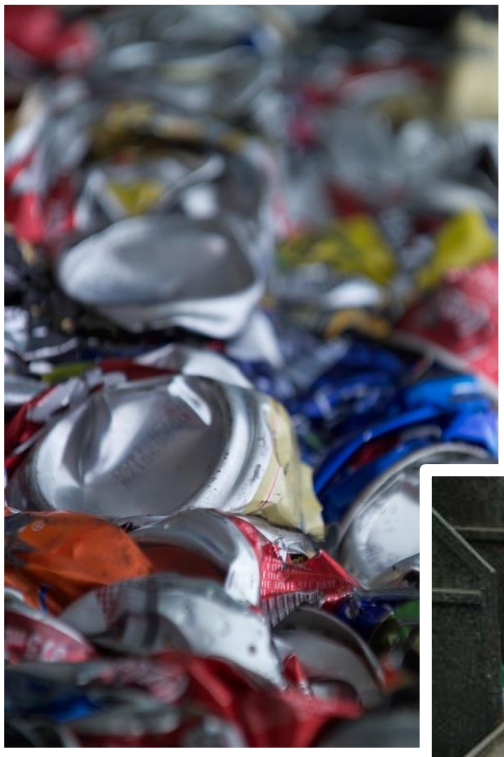

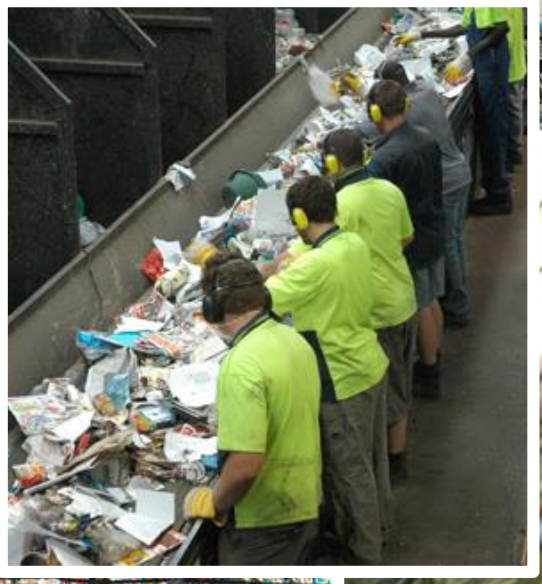

South Australia's

Recycling Activity Survey

2012-13 Financial Year Report

Government of South Australia

Zero Waste SA

rawtec

Contents

Executive Summary

Introduction

Each year since 2003-04 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 2012-13, which collected the State's recycling and landfill disposal data for this purpose.

Summary of 2012-13 results

Total resource recovery for SA was 3.45 million tonnes (Table 1 below). In accordance with National Guidelines for compiling waste and recycling data (DSEWPC 2012a), this total resource recovery comprised:

- 2.66 million tonnes of 'Standard Reporting Materials' – which includes traditionally reported material categories of metals, organics, cardboard & paper, glass, plastics, masonry, etc.;
- 0.79 million tonnes of 'Separately Reported Materials' & Clean Fill – reported data for soil, sand, rock, rubble and fly ash materials, which are considered separately because these materials can fluctuate significantly across reporting years and between different States and Territories.

Total landfill disposal for SA was 1.01 million tonnes.

- Approximately 14% (140,000 tonnes) of this landfill disposal was contaminated soil from construction activities. This material can also be categorised as a Separately Reported Material under National Guidelines for compiling waste and recycling data (DSEWPC 2012a).

SA therefore, achieved a diversion rate of 77.4% (of total waste generated to resource recovery).

Table 1 Summary of 2012-13 Recycling Activity results for resource recovery, landfill disposal, total waste generated, and total diversion (waste to resource recovery) achieved in SA.

	2012-13 Recycling Activity Data Account Summary		
	Standard Reporting Materials*	Separately Reported Materials & Clean Fill*	**TOTAL (All materials)**
Resource recovery, tonnes	2.66 million	0.79 million	**3.45 million**
Landfill disposal, tonnes	0.87 million	0.14 million	**1.01 million**
Total Waste generated**, tonnes	3.53 million	0.93 million	**4.46 million**
Diversion, % to resource recovery	75.4%	84.9%	**77.4%**

* *Standard Reporting Materials and Separately Reported Materials & Clean Fill – As specified by the National Guidelines for compiling waste and recycling data (DSEWPC 2012a)*

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

Resource recovery by material

Over 1.6 million tonnes, or roughly half (47%, by weight), of SA's resource recovery was made up of Masonry materials, and Separately Reported Materials & Clean Fill (Figure 1 below). These materials were mainly generated by construction activities. The next major contributor to SA's resource recovery was Organic materials (at 0.96 million tonnes or 28%) mainly arising from timber mills, regional processing of primary produce, and local government kerbside collections of organics. Metal (12%) and Cardboard & Paper materials (7%), from Commercial & Industrial (C&I) activity and kerbside collections, were the other significant contributors to SA's resource recovery.

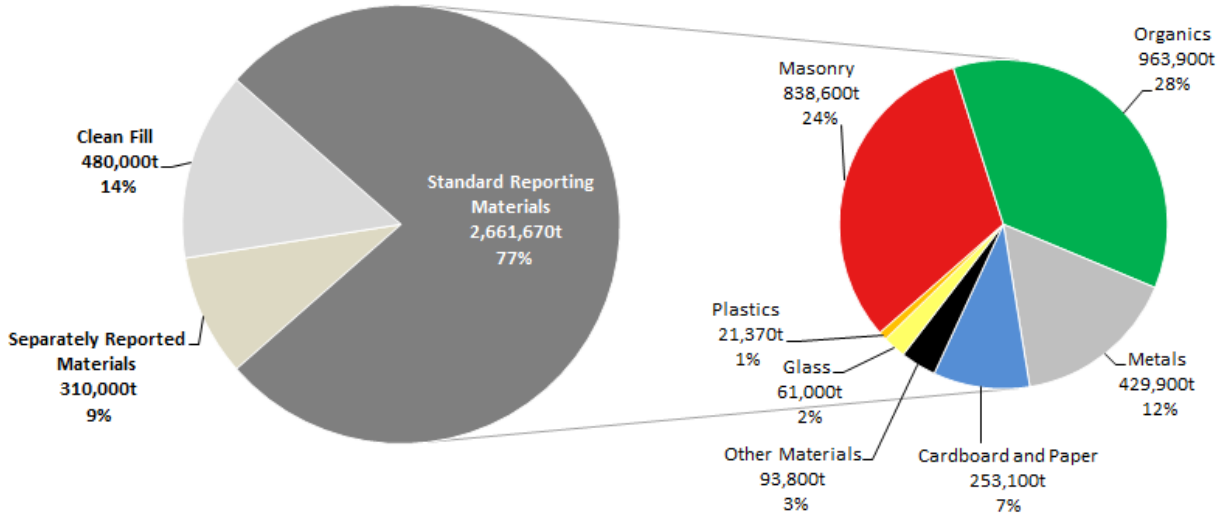

Figure 1 Contribution of different material categories to SA's resource recovery during 2012-13

Market value of resource recovery

The estimated total direct market value of resource recovered materials for SA in 2012-13 was $299 million (Figure 2), or $87 per tonne of resource recovered on average. Metals, Cardboard & Paper and Organic waste materials were the major contributors to this resource market value.

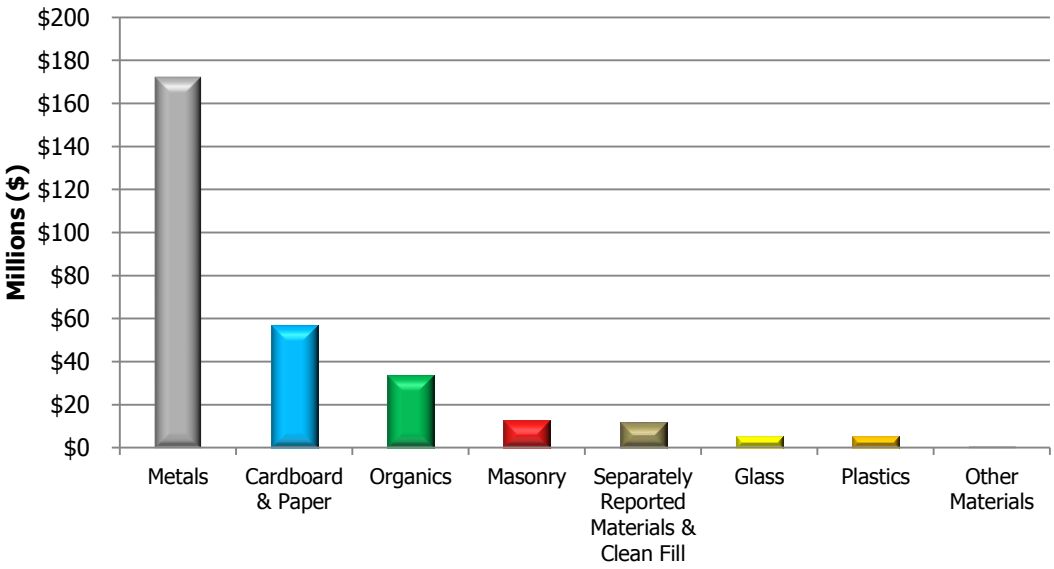

Figure 2 Estimated market value of resource recovered material in SA during 2012-13

Resource recovery trends

Total resource recovery (3.45 million tonnes) and resource recovery per GSP (36.6 tonnes per $ million) were down from 2011-12, however diversion increased (from 76.5% in 2011-12 to 77.4% in 2012-13) (Figure 3 below and Figure 4 overleaf).

- Separately Reported Materials & Clean Fill decreased by 36% (or 440,000 tonnes) from 2011-12.
- Standard Reporting Materials also decreased, by 3% (or 90,000 tonnes) from 2011-12.

The long-term trend for resource recovery in SA, however, remains upwards. In the period since 2003-04:

- Total reported resource recovery has nearly doubled, from 2 million to between 3.5 & 4.0 million tonnes each year.
- The diversion rate has steadily increased from just above 60% to between 75 and 80%.

Several large infrastructure projects have occurred in SA during the past four years (since 2009-10). These projects include the Adelaide Desalination Plant, Adelaide Oval Redevelopment, South Road Superway and Royal Adelaide Hospital. Waste soil from this construction activity has contributed substantially to increased resource recovery of Separately Reported Materials & Clean Fill over this period, however the majority of these projects will progress past their major waste generation stages during the 2013-14 period, if they have not already passed this stage.

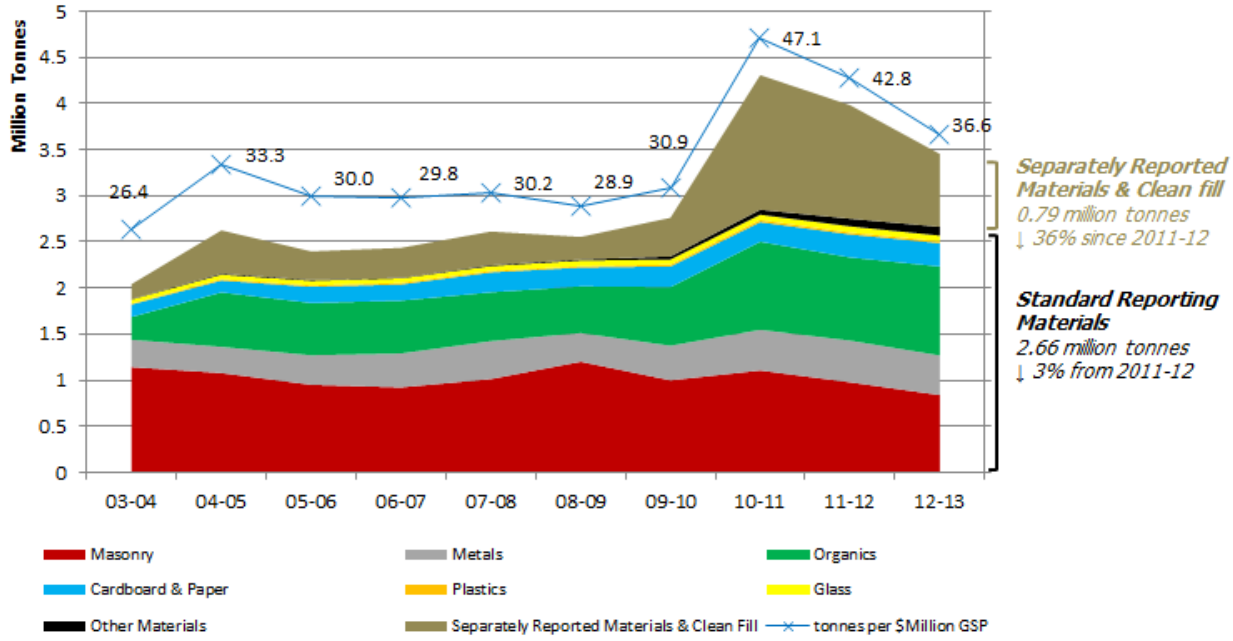

Figure 3 Trend in resource recovery for SA by material category since 2003-04, including tonnes per $m of Gross State Product (GSP).

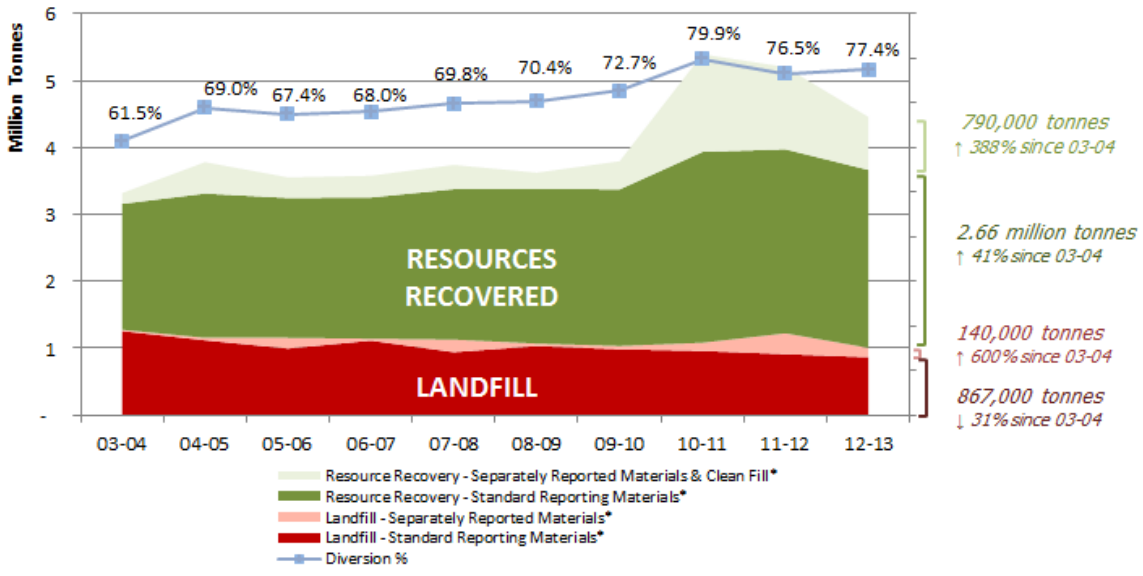

Figure 4 Trend in resource recovery and landfill disposal in SA since 2003-04. * *Reporting of both resource recovery and landfill disposal is divided into Standard Reporting Materials and Separately Reported Materials & Clean Fill categories (see page 1).*

Resource recovery by source sector

Construction & Demolition (C&D) was again the major source sector (at 46% by weight) for SA's resource recovery (Figure 5 below). Separately Reported Materials & Clean Fill provided over 40% of this source sector contribution. The quantity of C&D sourced resource recovery fell from the previous reporting period (down by 552,000 tonnes). As a result, the sector's percentage contribution to resource recovery has also fallen (down from 54% in 2011-12).

Commercial and Industrial (C&I) sources contributed 1.41 million tonnes to resource recovery. This is an increase of 24,000 tonnes from 2011-12 reported volumes. The sector's contribution to total resource recovery also increased to 41% (up from 35% in 2011-12).

The Municipal (MSW) source sector achieved similar levels of resource recovery to its reported volumes in 2011-12.

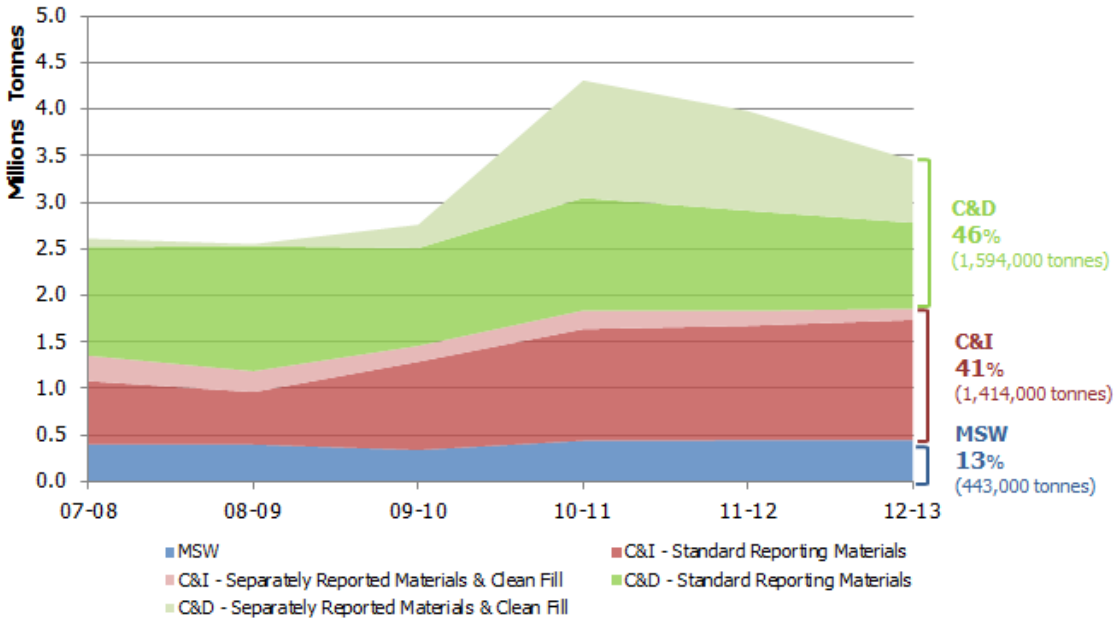

Figure 5 Contribution to resource recovery in SA by source sector for 2012-13 and trend since 2007-08

Environmental benefits

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

In 2012-13, SA's resource recovery activities led to estimated savings in:

- Greenhouse Gas emissions of 1.23 million tonnes of CO2-e;
- Energy savings of about 15,910 Terajoules (TJ[1]); and
- Water savings of about 13,160 Megalitres (ML[2]).

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

[2] 1 Megalitre or ML = 10^{6} Litres = 1 million litres

Landfill disposal

Total landfill disposal fell to 1.01 million tonnes, down by 18% from 1.22 million tonnes recorded in 2011-12 (Figure 4 on page 5 and Figure 6 below). This decrease in landfill disposal was mostly due to a fall in the volumes of contaminated soil to landfill from large infrastructure projects. As a consequence, C&D contribution to landfill disposal (at 36%) fell. There was also a decrease in C&I volumes to landfill (down 25,000 tonnes from 2011-12).

Waste to landfill from MSW sources remained consistent with 2011-12 levels.

Landfill disposal of Standard Reporting Materials across MSW, C&I and C&D source sectors has remained relatively steady over the past several years, displaying slight downward trends.

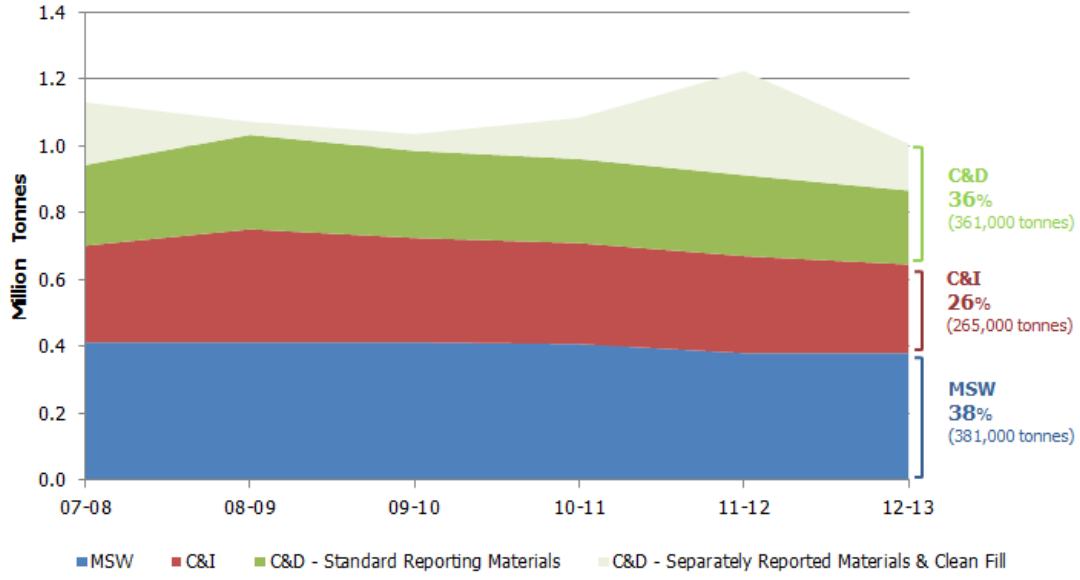

Figure 6 Contribution to landfill disposal in SA by source sector for 2012-13 and trend since 2007-08

South Australia's Strategic Plan – Landfill Reduction Target

Target 67 of South Australia's Strategic Plan (SA Government, 2011) sets the following landfill reduction goal for SA:

- ***Reduce waste to landfill by 35% by 2020 (baseline: 2002-03); Milestone of 25% by 2014.***

Excluding contaminated soil, SA's disposal to landfill (at 867,000 tonnes) has surpassed the 2014 State Target with reduced waste to landfill of 30% since 2002-03 (1.23 million tonnes) (see Figure 7 below). Including contaminated soil, however, SA's disposal to landfill (at 1,007,000 tonnes) has reduced by 20% since 2002-03 (1.25 million tonnes). This target may be achievable if contaminated soil disposed to landfill continues to reduce in quantity, as expected.

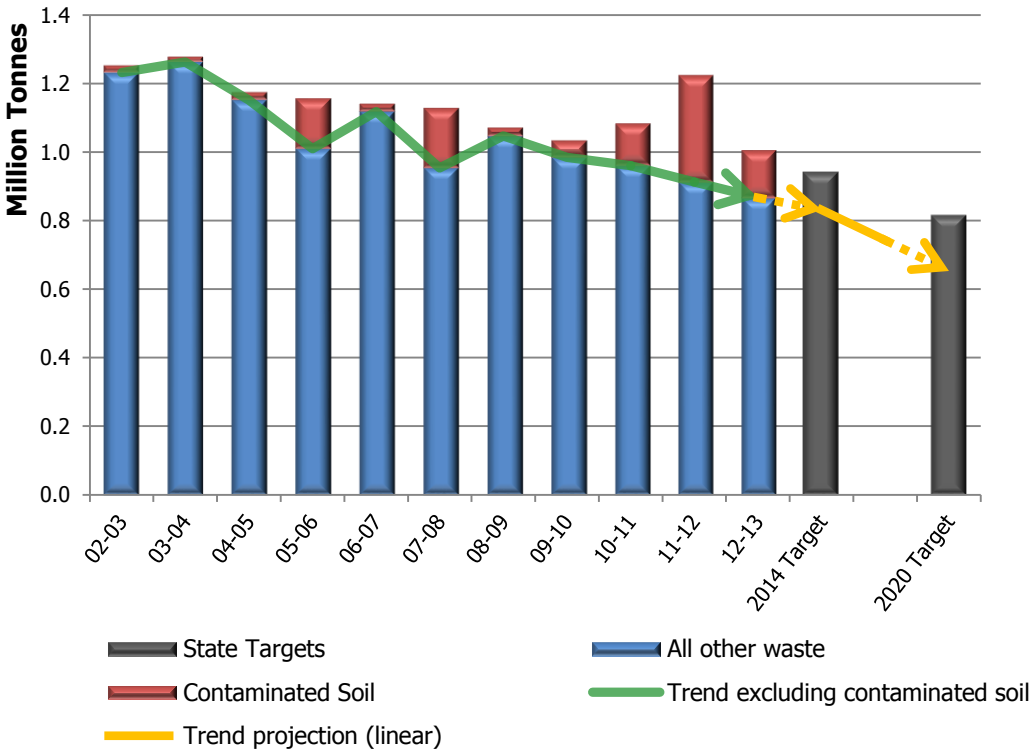

Figure 7 Landfill disposal trend in SA versus State Waste Strategy Target for landfill reduction

South Australia's Waste Strategy – Per Capita Waste Generation Reduction Target

South Australia's Waste Strategy (Zero Waste SA, 2012) sets a per capita waste generation target for SA of:

- ***5% reduction in waste generation per capita by 2015 (baseline: 2010-11).***

Per capita waste generation in 2012-13 decreased by 7.8% (from baseline year 2010-11) for Standard Reporting Materials and by 17.8% overall (including Separately Reported Materials & Clean Fill). If this trend continues, South Australia will achieve the 2015 target.

