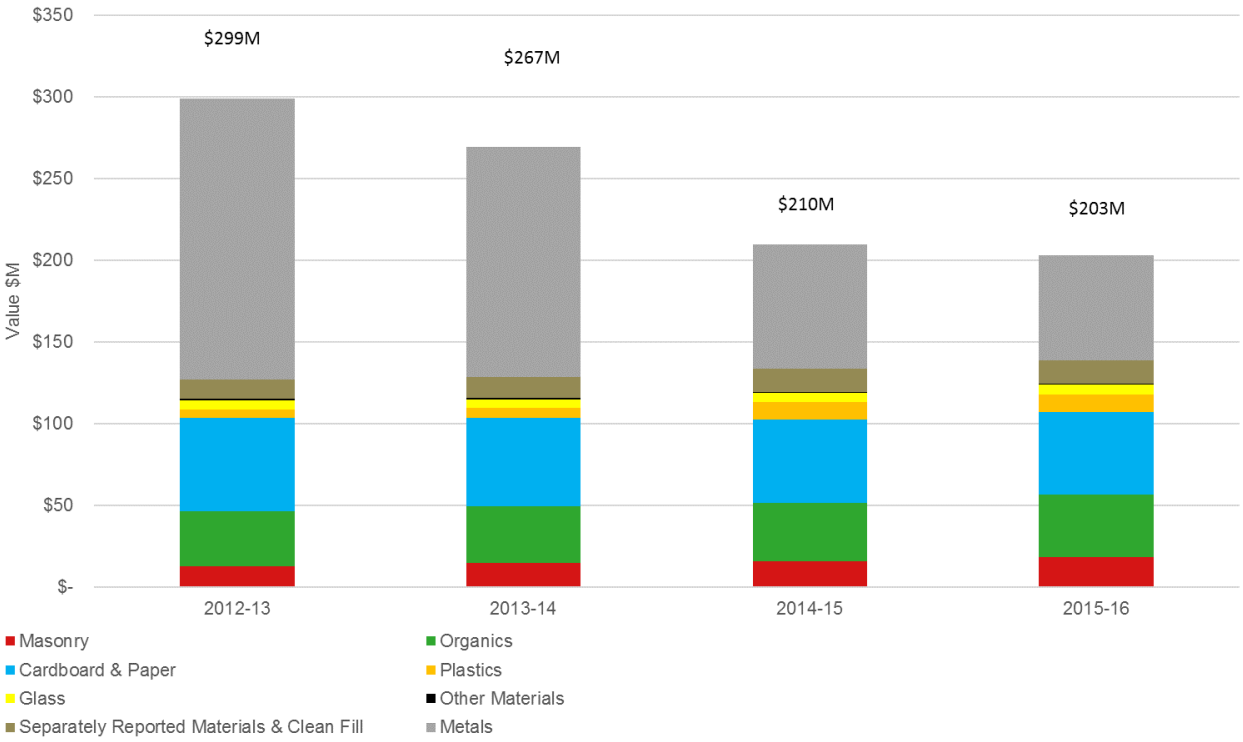

Figure 6.2 Estimated market value of resource recovered materials in SA, 2012-13 to 2015-16

7 Environmental Benefits of Recycling

At a glance:

- *This section quantifies the following environmental benefits of recycling based on the material data collected for the 2015-16 recycling activity survey using the conversion and emission factors given in Appendix 4.*
- *The environmental benefits have been calculated for each material except E-waste and reuse items.*
- *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** – 1.18 million tonnes of CO2-e*
  - ***Cumulative Energy Demand saved** – 15,130 TeraJoules (TJ)*
  - ***Water Savings** – 12,720 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 2015-16 is about 1.18 million tonnes of CO_2-e (Tables 7.1 and 7.2 and Figure 7.1 on following pages). Again, as the 2014-15 greenhouse gas savings were not calculated, comparisons with 2013-14 are made.

- This is an increase of about 6% on the value reported for 2013-14.
- Metals (at 40%) generated the substantive part of the estimated greenhouse gas savings, followed by Organics (at 36%), Masonry (9%) and Cardboard & paper (7%). This is in line with findings from the 2013-14 survey.
- These greenhouse gas savings are considered approximately equivalent to:
  - About 1.8 million trees that would have to be planted to absorb the same amount of CO_2.
  - The greenhouse gas emissions that 271,900 cars would produce in a year[7].
- The greenhouse gas savings from SA recycling, 2015-16 equate to:
  - Approx. 17% of SA's total Community sector GHG emissions in 2011[8]

[7] 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)

[8] 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 2013).