Table 2 2012-13 Recycling Activity results for per capita waste generation vs. State Waste Strategy target

	Per capita Waste Generation (kg/person/yr)				2015 Target
	10-11	*11-12*	*12-13*	***% Change***	
Standard Reporting Materials	2,300	2,210	2,120	**-7.8%**	5% Reduction
Separately Reported Materials & Clean Fill	950	930	550		
TOTAL	3,250	3,140*	2,670	**-17.8%**	

* *Value for per capita total waste generation in 2011-12 is reported differently to that reported in Table 2.1 due to rounding.*

South Australia's Waste Strategy – Metropolitan Diversion Targets

South Australia's Waste Strategy (Zero Waste SA, 2012) includes targets for metropolitan diversion (to resource recovery) by source sector (Table 3 below).

SA made steady progress towards achieving these targets during 2012-13:

- MSW – A diversion rate of 57.5%, which is below the 2012 Target of 60%.
- C&I – A diversion rate of 77.1% well exceeded the 2012 Target.
- C&D excluding Separately Reported Materials & Clean Fill – A diversion rate of 82.8%, which is below the 2012 Target.
- C&D Total – A diversion rate of 82.2%, which is below the 2012 Target.

Table 3 2012-13 Recycling Activity results for metropolitan diversion by source sector vs. State Waste Strategy targets

Source Sector	2012-13 Diversion Achieved	Metro Diversion Target	
		By 2012	*By 2015*
■ **MSW**	**57.5%**	60%	70%
■ **C&I**	**77.1%**	65%	75%
■ **C&D – *excluding Separately Reported Materials & Clean Fill***	**82.8%**	85%	90%
■ **C&D – *Total***	**82.2%**		

South Australia's performance relative to other states & 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 77.4%) and per capita resource recovery (at 2,070 kg/person/yr) in Australia;
- Has the lowest per capita landfill disposal rates (at 600 kg/person/yr);
- But continues to have a per capita waste generation rate (at 2,670 kg/person/yr) above several other states or territories (refer to Figure 2.6).

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 2012-13 financial year.*
- *This data enables us to measure the performance of South Australia against waste diversion goals and targets in the State Strategic Plan and South Australia's State Waste Strategy 2011-15.*

1.1 Background

"One of our greatest challenges in the coming years is to learn to enjoy and manage the quality of our lives by wasting less and caring more[3]."

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 of 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 2011-2015 (Zero Waste SA, 2012). These requirements include targets for reducing waste generation and diverting waste materials from landfill (see 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.

Zero Waste SA's annual survey of South Australian recyclers and re-processors collects data about SA's handling of resources which would otherwise go to waste. 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. Current market conditions for resource recovery and recycling are also discussed including market size and strength.

The annual survey data collected allows Zero Waste SA to measure progress towards meeting the waste reduction targets of South Australia's Waste Strategy and is an authoritative reference for industry, government and the community. Results of the survey are also compiled using the National Guidelines for compiling waste and recycling data (DSEWPC 2012a). This ensures that SA's recycling data can successfully contribute to national recycling surveys and assessments undertaken by the Australian Government.

[3] Minister for Sustainability, Environment and Conservation: Preface to South Australia's State Waste Strategy 2011-2015 (Zero Waste SA, 2012)

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

> 35% reduction in landfill disposal from 2002-03 level by 2020
milestone of 25% by 2014

Per capita target

> 5% reduction in waste generation per capita by 2015

South Australia's Waste Strategy 2011-2015 (Zero Waste SA)

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 achievable
2015	70	Maximise diversion to the extent practically achievable
Commercial and industrial (C&I) landfill diversion targets		
2009 (baseline)**	60	Not applicable
2012	65	Maximise diversion to the extent practically achievable
2015	75	Maximise diversion to the extent practically achievable
Construction and demolition (C&D) landfill diversion targets		
2009 (baseline)***	80	Not applicable
2012	85	Maximise diversion to the extent practically achievable
2015	90	Maximise diversion to the extent practically achievable

* Estimated from *Recycling Activity Report 2008-09* and assumes 30% MSW disposed to landfill. The MSW baseline figure is also supported by Zero Waste SA funded kerbside audit data of three-bin system from 2008 and 2009 in which the collection frequency (all tenements) consisted of: weekly residual waste; with fortnightly co-mingled and fortnightly green organics. These audits typically find diversion in the mid 50% range.

** Estimated from *Recycling Activity Report 2008-09*. Assumes 43% C&I disposed to landfill.

*** Estimated from *Recycling Activity Report 2008-09*. Assumes 27% C&D disposed to landfill.

Figure 1.1 Summary of South Australia's goals and targets for diversion from landfill.
Reproduced from SA's State Waste Strategy 2011-2015 (Zero Waste SA, 2012).

1.2 The 2012-13 Recycling Activity Survey report

This report presents the results of Zero Waste SA's annual Recycling Activity Survey for the 2012-13 financial year (1 July 2012 – 30 June 2013). The following provides a guide to how this data and information in this report is organised and presented.

- **Section 2** – Provides an overview of key Recycling Activity statistics obtained for 2012-13.
- **Section 3** – Presents the 2012-13 Recycling Activity Survey data by material category.
- **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 2012-13 Recycling Activity Survey data.
- **Section 6** – Assesses the environmental benefits, including greenhouse gas emission savings, of recycling for SA achieved by its 2012-13 recycling performance.

- **Section 7** – Provides an estimate of the market value for resources recovered during 2012-13.
- **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 2012-13 Recycling Activity Survey.
  - *Appendix 2* – Summarises selected 2012-13 Recycling Activity Survey statistics relating to industry participation.
  - *Appendix 3* – Provides a copy of the questions used in the 2012-13 Recycling Activity Survey.
  - *Appendix 4* – Lists the emission and conversion factors that were adopted for the environmental benefits analysis of the 2012-13 Recycling Activity data.

2 Key 2012-13 Recycling Activity Statistics

At a glance:

- *This section summarises the key outcomes and statistics obtained from analysis of the 2012-13 SA Recycling Activity Survey data. This outcomes and statistics include:*
  - *Resource recovery and landfill disposal (Section 2.1) – Total and by type of material, source sector, geographical origin, and destination for re-processing;*
  - *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 & landfill disposal

2.1.1 Overview

In 2012-13 SA's recycling industries reported 3.45 million tonnes of material diverted to resource recovery (see Table 2.1 overleaf). In accordance with new National Guidelines for compiling waste and recycling data (DSEWPC 2012a), this total resource recovery comprised:

- 2.66 million tonnes of 'Standard Reporting Materials' – which includes traditionally reported material categories of Metals, Organics, Cardboard & Paper, Glass, Plastics, Masonry, etc.;
- 0.79 million tonnes of 'Separately Reported Materials' & Clean Fill – reported data for soil, sand, rock, rubble and fly ash materials[4].

Total resource recovery volumes were down by 13.3% from the 3.98 million tonnes reported for 2011-12. As a consequence, SA's 2012-13 per capita diversion/recovery rate decreased to 2,070 kg/p/yr (down from 2,410 kg/p/yr in 2011-12). Material recovered per $ Gross State Product (GSP) in 2012-13 also reduced (from 43 tonnes in 2011-12) to 37 tonnes per $1 million.

Based on this total resource recovery, SA achieved a diversion rate of 77.4% (up from 76.5% in 2011-12). This outcome is the second highest resource recovery rate that the State has achieved since SA's first Recycle Activity Survey in 2003-04.

During 2012-13 the amount of waste accepted by landfills in SA decreased to 1.01 million tonnes (down from 1.22 million tonnes in 2011-12). This represents a per capita waste-to-landfill rate of 600 kg/p/yr (down from 740 kg/p/yr in 2011-12). Waste to landfill per $1 million GSP also decreased from 13 tonnes in 2011-12 to 11 tonnes in 2012-13.

{Continued overleaf 2 pages}

[4] These materials are considered separately under the new National Guidelines for compiling waste and recycling data (DSEWPC 2012a) 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 2012-13, 2003-04 (first survey year) and since 2008-09. *This table presents a breakdown of Standard Reporting Materials and Separately Reported Materials & Clean Fill in accordance with National Waste Reporting Guidelines (DSEWPC 2012a). Of 3.45 million tonnes of recycling reported in 2012-13, 0.79 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 2011-12 are also shown.*

	2003-04	2008-09	2009-10	2010-11	2011-12	2012-13	Change	
							11-12 to 12-13	03-04 to 12-13
RESOURCE RECOVERY (TONNES)								
Standard Reporting Materials	1,880,000	2,309,000	2,340,000	2,850,000	2,750,000	2,660,000	-3.3%	41.5%
Separately Reported Materials & Clean Fill	162,000	243,000	420,000	1,460,000	1,230,000	790,000	-35.8%	387.7%
TOTAL (for SA)	**2,042,000**	**2,552,000**	**2,760,000**	**4,310,000**	**3,980,000**	**3,450,000**	**-13.3%**	**69.0%**
LANDFILL DISPOSAL (TONNES)								
Standard Reporting Materials	1,258,000	1,033,000	985,000	961,000	913,000	867,000	-5.0%	-31.1%
Separately Reported Materials & Clean Fill	20,000	39,000	50,000	123,000	311,000	140,000	-55.0%	600%
TOTAL (for SA)	**1,278,000**	**1,072,000**	**1,035,000**	**1,084,000**	**1,224,000**	**1,007,000**	**-17.7%**	**-21.2%**
WASTE GENERATION (TONNES)								
Standard Reporting Materials	3,138,000	3,342,000	3,325,000	3,811,000	3,663,000	3,527,000	-3.7%	12.4%
Separately Reported Materials & Clean Fill	182,000	282,000	470,000	1,583,000	1,541,000	930,000	-39.6%	411.0%
TOTAL (for SA)	**3,320,000**	**3,624,000**	**3,795,000**	**5,394,000**	**5,204,000**	**4,457,000**	**-14.4%**	**34.2%**
DIVERSION/RECOVERY RATE (%)								
Standard Reporting Materials (ONLY)	59.9%	69.1%	70.4%	74.8%	75.1%	75.4%	0.5%	25.9%
TOTAL (for SA)	**61.5%**	**70.4%**	**72.7%**	**79.9%**	**76.5%**	**77.4%**	1.2%	25.9%
SA population (persons)	**1,534,000**	**1,622,700**	**1,644,600**	**1,657,000**	**1,654,800**	**1,667,500**	**0.8%**	**8.7%**
PER CAPITA DIVERSION/RESOURCE RECOVERY (KG/PERSON/YR)								
Standard Reporting Materials (ONLY)	1,230	1,420	1,420	1,720	1,660	1,600	-3.6%	30.1%
TOTAL (for SA)	**1,330**	**1,570**	**1,680**	**2,600**	**2,410**	**2,070**	**-14.1%**	**55.6%**
PER CAPITA LANDFILL DISPOSAL (KG/PERSON/YR)								
Standard Reporting Materials (ONLY)	820	640	600	580	550	520	-5.5%	-36.6%
TOTAL (for SA)	**830**	**660**	**630**	**650**	**740**	**600**	**-18.9%**	**-27.7%**
PER CAPITA WASTE GENERATION (KG/PERSON/YR)								
Standard Reporting Materials (ONLY)	2,050	2,060	2,020	2,300	2,210	2,120	-4.1%	3.4%
TOTAL (for SA)	**2,160**	**2,230**	**2,310**	**3,250**	**3,150**	**2,670**	**-15.2%**	**23.6%**
SA Gross State Product[(a)] (GSP) ($millions)	**77,374**	**88,333**	**89,382**	**91,411**	**93,031**	**94,210**	**1.3%**	**21.8%**
PERFORMANCE METRICS PER $GSP (TONNES/$MILLION GSP)								
TOTAL SA Diversion/Resource Recovery (b)	26	29	31	47	43	37	-14.4%	38.8%
TOTAL SA Landfill Disposal (b)	17	12	12	12	13	11	-18.8%	-35.3%
TOTAL SA Waste Generation (b)	43	41	42	59	56	47	**-15.4%**	**10.3%**

Notes:

(a) Reference year for GSP chain volume measures (which removes the inflation effects on GSP values) is 2011-12.

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

A decrease in resource recovery and waste to landfill in South Australia was evident in 2012-13 from the previous two reporting periods. Resource recovery and waste to landfill were particularly high in 2010-11 and 2011-12 due to several large infrastructure projects in metropolitan Adelaide (i.e. Royal Adelaide Hospital, Adelaide Oval Redevelopment, and Adelaide Desalination Plant). In each of these previous periods, the waste from these large projects contributed an additional 1 million tonnes of soil and contaminated soil to resource recovery and landfill. However, in 2012-13 these large projects progressed past their major waste stages contributing significantly less soil and contaminated soil volumes (refer Table 2.1). It is expected that resource recovery and disposal levels of these materials should return to more normal volumes following completion of these projects.

The landfill disposal rate for 2012-13, once contaminated soils are excluded (i.e. for Standard Reporting Materials, only), shows a decrease of 5% from 2011-12, and 31% since 2003-04.

2.1.2 Recovery by material type

Resource recovery reported for various waste materials changed during 2012-13 (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 highlights or changes are summarised below.

Lower quantities of resource recovery were reported for Masonry materials (down 14% overall from 2011-12). The contribution of the large infrastructure projects occurring in SA, appear to be moving past their major waste generation stage, resulting in a reduction in Construction and Demolition (C&D) activity across the economy.

A slight decrease in Metal recovery appeared to be evident across all Metal material streams (down 5% from 2011-12). This decrease may also be aligned with the reduction in waste from large infrastructure projects and the manufacturing sector across the state.

An increase in resource recovery was reported for Organics (up 7% in 2012-13 from 2011-12). This increase is partially contributable to increasing numbers of Councils allowing food organics in their green organics kerbside collection, increases in commercial food organics recoveries, as well as improved reporting practices.

Cardboard & Paper recovery also experienced a slight increase (1%) in overall weight from 2011-12. This upward trend is consistently evident in the data, doubling its weight in recovered tonnes since 2003-04. The upward trend has been driven by a reasonably stable commodity value and on-going expansion of local services and source separation infrastructure for its collection. This trend has continued despite the introduction of the 'Green Fence' Policy in China, restricting the quality of materials accepted for re-processing.

Plastics recovery increased in weight by 9% from 2011-12, with volumes recovered apparently unaffected by the introduction of the 'Green Fence' Policy in China. This reported increase in plastic recovery may be due to improved reporting methods (particularly for Polyvinyl Chloride, up 420%, and

Polystyrene, up 52%). In addition it could be due to changes occurring in the use and/or design of plastics packaging types, and an increase in the use of mixed plastics from the C&I and C&D sectors.

A decrease in recovery rates of glass from 2011-12 to 2012-13 was evident (down by 10%), although the overall weight (61,000 tonnes) still remains high compared to previous years (since 2003-04).

Other Materials recorded an increase in volumes recovered (up 13% from 2011-12), driven by an increase in Foundry Waste (up by 15% from 2011-12) and Tyres & Other Rubber (up by 13% from 2011-12). Foundry Waste continues to be the main contributor to Other Materials recovery, with what appears to be several factors influencing the increase. Firstly, foundries have turned to resource recovery as a lower cost than landfill disposal for these waste materials. Secondly, a major re-processor resumed accepting foundry waste materials in 2010-11, including accepting slag-type wastes, for cement manufacture.

Table 2.2 Reported material quantities (tonnes) being diverted for resource recovery in SA for 2012-13, 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 2011-12 and 2012-13. The data is presented in accordance with National Waste and Recycling Guidelines (DSEWPC 2012a).*

ID	Material	2003-04	2007-08	2008-09	2009-10	2010-11	2011-12	2012-13	Change (%) 11-12 to 12-13
	Masonry								
1	Asphalt	100,000	103,070	101,484	131,000	145,000	143,000	148,000	3%
2	Bricks	165,000	90,846	113,993	77,000	100,000	73,000	50,000	-32%
3	Concrete	877,000	818,116	984,735	790,000	860,000	760,000	640,000	-16%
4	Plasterboard					300	600	600	0%
	Subtotal	*1,142,000*	*1,012,032*	*1,200,212*	*998,000*	*1,105,300*	*976,600*	*838,600*	-14%
	Metals								
7	Steel	264,200	365,391	271,277	334,000	391,000	404,000	387,000	-4%
8	Aluminium	19,000	24,434	21,895	18,200	19,400	20,500	18,500	-10%
9	Non-ferrous metals	13,000	21,755	18,495	23,600	31,100	27,800	24,400	-12%
	Subtotal	*296,200*	*411,580*	*311,667*	*375,800*	*441,500*	*452,300*	*429,900*	-5%
	Organics								
10	Food Organics	0	5,796	4,820	5,800	4,400	5,600	7,900	41%
11	Garden Organics	130,100	202,397	203,558	220,000	230,000	212,000	209,000	-1%
12	Timber	116,700	241,387	254,866	262,000	280,000	281,000	237,000	-16%
13,14,15,16	Other Organics	0	79,359	41,666	148,000	440,000	403,000	510,000	27%
	Subtotal	*246,800*	*528,939*	*504,910*	*635,800*	*954,400*	*901,600*	*963,900*	7%
	Cardboard & Paper								
17	Cardboard & Waxed Cardboard	91,000	122,357	104,128	162,000	154,000	183,000	190,000	4%
18	Liquid Paperboard	0	1,476	1,475	3,900	3,500	3,600	3,600	0%
19, 20, 21	Magazines & Newsprint	32,701	49,121	52,583	40,000	40,200	39,500	38,800	-2%
22	Printing & Writing Paper	12,300	42,745	45,877	16,400	13,600	23,300	20,700	-11%
	Subtotal	*136,001*	*215,699*	*204,063*	*222,300*	*211,300*	*249,400*	*253,100*	1%
	Plastics								
23	Polyethylene Terephthalate	0	5,440	5,200	5,500	4,100	4,500	4,300	-4%
24	High Density Polyethylene	0	2,821	2,685	4,900	4,600	3,200	3,600	13%
25	Polyvinyl Chloride	0	317	408	80	170	50	260	420%
26	Low Density Polyethylene	0	3,375	2,954	4,200	4,600	4,400	4,600	5%
27	Polypropylene	0	1,202	1,529	4,000	4,000	2,100	2,200	5%

ID	Material	2003-04	2007-08	2008-09	2009-10	2010-11	2011-12	2012-13	Change (%) 11-12 to 12-13
28	Polystyrene	0	365	540	200	430	270	410	52%
29	Mixed &/or Other Plastics	8,607	1,755	462	1,600	5,800	5,100	6,000	18%
	Subtotal	*8,607*	*15,275*	*13,778*	*20,480*	*23,700*	*19,620*	*21,400*	9%
	Glass								
30	Glass	45,600	53,224	61,552	57,000	58,000	68,000	61,000	-10%
	Other Materials								
40	Foundry Waste	0	0	0	11,900	31,800	60,900	70,200	15%
41	Leather & Textiles	4,080	2,376	3,052	3,900	3,900	4,500	3,900	-13%
42	Tyres & Other Rubber	88	9,434	10,138	15,000	17,000	17,400	19,700	13%
	Subtotal	*4,168*	*11,810*	*13,190*	*30,800*	*52,700*	*82,800*	*93,800*	13%
	Total of above materials	***1,879,376***	***2,248,559***	***2,309,372***	***2,340,180***	***2,846,900***	***2,750,320***	***2,661,700***	**-3%**
39	Fly Ash	0	272,000	223,000	170,000	200,000	160,000	120,000	-25%
5	Clay, Fines, Rubble & Soil	162,400	90,837	19,831	250,000	1,260,000	910,000	480,000	-47%
6	Clay, Fines, Rubble & Soil – Intermediate Waste Soil[1]	NRS[2]	NRS[2]	NRS[2]	NRS[2]	NRS[2]	160,000	190,000	19%
	Total Clay, Fines, Rubble & Soil	162,400	90,837	19,831	250,000	1,260,000	1,070,000	*670,000*	-37%
	Total Reported	***2,041,776***	***2,611,396***	***2,552,203***	***2,760,000***	***4,310,000***	***3,980,000***	***3,450,000***	**-13%**

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 2012-13, Municipal (MSW) sources contributed 443,000 tonnes to resource recovery (slightly lower than reported volumes in 2011-12) (see Table 2.3 below). The estimated quantity of MSW volumes to landfill remained constant at 2011-12 levels (381,000 tonnes), leading to a similar level of diversion (53.8%).

The volume of C&I waste to landfill appeared to decrease (down by 25,000 tonnes from 2011-12). This was met with an increase in the reported quantity of C&I resource recovery (up by 24,000 tonnes from 2011-12), leading to an increase in diversion (up to 84.2% from 82.7%).

Volumes of both C&D recovery and landfill disposal decreased significantly from 2011-12 (down by 542,000 tonnes & 192,000 tonnes respectively). This is the result of large state infrastructure projects progressing past their major waste generation stages. The overall impact of these changes in C&D volumes led to an increase in C&D diversion (up to 81.5% from 79.5%).

C&I and C&D sources (at 41% and 46%, respectively) continued to constitute the main sources of resource-recovered material reported by SA recycling industries in 2012-13 (Table 2.3 and Figure 2.1 overleaf). Due to the decrease in reported C&D recovered volumes, the proportion of this waste stream relative to C&I & MSW sources has decreased.

MSW sources made up the majority (38%) of waste disposed of to landfill. C&D and C&I sources constituted 36% and 26% of landfill volumes respectively. The contribution of C&D to landfill disposal has fallen relative to the previous reporting period due to a decrease in reported soil quantities to landfill. The proportions of waste to landfill from the MSW and C&I sectors have therefore increased.

Table 2.3 Source sector origins (by weight, tonnes and %) of SA recovered materials and waste to landfill, 2012-13, and diversion rates (%). *Source data for resource recovery by source sector was obtained from the 2012-13 Recycling Activity Survey data. Source data for landfill disposal by source sector during 2012-13 was obtained from Zero Waste SA.*

Sector Origin	Resource Recovery		Landfill		Diversion (%)
	tonnes	(%)	tonnes	(%)	
Municipal	443,000	13%	381,000	38%	53.8%
C&I	1,414,000	41%	265,000	26%	84.2%
C&D	1,594,000	46%	361,000	36%	81.5%
Total[1]	**3,450,000**	**100%**	**1,007,000**	**100%**	**77.4%**

1. Totals may not equate to sums due to rounding.

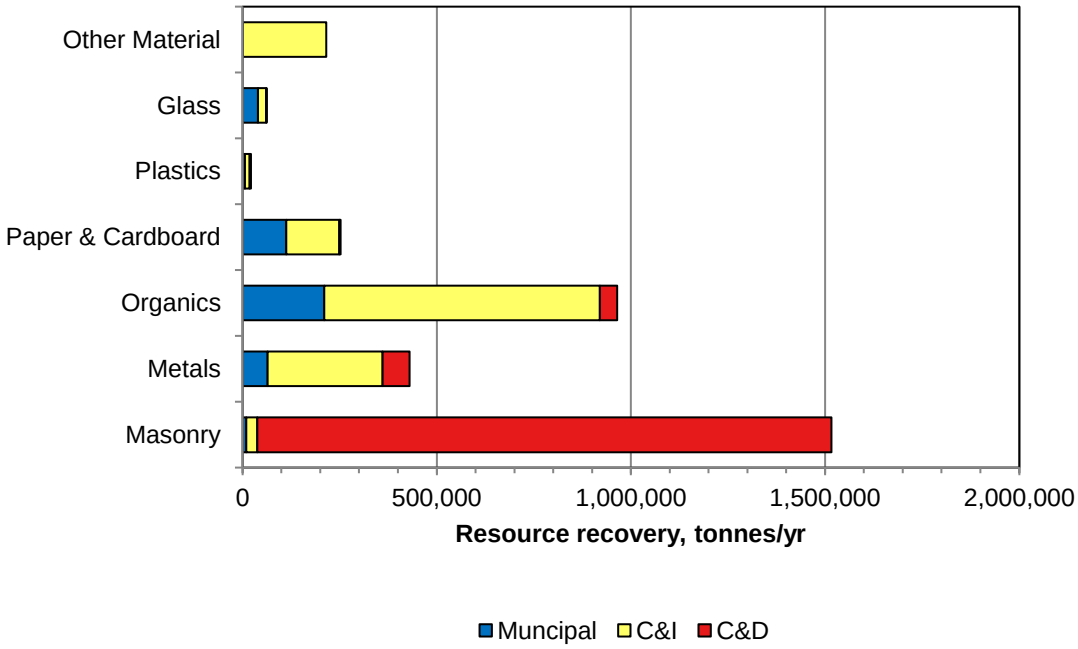

Figure 2.1 **Sector origin of SA recovered materials according to material category (by weight, tonnes), SA 2012-13.** *This figure shows the source sector splits for resource recovered materials by source sector (MSW, C&I and C&D).*

2.1.4 Geographical origin

During 2012-13, metropolitan areas were responsible for three quarters (75% or 2.6 million tonnes) of resource recovery across SA and 80% (0.8 million tonnes) of waste sent to landfill (Table 2.4 below and Figure 2.2 overleaf).

Regional areas again contributed strongly to SA's recycling activity in 2012-13, providing the balance (0.85 million tonnes or 25%) of material being resource recovered. A significant proportion of this resource recovery was achieved from re-processing of industrial by-products from processing industries (e.g. fly ash, wine, timber, meat). Regional areas were also responsible for 0.2 million tonnes (or 20%) of waste disposed of to landfill in SA. Refer to Figures 2.2 and 2.3 for locations of main sites for recyclers/re-processors reporting resource recovery data to the 2012-13 Recycling Activity Survey.

Table 2.4 **Geographical origins (by weight, tonnes and %) of SA recovered materials and waste to landfill, 2012-13, 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	(%)	tonnes	(%)	
Metro	2,600,000	75%	807,000	80%	76.3%
Regional	850,000	25%	200,000	20%	81.0%
Total	**3,450,000**	**100%**	**1,007,000**	**100%**	**77.4%**

1. Landfill data was provided by Zero Waste SA

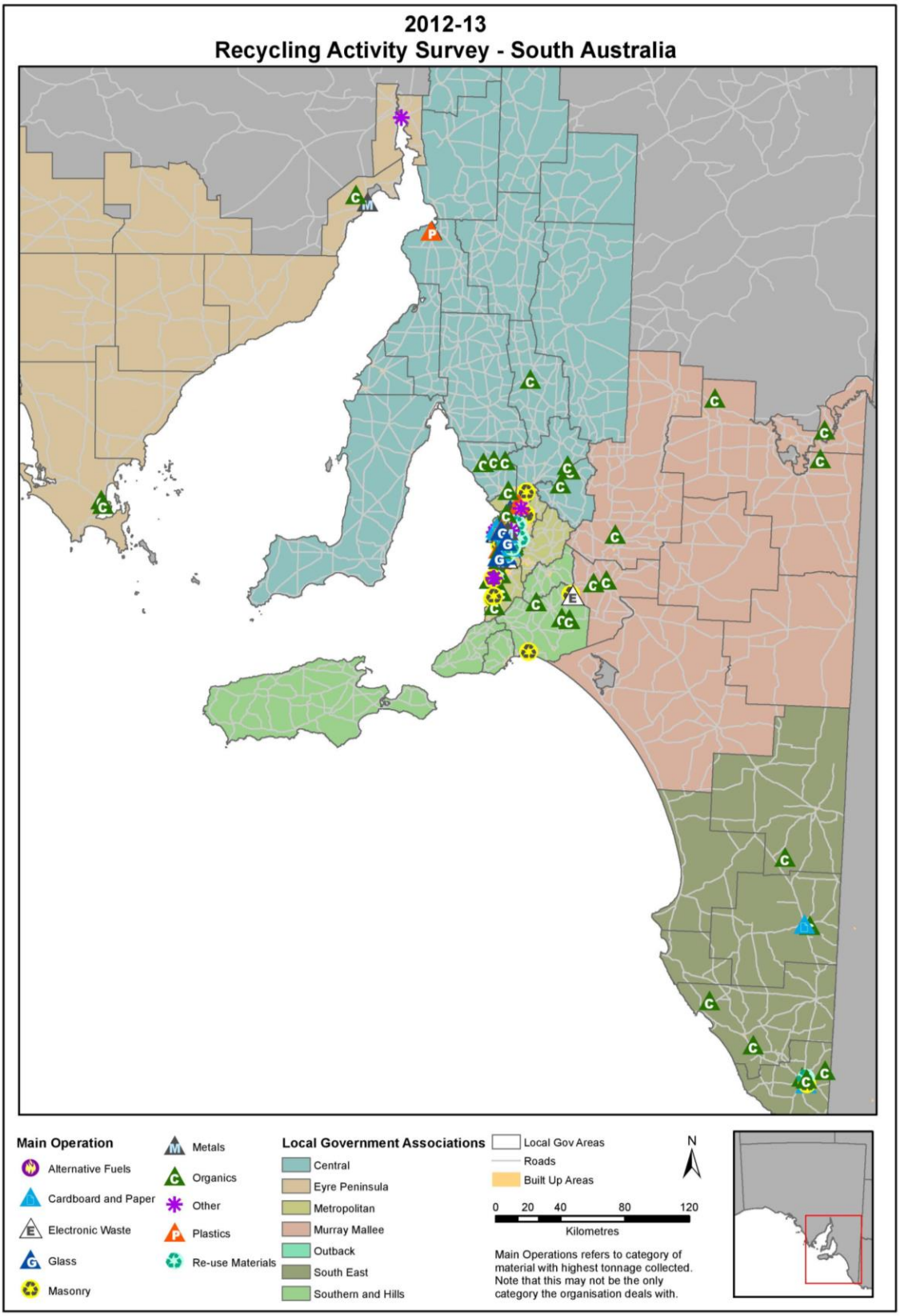

Figure 2.2 Approximate geographical location of main sites for recyclers/re-processors in South Australia. *This map was produced by Zero Waste SA using data from the Zero Waste Environment User System (ZEUS) and from 2012-13 Recycling Activity Survey data. The map illustrates the clustering of SA resource recovery sites across the state.*

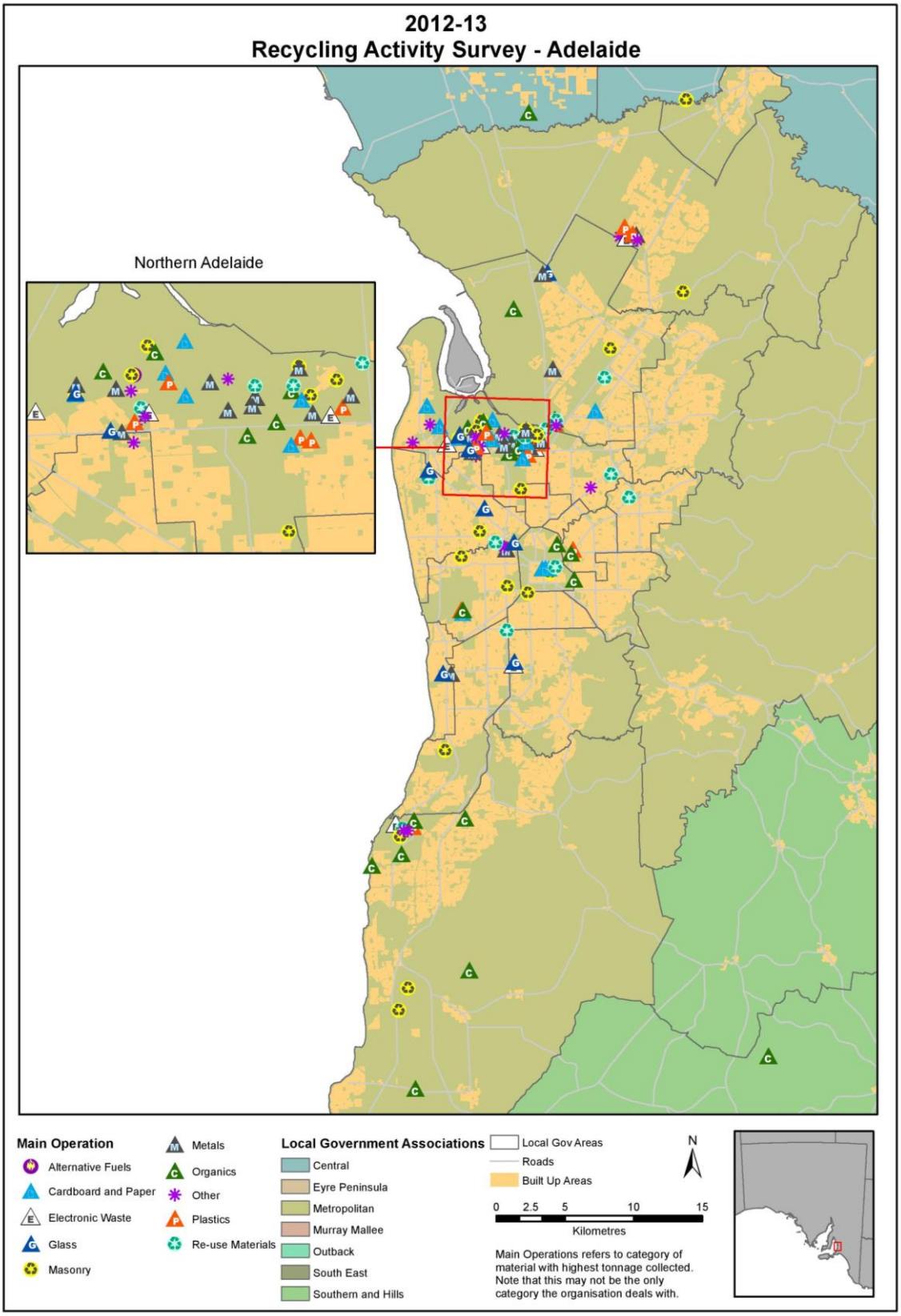

Figure 2.3 Approximate geographical location of main sites for recyclers/ re-processors in Adelaide. *This map was produced by Zero Waste SA using data from the Zero Waste Environment User System (ZEUS) and from 2012-13 Recycling Activity Survey data. The map illustrates the clustering of SA resource recovery sites in the metropolitan area.*

2.1.5 Destination for Recovered Materials

In 2012-13, an estimated 2.83 million tonnes or 82% of all recovered material reported was re-processed in SA (see Table 2.5 below). South Australia has developed its own recycling industry capabilities in most material streams (Figure 2.4). Despite this, the quantity of materials reported as being exported overseas increased to 460,000 tonnes (from 430,000 tonnes in 2011-12). This rise in exported material is principally attributable to greater quantities of recovered Cardboard & Paper being sent overseas for re-processing, rather than being sent interstate, due to the closure of a paper mill in Victoria. Although decreases in Plastic and Other Materials sent overseas for re-processing were evident, these decreases were minor in comparison to the increase in Cardboard & Paper sent overseas (see Table 2.5 & Figure 2.4).

Table 2.5 **Final reported destination (by weight, tonnes and %) of SA sourced materials, 2012-13.** *The destination is where material is sent for re-processing. The majority of resource recovered material in SA is locally re-processed and used in the manufacture of new products.*

Destination	Quantity	
	tonnes	%
SA	2,830,000	82%
Interstate	160,000	5%
Overseas	460,000	13%
Total	**3,450,000**	**100%**

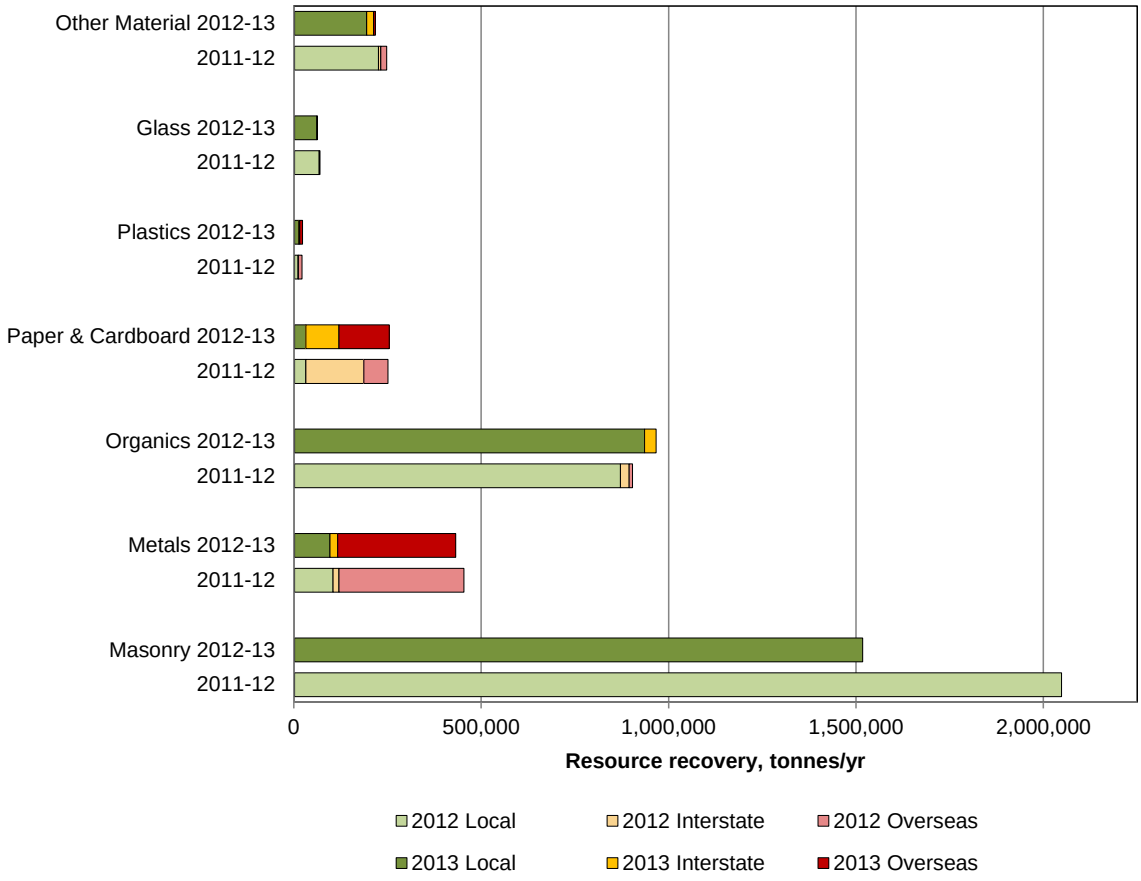

Figure 2.4 **Destination of SA recovered materials according to material category (by weight, tonnes), SA 2012-13 compared with 2011-12.** *This figure shows that the majority of materials are being re-processed within SA. There is a decrease in Other Material sent overseas for recovery and an increase in Cardboard & Paper being sent overseas for recovery. There is also a decrease in quantities of metal sent interstate for re-processing.*

2.2 Performance against State Waste Strategy Targets

2.2.1 Landfill Reduction Target

Target 67 of South Australia's Strategic Plan (SA Government, 2011) sets the following landfill reduction goal for SA:

- ***Reduce waste to landfill by 35% by 2020 (baseline: 2002-03); Milestone of 25% by 2014.***

SA's total landfill disposal during 2012-13 was 1.01 million tonnes, which is a decrease of 20% on the landfill disposal rate in 2002-03 (1.25 million tonnes) – Figure 2.5 below. Excluding contaminated soil, however, SA's disposal to landfill (at 870,000 tonnes) has reduced by 30% since 2002-03 (1.23 million tonnes). SA is therefore on track to achieve its 2014 target if the decrease in contaminated soil to landfill continues to decrease in quantity.

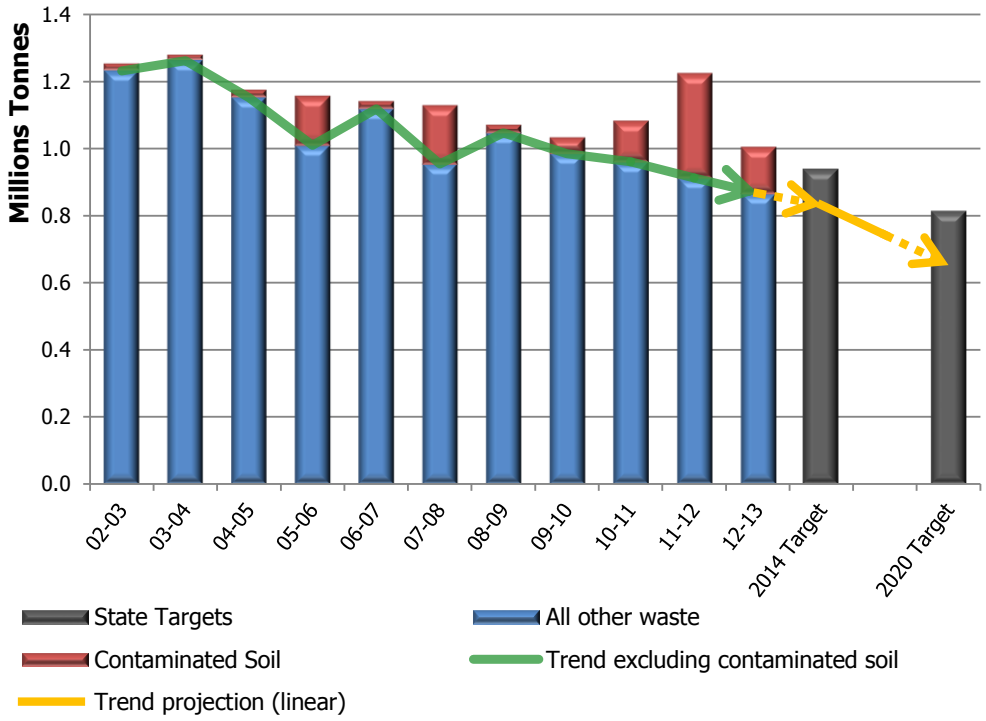

Figure 2.5 **Landfill disposal: Trend in SA since 2002-03 and State Waste Strategy Targets.** *This figure shows how landfill disposal in SA has changed since 2002-03 relative to SA's Strategic Plan (SA Government, 2011) landfill reduction targets. The separate contribution to landfill disposal of contaminated 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 2011-2015 (Zero Waste SA, 2012) has a per capita waste generation target for SA of:

- ***5% reduction in waste generation per capita by 2015 (baseline: 2010-11).***

During 2012-13, per capita waste generation for Standard Reporting Materials decreased by 7.8% from 2010-11 (Table 2.6 below). A larger reduction occurred per capita with Separately Reported Materials & Clean Fill included in the total, with a 17.8% reduction in waste to landfill in 2012-13 since 2011-11.

While only two years have passed (since the baseline year), SA is on track to achieve the 2015 Target for reduction in per capita waste generation, providing waste generation per capita does not increase dramatically before 2015.

Table 2.6 **Per capita waste generation 2012-13: Recycling Activity results and State Waste Strategy target.** *This table gives values for per capita waste generation in 2010-11 to 2012-13 and compares the change achieved from 2010-11 with the 2015 target from the South Australia's State Waste Strategy 2011-2015 (Zero Waste SA, 2012).*

	Per capita Waste Generation (kg/person/yr)				2015 Target
	10-11	*11-12*	*12-13*	***% Change***	
Standard Reporting Materials	2,300	2,210	2,120	**-7.8%**	5% Reduction
Separately Reported Materials & Clean Fill	950	930	550		
TOTAL*	3,250	3,140	2,670	**-17.8%**	

* *Figures may not equate to total due to rounding.*

2.2.3 Metropolitan Diversion Targets

South Australia's Waste Strategy 2011-2015 (Zero Waste SA, 2012) includes targets for metropolitan diversion (to resource recovery) by source sector (Table 2.7 overleaf).

During 2012-13, SA has demonstrated the following progress towards achieving these diversion targets.

- MSW – The diversion rate of 57.5% fell short of the 2012 Target.
- C&I – The diversion rate of 77.1% well exceeded the 2012 Target.
- C&D excluding Separately Reported Materials & Clean Fill – The diversion rate of 82.8% is below that of the 2012 Target.
- C&D Total – The diversion rate of 82.2 % was below the 2012 Target.

Table 2.7 **Metropolitan diversion by source sector: 2012-13 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 South Australia's Waste Strategy 2011-2015 (Zero Waste SA, 2012).*

Source Sector	2012-13 Diversion Achieved	Metro Diversion Target	
		By 2012	*By 2015*
■ **MSW**	**57.5%**	60%	70%
■ **C&I**	**77.1%**	65%	75%
■ **C&D – *excluding Separately Reported Materials & Clean Fill***	**82.8%**	85%	90%
■ **C&D – *Total***	**82.2%**		

2.3 Comparative performance (with other jurisdictions)

Based on resource recovery and landfill data for 2012-13, SA currently has both the highest publicly reported diversion (at 77.4%) and per capita resource recovery volumes (2,070 kg/p/yr) of any state or territory in Australia[5] (Figure 2.6 overleaf). SA also has the lowest landfill volumes at 600 kg per person per year.

SA's per capita waste generation rate (2,670 kg/p/yr) continues to be above several other states or territories, with Victoria achieving the lowest overall per capita waste generation rate (2,097 kg/p/yr) and Queensland reporting the highest per capita waste generation rate (3,477 kg/p/yr).

[5] Note: Not all recycling data needed for this comparison could be obtained for 2012-13. Furthermore, not all Australian states and territories collect and report this data in conformance with the National Waste and Recycling Reporting Guidelines (DSEWPC 2012a). 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.

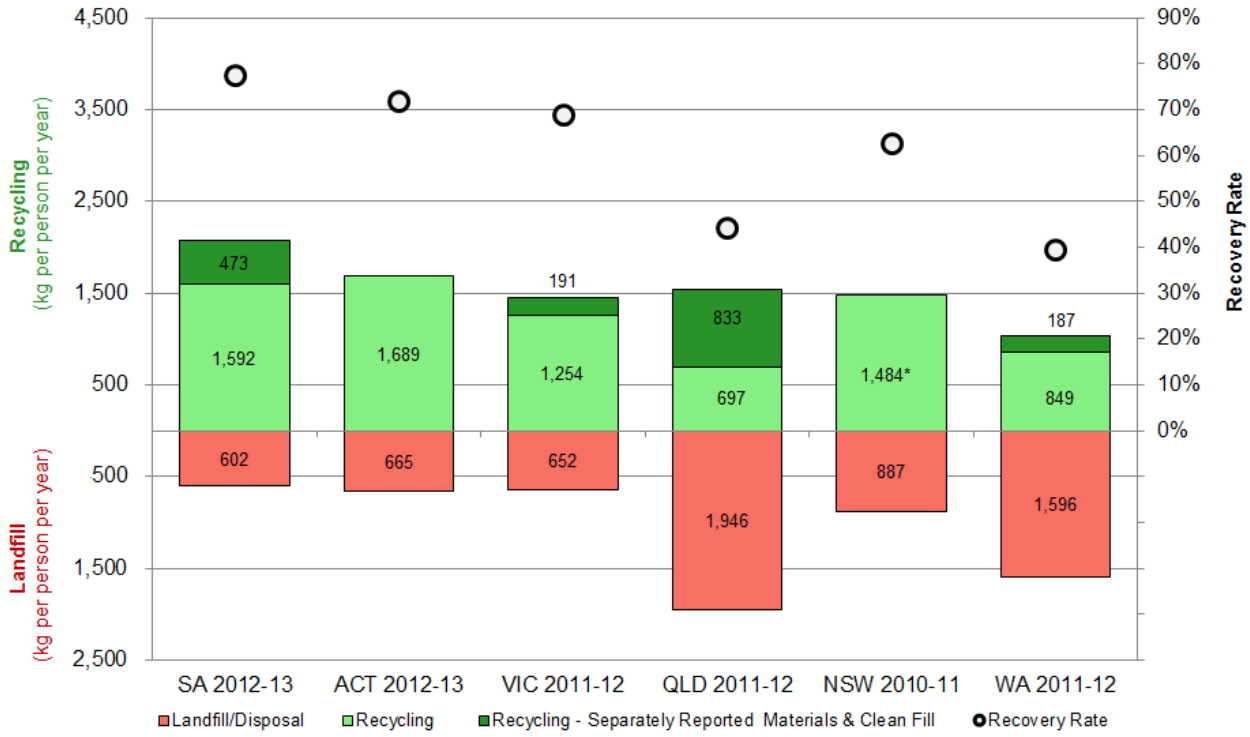

Figure 2.6 Comparison of reported per capita (kg/person/yr) resource recovery and landfill disposal and recovery (%) by state or territory. *This figure illustrates the per capita resource recovery and landfill disposal for different states and territories in Australia based on latest and currently available data (not all of which are for 2012-13). 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 Waste Reporting Guidelines (DSEWPC 2012a). *NSW reported recovery illustrated does not show a breakdown between Standard Reporting Materials and Separately Reported Materials & Clean Fill, which may be included in these quantities.*

3 Material Recycling Activity Reports

At a glance:

- *This section presents the key findings from analysis of 2012-13 Recycling Activity Survey data by material type. These Material Recycling Activity Reports are presented according to commonly accepted material sectors and types listed below, which are aligned with the new National Waste Reporting Guidelines (DSEWPC 2010).*
  1. ***Masonry [refer pg.30 of this report]***
     - *Asphalt*
     - *Bricks*
     - *Concrete*
     - *Plasterboard*
     - *Clay, Fines, Rubble & Soil*
     - *Clay, Fines, Rubble & Soil- Intermediate Waste Soil (Separately Reported Materials & Clean Fill)*
  2. ***Metals [refer pg.34]***
     - *Steel or Ferrous Metals*
     - *Aluminium*
     - *Non-ferrous Metals (exc. Aluminium)*
  3. ***Organics [refer pg. 38]***
     - *Food Organics*
     - *Garden Organics*
     - *Timber*
     - *Other Organics*
  4. ***Cardboard & Paper [refer pg. 42]***
     - *Cardboard and Waxed Cardboard*
     - *Liquid Paperboard*
     - *Magazines & Newsprint*
     - *Printing & Writing Paper*
  5. ***Plastics [refer pg. 46]***
     - *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. 50]***
  7. ***Other Materials [refer pg. 52]***
     - *Fly Ash*
     - *Foundry Sands*
     - *Leather & Textiles*
     - *Tyres & Rubber*
- *This data enables us to measure the performance of South Australia against waste diversion goals and targets in South Australia's State Waste Strategy 2011-15.*

3.1 Masonry

Highlights:

- *In 2012-13 the quantity of recovered Masonry materials fell in line with lower levels of C&D activity in the State.*
- *Recovered Clay, Fines, Rubble & Soil have begun to decrease due to reduced waste produced by several large state infrastructure projects.*
- *The short-term outlook for resource recovery of Masonry is considered poor due to the reduced waste activity from large state infrastructure projects and the private sector C&D activity remaining depressed.*

The total quantity of recovered Masonry materials reported for SA during 2012-13 was approximately 1.5 million tonnes (see Table 3.1 below), which is down by 26% from 2011-12 (2.0 million tonnes). Clay, Fines, Rubble & Soil continued to constitute nearly half (44%) of Masonry materials recovery, followed by Concrete, which contributed 42% to the overall Masonry materials recovered (see Figure 3.1 overleaf). About 28% of the Clay, Fines, Rubble & Soil were classified as Intermediate Waste Soil[6], which was separately reported for the first time in 2011-12.