Table 7.1 Estimated environmental benefits as a result of recycling in SA, 2015-16[(a)]

	Material	Material Quantity tonnes	GHG Emissions Saved[(a)] tonnes CO2-e	Energy Saved[(a)] TJ LHV	Water Saved[(a)] ML
	Masonry				
1	Asphalt	210,000	3,300	430	180
2	Bricks	53,000	500	10	70
3	Concrete	940,000	27,300	520	1,200
4	Plasterboard	1,400	66	320	-40
5, 6	Clay, fines, rubble & soil	860,000	74,400	580	370
	Metals				
7	Steel	230,000	141,500	1,830	-540
8	Aluminium	18,000	265,900	3,080	3,270
9	Non-ferrous metals	19,000	64,500	690	110
	Organics				
10	Food Organics	7,900	4,100	10	6
11	Garden Organics	255,000	58,800	120	120
12	Timber	273,000	89,700	360	150
13, 14, 15, 16	Organics - Other	570,000	274,200	1,230	130
	Cardboard & paper				
17	Cardboard & waxed cardboard	151,000	45,900	1,890	4,990
18	Liquid Paperboard	1,700	1,100	20	30
19, 20, 21	Magazines & Newspaper	61,000	28,300	550	1,350
22	Printing & Writing Paper	14,000	8,100	180	440
	Plastics				
23	Polyethylene terephthalate	4,200	4,300	210	-90
24	High density polyethylene	4,800	3,300	270	-20
25	Polyvinyl chloride	300	500	10	20
26	Low density polyethylene	3,700	2,600	210	-10
27	Polypropylene	1,600	2,600	90	-20
28	Polystyrene	300	400	20	-10
29	Mixed &/or Other plastics	13,000	17,700	790	-230
	Glass				
30	Glass	64,000	38,200	410	150
	Other Materials				
39	Fly Ash	100,000	2,900	60	130
40	Foundry Waste	34,400			
41	Leather & Textiles	4,000			
42	Tyres & Other Rubber	18,400	21,800	1,240	960
	Total	**3,910,000**	**1,182,000**	**15,130**	**12,720**

Notes:

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

Table 7.2 Estimated greenhouse gas savings as a result of recycling in SA, 2015-16[(a)]

Sector Origin	GHG Emissions Saved[(a)] tonnes CO2-e	Equivalent trees planted required for carbon absorption[(a)]	Equivalent cars off the road (1 year) [(a)]
Masonry	105,600	158,000	24,300
Metals	471,900	705,000	108,500
Organics	426,800	638,000	98,200
Cardboard & paper	83,400	125,000	19,200
Plastics	31,400	47,000	7,200
Glass	38,200	57,000	8,800
Other Material	24,800	37,000	5,700
Total	1,182,000	1,767,000	271,900

Notes:

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

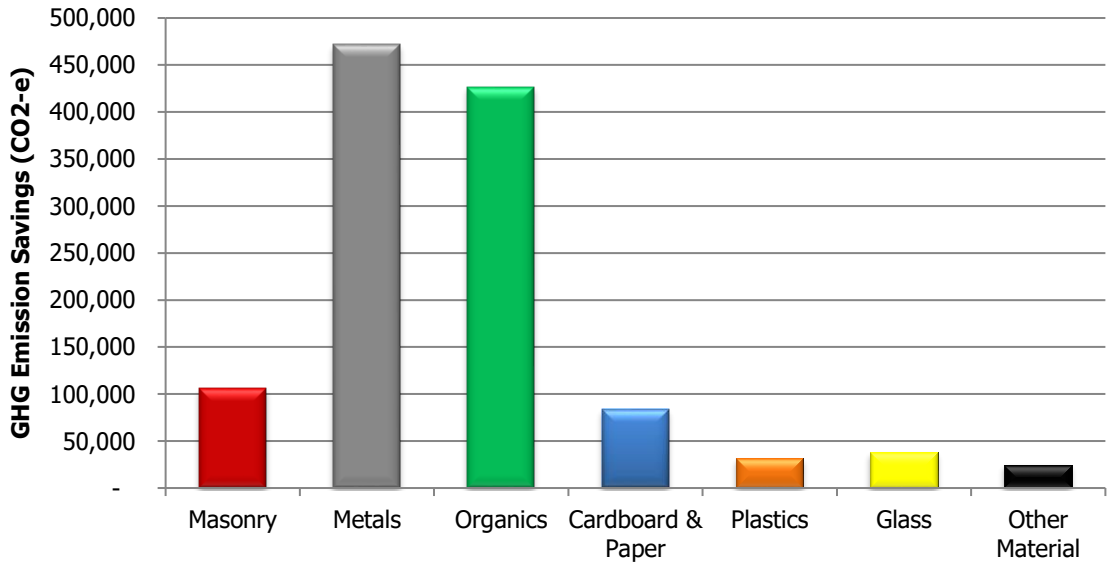

Figure 7.1 Avoided greenhouse gas emissions (by material category), as a result of recycling in SA 2015-16

7.2 Energy Savings

The total projected energy savings (in Terajoules or TJ[9]) from recycling in SA during 2015-16 was about 15,100 TJ (Table 7.1 above and Table 7.3 below & Figure 7.2 overleaf).

- Metals contribute 37% 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.
- Similarly, plastics contribute to nearly 11% of energy savings even though it is only 1% of total resource recovery.
- After Metals, Cardboard & Paper (at 17%) is the next most significant contributor to energy savings, followed by Masonry at 12%.
- These energy savings are considered approximately equivalent to:
  - Energy use by 294,400 average households in one year[10].
  - The energy supplied by 2.7 million barrels of oil.
- The energy savings from SA's recycling activity during 2015-16 equate to:
  - Approximately 4.6% of SA's total energy consumption reported for 2014-15[11].

Table 7.3 Estimated energy savings as a result of recycling in SA, 2015-16(a)

Sector Origin	Energy Saved TJ LHV	Equivalent households (1 year) (a)	Barrel of Oil Equivalents (BOE) (a)
Masonry	1,860	36,200	326,000
Metals	5,600	108,900	982,000
Organics	1,720	33,500	302,000
Cardboard & paper	2,640	51,400	463,000
Plastics	1,600	31,100	281,000
Glass	410	8,000	72,000
Other Material	1,300	25,300	228,000
Total	15,130	294,400	2,654,000

Notes:

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

[9] 1 Terajoule or TJ = 10^{12} Joules (J) = 1,000 Gigajoules (GJ)

[10] Average household energy use value ≈ 51.4 GJ/yr; Source: National Appliance and Equipment Energy Efficiency Committee (1998)

[11] Source: 2016 Australian Energy Update (Australian Government Bureau of Resources and Energy Economics, 2016).

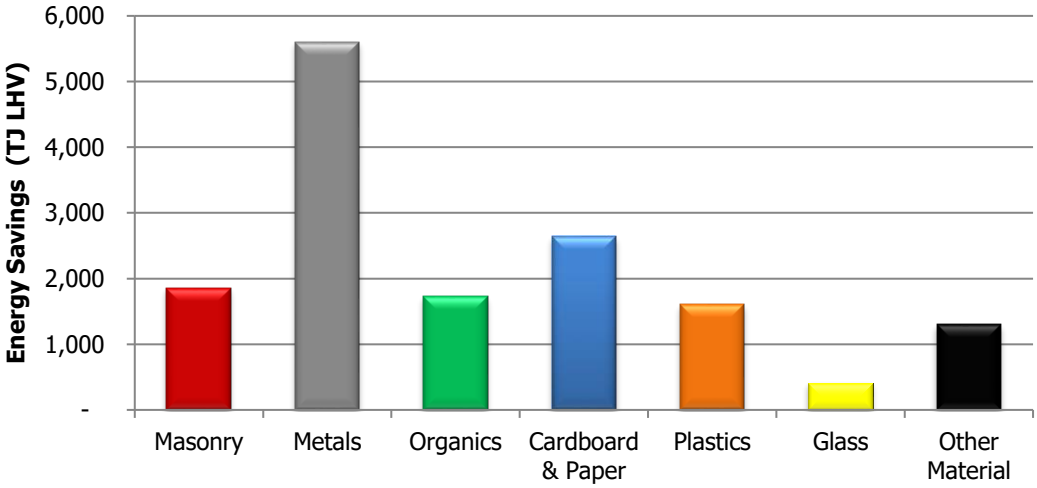

Figure 7.2 **Avoided energy consumption (by material category) as a result of recycling in SA, 2015-16**

7.3 Water savings

The total projected water savings (in Megalitres or ML[12]) from recycling in SA during 2015-16 was approximately 12,716 ML (Table 7.1 and Table 7.4 and Figure 7.3 overleaf).

- Cardboard & Paper contributes most significantly (at 54%) to water savings achieved from recycling (see Figure 7.3 overleaf) as manufacture of virgin cardboard and paper materials consumes large volumes of water.
- Metals are also a significant contributor at 22%. These water savings principally result from recycling of aluminium which consumes substantial quantities of water in its manufacturing process.
- Recycling of some plastics actually consume more water than they save.
- The overall water savings for SA's recycling activity during 2015-16 are considered approximately equivalent to:
  - Water use by about 66,940 average Adelaide households in one year[13].
  - The water contained in about 5,090 Olympic-sized swimming pools[14].
- The water savings from SA's recycling activity in 2015-16 equate to:
  - 6% of Metropolitan Adelaide's total water consumption reported for 2015-16[15].

[12] 1 Megalitre or ML = 10^6 Litres (J) = 1,000 kilolitres (kL)

[13] Average household water consumption value ≈ 190 kL/yr; Source: SA Government (2009)

[14] Olympic-sized pool value ≈ 2,500 kL/yr

[15] Source: South Australian Water Corporation Annual Report: For the year ending 30 June 2016 (SA Water (2016)).

Table 7.4 Estimated water savings as a result of recycling in SA, 2015-16[(a)]

Sector Origin	Water saved ML	Equivalent households (1 year) [(a)]	Olympic Swimming Pools[(a)]
Masonry	1,780	9,370	710
Metals	2,840	14,950	1,140
Organics	406	2,140	160
Cardboard & paper	6,810	35,840	2,720
Plastics	-360	-1,890	-140
Glass	150	790	60
Other Material	1,090	5,740	440
Total	12,716	66,940	5,090

Notes:

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

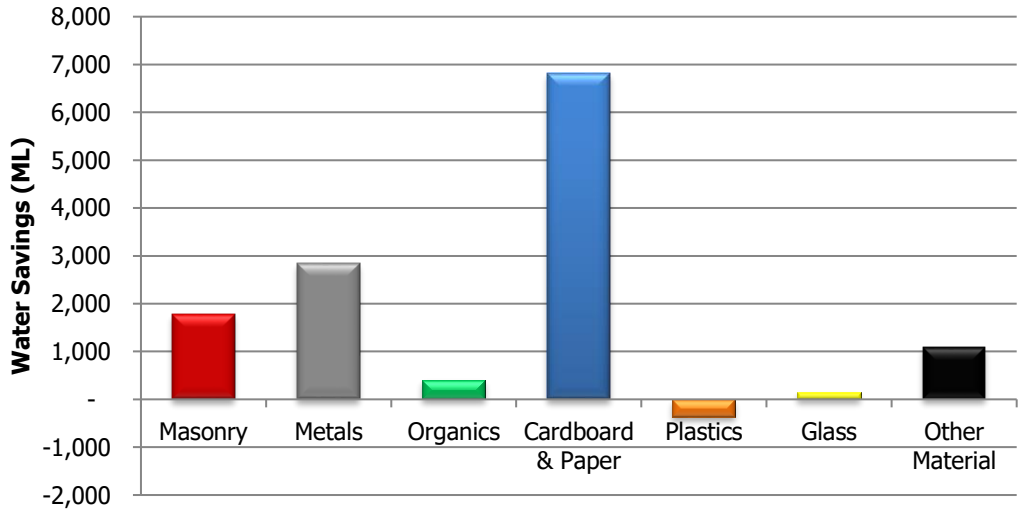

Figure 7.3 Avoided water consumption (by material category) as a result of recycling in SA, 2015-16

8 Acknowledgements

Green Industries SA and Rawtec would like to recognise and thank the following participants in the 2015-16 SA Recycling Activity Survey. The list below does not indicate all organisations who participated in the survey but those that agreed to be recognised.