Table 3.1 Quantity (tonnes) of Masonry material recovered in SA during 2012-13, including estimated reporting error (in tonnes & %). *This table includes separate reporting of Intermediate Waste Soil in the total Clay, Fines, Rubble & Soils.*

Item	Net Recovery[1]	Reporting Error	
	tonnes	tonnes	%
Asphalt	148,000	24,000	16%
Bricks	50,000	10,000	20%
Concrete	640,000	143,000	22%
Plasterboard	600	100	17%
Total Clay, Fines, Rubble & Soil [2]	670,000	128,000	19%
■ Clay, Fines, Rubble & Soil[2]	480,000	87,000	18%
■ Clay, Fines, Rubble & Soil – Intermediate Waste Soil[3]	190,000	41,000	22%
Total	**1,508,600**	**310,000**	21%

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] is a new material category, reported for the first time in 2011-12.

[6] 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 soil type from Waste Derived Fill (WDF) (or 'clean fill'). Intermediate Waste Soil can be used for construction fill or purposes without remediation or treatment but only required a site-specific risk-based assessment verified by an independent auditor.

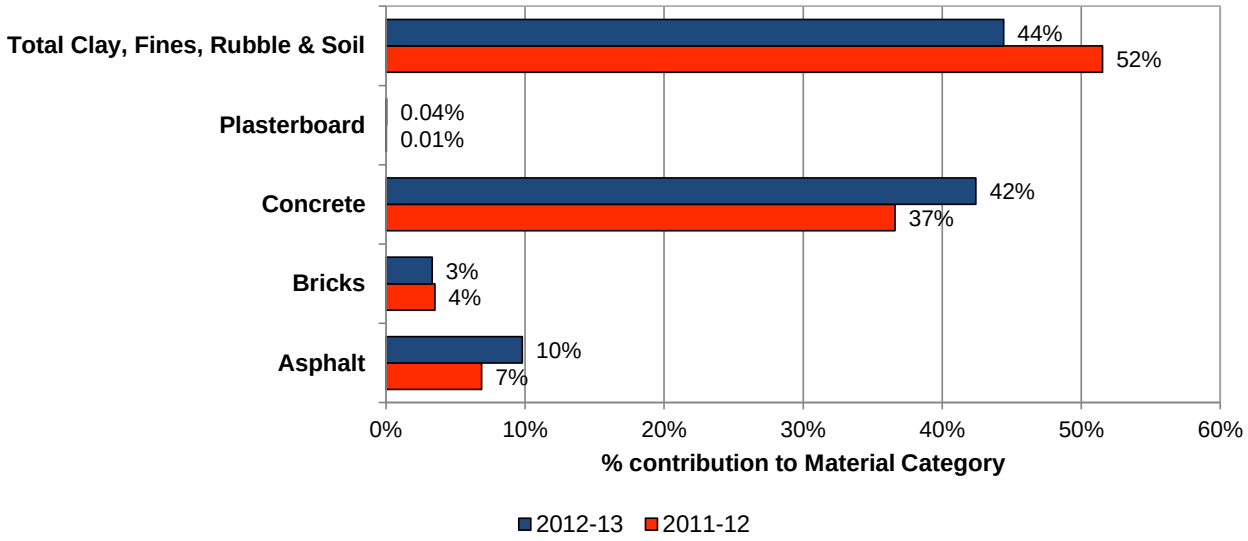

Figure 3.1 Changes in percent composition of recovered Masonry (by weight), SA, between 2011-12 and 2012-13. *In 2012-13, the total Masonry tonnes decreased, mainly driven by a decrease in Total Clay, Fines, Rubble & Soil.*

During 2012-13 there was an apparent large decrease in the resource recovery for some Masonry materials:

- Clay, Fines, Rubble & Soil fell by 37% (or 400,000 tonnes);
- Bricks were down 32% (or by 23,000 tonnes); and
- Concrete appears to be down 16% (or by 120,000 tonnes).

The exceptions to reduced resource recovery in the Masonry sector were Asphalt, which appears to have increased by 3% (or 5,000 tonnes), Plasterboard, which remained stable from 2011-12 (no change), and Intermediate Waste Soil, which appeared to increase by 19% (or 30,000 tonnes). The increase in Intermediate Waste Soil is most likely attributable to better separation measures/classifications.

In 2012-13 the majority (97%) of recovered Masonry materials originated from C&D sources (Table 3.2 overleaf) with small quantities were reported from C&I (2%) and Municipal (1%) sources. Most of these Masonry materials (96%) were sourced from Metropolitan SA (Table 3.2), and all tonnes were re-processed locally in SA (Table 3.2 overleaf).

The volumes of Masonry materials recovered in SA are affected by fluctuations in building construction and demolition activity that occur from year to year (see Figures 3.2 and 3.3 on pages overleaf).

- In 2012-13, Clay, Fines, Rubble & Soil remained high, despite the 37% fall in total tonnes recovered since 2011-12 (see Figure 3.2 overleaf), which is partially due to large on-going state infrastructure projects advancing beyond the significant waste generation stages.
- Asphalt remains high since a large increase in 2009-10.
- Bricks and Concrete appear to have both continued their decrease from 2010-11 tonnes.
- Plasterboard, which was only introduced in the SA Recycling Activity Report in 2010-11, remains a minor quantity, and appears stable.

Table 3.2 Sector and geographical origins and re-processing locations for recovered Masonry in SA in 2012-13. *The metropolitan region and C&D sector provided the source of virtually all recovered Masonry for SA, which was locally re-processed.*

Item	Sector Origin (%)			Geographical Origin (%)		Re-processing Location (%)		
	Municipal	C&I	C&D	Metro	Regional	SA	Interstate	Overseas
Asphalt	0%	0%	100%	99%	1%	100%	0%	0%
Bricks	0%	0%	100%	93%	7%	100%	0%	0%
Concrete	0.6%	0.8%	98.6%	96%	4%	100%	0%	0%
Plasterboard	11%	0%	89%	86%	14%	100%	0%	0%
Total Clay, Fines Rubble & Soil	1%	3%	96%	95%	5%	100%	0%	0%
Total	1%	2%	97%	96%	4%	100%	0%	0%

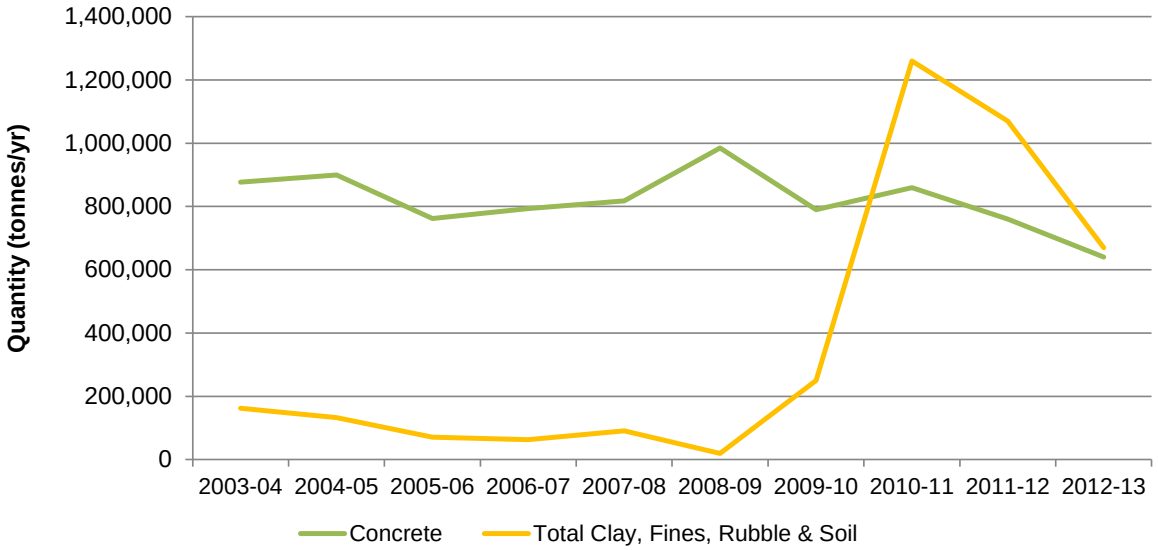

Figure 3.2 Changes in reported Masonry quantities since 2003-04 – Concrete and Total Clay, Fines, Rubble & Soil. *This figure shows the recent high levels of recovered Clay, Fines, Rubble & Soil, have appeared to decline due to the advancement of large state infrastructure projects.*

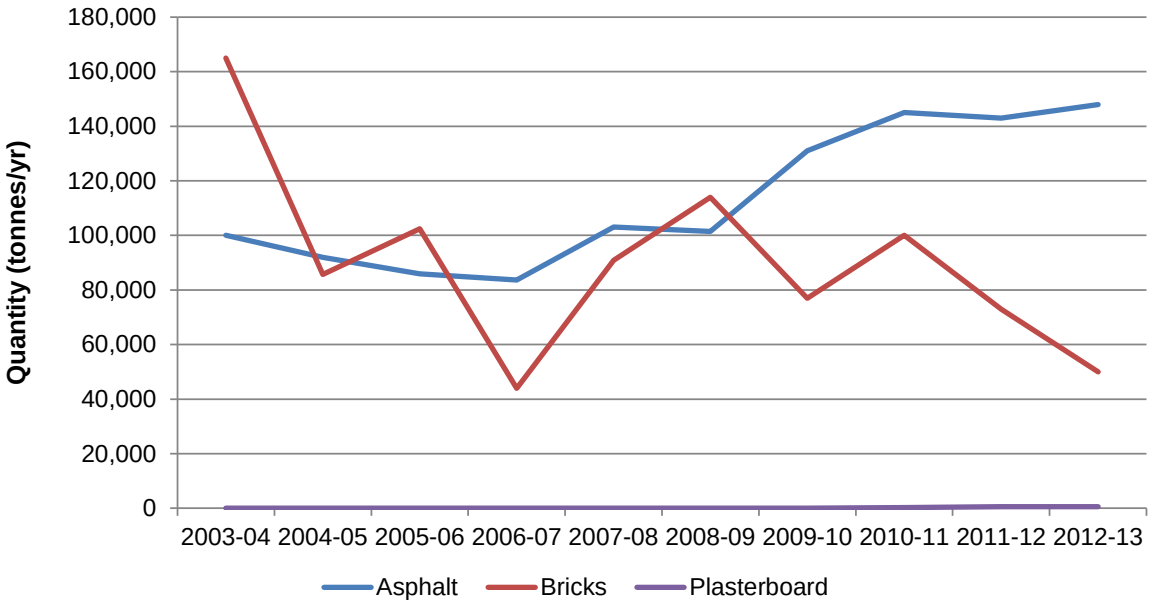

Figure 3.3 **Changes in reported Masonry quantities since 2003-04 – Asphalt, Bricks and Plasterboard.** *Recovery of Asphalt increased from 2011-12, whereas Bricks appear to have fallen from 2010-11 levels.*

Industry reported that there were still depressed levels of private sector C&D activity during 2012-13. The reported outlook for Masonry material recovery for the next period was also considered poor:

- Depressed private sector C&D activity is expected to continue in the short term.
- The advancement of large state infrastructure projects also indicates that public C&D activity will also be down in the next period.
- The decrease in tonnes in 2012-13 and expected additional decrease in tonnes for the next period have led to an extremely competitive market. Additional policing may be required to ensure compliance with regulatory and EPA licensing requirements to provide a 'level playing field' for market players.
- Concerns for increasing Masonry stockpiles were also evident.
- State Government has increased the recycled content of asphalt allowed since 2011-12, thus improving the market for recycled asphalt materials.
- There are still concerns in the industry about waste soil finding its way to landfill rather than to beneficial reuse as the industry transitions to new regulatory requirements for managing waste derived fill.
- Market prices for end products of re-processed materials are also down, which has contributed to a decrease in revenue earned by the Masonry materials recovered. However, a good future market for recycled masonry materials appears to continue.

3.2 Metals

Highlights:

- *In 2012-13 the quantity of recovered Metals decreased slightly for all material streams.*
- *Large state infrastructure projects are advancing past their major waste stages, reducing Metal scrap tonnes in the market for the next period (2013-14).*
- *The immediate outlook for Metals recovery is expected to be poor. This was reported to be the result of higher Australian dollar, lower commodity values and pressures on local manufacturing.*

The total quantity of recovered Metals reported for SA during 2012-13 was approximately 429,900 tonnes (Table 3.3 below), which is down by 5% (or 22,400 tonnes) from 2011-12. Steel remained the dominant contributor to recovered Metals. A slight decrease in volumes occurred across all Metal materials:

- Non-ferrous Metals decreased by 12% (or 3,400 tonnes);
- Aluminium decreased by 10% (or 2,000 tonnes); and
- Steel decreased slightly, by approximately 4% (or 17,000 tonnes).

The slight decrease in overall Metal recovery tonnes is partially due to large state infrastructure projects coming to an end of their major waste generation stages. In this period, recovery of scrap steel from the demolition of the Port Stanvac refinery partially offset what would have otherwise been significantly lower volumes of steel recovery. Lower quantities of Metal recovery were reported from the Municipal and C&D sectors, while volumes from C&I sources remained relatively stable. High competition for Metal scrap volumes available in the market has led to the closure of at least one metal collector/re-processor.

Table 3.3 **Quantity of Metals (tonnes) recovered in SA during 2012-13, including estimated reporting error (tonnes & %).** *Steel remained the dominant contributor to recovered Metals in SA.*

Item	Net Recovery[1]	Reporting Error	
	tonnes	tonnes	%
Steel	387,000	63,000	16%
Aluminium	18,500	2,000	11%
Non-ferrous Metals	24,400	3,300	14%
Total	**429,900**	**68,000**	16%

1. Net recovery excludes re-processing losses

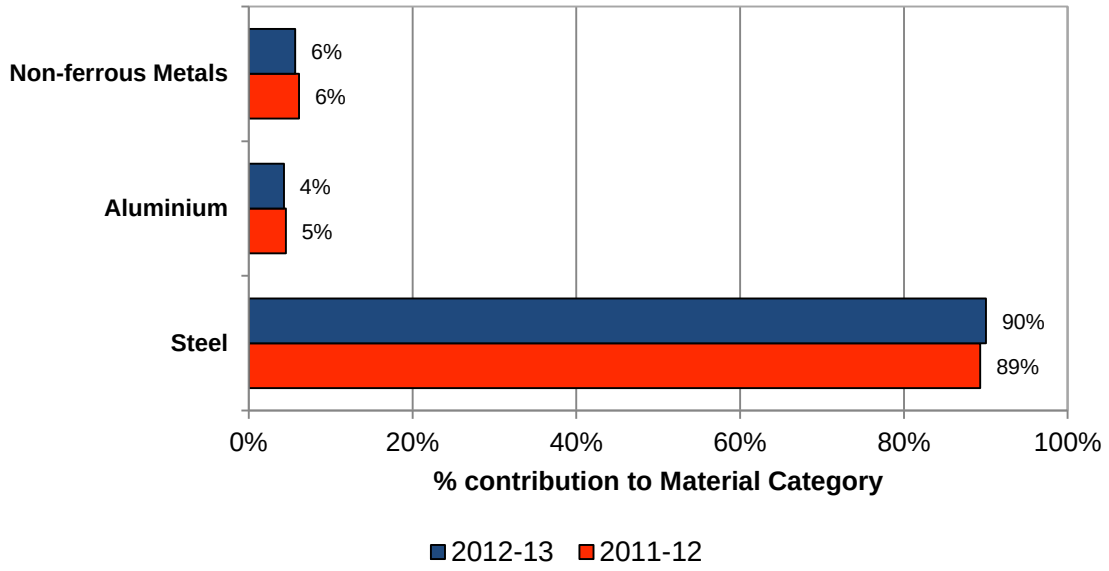

Figure 3.4 **Changes in percent composition of recovered Metals (by weight), SA, between 2011-12 and 2012-13.** *There was little change in the relative contributions of the different metal types to overall recovered Metals.*

Steel continued to constitute the majority (90%) of Metal recovery (see Figure 3.4 above). Non-ferrous Metals and Aluminium made up 6% and 4% of reported Metal recovery respectively.

The slight decrease in Metal recovery during 2012-13 stabilises the material recovery increase experienced since 2008-09 (see Figures 3.5 and 3.6 overleaf).

During 2012-13, C&D recovery material origins decreased from 2011-12 contributions (16% in 2012-13, 21% in 2011-12). This was offset by a slight increase in Metal from C&I sources (69% in 2012-13, up from 64% in 2011-12).

The destination for re-processing of Metals was approximately 22% and 78% between re-processors in SA and those interstate and overseas. The re-processing of Steel in SA occurs at local steelworks and metals foundries that accept substantial amounts of scrap steel for recycling. Almost all of recovered Aluminium (98%) and virtually all (99%) of the Non-ferrous Metals, however, were sent interstate or overseas for re-processing.

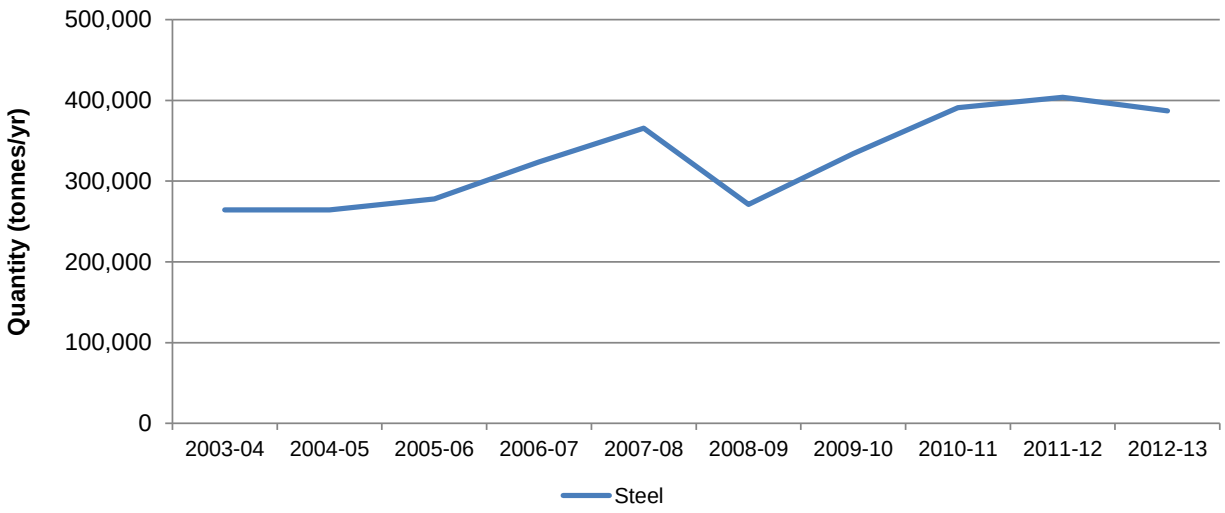

Figure 3.5 **Changes in reported metal quantities since 2003-04 – Steel.** *Recovered Steel decreased in 2012-13, returning to 2010-11 levels.*

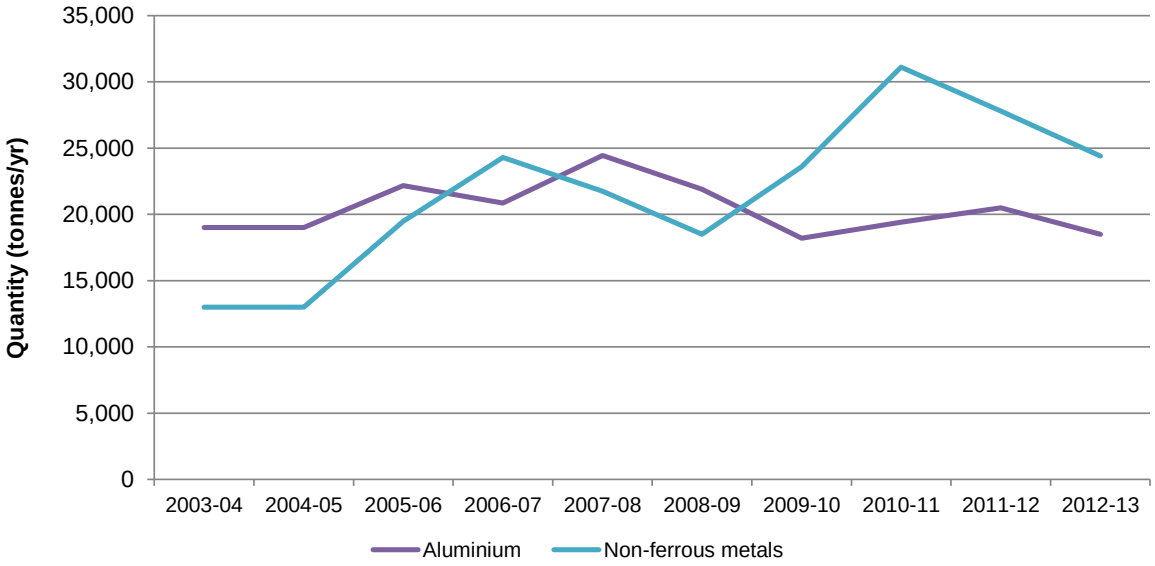

Figure 3.6 **Changes in reported metal quantities since 2003-04 – Aluminium and Non-ferrous Metals.** *Recovery of Non-ferrous continued to decrease in 2012-13 from the 2010-11 high.*

Table 3.4 **Sector and geographical origins and re-processing locations for recovered Metals in SA during 2012-13.** *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	15%	68%	17%	85%	15%	24%	3%	73%
Aluminium	15%	77%	8%	88%	12%	2%	11%	87%
Non-ferrous Metals	14%	72%	14%	92%	8%	1%	23%	76%
Total	15%	69%	16%	85%	15%	22%	4%	74%

The outlook for Metals recovery for the next period is expected to be poor with quantities anticipated to fall again.

- Large state infrastructure projects are coming to a close of their major waste generation stages.
- Scrap metal from the manufacturing sector is expected to continue to decline. This may be partially offset again in the 2013-14 period as the demolition of the Port Stanvac refinery is completed.
- Due to decreased tonnes, competition within the market has increased, which has led to the closure of one collector/re-processor.
- The ferrous market is considered to be reasonable and stable over the 2012-13 and forecast to remain stable in the next period.
- Several challenges to Metals recovery reported by industry relate to export of the material (given that 74% of metals are sent overseas for re-processing). These include the high Australian dollar, increased shipping costs and reduced demand from China for scrap metal resulting in lower commodity values.

Another factor reported to be impacting on the Metals recycling sector is the increasing Solid Waste Levy, which increases operating costs involved with disposing residual material to landfill. There are efforts being made to recover more metals from the residual to reduce this impact.

3.3 Organics

Highlights:

- *In 2012-13 overall quantities of Organic material recovery increased.*
- *This increase was driven by an increase in Other Organics materials and Food Organics.*
- *The increase in Other Organics was mainly due to improved reporting practices (including the addition of new materials to the stream) and increases in the volumes of Grease Trap recovery*
- *The wine industry also increased its contribution in 2012-13 compared to previous periods, adding to Other Organics tonnes.*

The total quantity of recovered Organics reported for SA during 2012-13 was approximately 963,900 tonnes (see Table 3.5 below), which is up slightly, by 7%, from 2011-12.