- *A&V Contractors*
- *Accolade Wines*
- *Adelaide Brighton Cement*
- *Adelaide City Council Greenwaste Recycling Facility*
- *Adelaide Hills Recycling*
- *Adelaide Hills Region Waste Management Authority*
- *Advanced Plastic Recycling*
- *Aspitech*
- *BioGrow*
- *Boral Resources (SA)*
- *Ceduna Recycling*
- *Cleanaway*
- *Close the Loop*
- *CMA Ecocycle*
- *Coolfoam*
- *Department for Education and Child Development, Computer Recycling Scheme*
- *Department of Planning, Transport and Infrastructure*
- *Distribution 360*
- *Downer Group*
- *E-Cycle Recovery*
- *Foamex*
- *General Recyclers*
- *Intercast & Forge*
- *Kuchel Contractors*
- *Master Butchers SA*
- *MobileMuster*
- *MRI (Aust)*
- *Nippys*
- *Normetals*
- *Norske Skog Paper Mills (Australia)*
- *O-I Asia Pacific*
- *Onesteel recycling*
- *Orora Recycling*
- *Peats Soil & Garden Suppliers*
- *Plastics Granulating Services*
- *Port Lincoln Council/DK Quarries*
- *Potters Industries*
- *ResourceCo*
- *SA Water*
- *Sims Metal Management*
- *Suez Australia*
- *SKM Recycling*
- *Southern Region Waste Resource Authority*
- *St Vincent De Paul Society (SA)*
- *Statewide Recycling*
- *Tarac Technologies*
- *Thomas Foods International*
- *Topcoat Asphalt*
- *Toxfree Solutions*
- *Trident Plastics*
- *Visy Recycling*
- *Whyalla City Council*
- *YCA Recycling*

9 Glossary[16]

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.
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 (CO2), 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", Dept 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.

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

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
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 clothes

Material	Source products	End Products
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.	Printing and writing paper
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
Magazines	Magazines Pre-consumer waste and post-consumer magazine material	Composted soil conditioners, potting mixes and mulches
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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13 Document Status

Revision	Date	Prepared by	Checked by	Approved by
Draft	31/1/17	M. Allan, K. Heinrich, M Rawson	M. Rawson	M. Rawson
Final Report V1	23/2/17	M. Allan, K. Heinrich, M Rawson	M. Rawson	M. Rawson
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11 Paringa Avenue, Somerton Park, SA 5044
PO Box 1159, Glenelg South, SA 5045
T: +61 8 8294 5571

Appendix 1: Survey Methodology

Rawtec was engaged by Green Industries SA to undertake the Recycling Activity (survey) in South Australia (SA) for the financial years 2014-15 and 2015-16. This section summarises the approach and methodology used to conducting the survey.

- *Rawtec was engaged to conduct the survey for two financial years (2014-15 and 2015-16) as the 2014-15 recycling activity survey was not conducted in that financial year. Instead, the 2015-16 survey incorporated questions about the 2014-15 financial year to establish volumes and streams or recycled materials.*
- *This approach and methodology was similar to that used for the 2009-10, 2010-11, 2011-12 and 2012-13 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 114 organisations, which included survey respondents from 2013-14 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)[17]
- 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 2013-14 questionnaire, with the exception of:

- The question asking for the number of FTE's directly employed by the organisation associated with material collection, resource recovery and/or recycling was moved to the front of the survey (question 3).
  - This was due to an increased interest in this information.
- Organisations were also asked to estimate the volume of material in 2014-15, or the increase or decrease in tonnes of each material recovered from 2014-15 to 2015-16.
  - This was due to the 2014-15 survey not being conducted.

[17] 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.

A1.2.4 Survey Deployment

The survey was deployed to survey respondents in September 2016.

- *The deployment method was by email*
- *An additional option of filling-out the survey online was also offered to respondents.*
- *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 a number of instances, it was discovered that the relevant company or organisation no longer existed or recycling activity had not occurred during 2015-16 or 2014-15.*

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 2016.

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 2015-16 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.*

A1.3 Data Analysis

A1.3.1 Materials Analysis & Reporting

Data collected by the survey was analysed to determine the following for each material. This analysis was conducted according to the National Guidelines for compiling waste and recycling data (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[18].

[18] Resource recovery considered as 'energy recovery' in this report is therefore classified as: 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 Guidelines for compiling waste and recycling data (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

- ***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, were used to reasonably estimate recycling activity (but only where such data was considered a reliable indication of the respondent's current recycling activity).

recovery. This circumstance is still classified 'material recovery' as any potential energy recovery from the waste material occurs outside of SA. This definition also necessarily excludes energy recovery from landfill gas arising from waste disposed to landfills.

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[19].