Other Organics continued to constitute the majority (53%) of Organics recovery (see Figure 3.7 overleaf). Timber and Garden Organics made up 25% and 22% of reported Organics recovery respectively.

The main contributor to the increase in Organics recovery was Other Organics (up 107,000 tonnes from 2011-12), and an increase in Food Organics (up 2,300 tonnes from 2011-12). Conversely, Timber and Garden Organics recovery tonnes were slightly down from 2011-12 by 44,000 tonnes and 3,000 tonnes respectively (see Figures 3.8 and 3.9 overleaf).

Miscellaneous Organics under the Other Organics category includes organic items that could not be classified in the specific Organic material streams, such as pre-consumer waste from the food industry. The Organics – Other category also experienced an increase from 2011-12 levels (up 39,000 tonnes from 2011-12).

Table 3.5 **Quantity of Organics (tonnes) recovered in SA during 2012-13, including estimated reporting error (tonnes & %).** *Other Organics, followed by Timber, then Garden Organics, were the major contributors to recovered Organics.*

Item	Net Recovery[1]	Reporting Error	
	tonnes	tonnes	%
Food Organics	7,900	1,400	18%
Garden Organics	209,000	27,300	13%
Timber	237,000	54,000	23%
Other Organics	510,000	34,000	7%
- Meat Rendering	210,000	8,000	4%
- Waste Grease & Fat	102,000	8,000	8%
- Waste Sludge & Bio-solids	48,000	11,000	23%
- Miscellaneous Organics	150,000	7,000	5%
Total	**963,900**	**116,700**	12%

1. Net recovery excludes re-processing losses

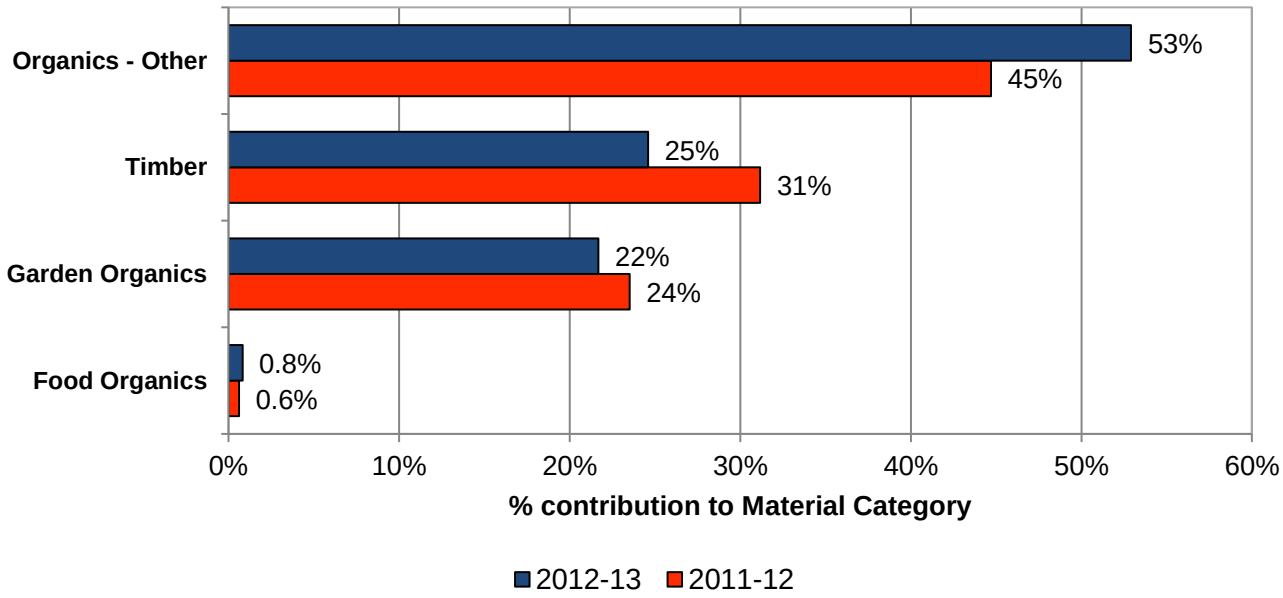

Figure 3.7 **Changes in percent composition of recovered Organics (by weight), SA, between 2011-12 and 2012-13.** *The increase in Other Organics increased their overall contribution to the overall Organics tonnes recovered. Total percentages may not equate to 100% due to rounding.*

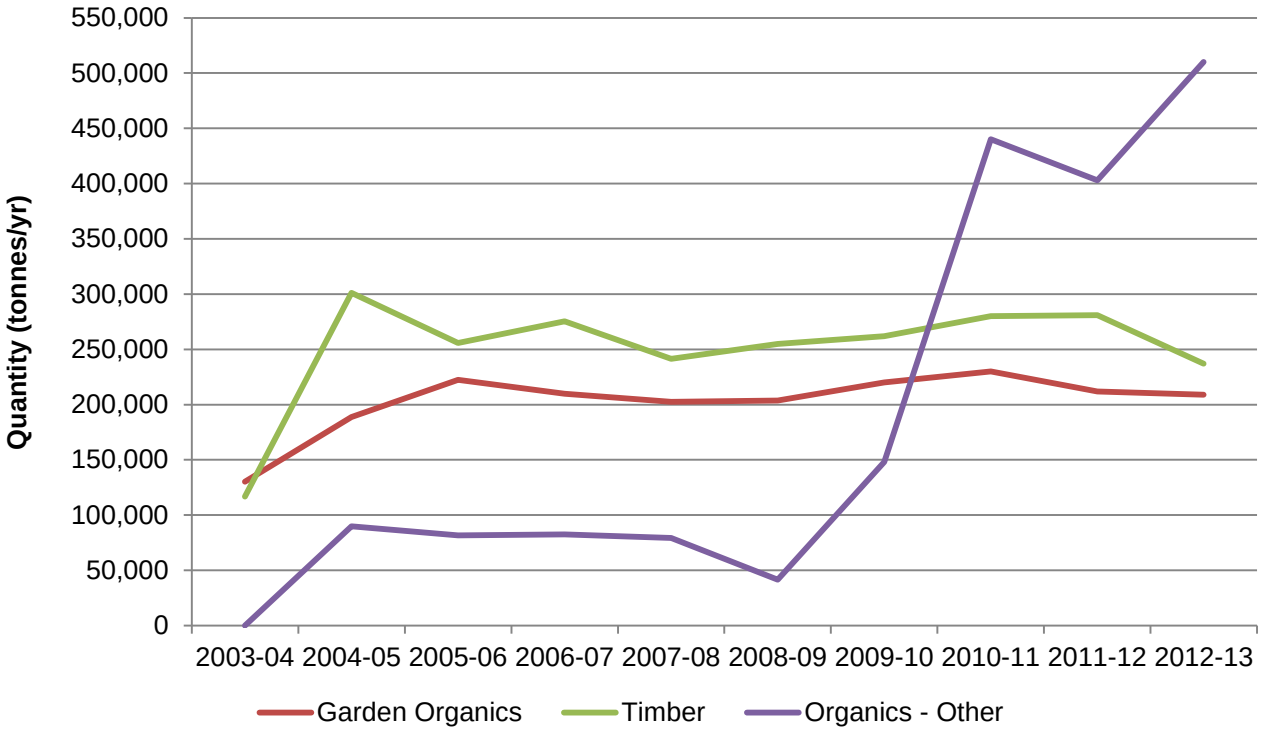

Figure 3.8 **Changes in reported organics quantities since 2003-04 – Garden Organics, Timber and Other Organics.** *Garden Organics and Timber decreased slightly, while Other Organics increased in 2012-13.*

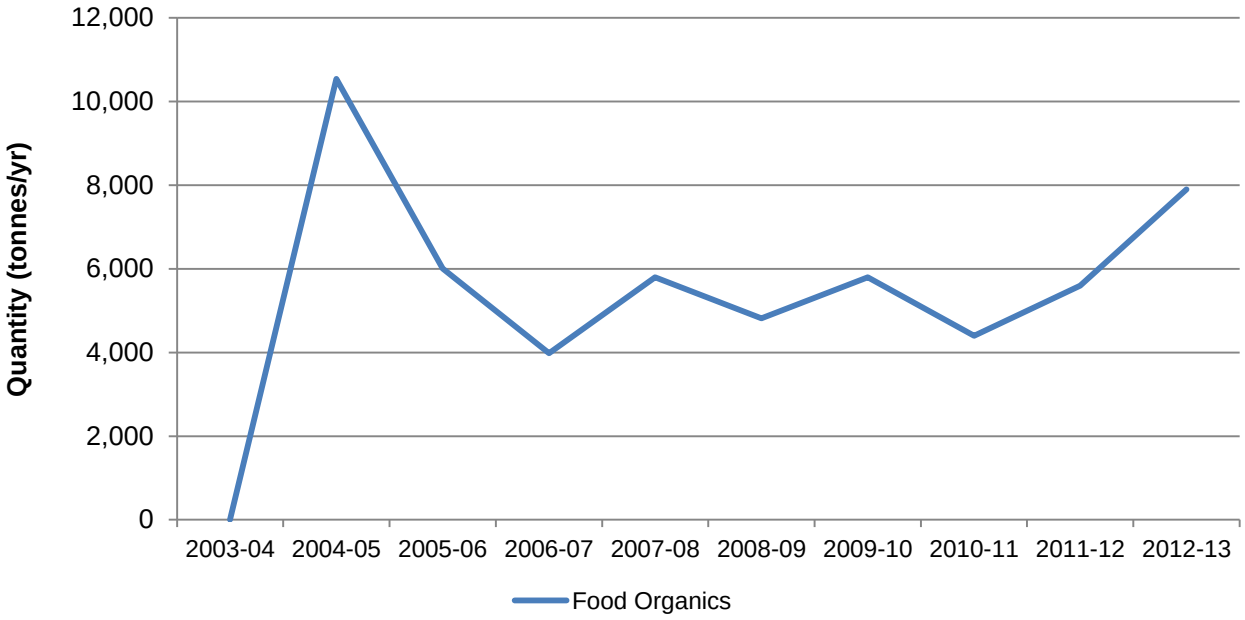

Figure 3.9 **Changes in reported organics quantities since 2003-04 – Food Organics.** *Food Organics rose due to the addition of food to some Municipal service collections.*

The overall increase in Organics material recovery was driven by an increase in Other Organic materials. The increase in Other Organics materials was mainly due to improved reporting practices (including the addition of new materials to the stream) and increases in the volumes of Grease Trap recovery.

An increase in Food Organics was also noted (up 41% or 2,300 tonnes from 2011-12):

- This higher Food Organics recovery was due to the continued expansion of commercial food waste recycling collections; and
- Greater amounts of Food Organics are also being recovered through expansion of council organics collections. However, these additional municipal volumes were not separately identifiable and remain included in Garden Organics category.

These increases offset the declines in the Timber and Garden Organics materials.

In 2012-13, the majority (73%) of recovered Organics originated from C&I sources including material from the timber, meat rendering and wine production industries (Table 3.6). Approximately 22% of recovered Organic materials originated from municipal sources including a large amount of Garden Organics. The rest (5%) was sourced from the C&D sector, including quantities of Timber and Garden Organics.

Due to the significant contribution by regional industries to Other Organics and Timber, approximately half (49%) of recovered Organics was sourced from SA's regional areas (Table 3.6 overleaf).

Most Organic materials (97%) were re-processed locally with only small quantities of Other Organics sent interstate for recovery (Table 3.6).

The outlook for Organics recovery for the next period is expected to be generally positive:

- The wine industry is contributing increasing tonnes after a decline over the past few periods;
- Continued growth of Food Organics recovery through an increased number of councils accepting food in kerbside green organic collections and increased commercial food organics collections;
- Competition for Organics tonnes is increasing within the market;
- The market price for the end product has seen some reduction despite a steady demand for the end products being expected to continue;
- The industry is continuing to develop new markets and products to suit in areas such as broad acre agriculture and horticulture;
- Waste to energy is being investigated by some market participants for residuals from organics processing;
- The demand in the market for compost and mulch is generally steady, but up for other organics end-products such as those from Meat Rendering are increasing;
- There is still uncertainty around timber industry related recovery in the South East of South Australia.

Perceived barriers in the market include the rise of electricity prices, along with the cost of equipment.

Table 3.6 **Sector and geographical origins and re-processing locations for recovered organics in SA during 2012-13.** *C&I, particularly regional industries, make substantial contributions to recovered organics. Most recovered organics are re-processed locally.*

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	77%	18%	5%	88%	12%	100%	0%	0%
Timber	2%	84%	14%	57%	43%	100%	0%	0%
Other Organics	9%	91%	0%	33%	67%	94%	6%	0%
Total	22%	73%	5%	51%	49%	97%	3%	0%

3.4 Cardboard & Paper

Highlights:

- *In 2012-13 overall quantities of recovered Cardboard & Paper remained relatively stable (increase of only 1% from 2011-12).*
- *An increase in Cardboard & Paper being sent for re-processing overseas, rather than interstate emerged, despite the introduction of the Chinese 'Green Fence' Policy in February 2013.*
- *Magazines & Newspapers were reported as a single category, along with Phone Books for the first time in 2012-13.*

The total quantity of recovered Cardboard & Paper materials reported for SA during 2012-13 was approximately 253,100 tonnes (see Table 3.7 below), which remained stable from 2011-12 figures (increase of only 1% or 3,700 tonnes).

The majority of Cardboard & Paper materials remained relatively stable from 2011-12 figures. Printing & Writing Paper decreased by 11% (or 2,600 tonnes) (see Figure 3.12), whereas Cardboard & Waxed Cardboard increased slightly, by 4% (or 7,000 tonnes) (see Figure 3.11). Anecdotal evidence suggests that the decrease in reported volumes of Printing & Writing Paper recovery may be due to paper instead being sent for recovery and reported as a mixed cardboard/paper stream. This trend increase in Cardboard & Waxed Cardboard may reflect a wider use of cardboard for consumer and pre-consumer packaging in place of polystyrene and increased recovery from C&I sources. Magazines & Newsprint decreased by 2% (or 700 tonnes) and Liquid Paperboard volumes remained stable from the previous period (see Figure 3.12).

Overall the market remained relatively stable, despite the introduction of the Chinese 'Green Fence' Policy, which ensures the quality of Paper & Cardboard (along with other materials) exported to China contain minimal contaminants (Tolokon, 2013).

Cardboard & Waxed Cardboard continued to constitute the majority (75%) of Cardboard & Paper recovery (see Figure 3.10 overleaf). Magazines & Newsprint, and Printing & Writing Paper contributed 15% and 8% of recovered Cardboard & Paper recovery respectively.

Magazines & Newsprint are reported together for the first time in 2012-13. This classification includes phone books. In previous years these three streams were reported individually.

Table 3.7 **Quantity of Cardboard & Paper (tonnes) recovered in SA during 2012-13, 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	190,000	29,000	15%
Liquid Paperboard	3,600	300	8%
Magazines & Newsprint[2]	38,800	1,965	5%
Printing & Writing Paper	20,700	1,600	8%
Total	**253,100**	**32,900**	13%

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

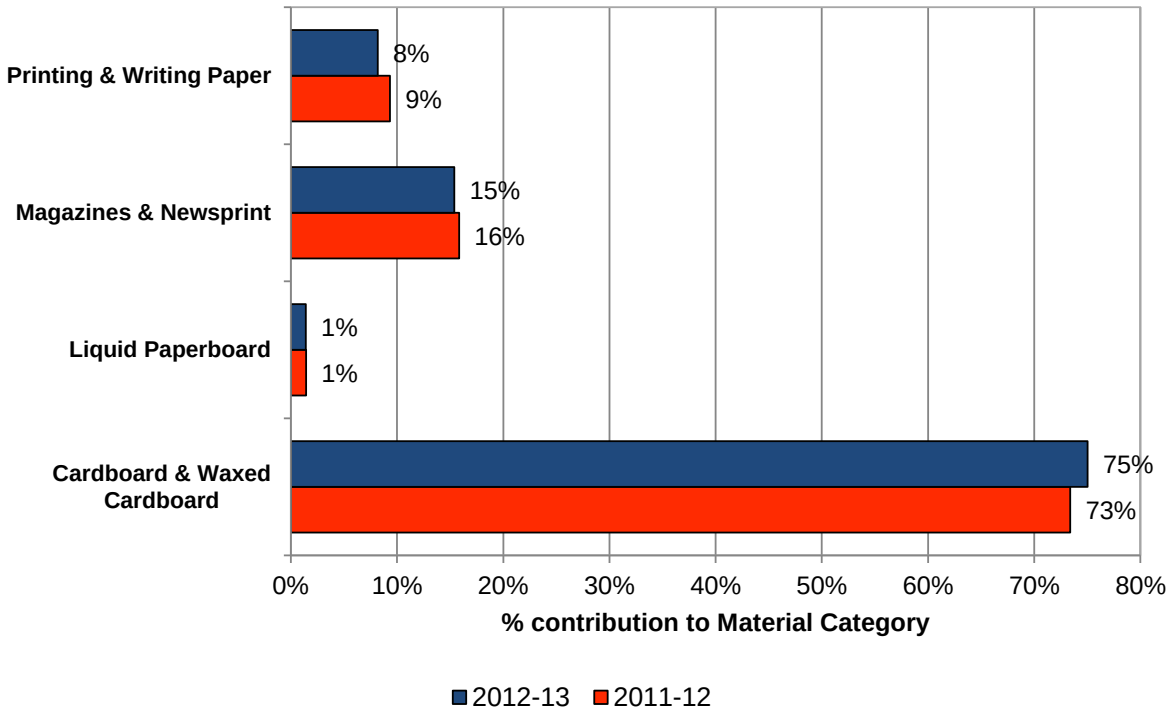

Figure 3.10 **Changes in percent composition of recovered Cardboard & Paper (by weight), SA, between 2011-12 and 2012-13.** *Relative contributions by the different material types have remained relatively similar to 2011-12 proportions.*

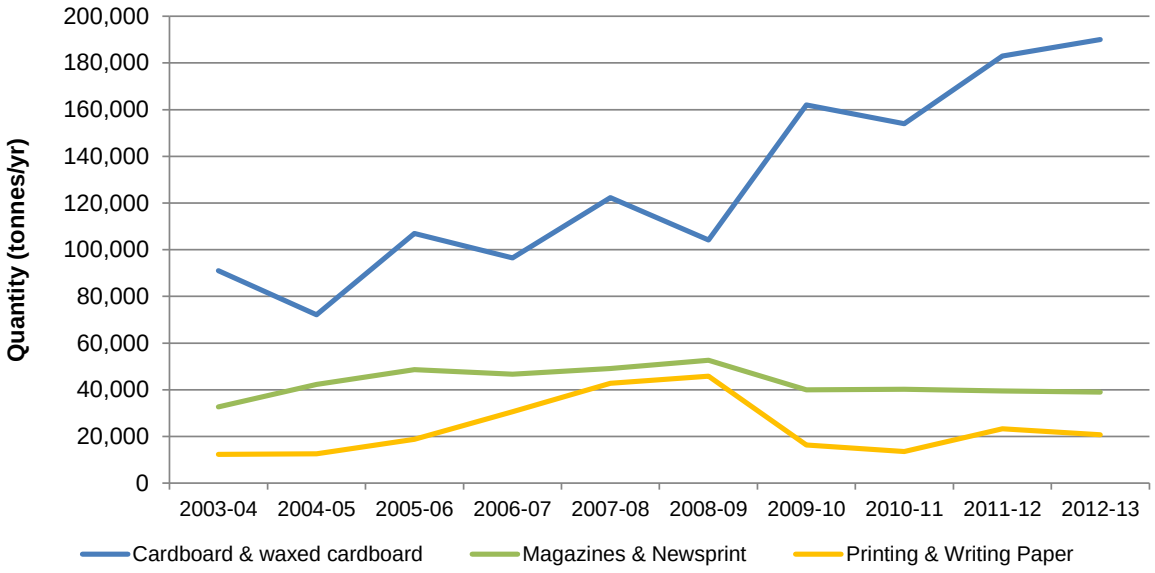

Figure 3.11 **Changes in reported Cardboard & Paper quantities since 2003-04 – Cardboard & Waxed Cardboard, Magazines & Newsprint and Printing & Writing Paper.** *Cardboard has continued on its upward trend.*

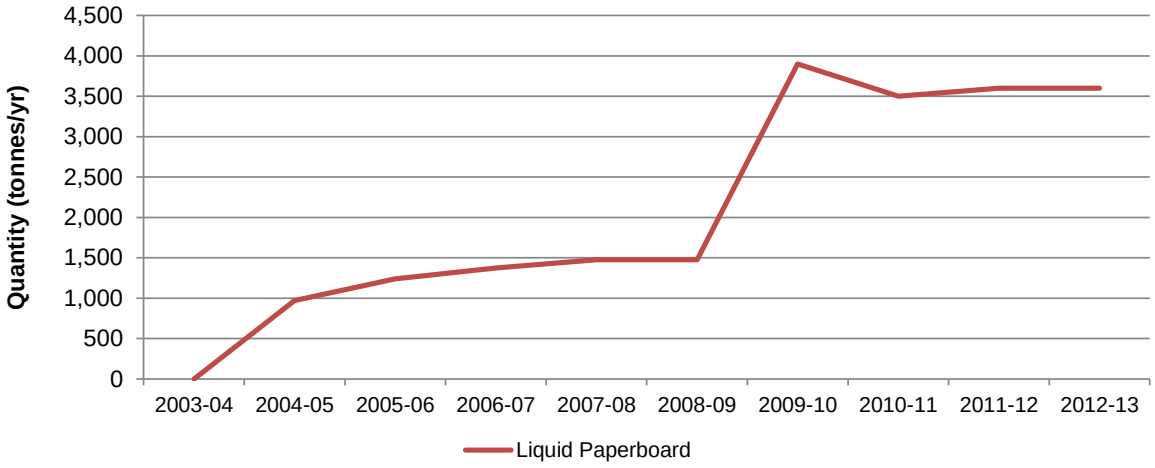

Figure 3.12 **Changes in reported Cardboard & Paper quantities since 2003-04 – Liquid Paperboard.** *Recovery of Liquid Paperboard has remained stable since 2010-11.*

In 2012-13 C&I and Municipal sources made up 54% and 44% of reported recovered Cardboard & Paper materials respectively (see Table 3.8 overleaf).

In 2012-13 a greater proportion of Cardboard & Paper was sent overseas for re-processing (26% in 2011-12, increased to 53% in 2012-13), rather than sent interstate (62% in 2011-12, decreased to 35% in 2012-13) (see Table 3.8). Changes in supply chains and in paper mills Australia-wide have partially influenced the appeal of exporting Cardboard & Paper products from South Australia.

The majority of Cardboard & Paper (77%) was sourced from Metropolitan South Australia (Table 3.8). This remained consistent with 2011-12 figures.

A significant amount (12%) was reported as being re-processed in SA via composting, vermiculture and waste-to-energy.

The outlook for recovery of Cardboard & Paper is expected to remain relatively stable:

- The Cardboard & Paper recycling industry appears to be coping well with the introduction of the Chinese 'Green Fence' Policy in February 2013. This has seen an increase in exports to South-East Asian countries other than China on the rise;
- The market is expected to remain stable throughout 2013-14, although Magazines & Newspapers are expected to continue in steady decline;
- The high Australian dollar can affect the viability of exporting product, and a weaker global market is becoming apparent; and
- The Solid Waste Levy is seen as an additional cost and a barrier to being able to invest back into business.

Table 3.8 **Sector and geographical origins and re-processing locations for recovered Cardboard & Paper in SA during 2012-13.** *An increase in material being sent for re-processing overseas instead of interstate is an evident change from 2011-12.*

Item	Sector Origin (%)			Geographical Origin (%)		Re-processing Location (%)		
	MSW	C&I	C&D	Metro	Regional	SA	Interstate	Overseas
Cardboard & Waxed Cardboard	41%	57%	2%	75%	25%	13%	31%	56%
Liquid Paperboard	95%	5%	0%	82%	18%	0%	41%	59%
Magazines & Newsprint	75%	25%	0%	96%	4%	0%	57%	43%
Printing & Writing Paper	9%	91%	0%	62%	38%	29%	27%	44%
Total	44%	54%	2%	77%	23%	12%	35%	53%

3.5 Plastics

Highlights:

- *In 2012-13 reported quantities of recovered Plastics increased.*
- *In particular HDPE increased by 13%, LDPE increased by 5%, PVC increased four-fold and PS increased by 52%. These increases could be due to more accurate reporting by local re-processors instead of indicating a real change.*
- *The introduction of the Chinese 'Green Fence' Policy appears to have contributed towards a decrease in Plastic material exports.*
- *Plastics recovery appears to be a dynamic sector subject to future change as local re-processors look to source feedstock material interstate and design changes to plastics packaging continue to occur. There is a trend towards substitution of plastics packaging with other materials.*

The total quantity of recovered Plastics reported for SA during 2012-13 was approximately 21,400 tonnes (see Table 3.9 overleaf), which is up by 9% (or 1,780 tonnes) from 2011-12. Mixed &/or Other Plastics constituted the majority (28%) of reported Plastics recovery followed by LDPE (22%), PET (20%) and HDPE (17%) (Figure 3.13 overleaf).

This increase in Plastics recovery occurred across most plastics materials (see Figures 3.14 and 3.15 overleaf):

- PVC increased four-fold due to the addition of a major re-processor;
- PS increased by 52% (or 140 tonnes);
- HDPE increased by 13% (or 400 tonnes);
- LDPE increased by 5% (or 200 tonnes);
- Mixed &/or Other Plastics appears to have increased 18% (or 900 tonnes); and
- PP appears to have increased by 5% (or 100 tonnes).

The only exception was PET, which appeared to have decreased by 4% (200 tonnes) due to lower volumes of CDL recovered (refer to Section 5). This recovered PET material from SA remains highly prized by re-processors due to its low contamination (compared to other sources.)

The current increase in reported Plastics recovery may be as result of a number of factors:

- The increase in use of potentially previously contaminated plastics re-processed through waste-to-energy;
- Changes which are occurring in the use and/or design of plastics packaging types; and/or
- The addition of plastic collectors/re-processors to the survey.

In addition to the recovered Plastics from within South Australia (see Table 3.9), local re-processing of feedstock sourced from interstate continued to further boost the growth of the plastics industry within South Australia (which is not included in SA's reported tonnes for Plastics recovery).

Table 3.9 **Quantity of Plastics recovered (tonnes) in SA during 2012-13, including estimated reporting error (tonnes & %).** *Major plastics recovered in SA were PET, HDPE, LDPE, PP and Mixed Plastics.*

Item	Net Recovery [1]	Reporting Error	
	tonnes	tonnes	%
Polyethylene Terephthalate (PET)	4,300	820	19%
High density Polyethylene (HDPE)	3,600	340	9%
Polyvinyl Chloride (PVC)	260	4	2%
Low density Polyethylene (LDPE)	4,600	150	3%
Polypropylene (PP)	2,200	120	5%
Polystyrene (PS)	410	27	7%
Mixed &/or Other Plastics (MIX)	6,000	1,190	20%
Total[2]	**21,400**	**3,000**	14%

1. Net recovery excludes re-processing losses
2. Total does not equate to the sum of all tonnes due to rounding.

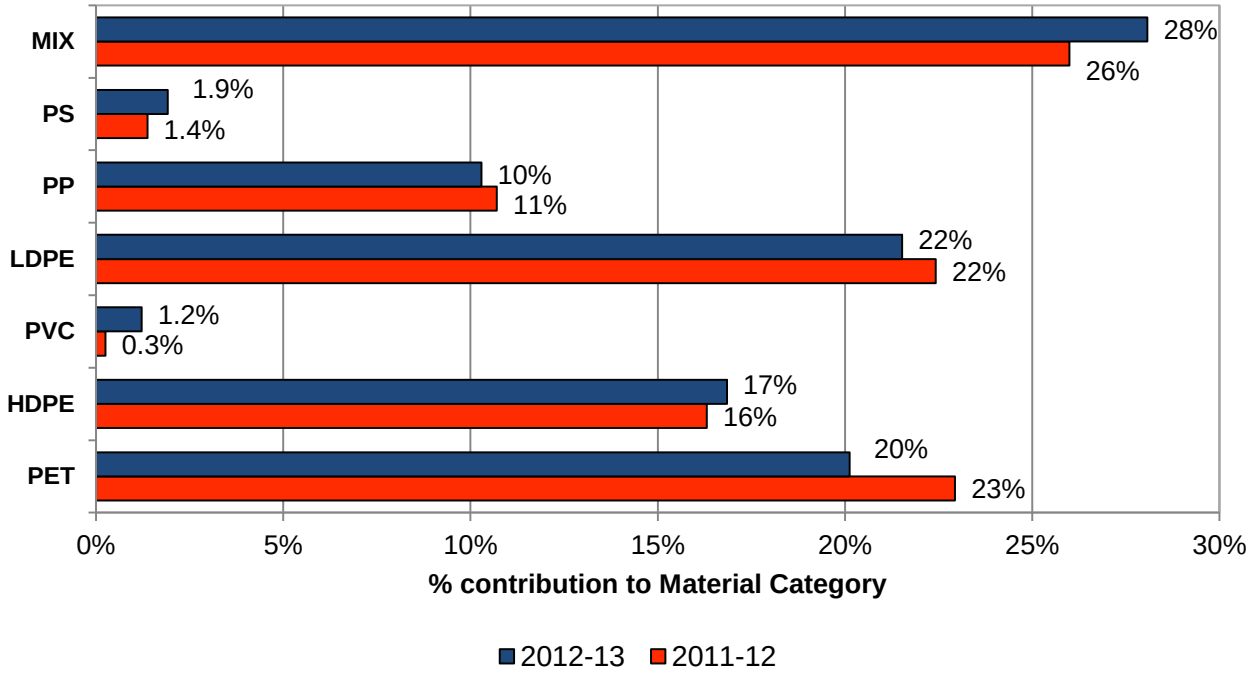

Figure 3.13 **Changes in percent composition of recovered Plastics (by weight), SA, between 2011-12 and 2012-13.** *The contribution of Mixed &/or Other Plastics and of HDPE increased from 2011-12, while PET and PP appear to have decreased.*

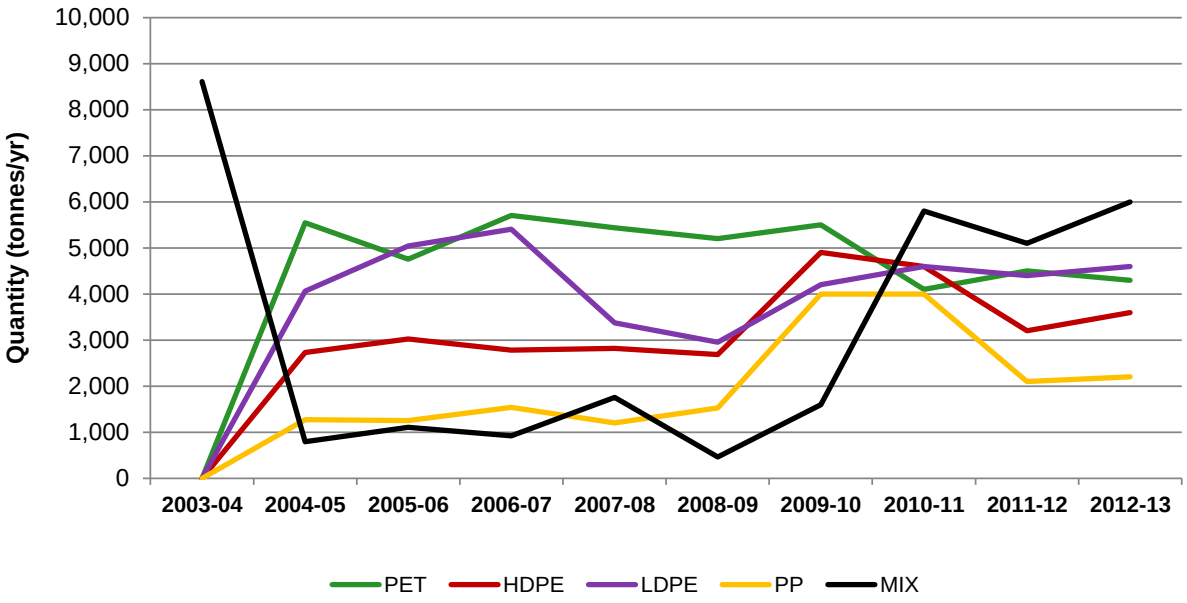

Figure 3.14 **Changes in reported Plastics quantities since 2003-04 – PET, HDPE, LDPE, PP and MIX.** *Most Plastic recovery materials remained stable or increased slightly from 2011-12.*

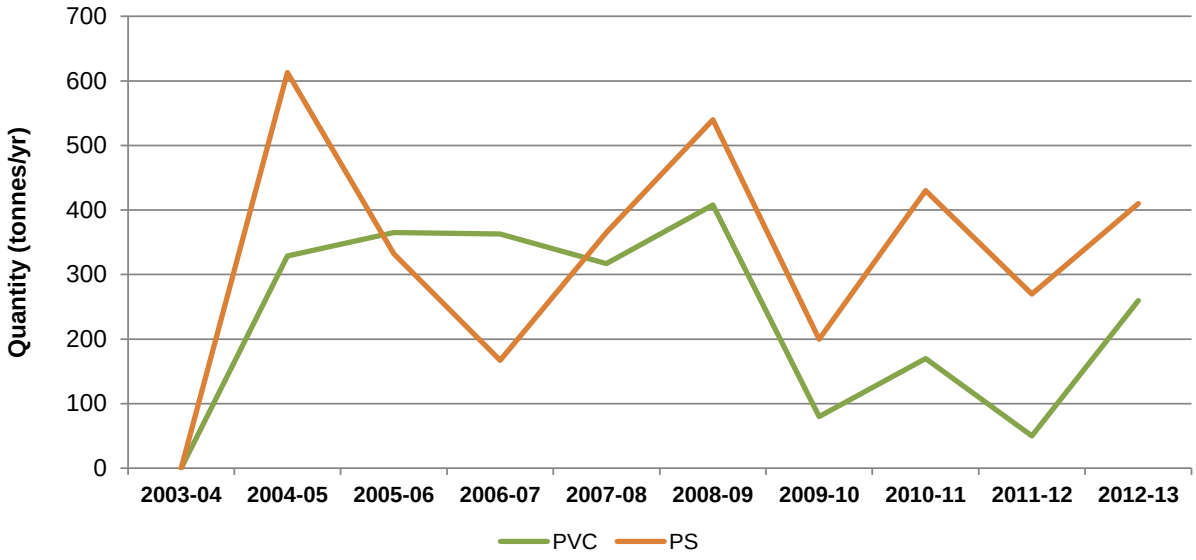

Figure 3.15 **Changes in reported Plastics quantities since 2003-04 – PVC and PS.** *Both PVC and PS saw an increase in 2012-13.*

In 2012-13 C&I sources of reported recovered Plastics materials increased (up to 56% from 49% in 2011-12) and Municipal sources decreased (29% in 2012-13 down from 40% in 2011-12) (see Table 3.10 below). Material sourced from C&D increased to 15% (from 11% in 2011-12) (see Table 3.10).

A substantial amount (52%) of Plastics re-processing continued to occur in SA (see Table 3.10), through a major and several smaller re-processors (Table 3.10). SA re-processors take all types of recovered plastic materials, but PET to a lesser extent. A slight decrease in Plastic materials is noticeable (46% in 2011-12 down to 33% in 2012-13) may be partially attributable to the introduction of the Chinese 'Green Fence' Policy, which also restricts the contamination of all plastic bails being exported to China (Tolokon, 2013). Cardboard contamination in plastic bails remains an issue.

A slight increase in Plastic materials being sent interstate can also be seen (5% in 2011-12, up to 15% in 2012-13). These changes are also partially due to the inclusion of additional Plastics collectors/re-processors to most Plastics materials streams (Table 3.10).

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

- The C&I market is expected to remain stable;
- International demand for Plastics in increasing as local demand for end-products is decreasing;
- The introduction of the Chinese 'Green Fence' Policy is expected to increase the quality of recovered plastic products; and
- Local re-processors reported that electricity cost rises were affecting the viability of their operations.

Table 3.10 **Sector and geographical origins and re-processing locations for recovered plastics in SA in 2012-13.** *A decrease in Plastic materials being sent overseas for re-processing is evident compared to 2011-12 figures.*

Item	Sector Origin (%)			Geographical Origin (%)		Re-processing Location (%)		
	MSW	C&I	C&D	Metro	Regional	SA	Interstate	Overseas
Polyethylene Terephthalate (PET)	70%	30%	0%	79%	21%	2%	61%	37%
High density Polyethylene (HDPE)	49%	51%	0%	84%	16%	74%	10%	16%
Polyvinyl Chloride (PVC)	2%	98%	0%	98%	2%	91%	2%	7%
Low density Polyethylene (LDPE)	3%	79%	18%	71%	29%	34%	0%	66%
Polypropylene (PP)	1%	99%	0%	83%	17%	81%	4%	15%
Polystyrene (PS)	0%	100%	0%	100%	0%	29%	0%	71%
Mixed &/or Other Plastics (MIX)	21%	39%	40%	96%	4%	76%	2%	22%
Total	29%	56%	15%	84%	16%	52%	15%	33%

3.6 Glass

Highlights:

- *In 2012-13 the total quantity of recovered Glass decreased by 10%, although the overall trend from 2003-04 is still evident.*
- *The majority of Glass was re-processed locally.*
- *The high Australian dollar has reduced the competitiveness of Australian re-processors in selling the end-product, and may reduce the viability of re-processing glass within Australia.*

The total quantity of recovered Glass reported for SA during 2012-13 was approximately 61,000 tonnes (Table 3.11 below), which is down by 10% from 2011-12 (Figure 3.16 overleaf). All of this recovered glass was packaging, including glass bottles and jars (refer to Section 5).

In 2012-13 most Glass (65%) was recovered from Municipal sources and the remainder was from C&I (35%) (see Table 3.12 overleaf). The majority (78%) of Glass was from metropolitan sources (Table 3.12), which remains unchanged from 2011-12 sources. Most Glass was re-processed in SA (98 %), with the remainder (2%) sent interstate (Table 3.12).

Since 2003-04, there has been on-going upward trend for recovered Glass (Figure 3.16). The recent slight decline in volumes may be attributable to declining sales of end products.

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

- Local demand for the beneficiated Glass is very important to this market stability;
- CDL Glass material recovery increases in line with consumer consumption, thus tonnes are consistently higher in the summer months and around Christmas and Easter;
- The high Australian dollar has reduced the competitiveness of Australian re-processors in selling the end-product, and may lead to the reduced viability of re-processing glass within Australia.

Table 3.11 Quantity of Glass recovered (tonnes) in SA during 2012-13, including estimated reporting error (tonnes & %)

Item	Net Recovery [1]	Reporting Error	
	tonnes	tonnes	%
Glass	**61,000**	**10,000**	16%

1. Net recovery excludes re-processing losses

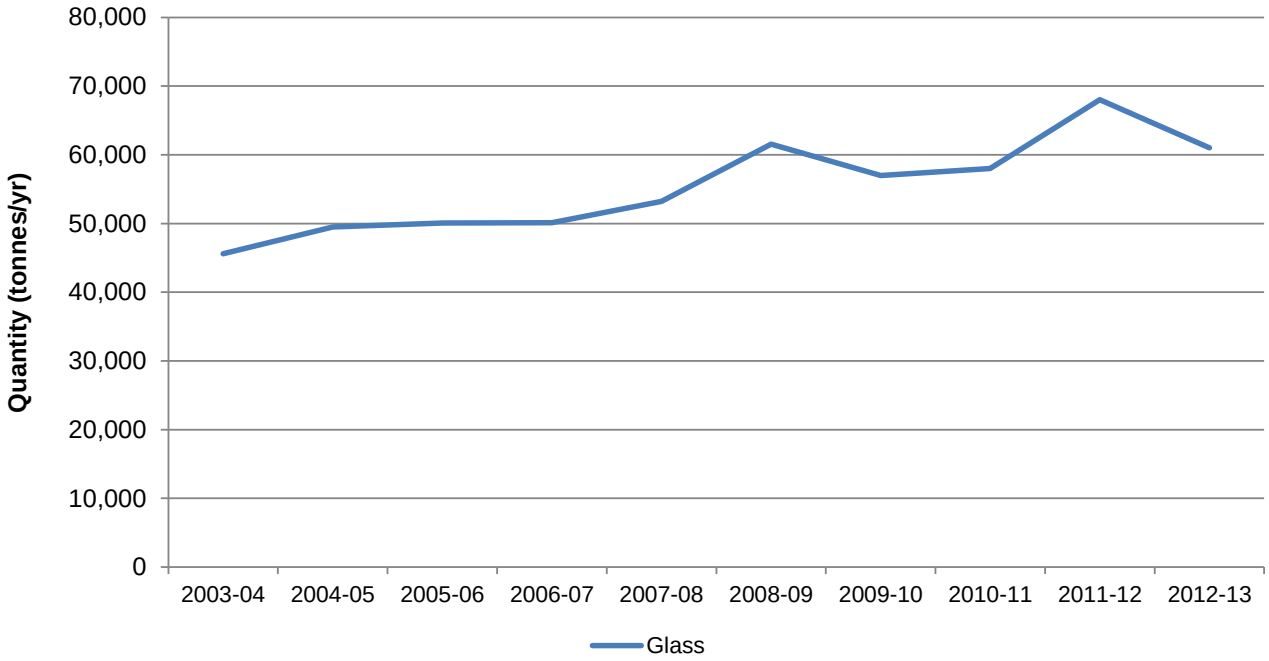

Figure 3.16 **Changes in reported Glass quantities since 2003-04 – Glass.** *There has been an overall consistent upward trend since 2003-04.*

Table 3.12 **Sector and geographical origins and re-processing locations for recovered Glass in SA in 2012-13.** *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	65%	35%	0%	78%	22%	98%	2%	0%

3.7 Other Materials

Highlights:

- *In 2012-13 the overall quantity of recovered Other Materials decreased, which was largely driven by a drop in Fly Ash recovery.*
- *Recovery of Fly Ash appears to be continuing a downward trend, while Foundry Sands is continuing its upward trend.*

The total quantity of recovered Other Materials reported for SA during 2012-13 was approximately 213,800 tonnes (Table 3.13 below), which is down by 12% (or 29,000 tonnes) from 2011-12.

- This decrease was largely driven by a reduced quantity of recovered Fly Ash materials (down 25% or 40,000 tonnes from 2011-12) (see Figures 3.18 overleaf).
- Decreases also appeared to be evident for Leather & Textiles materials, which were down by 13% (or 600 tonnes from 2011-12).

Despite these decreases and the overall drop in Other Materials recovered in 2012-13, Foundry Sands and Tyres & Other Rubber reported increases in total material recovered, increasing by 15% and 13% (or 9,300 tonnes and 2,300 tonnes) respectively, from 2011-12 figures. Tyres & Other Rubber has steadily increased since 2006-07, which has been driven by increasing awareness of resource recovery and the landfill ban on these materials (SA Government, 2010).

Fly Ash continued to constitute the majority (56%) of reported Other Materials recovery followed by Foundry Waste (33%) (see Figure 3.17 overleaf). The change in figures for these two material streams since 2011-12 is evident in the decrease in the overall proportion of Other Materials comprised of Fly Ash and the increased proportion of Other Materials comprised of Foundry Sands.

Nearly all (99%) of the Other Materials in 2012-13 were collected from C&I sources (see Table 3.14). The majority (84%) of these Other Materials were sourced from regional SA (Table 3.14). This is mainly attributed to Fly Ash, which originates from coal-fired power stations in Port Augusta, and significant quantities of Foundry Waste materials recovered from smelters in Whyalla and Port Pirie.

Table 3.13 **Quantity of Other Materials (tonnes) recovered in SA during 2012-13, including estimated reporting error (tonnes & %).** *Fly Ash and Foundry Waste were the major contributor to Other Materials recovered in SA.*

Item	Net Recovery [1]	Reporting Error	
	tonnes	tonnes	%
Fly Ash	120,000	5,000	4%
Foundry Waste	70,200	900	1%
Leather & Textiles	3,900	700	18%
Tyres & Other Rubber	19,700	2,200	11%
Total	**213,800**	**8,800**	4%

1. Net recovery excludes re-processing losses

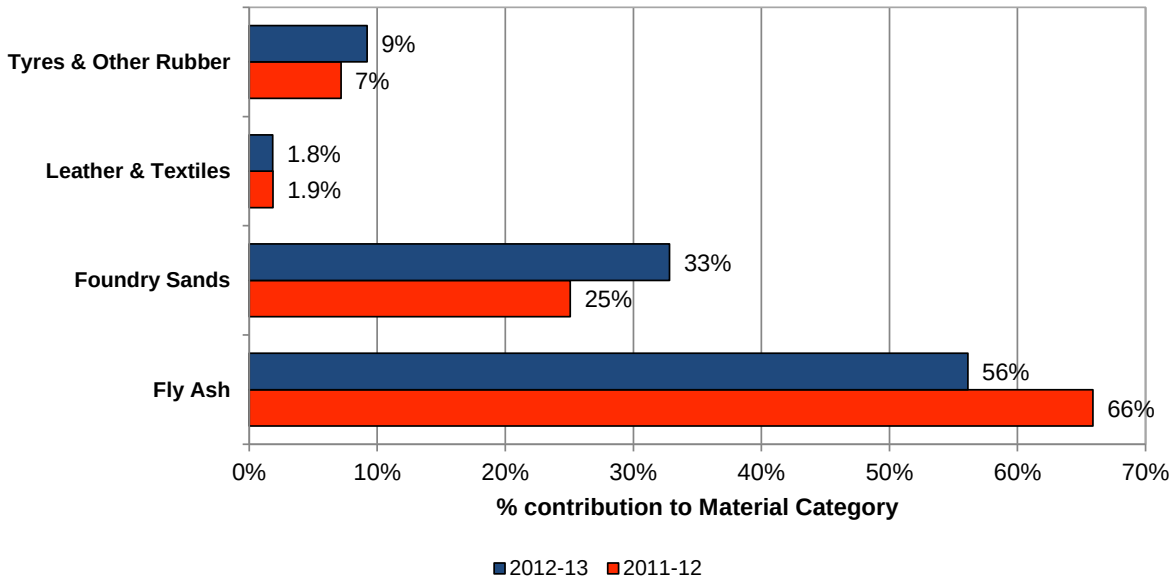

Figure 3.17 **Changes in percent composition of recovered Other Materials (by weight), SA, between 2011-12 and 2012-13.** *The relative contribution of Foundry Waste increased during 2012-13.*

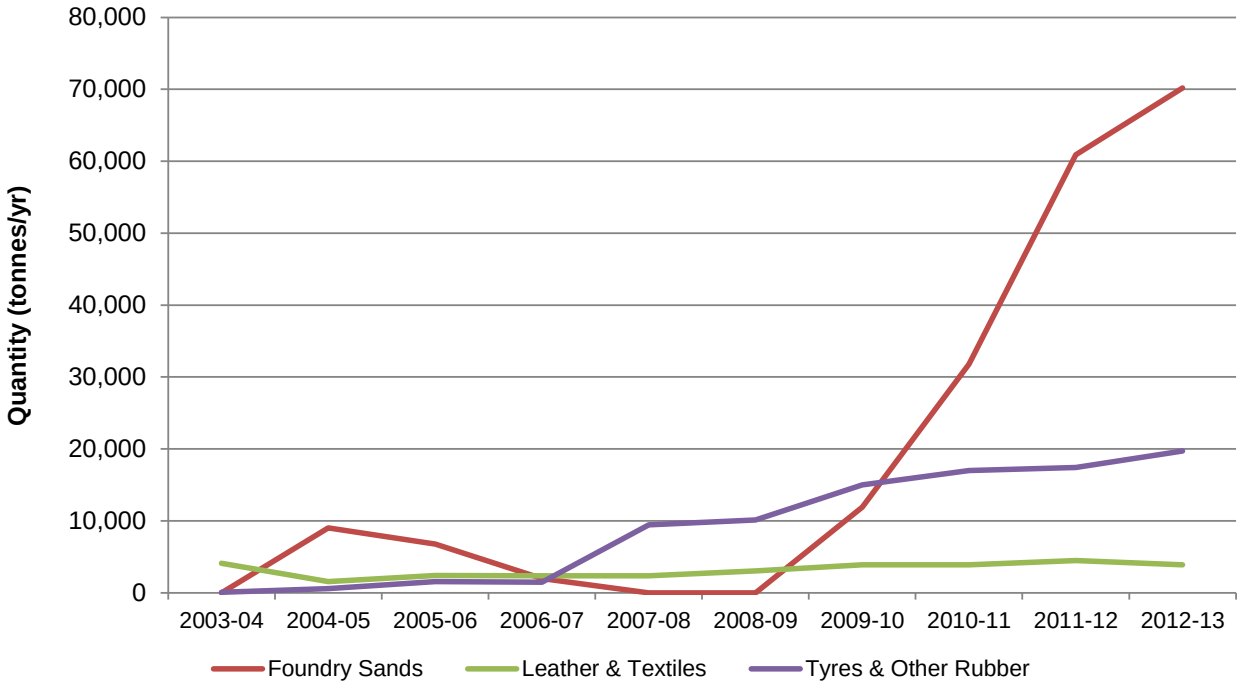

Figure 3.18 **Changes in reported Other Materials quantities since 2003-04 – Foundry Waste, Leather & Textiles, and Tyres & Other Rubber.** *Foundry Waste has seen significant rises since 2008-09.*

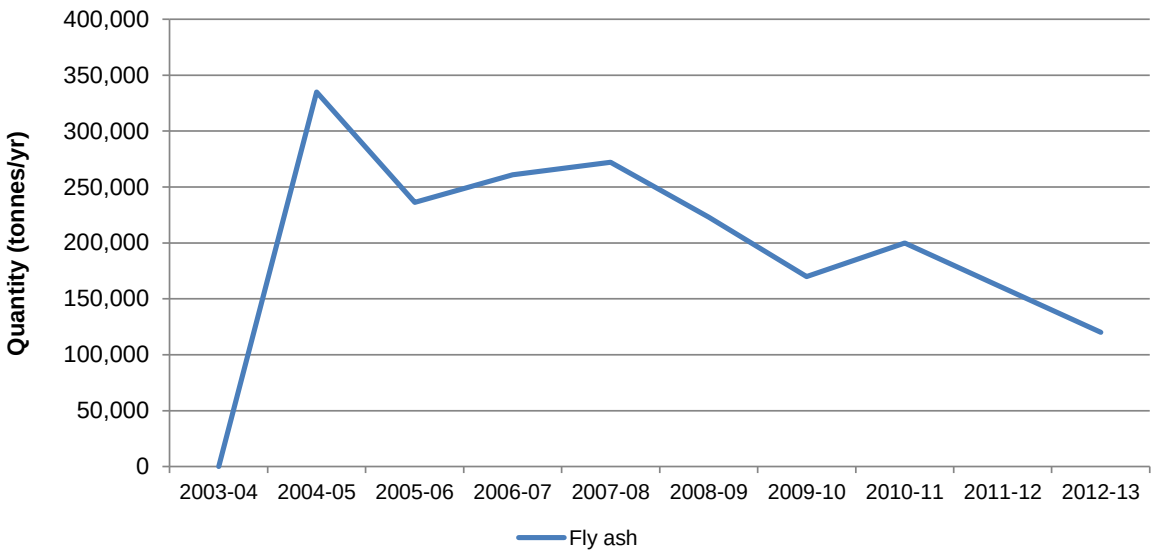

Figure 3.19 Changes in reported Other Materials quantities since 2003-04 – Fly Ash. *Fly Ash appears to be slowly trending downwards.*

All reported Fly Ash and most Foundry Waste was re-processed in SA for cement production (see Table 3.14).