- *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) (2016a).
- The relevant reporting periods and sources of recycling activity data were:
  - SA: 2015-16, as reported in this survey;
  - ACT: 2014-15, as reported by: Territory and Municipal Services Annual Report 2014-15, (ACT Territory and Municipal Services, 2015);
  - VIC: 2014-15, as reported by: Annual Report 2014-15 (Sustainability Victoria, 2016);
  - WA: 2013-14, as reported by: Recycling Activity in Western Australia, 2013-14 (WA Waste Authority, 2015);
  - NSW: 2012-13, as reported by: NSW State of the Environment 2015 (NSW EPA, 2015);
  - QLD: 2014-15, as reported by: The State of Waste and Recycling in Queensland 2015 (QLD DEHP, 2016).
- Adjustments were made to the above data to present recycling data in accordance with the National Guidelines for compiling waste and recycling data (Dept Environment and Energy, 2015).

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

A1.3.4 Packaging Recovery Analysis & Reporting

Packaging data was taken directly from Recycling Activity Survey data:

- Container deposit bottle and can packaging:
  - From 2015-16 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 and was essentially the same as that developed for the 2009-10 SA Recycling Activity Survey. The scope of environmental benefits analysis included the following metrics.

- ***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.

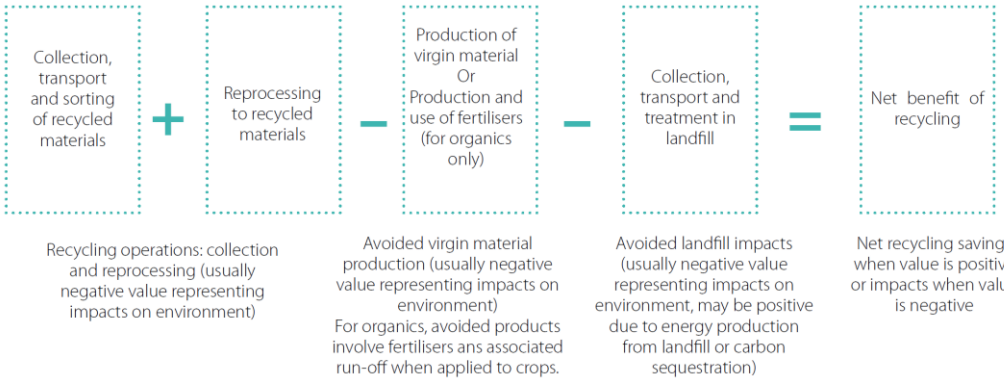

Figure A1.1 Method for calculating the net environmental impacts in the recycling process. Source: NSW DECCW (2010)

LCA techniques have previously been used to estimate conversion and emission factors for Australian situations including for SA. For the purpose of this study, the following sources were used to infer or obtain relevant conversion and emission factors for environmental benefits of recycling in SA:

- Benefits of Recycling in South Australia study (Green Industries SA, previously Zero Waste SA, 2009);
- Life Cycle Impact Data for Resource Recovery for Commercial and Industrial and Construction and Demolition Waste in Victoria (EcoRecycle Victoria 2005);
- Environmental benefits study of recycling for NSW (NSW DECCW, 2010); and
- SA Recycling Activity survey, 2008-09 (Green Industries SA, previously Zero Waste SA, 2010).

These sources often provided or suggested separate conversion and emission factors relevant to materials recovered for recycling from Municipal, C&I and C&D sectors. The conversion and emission factors between these different sectors were generally found to be similar.

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 2015-16 environmental benefits analysis adopted the same conversion and emission factors that were developed from the above sources and used for the 2009-10 SA recycling activity report (Green Industries SA, previously Zero Waste SA, 2011). These conversion and emission factors are listed in Appendix 4. Some brief notes on the sources and key assumptions made in deriving these conversion and emission factors are included in Appendix 4.

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 2015-16 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 (DSEWPC, 2012).

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 2015-16 are given in Table A1.1 overleaf. These assumed values are based on:

- Consultations with industry in October 2016;
- 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.

Table A1.1 Assumed values for recovered materials in SA during 2015-16 used to estimate resource market value. (For references in the Table below, refer to Section 12)

Material category	***Estimated on-sale price ($/tonne)***	***Price data source:***
Masonry	$15	Based on public available price lists
Metals	$240	Based on industry consultations Oct 2016
Organics	$35	Based on publicly available price lists
Paper & cardboard	$220	Based on industry consultations Oct 2016
Plastics	$400	Based on industry consultations Oct 2016
Glass	$90	Consultants' estimate
Other materials	$10	Consultants' estimate
Separately Reported Materials & Clean Fill	$15	Consultants' estimate

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 2015-16.