Most of the Leather & Textiles were sent interstate (80%) for processing into cleaning cloths. The majority of Tyres & Other Rubber were sent interstate (77%) or exported overseas (23%) for re-processing into rubber mats or for use in energy production.

The outlook for future recovery of other materials is expected to be mixed:

- The end-product demand for Leather & Textiles is decreasing;
- The recovery of Foundry Waste and other heavy industrial waste streams is expected to continue to increase in the next period; and
- Fly Ash is expected to continue reducing in line with decreased use of coal-fired power generation in the State and the planned closure of the Port Augusta Power Station.

Table 3.14 Sector and geographical origins and re-processing locations for recovered Other Materials in SA in 2012-13. *Almost all Other Materials are produced by the C&I Sector.*

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%	19%	81%	100%	0%	0%
Leather & Textiles	18%	82%	0%	91%	9%	8%	80%	12%
Tyres & Other Rubber	2%	98%	0%	92%	8%	0%	77%	23%
Total	1%	99%	0%	16%	84%	89%	9%	2%

4 Electronic & 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.*
- *In 2012-13 the total quantity of recovered E-waste increased with SA landfill bans and the new End-Of-Life (EOL) TV/Computer National Product Stewardship scheme.*
- *Greater recovery for E-waste was achieved from commercial and industrial sources.*
- *Substantial future increases in E-waste are expected to occur as a result of the new product stewardship schemes for TVs and computer and landfill bans on E-waste.*

The total quantity of recovered E-waste reported for SA during 2012-13 was approximately 5,500 tonnes (Table 4.1), which is up by 10% from 2011-12 (5,000 tonnes). This increase was driven by a combination of factors including the new End-Of-Life (EOL) TV/Computer National Product Stewardship Scheme (the Scheme) and E-waste landfill bans for metropolitan Adelaide. It is expected that additional volumes of E-waste were recovered through the Scheme in 2012-13, however data on these quantities were not available at the time of this report's release.

A large proportion of this increase in recovery was comprised of Televisions (up by 1,850 tonnes or 103%), with increased volumes of this waste stream collected at the completion of the Digital TV Switchover in SA in April 2013.

Increases in recovery were also reported across a number of other E-waste streams:

- Batteries up 61% (or by 0.9 tonnes);
- Printer Cartridges were up 67% (or by 100 tonnes);
- Mobile Phones & Other E-waste both up 25% (or by 1 tonne and 30 tonnes); and
- Compact Fluorescent Lamps were up by 23% (or 14 tonnes).

However, Computers quantities fell (down 51% or 1,470 tonnes), despite major sources claiming increased volumes. This may be the result of different reporting by recyclers/re-processors.

In 2012-13, the major E-waste constituents by weight were Televisions & Monitors (66%) and Computers (25%) (see Figure 4.1). Printer Cartridges also made a sizeable contribution (5%), reflecting its high use as a consumable item. The higher quantities of Televisions & Monitors being recovered significantly increased its relative contribution to E-waste recovery in 2012-13 (Figure 4.1).

E-waste was sourced from Municipal (53%) and C&I (47%) sources, with regional areas constituting a disproportionate (40%) contribution to the population split of the geographical regions (see Table 4.2). The high proportion of regional tonnes can be attributed to the End-Of-Life (EOL) TV/Computer National Product Stewardship scheme, along with organisations assisting regional schools in managing the E-waste resulting from the Digital Switchover.

Table 4.1 **Changes in reported quantities of E-waste between 2011-12 and 2012-13.**
TVs/Monitors and Computers were major contributors to E-waste recovery in SA.

Item	2012-13	2011-12	% change 11-12 to 12-13
Printer Cartridges	250	150	67%
Compact Fluorescent Lamps	76	62	23%
Batteries	2.3	1.4	61%
Computers	1,390	2,860	-51%
Televisions / Monitors	3,650	1,800	103%
Mobile Phones	5	4	25%
Other E-waste	150	120	25%
Total	**5,520[2]**	**5,000**	**10%**

1. Net recovery excludes re-processing losses
2. This value has a reporting error of 150 tonnes (+/-3%).

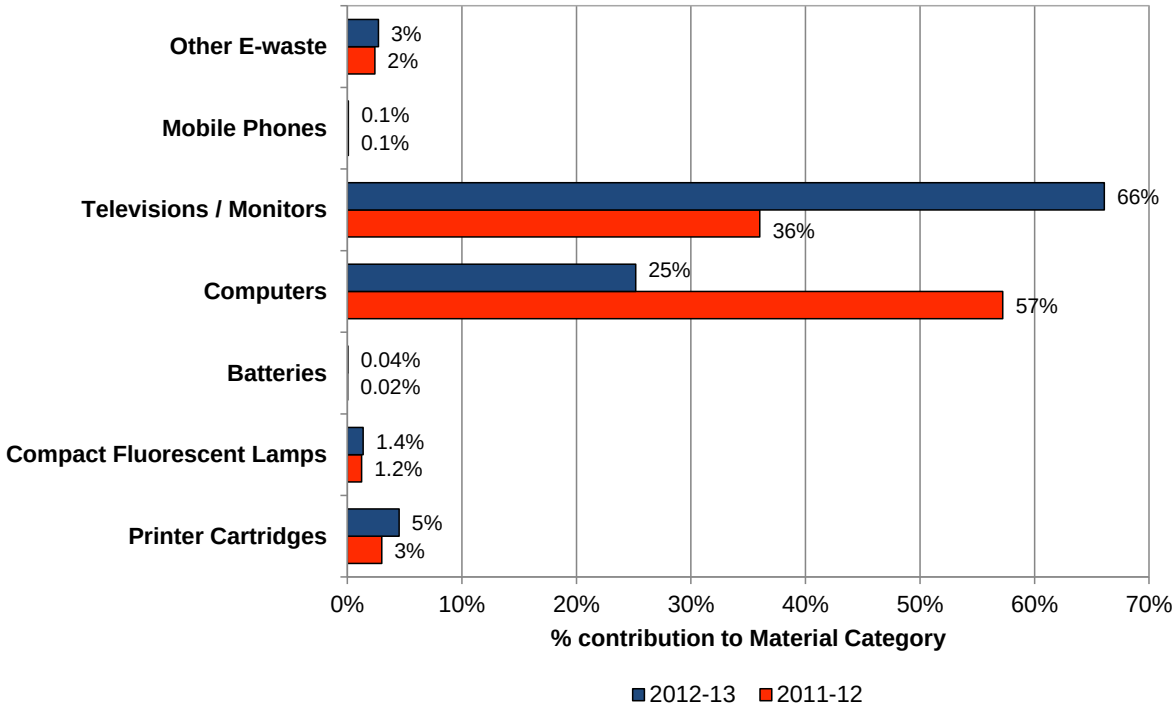

Figure 4.1 **Changes in percent composition of recovered E-waste (by weight), SA, between 2011-12 and 2012-13.** *The relative proportion of Televisions/Monitors in E-waste recovery significantly increased & the proportion of Computers decreased during 2012-13.*

Whilst the destination for 77% of the materials was reported as South Australia (Table 4.2), this does not necessarily involve re-processing of the materials. 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 all of these materials.

Table 4.2 **Sector and geographical origins and re-processing locations for recovered E-waste in SA in 2012-13.** *E-waste was sourced from MSW & C&I sources with regional areas constituting a disproportionate contribution.*

Item	Sector Origin (%)			Geographical Origin (%)		Re-processing Location (%)		
	MSW	C&I	C&D	Metro	Regional	SA	Interstate	Overseas
Total E-waste	53%	47%	-	60%	40%	77%	23%	0%

The growth in E-waste recovery during 2012-13 can be attributed to a number of factors including:

- Introduction of SA landfill bans for E-waste in September 2012;
- Continuation of the new End-Of-Life (EOL) TV/Computer National Product Stewardship scheme with additional rollout of free public drop-off locations set up across SA.
- Impacts of E-waste recycling programs, such as FluoroCycle scheme for used fluorescent tubes, MobileMuster program for used mobile phones, and Cartridges for Planet Ark program for used printer cartridges.
- Completion of the roll out of the South Australian Digital TV Switchover in April 2013, which commenced in regional areas of South Australia during 2010-11.

The recovery of E-waste is anticipated to further increase in 2013-14 as further computers and televisions are collected through the new End-Of-Life (EOL)/TV National Product Stewardship Scheme.

A challenge to future E-waste recovery could include that the general public is still largely uneducated about correct recovery and the benefits of recycling E-waste. The lack of technology available to dismantle and separate E-waste materials is also seen as a barrier to additional resource recovery within the material category. An industry standard was released by Standards Australia in February 2013 for collection, storage, transport and treatment of end of life electrical and electronic equipment. It was reported that additional policing may also be required to ensure that this standard is being followed.

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.*
- *2012-13 saw a slight decrease in the recovery of packaging materials in SA from 2011-12.*
- *The improved reporting method for Plastics saw a decrease in some of the plastics streams, which contributed to this overall decrease, along with a decrease in Steel Cans.*
- *The Container Deposit scheme continues to make a substantial contribution to recovery of packaging materials in SA.*

5.1 Total Packaging

Total packaging recovery was estimated at 253,785 tonnes, of which 46,200 tonnes (18%) was recovered through the container deposit system, and 207,585 tonnes (82%) was recovered from other sources (see Table 5.1 overleaf).

This outcome is a slight decrease from 2011-12 reported packaging recovered (down by 1%, 256,620 tonnes in 2011-12), however is still much higher than the 2010-11 recovered packaging recorded (219,940 tonnes). A number of Packaging Material streams recorded significant changes from 2011-12 to 2012-13:

- Steel Cans increased by 54% (or 560 tonnes);
- Other Plastics Packaging increased by 83% (or 1,950 tonnes);
- Cardboard Packaging increased by 4% (or 6,200 tonnes);
- HDPE packaging decreasing by 89% (or 2,210 tonnes);
- Polypropylene Packaging decreasing by 99% (or 1,750 tonnes);
- Aluminium cans decreased by 7% (or 280 tonnes); and
- PET Packaging decreased by 10% (or 460 tonnes).

These changes are mostly attributed to better reporting methods, although the decrease in PET CDL tonnes reported (3,900 tonnes in 2012-13 down from 4,420 tonnes in 2011-12) is partially attributable to the manufacturing trend of light-weighting these PET CDL bottles.

These packaging quantities are a subset of the individual material data presented in Section 4. Packaging materials therefore constitute an important proportion of the total amount of recycling activity reported in SA for some of these individual materials, e.g.:

- Glass packaging was 100% of total glass recycling activity being reported during 2012-13;
- PET packaging was 94% of total PET recycling activity;
- LDPE packaging was 94% of all recovered LDPE;
- Cardboard packaging was 90% of the total amount of cardboard recycling activity; and
- Liquid Paperboard packaging was 94% of total Liquid Paperboard recycling activity.

Table 5.1 **Estimated packaging recovery, SA 2012-13.** *Cardboard and glass are dominant contributors to packaging recovery. Packaging constitutes significant proportions of resource recovery for some materials.*

Packaging Material	Origin (tonnes)		Total packaging (tonnes)	Packaging as a proportion of total material recovered
	CDL [1]	Other		
Steel Cans		1,600	1,600	<1%
Aluminium Cans	3,800	20	3,820	21%
Cardboard Packaging		171,000	171,000	90%
Liquid Paperboard Cartons	800	2,600	3,400	94%
PET Packaging	3,900	100	4,000	94%
HDPE Packaging	200	60	260	7%
PVC Packaging		15	15	6%
LDPE Packaging		4,300	4,300	93%
Polypropylene Packaging		20	20	1%
Polystyrene Packaging		70	70	17%
Other Plastics Packaging		4,300	4,300	72%
Glass bottles & Jars	37,500	23,500	61,000	100%
Total	**46,200**	**207,585**	**253,785**	

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

5.2 Container Deposits

South Australia is one of two Australian states or territories to currently have a container deposit system for return of recyclable bottles and cans (with the NT introducing a system on 3 January 2012).

In 2012-13, glass containers represented 81% (by weight) of returned recycled deposit containers in SA (see Figure 5.1). The average return rate for container deposits in 2012-13 was 84% (by weight) from approximately 719 million containers (estimated as used in SA during this period). This return rate is slightly up from the value (83%) reported in 2011-12 (for 742 million containers used).

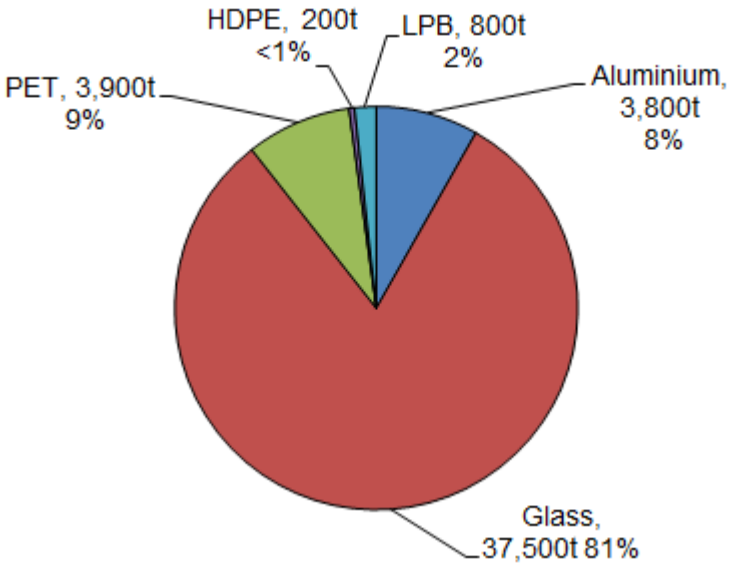

Figure 5.1 **Relative proportions of returned recycled deposit containers (by weight), SA 2012-13.** *Glass is the major contributor by weight.*

Table 5.2 **Return rates for recycled deposit containers, SA 2012-13.** *SA achieves high return rates of recycled deposit containers.*

Material	Recovered (tonnes)	Return rate (%)
Aluminium	3,800	87%
Glass	37,500	86%
PET	3,900	72%
HDPE	200	58%
LPB	800	63%
Total	**46,200**	**84%**

5.3 Other Packaging Materials

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

Cardboard (83%) and Glass (11%) materials were the dominant contributors to resource recovery of other packaging materials, but plastic packaging materials, which includes film wrap-type packaging, also make an important contribution (at *ca.* 8,000 tonnes).

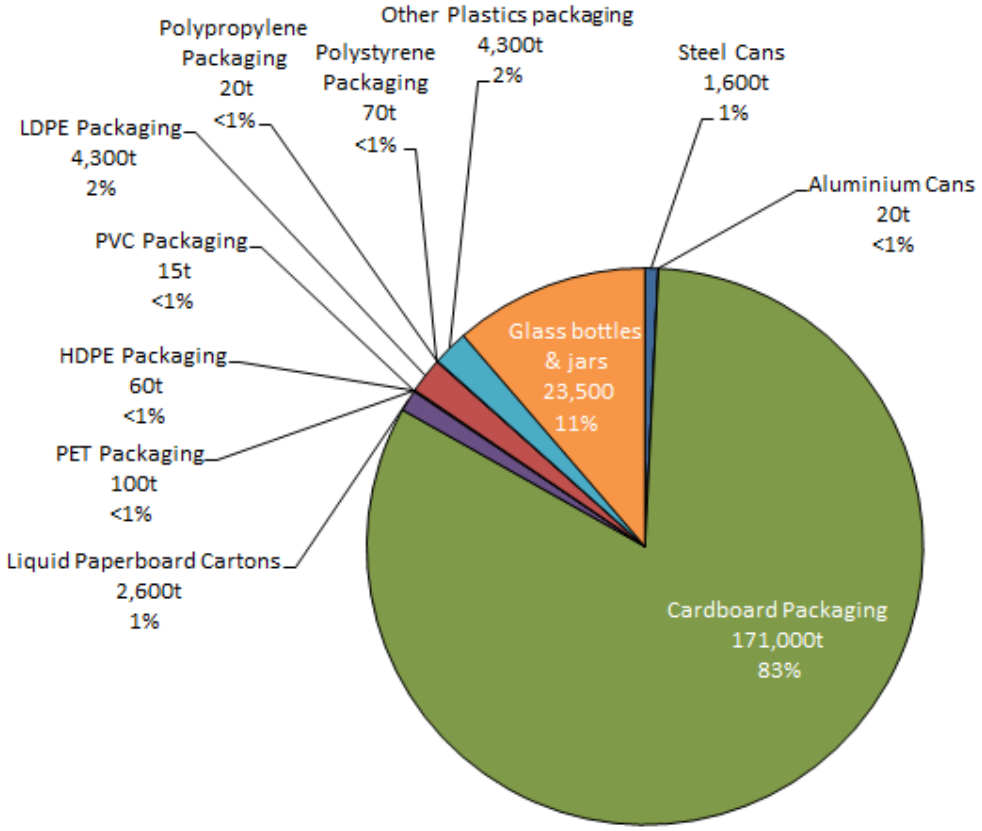

Figure 5.2 **Relative proportions of recovered other packaging materials by weight, SA 2012-13.**
Cardboard, Glass and Plastic materials are the major contributors to recovery for other packaging materials.

6 Resource Recovery Value

At a glance:

- *This section quantifies the resource value of recovered materials reported in 2012-13.*

Highlights:

- *The resource value of recovered materials in 2012-13 was estimated at $299 million.*
- *Metals were the major contributor to this value comprising 58% or $175 million.*
- *The average resource value for recovered materials was $87 per tonne.*

Based on the quantities reported during this year's Recycling Activity survey, the estimated value of resource recovery for South Australia during 2012-13 was $299 million, or $87 for each tonne of resource recovered on average (Table 6.1 overleaf).

The major contributor to this resource recovery valuation (at 58%) was Metals (Figure 6.2 overleaf). The next most significant contributors to resource recovery value were Cardboard & Paper (at 19%) and Organics (at 11%) waste materials.

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 take into account 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, 2012-13 [(a)].

Material category	Resource recovery (tonnes)	Estimated on-sale price[(a)] ($/tonne)	Estimated Resource Value ($ millions)	Price data source[(a)]:
Masonry	838,600	$15	$12.6	WME (2011)
Metals	429,900	$400	$172.0	WME (2011)
Organics	963,900	$35	$33.7	WME (2011)
Cardboard & Paper	253,100	$225	$56.9	WME (2011)
Plastics	21,400	$250	$5.4	WME (2011)
Glass	61,000	$90	$5.5	Authors' estimate
Other Materials	93,800	$10	$0.9	Authors' estimate
Separately Reported Materials & Clean Fill	790,000	$15	$11.9	Authors' estimate
TOTAL ALL Materials	3,450,000	$87	$298.8	

Notes:

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

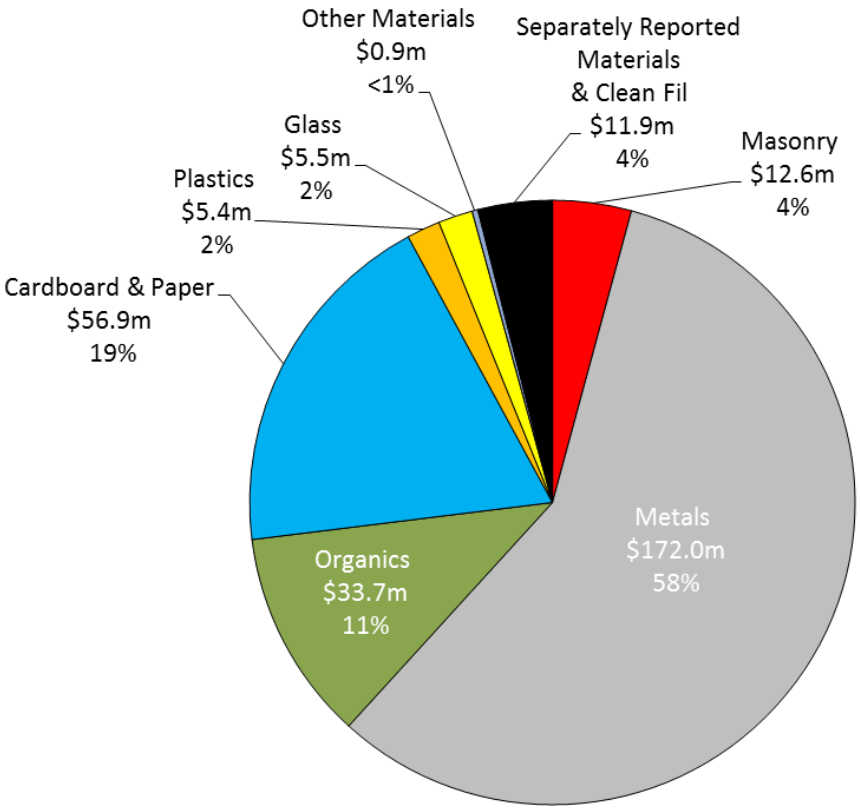

Figure 6.2 Estimated market value of resource recovered materials in South Australia from the 2012-13 Recycling Activity Survey

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 2012-13 recycling activity survey using the conversion and emission factors given in Appendix 2.*
- *The environmental benefits have been calculated for each material except E-waste and reuse items.*

Highlights:

- *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** – 1.23 million tonnes of CO2-e*
  - ***Cumulative Energy Demand saved** – 15,910 Tera-Joules (TJ)*
  - ***Water Savings** – 13,160 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 South Australia during 2012-13 is about 1.23 million tonnes of CO_2-e (see Tables 7.1 and 7.2 and Figure 7.1 on following pages).

- This is a decrease of about 4% on the value reported for 2011-12.
- The lower estimated greenhouse gas savings were a combination of several factors:
  - The overall decrease in reported material recovery.
  - Specific decreases in reported recovery for Masonry and Metal materials.
- Metals (at 49%) contributed disproportionately to greenhouse gas savings because a virgin metal is highly energy intensive to manufacture. The greenhouse gas savings per unit tonne delivered by recycling metals far outstrip savings made by other materials.
- 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 281,900 cars would produce in a single year[7].
- The greenhouse gas savings from SA recycling, 2012-13, equate to:
  - Approximately 17% of South Australia's total Community sector GHG emissions in 2009[8].