A2.1 Survey Participation & Reported data

Table A2.1 below summarises the survey participation and reported data points for 2015-16.

- The survey questionnaire was successfully deployed to 114 or 95% of the initial list of 120 organisations identified as potentially involved with recycling activity in SA.
- The survey returns produced recycling activity data or information sets for 91 of these companies or organisations.
- Of these 91 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.
    - 1 was reference &/or aggregated data sets from industry bodies or government agencies.
    - 20 data sets came from companies or organisations that generated the material that was being recovered for recycling.
    - 64 data sets were companies or organisations involved in collection or aggregation of recovered material.
    - 52 data sets were for companies or organisations undertaking re-processing activities.
    - 37 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		120		
Surveys Deployed*		114	95%	of Sample Size
Survey Data Points		91	80%	of Surveys Deployed
Activity Type	Industry Reference Data	2	2%	of Survey Data Points
	Source	20	22%	of Survey Data Points
	Aggregator/Collector	64	70%	of Survey Data Points
	Recycler	52	57%	of Survey Data Points
	Manufacturer	37	41%	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[20] – 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		91	100%
Material Activity	Masonry	18	20%
	Metals	32	35%
	Organics	29	32%
	Cardboard & paper	26	29%
	Plastics	31	34%
	Glass	13	14%
	Other Materials	12	13%
	E-waste	13	14%
	Reuse Materials	5	5%
Material Destination	SA	72	79%
	Interstate	37	41%
	Export	20	22%
Waste Hierarchy	Reuse	7	8%
	Recycle	56	62%
	Material Recovery	63	69%
	Energy Recovery	2	2%

[20] 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.

Appendix 3: 2015-16 Recycling Activity Survey Questionnaire

Survey Form – Recycling Activity in SA, 2015-16

Issued: 27 September 2016

1. Survey Company & Contact Details

Rawtec Pty Ltd (www.rawtec.com.au)
• Matthew Allan, Consultant, p: (08) 8294 5571, e: matthew.allan@rawtec.com.au
• Jarvis Webb, Consultant, p: (08) 8294 5571, e: jarvis.webb@rawtec.com.au

2. Survey Questions for Period 1 July 2015 - 30 June 2016

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 2015-16 SA Recycling Activity survey? (*Please Circle/Highlight)*
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 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 2015/16 Financial Year (July 2015 – June 2016)											
		MATERIAL SOURCE/INPUT							MATERIAL DESTINATION/OUTPUT				RESIDUAL
		Total materials received for recycling in 2015/16 (in tonnes)	Estimated % change in total volumes from 2014/15 increase (+%) or decrease (-%) or Actual tonnes received in 2014-15	Materials received for recycling metro vs regional (2015-16 in tonnes or %)		Source of material (2015-16 in tonnes or %)			Destination of material for re-processing (2015-16 in tonnes or as %)				% residual (2015-16, if any) generated from recovery or re-processing to landfill
				SA-Metro	SA-Regional	MSW	C&I	C&D	Your SA facility (ies)	Elsewhere in SA	Sent Interstate	Sent Overseas	
	EXAMPLE	23,100	+10% or 21,000	20,100	3,000	25%	70%	5%	-	-	23,100	-	10%

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 2015-16 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 2015 - 30 June 2016

	For the following questions, please enter responses directly into the table below.
6.	In addition to the volumes reported in Table 1, did you receive any waste from interstate or overseas sources that was reprocessed at your site? If so, please list materials received (see Table 2) and state volumes and sources. If you received any plastics, please provide this information in the plastics recyclers survey form. *Material* *Tonnes received* *Source location* • •
7.	Were any of the reported materials derived from packaging? If yes, (for each material) approximately what proportion (as % of total)? If you received any plastics, please provide this information in the plastics recyclers survey form. *Material* *Tonnes received* *Source location* • •
8.	If there have been any significant changes in quantities, stockpiles, sources or destinations from the 2014-15 financial year, what was the reason for this?
9.	Where do you receive most of your material from, e.g. Councils, manufacturing, retail, hospitality, etc.?
10.	Where do you send most of recovered or re-processed materials and how are they recycled, e.g. composters, building construction, plastics re-processor, material aggregator, e-waste recycler, quarry, etc.?
11.	What is your opinion about the market strength/prospects for recycled materials?
12.	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?

13.	Are there any significant barriers, e.g. market, regulatory, technology, for your SA operations?
14.	What is your organisation's approximate Annual Sales Revenue (Turnover) from material collection, resource recovery and/or recycling activities?
15.	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)*
16.	Would you like to be invited to an industry seminar by Green Industries SA (GISA) summarising the findings of this 2015-16 SA Recycling Activity survey? (*Please Circle/Highlight)* *Y/N*

Appendix 4: 2015-16 Environmental Benefits Conversion & Emission Factors

Table A4.1 Emission and conversion factors adopted for estimation of environmental benefits of recycling, SA 2015-16. (For references in the Table notes, refer to Section 12)

	Material	GHG Emissions Saved		Energy Saved		Water Saved	
		Emission factor (t CO2-e/t)	*Note*	*Conversion factor (GJ LHV/t)*	*Note*	*Conversion factor (kL/t)*	*Note*
	Masonry						
1	Asphalt	0.016	(1)	2.037	(1)	0.880	(9)
2	Bricks	0.009	(1)	0.117	(1)	1.260	(9)
3	Concrete	0.029	(1)	0.552	(1)	1.280	(9)
4	Plasterboard	0.047	(1)	0.227	(1)	-0.030	(9)
5	Clay, fines, rubble & soil	0.087	(1)	0.675	(1)	0.440	(1)
	Metals						
6	Steel	0.615	(2)	7.940	(9)	-2.360	(9)
7	Aluminium	14.773	(2)	171.100	(8)	181.770	(8)
8	Non-ferrous metals	3.395	(3)	36.090	(9)	5.970	(9)
	Organics						
9	Food Organics	0.518	(3)	1.608	(1)	0.700	(1)
10	Garden Organics	0.230	(3)	0.470	(8)	0.480	(8)
11	Timber	0.328	(3)	1.318	(10)	0.540	(10)
12	Organics - Other	0.481	(3)	2.165	(1)	0.230	(1)
	Cardboard & paper						
13	Cardboard & waxed cardboard	0.304	(1)	12.532	(1)	33.040	(1)
14	Liquid Paperboard	0.641	(1)	9.191	(1)	16.220	(1)
15	Magazines	0.464	(1)	9.065	(1)	22.160	(1)
16	Newsprint	0.464	(1)	9.065	(1)	22.160	(1)
17	Phonebooks	0.243	(1)	12.306	(1)	33.120	(1)
18	Printing & Writing Paper	0.579	(1)	12.989	(1)	31.110	(1)
	Plastics						
19	Polyethylene terephthalate	1.032	(2)	50.703	(4)	-21.078	(4)
20	High density polyethylene	0.692	(2)	55.952	(4)	-3.510	(4)
21	Polyvinyl chloride	1.568	(4)	42.146	(4)	66.406	(4)
22	Low density polyethylene	0.692	(5)	55.952	(5)	-3.510	(5)
23	Polypropylene	1.644	(1)	58.632	(1)	-12.980	(1)
24	Polystyrene	1.365	(6)	60.663	(6)	-17.631	(6)
25	Mixed &/or Other plastics	1.365	(3)	60.663	(4)	-17.631	(4)
	Glass						
26	Glass	0.597	(1)	6.417	(1)	2.420	(1)
	Other Materials						
27	Fly ash	0.029	(7)	0.552	(7)	1.260	(7)
28	Foundry sands	NS		NS		NS	
29	Leather & textiles	NS		NS		NS	
30	Tyres & other rubber	1.185	(3)	67.162	(1)	52.430	(1)

Notes:

(1) Source: EcoRecycle Victoria (2005)
(2) Source: Zero Waste SA (2009); Municipal, C&I & C&D emission factors w eighted by 2009-10 Sector Origin
(3) Source: Zero Waste SA (2010); 2008-09 Recycling Activity emission factor
(4) Source: NSW DECCW (2010); Kerbside and C&I/C&D emission factors w eighted by 2009-10 Sector Origin
(5) HDPE value adopted per Zero Waste SA (2010)
(6) Mixed/Other plastics value adopted per Zero Waste SA (2010)
(7) Concrete value adopted per Zero Waste SA (2010)
(8) Source: NSW DECCW (2010); Kerbside value
(9) Source: NSW DECCW (2010); C&I/C&D value
(10) Source: EcoRecycle Victoria (2005); Saw dust value
(11) Organics - Other value adopted
NS Not specified as insufficient reference data identified