[7] Average car GHG emissions value ≈ 4.25 tonnes CO_2-e/yr; Source: SA 2008-09 Recycling Activity report (Zero Waste SA, 2010)

Table 7.1 Estimated environmental benefits as a result of recycling in SA, 2012-13[(a)]

	Material	Material Quantity tonnes	GHG Emissions Saved[(a)] tonnes CO2-e	Energy Saved[(a)] TJ LHV	Water Saved[(a)] ML
	Masonry				
1	Asphalt	148,000	2,400	300	130
2	Bricks	50,000	500	10	60
3	Concrete	640,000	18,600	350	820
4	Plasterboard	600	28	140	-20
5, 6	Clay, fines, rubble & soil	670,000	57,900	450	290
	Metals				
7	Steel	387,000	238,000	3,070	-910
8	Aluminium	18,500	273,300	3,170	3,360
9	Non-ferrous metals	24,400	82,800	880	150
	Organics				
10	Food Organics	7,900	4,100	10	10
11	Garden Organics	209,000	48,200	100	100
12	Timber	237,000	77,900	310	130
13, 14, 15, 16	Organics - Other	510,000	245,300	1,100	120
	Cardboard & paper				
17	Cardboard & waxed cardboard	190,000	57,800	2,380	6,280
18	Liquid Paperboard	3,600	2,300	30	60
19, 20, 21	Magazines & Newspaper	38,800	18,000	360	860
22	Printing & Writing Paper	20,700	12,000	270	640
	Plastics				
23	Polyethylene terephthalate	4,300	4,400	220	-90
24	High density polyethylene	3,600	2,500	200	-10
25	Polyvinyl chloride	260	400	10	20
26	Low density polyethylene	4,600	3,200	260	-20
27	Polypropylene	2,200	3,600	130	-30
28	Polystyrene	410	600	20	-10
29	Mixed &/or Other plastics	6,000	8,200	360	-110
	Glass				
30	Glass	61,000	36,400	390	150
	Other Materials				
39	Fly Ash	120,000	3,500	70	150
40	Foundry Waste	70,200			
41	Leather & Textiles	3,900			
42	Tyres & Other Rubber	19,700	23,400	1,320	1,030
	Total	**3,450,000**	**1,225,300**	**15,910**	**13,160**

Notes:

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

[8] The Community sector includes GHG emissions associated with residential stationary energy use and passenger vehicle use; Source: SA DENR (2011), Report on the operation of the 'Climate Change and Greenhouse Emissions Reduction Act' 2007.

Table 7.2 Estimated greenhouse gas savings as a result of recycling in SA, 2012-13[(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	79,400	119,000	18,300
Metals	594,100	888,000	136,600
Organics	375,500	561,000	86,400
Cardboard & paper	90,100	135,000	20,700
Plastics	22,900	34,000	5,300
Glass	36,400	54,000	8,400
Other Material	26,900	40,000	6,200
Total	1,225,000	1,831,000	281,900

Notes:

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

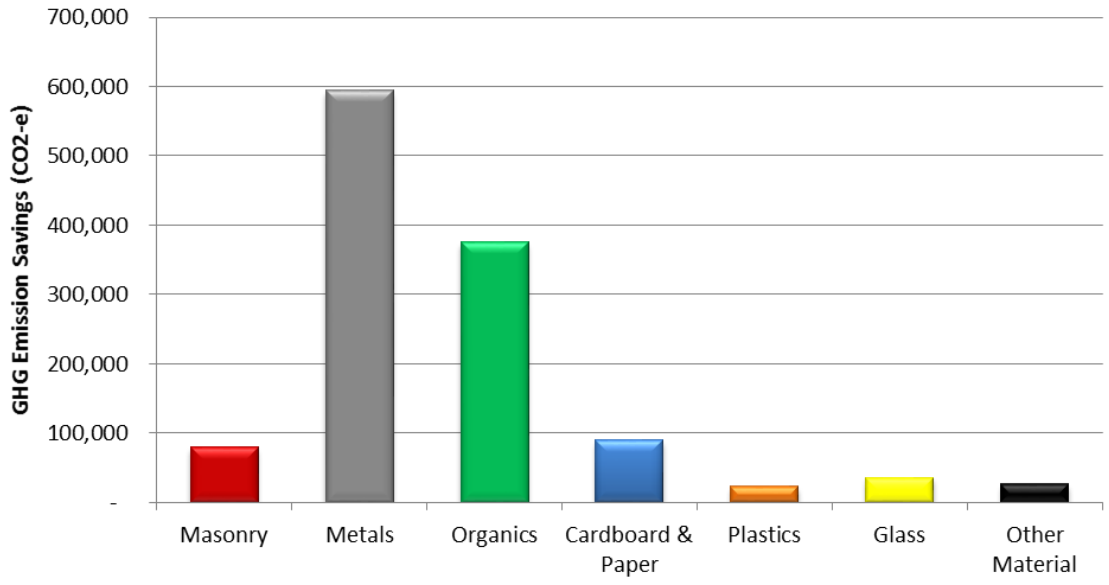

Figure 7.1 Avoided greenhouse gas emissions (by material category), as a result of recycling in SA 2012-13

7.2 Energy savings

The total projected energy savings (in Terajoules or TJ[9]) from recycling in South Australia during 2012-13 was about 15,910 TJ (see Table 7.1 above and Table 7.3 below & Figure 7.2 overleaf).

- Metals contribute 45% of projected energy savings, even though it represents only 12% 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 7% of energy savings even though it is only 0.6% of total resource recovery.
- Behind Metals, Cardboard & Paper (at 19%) is the next most significant contributor to energy savings.
- These energy savings are considered approximately equivalent to:
  - Energy use by 309,400 average households in one year[10].
  - The energy supplied by 2.8 million barrels of oil.
- The energy savings from SA recycling, 2012-13, equate to:
  - Approximately 4.1% of South Australia's total energy consumption reported for 2011-12.[11]

Table 7.3 Estimated energy savings as a result of recycling in SA, 2012-13[(a)]

Sector Origin	Energy Saved TJ LHV	Equivalent households (1 year) [(a)]	Barrel of Oil Equivalents (BOE) [(a)]
Masonry	1,250	24,300	219,000
Metals	7,120	138,500	1,249,000
Organics	1,520	29,600	267,000
Cardboard & paper	3,040	59,100	533,000
Plastics	1,200	23,300	211,000
Glass	390	7,600	68,000
Other Material	1,390	27,000	244,000
Total	15,910	309,400	2,791,000

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: Che, N, Feng, A, et al., 2013, 2013 Australian Energy Update, Australian Government Bureau of Resources and Energy Economics, Canberra, July, p. 8.

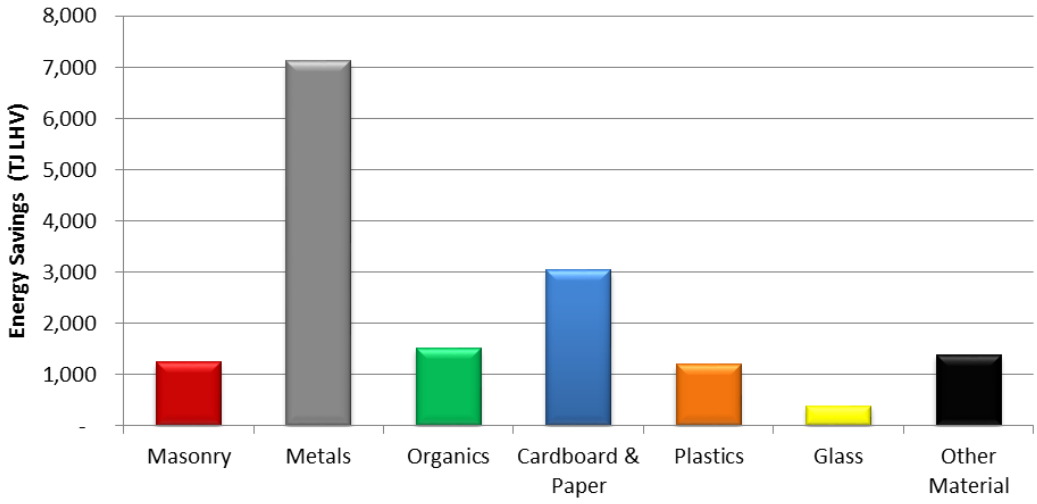

Figure 7.2 Avoided energy consumption (by material category) as a result of recycling in SA, 2012-13

7.3 Water savings

The total projected water savings (in Megalitres or ML[12]) from recycling in South Australia during 2012-13 was approximately 13,160 ML (see Table 7.1 above and Table 7.4 and Figure 7.3 overleaf).

- Cardboard & Paper contributes most significantly (at 60%) 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 19%. These water savings principally result from recycling of aluminum 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 material recover in 2012-13 are considered approximately equivalent to:
  - Water use by about 69,250 average Adelaide households in one year[13].
  - The water contained in about 5,260 Olympic-sized swimming pools[14].
- The water savings from SA recycling, 2012-13, equate to:
  - Approximately 9% of Metropolitan Adelaide's total water consumption reported for 2012-13[15].

[12] 1 Megalitre or ML = 10^6 Litres (J) = 1,000 kilo-Litres (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: SA Water (2013); South Australian Water Corporation Annual Report: For the year ending 30 June 2013, p. 79.

Table 7.4 Estimated water savings as a result of recycling in SA, 2012-13[(a)]

Sector Origin	Water saved ML	Equivalent households (1 year) [(a)]	Olympic Swimming Pools[(a)]
Masonry	1,280	6,740	510
Metals	2,600	13,680	1,040
Organics	360	1,890	140
Cardboard & paper	7,840	41,260	3,140
Plastics	-250	-1,320	-100
Glass	150	790	60
Other Material	1,180	6,210	470
Total	13,160	69,250	5,260

Notes:

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

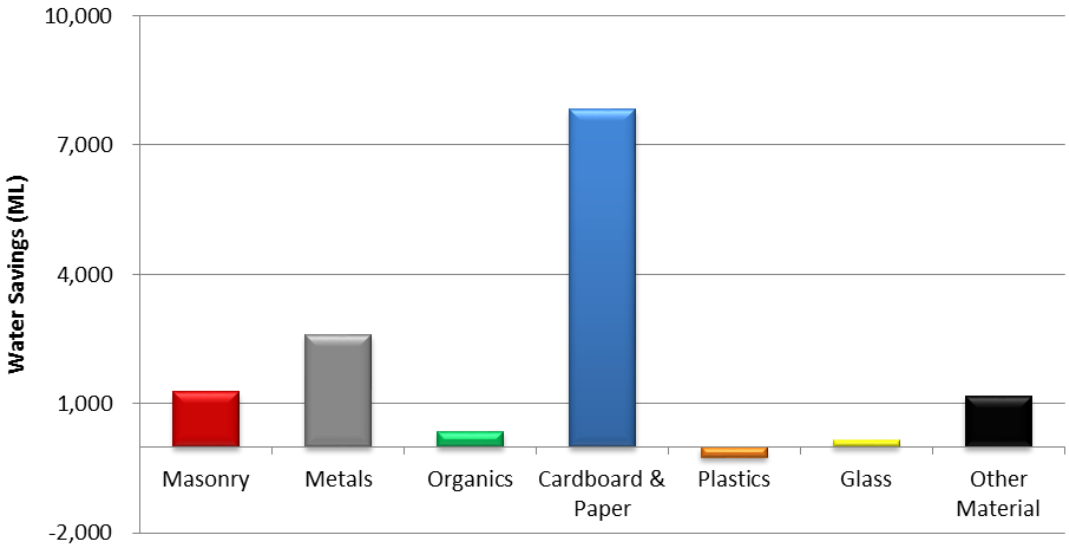

Figure 7.3 Avoided water consumption (by material category) as a result of recycling in SA, 2012-13

8 Acknowledgements

Zero Waste SA and Rawtec would like to recognise and thank the following participants in the 2012-13 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*
- *AAA Recycling*
- *Adelaide Brighton Cement*
- *Adelaide Granulation Industries*
- *Adelaide Hills Region Waste Management Authority*
- *Alinta Energy*
- *Almondco*
- *Amcor Recycling*
- *Aspitech*
- *Bin-It Waste Transport & Recycling*
- *Boral Resources (SA)*
- *Close the Loop*
- *Coolfoam*
- *Department of Education and Child Development, Computer Recycling Scheme*
- *Department of Planning, Transport and Infrastructure*
- *Downer Group*
- Eccosave
- *E-Cycle Recovery*
- *Exide Batteries*
- *Foamex*
- *Foodbank SA*
- *Fleurieu Regional Waste Authority*
- *Green Team*
- *Industrial Rag*
- *Intercast & Forge*
- *Master Butchers Co-operative*
- *MobileMuster*
- *MRI (Aust)*
- *Nippy's Fruit Juices*
- *Normetals*
- *Norske Skog Paper Mills (Australia)*
- *Nuleaf Organics*
- *Nyrstar*
- *O-I Asia Pacific*
- *Old Red Brick Co.*
- *OneSteel Recycling*
- *Peats Soil & Garden Supplies*
- *Plastics Granulating Services*
- *Plastic Recyclers International*
- *Potters Industries*
- *Recall*
- *RMAX*
- *SA Water*
- *Sensis*
- *SITA Australia*
- *Southern Region Waste Resource Authority*
- *Southern Tyre Disposals*
- *Southern Waste ResourceCo*
- *St Vincent de Paul Society (SA)*
- *Statewide Recycling*
- *Tarac Technologies*
- *The Corporation of the City of Whyalla*
- *The Tyre Collectors*
- *Thomas Foods International*
- *Toxfree Solutions*
- *Transpacific Cleanaway*
- *Tyrecycle*
- *Visy Recycling*
- *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.
Non-ferrous metals	Those metals that contain very little or no iron, e.g. copper, brass, bronze, lead, etc.
Packaging	Material used for the containment, protection, marketing or handling of product.
Polyethylene terephthalate (PET)	A clear, tough, light and shatterproof type of plastic, used to make products such as soft drink bottles, film packaging and fabrics.
Polypropylene (PP)	A member of the polyolefin family of plastics. PP is light, rigid and glossy and is used to make products such as washing machine agitators, clear film.
Polystyrene (PS)	A member of the styrene family of plastics. PS is easy to mould and is used to make refrigerator and washing machine components. It can be foamed to make single use packaging, such as cups, meat and produce trays.
Polyvinyl chloride (PVC)	A member of the vinyl family of plastics. PVC can be clear, flexible or rigid and is used to make products such as fruit juice bottles, credit cards, pipes and hoses.

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

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
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

Material	Source products	End Products
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
CO2-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
ML	Megalitre
MSW	Municipal Solid Waste
PET	Polyethylene Terephthalate
PP	Polypropylene
PS	Polystyrene
PVC	Polyvinyl Chloride
t	Tonnes
TJ	Terajoule

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Appendix 1: Survey Methodology

Rawtec was engaged by Zero Waste SA to undertake the Recycling Activity (survey) in South Australia for the financial year 2012-13. Input was provided by Infra-Plan and Life Cycle Strategies for the environmental benefits analysis conducted on the reported recycling activity data. This section summarises the approach and methodology used to conducting the 2012-13 recycling activity survey.

- *This approach and methodology was similar to that used for the 2009-10, 2010-11 and 2011-12 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 Zero Waste 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 South Australia for re-processing.*

A1.2 Survey Design & Delivery

A1.2.1 Survey Respondents

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

- *The final list included over 119 companies or organisations, which included all survey respondents from 2011-12 and newly identified companies involved with recycling activity in SA.*

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

1. ***Industry-based Recycled Material Collectors, Aggregators and/or Re-processors***
   Companies or organisations in South Australia or interstate involved with collecting, aggregating, transporting, exporting and/or re-processing materials recovered in South Australia.

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 South Australia.

- Zero Waste SA –
  - During 2010-11 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 South Australia; 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 Zero Waste 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 Zero Waste SA. This survey questionnaire was in line with the 2011-12 questionnaire.

A1.2.4 Survey Deployment

The survey was deployed to the survey respondents during September – October 2013.

- *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 by phone to confirm receipt of the survey and determine if they had any queries or required assistance with completing the survey. In several instances it was discovered that the relevant company or organisation no longer existed or recycling activity had not occurred during 2012-13.*

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-November 2013.

[17] ZEUS is a web-based system that has been purpose developed by Zero Waste SA to collect data from local government and industry on waste disposal and resource recovery within South Australia.

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 2012-13 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.

- ***Quantity*** – The total reported quantity of that material recovered in South Australia for recycling or reuse
- ***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 South Australia 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).

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[18].

- *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 South Australia and benchmarking of these metrics against similar data from other states and territories is only presented in the Executive Summary to this report. These metrics were calculated using the following data and assumptions. It should be noted that some of the interstate resource recovery data employed for benchmarking in 2012-13 is the same as that for 2011-12; more recent resource recovery data in these instances has either not been compiled or released publicly including in sufficient detail to enable proper analysis (at the time this analysis was undertaken).

- Population statistics were sourced from the Australian Bureau of Statistics (ABS) (2013).
- The relevant reporting periods and sources of recycling activity data were:
  - SA: 2012-13, as reported in this survey;
  - ACT: 2012-13, as reported by: Territory and Municipal Services Annual Report 2012-13, (ACT Territory and Municipal Services, 2013);
  - VIC: 2011-12, as reported by: Annual Report 2012-13 (Sustainability Victoria, 2013) and through email communications with Sustainability Victoria;
  - WA: 2011-12, as reported by: Recycling Activity in Western Australia, 2011-12 (WA Waste Authority, 2013);
  - NSW: 2010-11, as reported by: NSW Waste Avoidance and Resource Recovery Strategy 2013-21 (NSW EPA, 2013);
  - QLD: 2011-12, as reported by: The State of Waste and Recycling in Queensland 2012 (QLD DEHP, 2013).
- Adjustments were made to the above data to present recycling data in accordance with the National Waste and Recycling Guidelines (DSEWPC, 2012).

A1.3.4 Packaging Recovery Analysis & Reporting

Packaging data was taken directly from Recycling Activity Survey data:

- Container deposit bottle and can packaging:
  - From 2012-13 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.

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

- 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 South Australia and was essentially the same as that developed for the 2009-10 SA Recycling Activity Survey.

The scope of environmental benefits analysis therefore 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 overleaf 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.

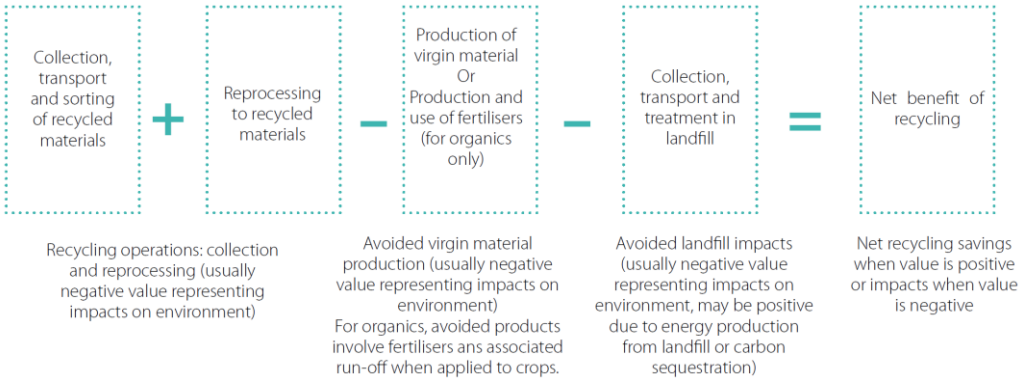

Figure A1.1 Method for calculating the net environmental impacts in the recycling process. Source: NSW DECCW (2010)

LCA techniques have previously been used to estimate conversion and emission factors for Australian situations including for South Australia. 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 South Australia:

- Benefits of Recycling in South Australia study (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 (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:

- Industry Organics;
- Foundry Waste;
- Leather & Textiles;
- Alternative Fuel;
- E-waste; and
- Reuse items.

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

The 2012-13 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 (Zero Waste SA 2011). The final values adopted for conversion and emission factors using in the 2012-13 recycling activity survey 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 2012-13 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 South Australia 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 2012b).

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 that mixed plastics. Glass recovered in South Australia 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 South Australia during 2012-13 are given in Table A1.1 below. These assumed values are based on:

- Estimated market values for recovered materials for South Australia presented in Waste Management & Environment Media's Inside Waste Industry Report 2011-12 (WME Magazine 2012);
- 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 South Australia during 2012-13 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	WME Magazine (2011)
Metals	$400	WME Magazine (2011)
Organics	$35	WME Magazine (2011)
Paper & cardboard	$225	WME Magazine (2011)
Plastics	$250	WME Magazine (2011)
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 and the types of data and information sets that were returned and analysed in 2012-13.

A2.1 Survey Participation & Reported data

Table A2.1 below summarises the survey participation and reported data points for 2012-13.

- The survey questionnaire was successfully deployed to approximately 109 or 92% of the initial list of 119 data sets from organisations potentially involved with recycling activity.
- The survey returns produced recycling activity data or information sets for 93 of these companies or organisations.
- Of these 93 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.
    - 7 were reference &/or aggregated data sets from industry bodies or government agencies
    - 22 data sets came from companies or organisations that generated the material that was being recovered for recycling
    - 65 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
    - 41 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		119		
Surveys Deployed*		109	92%	of Sample Size
Survey Data Points		93	85%	of Surveys Deployed
Activity Type	Industry Reference Data	7	6%	of Survey Data Points
	Source	22	20%	of Survey Data Points
	Aggregator/Collector	65	60%	of Survey Data Points
	Recycler	52	48%	of Survey Data Points
	Manufacturer	41	38%	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[19] – 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		93	
Material Activity	Masonry	20	22%
	Metals	33	35%
	Organics	35	38%
	Cardboard & paper	30	32%
	Plastics	27	29%
	Glass	16	17%
	Other Materials	27	29%
	E-waste	6	6%
	Reuse Materials	15	16%
Material Destination	SA	67	72%
	Interstate	33	35%
	Export	21	23%
Waste Hierarchy	Reuse	21	23%
	Recycle	55	59%
	Material Recovery	59	63%
	Energy Recovery	4	4%

[19] 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: 2012-13 Recycling Activity Survey Questionnaire

Survey Form – Recycling Activity in SA, 2012-13

Issued: 16 September 2013

1. Survey Company & Contact Details

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

- Mark Rawson, Principal Consultant, p: (08) 8294 5571, m: 0447 772 970, e: mark.rawson@rawtec.com.au
- Kat Heinrich, Consultant, p: (08) 8294 5571, m: 0432 254 454, e: kat.heinrich@rawtec.com.au

2. Survey Questions for Period 1 July 2012 - 30 June 2013

1.	Your company or organisation's contact address and details. Please also include the location(s) of your main facility(ies) for re-processing or handling of materials *Company/Organisation's Name:* *Contact Address:* *Location(s) of your main facility(ies) for re-processing or handling of materials:*
2.	Are you happy for your company to be recognised in the report as participating in the 2012-13 SA Recycling Activity survey? (*Please Circle/Highlight)* *[Yes / No]*
3.	Would you like to be invited to an industry seminar by Zero Waste SA summarising the findings of this 2012-13 SA Recycling Activity survey? (*Please Circle/Highlight)* *[Yes / No]*
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%** *For example, if you measure waste using a weighbridge an accuracy of **±1%**may be suitable.*

Table 1: Data entry of estimated quantities of recycling for 2012-13 for each relevant material from Table 2 (overleaf)

		MATERIAL SOURCE/INPUT					MATERIAL DESTINATION/OUTPUT				RESIDUAL
ID	Material	Materials received for recycling (in tonnes):		Source of material (in tonnes or %)			Destination of material for re-processing (in tonnes or as %)				% residual (if any) generated from recovery or re-processing to landfill
		SA-Metro	SA-Regional	Municipal	Commercial & Industrial	Construction & Demolition	Your SA facility(ies)	Elsewhere in SA	Sent Interstate	Sent Overseas	
	EXAMPLE	23,000	30	25%	70%	5%	10,000	530	10,000	2,500	10%

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

Definitions:

Municipal- Domestic household sourced waste

Commercial and Industrial- Industry and business sourced waste

Construction and Demolition- Building, construction and demolition waste

Table 2: List of Materials 2012-13 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	Miscellaneous Organics
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 2012 - 30 June 2013

	For the following questions, please enter responses directly into the table below.
6.	Were any of the reported materials derived from packaging? If yes, (for each material) approximately what proportion (as % of total)? *Material* *Proportion* • • •
7.	Have there been any significant changes in quantities, stockpiles, sources or destinations from last financial year?
8.	Where do you receive most of your material from, e.g. Councils, manufacturing, retail, hospitality, etc.?
9.	Where do you send most of recovered or re-processed materials and how are they recycled, e.g. compostors, building construction, plastics re-processor, material aggregator, e-waste recycler, quarry, etc.?
10.	What is your opinion about the market strength/prospects for recycled materials?
11.	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?
12.	Are there any significant barriers, e.g. market, regulatory, technology, for your SA operations?
13.	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?
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?

Appendix 4: 2012-13 Environmental Benefits Conversion & Emission Factors

Table A4.1 Emission and conversion factors adopted for estimation of environmental benefits of recycling, SA 2012-13. (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 weighted 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 weighted 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

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